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**Кваліфікаційна робота**

**КОМП'ЮТЕРНІ НЕОЛОГІЗМИ У НАУКОВО-ТЕХНІЧНИХ ТЕКСТАХ  
ЯК ПЕРЕКЛАДАЦЬКА ПРОБЛЕМА**

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**Department of Philology**

Qualifying paper

**COMPUTER NEOLOGISMS IN ACADEMIC AND TECHNICAL TEXTS  
AS A TRANSLATION PROBLEM**

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## **List of Abbreviations**

e.g. (exempli gratia) - for example

et al., - “and others” when a book has several authors

etc. (et cetera) - and other things

i.e. (id est) - that is

IT- information technology

n.d.- no date (of publication)

p., pp.- page/pages

## INTRODUCTION

Historical experience shows that the prosperity, viability, authority and security of any country depend primarily on the quality of higher education, the enhancement of the scientific and intellectual potential of society. Recently, our generation has opened the gates to a new era, the informational society era, which is characterised by the widespread use of computer technologies in manufacturing, administration, healthcare, commerce, education, science, etc. The key to acquiring many contemporary careers is digital literacy.

A few years ago, autonomous cars, humanoid robots and automated pets seemed like science fiction, but today they are the realities we live in. Medicine and biotechnology, ecology and energy, aerospace, education, culture, economy, fashion, entertainment, and technology are rapidly evolving.

Once there were only a few conversations about the creation of Artificial Intelligence, and today it is accessible from almost every smartphone. Many research and new technologies are just emerging, and this implies the formation of even more new words, terms, and concepts.

All spheres of human behaviour are interrelated, so where there is a development of one component, others are also evolving. Considering the technological progress of the last decade, however, there is no doubt that new concepts need new identities, and this is how neologisms come into existence.

The social importance of English is constantly increasing. And over the past decades, it has become the primary language of academic and scientific research. The greatest minds all over the world are working to create unique, new and never-before-seen inventions, describing their achievements in scientific articles, user manuals, video tutorials, and usually describing their work results in English. Consequently, the lexical structure of the English language is being intensively enriched with neologisms. The process of translating such units into Ukrainian is particularly difficult.

There is a significant amount of academic literature published on the problems related to neologisms. The major contribution to the field was made by Peter Newmark (1998). Newmark was one of the first, who described the concept of neologisms and distinguished neologisms by their typology. Moreover, many scholars from different countries have also contributed to the study of neologisms, including Awadh and Shafiull (2020), Moghadam and Sedighi (2012), Abdujalovna (2023), Fang (2021), Károly (2022). In terms of translation, we should mention the contribution of Mona Baker (2018), who identified the main methods of their translation. Additionally, in recent years, such authors as Dobrovolska et al. (2024), Bogachyk and Bigunov (2020), Khyzhun and Dyshleva (2023), Chornovyi (2024), Udovychenko and Mitsenko (2019) have made a great contribution to translation studies by researching the issue of neologisms.

The *relevance* of this study is determined by the dynamic progression of computer science and technology. Which in turn leads to the new terms and concepts creation in the academic and technical discourse. Furthermore, the *topicality* of the work lies in the rapid development of digital technologies, which will lead to the emergence of a significant number of new terms in English, many of which have no standardised equivalents in Ukrainian. This gap hinders effective communication in the scientific, academic, and technological fields. Therefore, a

systematic study of such terminology and strategies for its accurate and culturally appropriate translation is urgently needed.

The *object matter* of this study is English-language terminology related to modern digital and computing technologies.

The *subject matter* of this study is the challenges and strategies of translating computer neologisms in academic and technical discourse, with a focus on their linguistic, cultural, and contextual adaptation.

Therefore, the *aim* of this study is to identify, analyse, and translate contemporary English technical terms into Ukrainian using corpus and diachronic analysis in order to justify appropriate translation strategies and propose accurate Ukrainian equivalents. Furthermore, the *purpose* of the research is to analyse the peculiarities of computer neologisms in academic and technical texts. Identify the main difficulties translators face when rendering these terms into another language, especially Ukrainian. Additionally, the study target is to propose effective translation strategies to ensure accuracy and clarity in conveying specialized terminology.

The *tasks* of the thesis are as follows:

- Select academic texts on technical topics.
- Develop 12 corpora for each month in the period from January 2024 to December 2024 with one overall corpus that will include texts from January 2024 to March 2025 and conduct their analyses.
- Identify in texts computer-related neologisms using keywords method.
- Conduct a diachronic analysis of the general corpus.
- Conduct a diachronic analysis of each selected word.
- Search for the presence of neologisms in the dictionaries and analyse their translation.
- In case of absence of translation, analyse possible translation options.

The *novelty* of the research lies in:

1. A systematic analysis of the latest computer neologisms found in academic and technical texts.
2. An examination of translation strategies used to adapt these neologisms across different languages.
3. A comparative approach that evaluates the effectiveness of various translation techniques.
4. A focus on real-world translation issues, using corpus-based analysis and case studies from contemporary academic and technical publications.

This paper seeks to address the following *research questions*:

1. Are computer neologisms a problem for translators?
2. Do academic and technical texts of 2024-2025 contain any computer neologisms?
3. What is the most effective method for translating computer neologisms into Ukrainian?
4. Is diachronic analysis an effective method for identifying neologisms in academic texts?

Moreover, our main *hypothesis* is that a combination of corpus, diachronic and dictionary analysis is an effective method for identifying neologisms in academic and technical texts.

Both theoretical and empirical *methods* are employed in the study, such as analysis, synthesis, comparison, classification and generalization, corpus analysis, diachronic analysis, dictionary analysis,

*The practical* value of the study consists in developing useful instructional materials and practical recommendations for translators and researchers.

The master's thesis consists of contents, an introduction, three chapters, conclusions, a Ukrainian summary, a reference list, and appendices. The first chapter provides a theoretical basis for the research by presenting key concepts and approaches in translation studies. It focuses on the main types of translation, translation strategies, and the specifics of translating new and emerging vocabulary.

The second chapter addresses the theoretical foundations of word formation and neologisms, discussing how new lexical items appear in the language, the stages of their development, and the criteria by which they become recognized as part of the lexicon. It also explores the classification of neologisms and their translation as the linguistic problem.

The third chapter presents the practical part of the research. It includes a corpus-based analysis of academic texts, focusing on the identification of key neologisms, their frequency and usage patterns. The study also involves a diachronic analysis of selected terms and a comparison of their representation in different dictionaries. The aim of this chapter is to identify English neologisms in the field of IT and provide their Ukrainian translations. The conclusions are based on the theoretical framework as well as the results of the empirical analysis conducted in the third chapter.

## PART 1

### TRANSLATION AS A SCIENTIFIC STUDY

This part deals with studies in the field of linguistics and translation studies. In this section we try to describe the basic concepts of translation, types of translation, its strategies, and the complexities that arise in the process of translation. Since English is considered as a lingua franca for most spheres, such as medicine, business, politics, engineering, technology, and economics, it is essential for translators to be equipped with the competence or knowledge to transfer specific nuances in all language areas. Since technologies are evolving, it is necessary to develop new concepts for the designations of these new ones, and consequently, these concepts need to be transferred into foreign languages. While the Ukrainian language is no exception, an increasing number of words of foreign origin are entering the Ukrainian glossary. However, the most significant effect of such influence occurs in the IT sector. Over the past decade, numerous articles have been published in this field, researches have been carried out, and myriads of new concepts have been created and coined. To explain these notions to a foreign language listeners or readers, scientists, researchers, technicians, etc. require materials which are available in their native language. Therefore, we could hypothesise that translators are encountering even more challenges. Hence the increase in number of surveys. The fact that scientists continue to study translation with increasing frequency shows the importance of the research field. With the passage of time, new technologies have begun to rapidly reach all spheres of human existence. Therefore, it is no longer possible to imagine a society without innovations and devices. Since the development and improvement of technology is continuous and unstoppable, this topic is particularly relevant in translation studies. As translation is involved in all communication spheres of life, such as education, human labour relations, business, and trade. The first part of the study provides the theoretical and conceptual background of the researches through the literature review on the theory of translation. Furthermore, we will discuss the academic and technical translation and the difficulties that translators face in the process of working with these types of texts.

#### **1.1. James J. Holmes' Classification of the Field**

Despite the fact that the first attempts at translation were made several centuries ago, scholars have been trying to define and classify translation theories into a single field for a long

period of time. One of the first attempts to classify translation theories was ‘The Name and Nature of Translation Studies’, a fundamental paper which was presented by Holmes in 1972 at the meeting of the Translation Section of the Third International Congress of Applied Linguistics held in Copenhagen in August 1972. Later, the paper was published in a new expanded volume entitled *Translated!* Holmes (1988).

As noted earlier by Snell-Hornby (2006), the contribution made by James Holmes may have been the foundation stone for the development of the translation discipline.

Holmes (1988) in his work identifies two main goals of translation studies, “to describe the phenomena of translation and translation(s) as they appear in the world of our experience, and to establish general principles by which these phenomena can be explained and predicted” (p.71).

He divides translation studies into two main categories:

1. descriptive translation studies (DTS)
2. theoretical translation studies (ThTS)

He distinguishes between three types of descriptive translation studies: “product-oriented, function-oriented, and process-oriented” (p.72).

The first type describes existing translations. Individual translations or text-centric translation descriptions are researched by this type in different languages. Holmes clarifies that such studies can be either synchronous or diachronic, or wider in scope. The second type deals with the exploration of contexts. Exploring different text translations, the time frame they were written in, where they were written, and their influence. The third type deals with the translation processes. It was intended primarily to analyse the processes that take place in the brain of a translator at the moment of translation.

Another major area of pure translation studies, according to Holmes, is the branch that incorporates information from all related fields and combines it with descriptive translation studies. It develops models, principles and theories of translation and is consequently called ‘translation theory’ (p.73).

The author argues that the main goal was to develop a theory that would encompass so many elements that it could explain all phenomena that fall within the field of translation. He also emphasises that although the overall theory is complex and at the same time it needs to be well formalised.

Holmes also proposed a categorisation that distinguishes between six types of translation theories:

1. Medium-restricted translation theories. These can fall under the categories of human translation, machine translation, and mixed translation. He then divides human translation into interpretation and written translation, with further breakdown into simultaneous and consecutive interpretation.
2. Area-restricted translation theories. This type involves cultural and language limitations.
3. Rank-restricted translation theories. This category encompasses such theories that work with the entire text or discourse but are concerned with lower language levels.
4. Text-type (or discourse-type) restricted theories. These theories are concerned with the translation of specific genres and kinds of text.
5. Time-restricted theories. This type also has two subtypes: translation of ancient texts and translation of contemporary texts.
6. Problem-restricted theories. Here Holmes means those theoretical issues that can vary from such a wide and fundamental question to more specific issues, which are limited to a single or a few specific challenges within the whole scope of the field of general translation theory.

According to the author, there is in addition a field of applied translation studies, which includes four different subjects:

1. The teaching of translation, which includes both language teaching and the professional training for translators, dividing them into two subgroups.
2. Aids for education regarding language grammar, terminology as well as lexicography.
3. The translation policy.
4. Translation criticism.

The author emphasises that although the three types have been defined separately, they are also correlated, each of the three branches providing materials for the other two and using the outputs they provide to it.

## 1.2. The Definition of Translation

Since ancient times, people have made their first attempts at translating texts. However, translation as a science has only recently begun its development. Many scholars have begun to describe the theoretical concept of translation, its meaning, classify types, describe techniques and strategies. As a result, translation became an object of research in translation studies.

Over the 20th century, a number of different approaches have been developed to define translation. For instance, Catford (1965) defined translation as: “the replacement of textual material in one language (SL) by equivalent textual material in another language (TL)” (p. 20).

Similarly, Hartmann and Stork (1972) argued that translation is the replacement of a representation of a SL by a representation of an equivalent text in a TL.

The definition proposed by Nida and Taber (1969), considered translation as an act of transmitting the closest natural equivalent of the source text, focusing on semantic and stylistic accuracy rather than direct replacement. This type of explanation involves the following key terms: Closest, which links the two together based on the highest degree of approximation, Natural, which corresponds to the target language, and Equivalent, which denotes the source material.

According to Newmark (1981), “Translation is a craft consisting in the attempt to replace a written message and/ or statement in one language by the same message and/ or statement in another language. Each exercise involves some kind of loss of meaning, due to a number of factors. It provokes a continuous tension, a dialectic, an argument based on the claims of each language. The basic loss is on a continuum between overtranslation (increased detail) and undertranslation (increased generalisation)” (p.7).

The definition of translation has evolved, with early scholars such as Lefevere(1992) defining it as: “the most obviously recognisable type of rewriting, and since it is potentially the most influential because it is able to project the image of an author in another culture, lifting that author and those works beyond the boundaries of their culture or origin”(p.9), while in the collection of essays edited by Laurence Venutti (2000), was highlighted a paper from 1996 written by Annie Brisset, who described the translation as: “a dual act of communication” (p.343).

Bassnett (2002) offers a definition of term translation, describing it as the rendering of a source language (SL) text into the target language (TL). She considers two important points: that the surface meaning of both materials was approximately the same, and that the structures of the

target language have been reproduced as accurately as possible, but not to the degree that the structures of the source language have been seriously misrepresented.

She also emphasizes that this process is not just a straightforward transfer of texts from one language into another, but rather a process of intertextual and intercultural negotiation, a procedure in which all kinds of transformational processes take place, often negotiated by the person of the translator.

The definition proposed by Toury (1995) highlights the significance of translation, and describe it as: “a kind of activity that inevitably involves at least two languages and two cultural traditions, i.e. at least two systems of norms at each level” (p.200). Emphasising that in this case, the text belongs to a certain place in the particular culture and being a reproduction in that culture of a text in another language that belongs to another tradition and places in it a certain role.

Translation is seen as an interpretation which necessarily reconstitutes and transforms the foreign text (Venuti, 2000).

In conclusion, the concept of translation is complex and has been approached from multiple angles. Scholars highlight various aspects of the process, including the transfer of meaning, the influence of cultural contexts. Some perspectives focus on maintaining the original message, while others stress the importance of adapting content to suit new audiences. This variety of viewpoints reflects the evolving nature of translation, which extends beyond language to include cultural and interpretative dimensions. Exploring these perspectives offers a deeper understanding of how translation functions in diverse contexts and its significance in facilitating communication across languages and cultures.

### **1.3. Translation Types**

The field of translation studies recognizes a diverse range of approaches, each catering to specific communicative goals and textual characteristics. One of the foundational distinctions lies in the concept of literal translation, which, as defined by Newmark (1988), " ranges from one word to one word, through group to group, collocation to collocation ,clause to clause, sentence to sentence"(p.69). This method often proves useful in technical or legal documents where precision is paramount, aiming for maximal accuracy in representing the original text's factual content. However, relying solely on literal translation can frequently lead to awkward phrasing and a lack of naturalness in the target language, potentially hindering comprehension or

misrepresenting the author's intent, as highlighted by Venuti (1995) in his critique of "foreignizing" translation strategies. The inherent limitations of literal translation underscore the need for more nuanced and adaptable approaches that consider the broader context and communicative purpose of the text. This method is a cornerstone in the translator's toolbox.

In contrast to the emphasis on word-for-word correspondence, idiomatic translation seeks to convey the meaning of the source text in a way that is natural and idiomatic in the target language. According to Newmark (1988), idiomatic translation "reproduces the 'message' of the original but tends to distort nuances of meaning by preferring colloquialisms and idioms where these do not exist in the original" (p.47). This approach often involves rephrasing sentences, substituting cultural references, and adapting stylistic elements to resonate with the target audience. The primary goal is to achieve a translation that reads as if it were originally written in the target language, preserving the author's intent and the overall impact of the text.

Furthermore, adaptive translation, also known as "free translation," represented a more liberal approach, prioritizing the overall message and impact of the source text over strict adherence to its form. As Lefevere (1992) argued, this type of translation involved rewriting the source text for a new audience, often transforming its cultural and ideological context. This approach was commonly employed when translating literary works, marketing materials, or other texts where emotional or persuasive impact was paramount.

Adaptive translation allows translators to make significant changes to the original text, such as adding or omitting information, restructuring sentences, or adapting cultural references, to ensure that the translated text effectively communicates the intended message to the target audience. However, the freedom afforded by adaptive translation also raises ethical concerns about the potential for misrepresentation or manipulation, necessitating a high degree of responsibility and sensitivity on the part of the translator, as explored by Robinson (1997).

Moreover, communicative translation, described by Newmark (1988), "Communicative Translation attempts to produce on its readers an effect as close as possible to that obtained on the readers of the original" (p.47). This approach emphasizes the importance of considering the target audience's knowledge, expectations, and cultural background when translating a text. Communicative translation seeks to bridge the gap between the source text and the target audience by adapting the language, style, and cultural references to ensure that the translated text is clear, concise, and relevant. This involves a careful assessment of the text's purpose, audience, and context, allowing the translator to make informed decisions about how to best convey the intended message. The focus on clarity and accessibility makes communicative translation

particularly suitable for translating informative texts, such as news articles, educational materials, and technical manuals. This method is a cornerstone in the translator's toolbox.

According to Catford (1965), translation types vary according to levels, ranks and extent of transfer. Full and restricted translation refers to the levels of the target language. By total translation, Catford (1965) meant a translation in which all levels of the source text are replaced by the target language material. Building on this point, Catford (1965) defined total translation as 'the replacement of the grammar and vocabulary of the target language with equivalent grammar and vocabulary of the source language, followed by the replacement of the phonology and graphology of the target language with the (non-equivalent) phonology and graphology of the source language. By restricted translation, the author distinguishes between the replacement of the source text with equivalent target language text at only one level, i.e., the translation is carried out only at the phonological or graphological level, or only at one of the two levels of grammar and vocabulary.

In the same vein, Catford suggests that in a phonological translation, the source language phonology is replaced by the equivalent target language phonology, but no other substitutions are made, except for grammatical or lexical changes that may occur accidentally in a phonological translation. In a graphical translation, the graphology of the source language is replaced by the equivalent graphology of the target language, with no other substitutions except, again, for accidental changes.

Moreover, the second type of differentiation in translation is related to the rank in the grammatical (or phonological) hierarchy at which the translation equivalence is established. In an ordinary full translation, the grammatical units between which translation equivalences are established can be of any rank, but in a long text, the rank at which translation equivalences are established is constantly changing: in one place, equivalences are established between sentences, in another – between groups, in a third – between words, etc.,

In addition to this, the author highlights the third type of differentiation in translation relates to extent. Full and partial translation refers to the scope (in the syntactic sense) of the text of the source material to be translated. By text, the author means any piece of language, spoken or written, that is the subject of discussion. Depending on the circumstances, a text can be an entire library of books, a single volume, a chapter, a paragraph, a sentence, a clause, etc. It can also be a fragment that is not voluminous and is not a formal literary or linguistic unit. In case of full translation, the entire text is subject to the translation process: that is, each part of the source text is replaced by the target language text. In contrast, in a partial translation, a part or parts of

the source text remain untranslated: they are simply transferred to and incorporated into the target language text.

In terms of differentiation, Brislin (1976), distinguishes between translation types, according to their purpose into four types: pragmatic, aesthetic-poetic, ethnographic, linguistic translation (pp. 3-4).

The first distinction the author makes is pragmatic translation, which represent the “translation of a message with an interest in accuracy of the information meant to be communicated in the target language form” (p.3). Belonging to such translation is the translation of technical information, such as repairing instructions.

The second type, according to the author, is aesthetic-poetic translation that does not only focus on the information, but also the emotion, feeling, beauty involved in the original writing

The third type in the classification is ethnographic translation that “explicates the cultural context of the source and second language versions” (p.3).

The last type is linguistic translation, the one that is “concerned with equivalent meanings of the constituent morphemes of the second language and with grammatical form” (p.4).

Alternatively, Jakobson (1959) divided three types of translation:

1. ‘Intralingual translation’ which encompasses interpretation of verbal signs by means of other signs of the same language.

2. ‘Interlingual translation’ is an interpretation of verbal signs by means of some other language.

3. ‘Intersemiotic translation’ is an interpretation of verbal signs by means of signs of nonverbal sign systems.

In conclusion, the choice of translation type depends on a variety of factors, including the nature of the text, the purpose of the translation, and the needs of the target audience. While literal translation prioritizes accuracy and fidelity, idiomatic and adaptive translation prioritize fluency and impact. Ultimately, effective translation requires a nuanced understanding of both the source and target languages, as well as a keen awareness of the cultural and contextual factors that can influence meaning, a multifaceted skill that underscores the complexity of the translator's role. These different translation types offer a spectrum of approaches, enabling

translators to adapt their strategies to suit the specific demands of each project and ensuring that the translated text effectively achieves its intended purpose. Understanding the strengths and weaknesses of each type allows for informed decisions that optimize communication across linguistic and cultural barriers.

#### **1.4. Translation Techniques**

Many scholars have attempted to classify the types of translation techniques (Vinay & Darbelnet (1958); Nida (1964); Catford (1965); Newmark (1988); Molina & Albir (2002) ;). For example, Vinay & Darbelnet (1958) identified 7 main translation methods or strategy, and later Molina & Albir (2002) distinguished between the concepts of method, strategy and technique, defined them and proposed 17 translation techniques.

Vinay and Darbelnet (1958) identified two principal methods of translation, which encompass a variety of procedures grouped into seven subcategories.:

##### Direct Translation

1. Borrowing is the simplest method used to describe unknown concepts. In some cases, it seems to be better to borrow a word rather than trying to find an equivalent in the target language. (Vinay & Darbelnet, 1958)

2. Calque is a word-for-word translation of a borrowed expression in one language from another. There are two calque types:

2.1. Lexical calque, which provide an alternative way of expression;

2.2. Structural calque, which enters a new language construction

Moreover, Vinay & Darbelnet (1958) note that over time many calques became an integral part of the language, in the very same way as borrowings.

3. Literal Translation is the direct rendering of a source language text into a target language text that is appropriate grammatically and idiomatically, and the task of the translator is limited to following the target linguistic norms.

##### Oblique Translation

1. Transposition is a replacement of one word class using the other one with no changes in the sense and meaning of the text. Moreover, it can be applied within the same language.

2. Modulation is a changed perspective or point of view that changes the form of a message. Vinay & Darbelnet (1958) distinguish between the following types of modulation: ‘free or optional modulations and those that are fixed or obligatory’.

3. Equivalence is use of different expressions, phrases, texts, structural and stylistic methods to represent the same situation.

4. Adaptation occurs when the concepts of the source language do not appear in the culture of the target language.

As we have already mentioned at the beginning of this section, Molina and Albir (2002) in their article intended to separate the concept of translation techniques from translation methods and translation strategies because there was no previous agreement on the terminology of these concepts. As previously noted by Hurtado (1996), these three concepts belong to different categories. On this basis, they proposed their own categorisation of translation techniques based on the following principles: retaining the most commonly used terms, formulate new techniques to explain mechanisms that have not yet been described. Furthermore, to separate the concepts, including only the procedures specific to the text translation, while taking into account the fact that translation techniques are highly functional.

Consequently, according to Molina and Albir (2002), translation techniques are ‘procedures to analyse and classify how translation equivalence works’. Thus, to the techniques previously discussed, they included the following:

1. Amplification is the introduction of details that were not previously formed in the source language

2. Compensation is the reflection in another place in the text of an element of information or stylistic effect contained in the source language because it cannot be reflected in the same place as in the target language.

3. Description is the process of substituting a concept or term with a description of its form and/or function.

4. Discursive creation is the establishing of an unpredictable out-of-context or temporary equivalence

5. Established equivalent is a technique of employing a recognized by dictionaries expression or term as an equal in the target language.

6. Generalisation is a technique in which the most general or neutral term is used, it is the opposite of specification.
7. Linguistic amplification is the addition of extra elements of language.
8. Particularization- the opposite of generalisation, which means the use of a more precise or specific term.
9. Reduction is the contrary concept to amplification, which is the replacement of an element of information about the source language in the target language.
10. Substitution (linguistic, paralinguistic) is a technique used in interpreting and is the replacement of linguistic elements with paralinguistic ones (intonation, gestures) or vice versa.
11. Variation is a transformation of linguistic or paralinguistic elements that influence aspects of language variation.

### **1.5. Academic and Technical Text Translation**

Before proceeding with translation of academic and technical texts, it is necessary to find out what these types of texts are, what styles they are written in, and what their peculiarities are. According to the textbook by Kostyrko et al. (2022), academic writing is defined as the ability to express and prove one's ideas in a short, yet sufficiently convincing scientific text.

A scientific text aims to discuss, synthesize, and analyze information to explain new theories, ideas, and evaluate methods, while a technical text conveys information as clearly and efficiently as possible. According to these contrasting goals, the language used in each type of text, and thus the strategies required for their translation, can differ significantly (Byrne, 2006).

One of the most compelling reasons for studying scientific and technical translation is that in many cases the translation of documents in these domains is an activity which is required by law. In Europe, EU Council Resolution C411 specifically states that in order to be able to legally sell or distribute technical products and appliances, all technical documentation relating to the product must be translated into the language(s) of the country where the product is to be sold (Council of the European Union, 1998).

Shevchuk and Klymenko (2001) states that a scientific text necessarily reflects a particular problem, puts forward hypotheses, focuses on new knowledge, is characterized by the expediency and rationality of all provisions, and is focused on achieving the research goal and

objectives. It is rational in nature, consists of judgments, conclusions built according to the rules of the logic of science and formal logic. The text is not based on an image, does not activate the sensual world of its reader, but is oriented to the sphere of rational thinking. Its purpose to prove, substantiate, and argue the truth.

Passive Voice is one of the most frequent, well known and well documented strategies in scientific text. (Swales, 1990). The text should be clearly structured, divided into sections and paragraphs. You should strive to ensure that each section is an independent scientific study of a particular component of the overall problem, that each component is described in the text, and that the text is coherent rather than fragmented. In addition to dividing the text into sections and paragraphs, it has a detailed division into meaningful parts, paragraphs, and sentences. The internal formatting pattern such as Introduction, Method, Discussion and Result sections (IMRD) in scientific research articles is a recurrent phenomenon (Ahmad, 2012). It is worth remembering that excessive fragmentation of the text makes it difficult to perceive it, so paragraphs should be reasonable and be limited to expressing one idea. The text should be composed. The beginning and the end of paragraphs in a scientific text are the most informative places; other sentences only reveal, detail, substantiate, specify the main idea or serve as connecting elements. When presenting the material, you should avoid concepts that cannot be interpreted unambiguously. There should be no repetition in the text, in particular, this applies to conclusions, which require a new level of systematization and generalization.

A scientific text is devoid of the author's "I". Preference should be given to impersonal forms of presentation (Ding, 2002). It should be characterized by brevity and clarity of presentation. This requirement implies the prevention of repetition, verbosity, unnecessary words, bureaucracy, etc.

Translating academic texts requires a comprehensive and meticulous methodology that should not be limited to direct semantic based processing. All of this can be done while maintaining the same core values and critical arguments and finding alternative ways of adapting into the new academic community.

In particular, one of the essential strategies is to have full knowledge of the disciplinary contextual and the relevant terminology of the source text. Specialized knowledge of the subject being translated is necessary to be able to accurately translate subtle concepts and maintain terminological consistencies across languages (Muthu, 2022). This usually requires a lot of research, engaging with subject matter experts, and specialized dictionaries and glossaries. In

addition, academic translators need to be sensitive to the rhetorical and stylistic differences among academic traditions.

Specially, direct quotations, argumentation patterns, and citation styles vary a great deal from one language to another and across disciplines (Mauranen, 1993). Ultimately, translators need to accommodate these into the conventions of the intended research community, so what ends up in translation is a text that reads fluently and persuasively.

A second crucial strategy concerns the attention to the logical cohesion and fluency between the arguments in the original text (Hatim & Mason, 1990). This would involve the use of cohesive devices like conjunctions, pronouns, and topic sentences, which would need to be adapted as appropriate to ensure that sentences flow clearly and naturally in the target language. Additionally, sometimes restructuring of sentences or paragraphs is needed for it to be idiomatic in the style common of academic writing in the respective language (Venuti, 1995).

Lastly, effective academic translation requires an articulation of self-reflexive practice around the space for cultural and ideological biases in the source text, which is tempered with the awareness that such articulation leads to textual bias (Bassnett & Lefevere, 1990). Such biases must be sensitive to by translators, who should do their utmost to render the text correctly and appropriately culturally, steering clear from translations that may otherwise be misconstrued (or offensive) when used in the target context. The adoption of such subtle approaches by academic translators allows them to successfully navigate between languages and cultures, encouraging knowledge-sharing and international cooperation in the academic domain

Technical texts have their own unique set of challenges and translating them requires specific strategies that go beyond general linguistic competence. Being accurate and clear is key because misunderstandings can cause incorrect implementations, safety issues, and losing a lot of money.

One particular technique is getting terminology in order. The consistent and precise use of terms across languages is fundamental, which usually requires the creation and maintenance of glossaries and term bases (Dagan and Church, 1994). In addition, researchers denote the need to understand the purpose of the technical text as well as the audience who will read it. As an example, a instructions manual for expert technicians will demand a different tone than that of a user guide for everyday consumers.

A highly effective strategy is to use Computer-Assisted Translation (CAT) tools. They provide benefits like consistency, efficiency, and accuracy, because they store, reuse, and

rearrange previously translated segments, so the risk of mistakes is reduced and the time spent on translation is lessened (Karpinska, 2017). In addition to technological aids, having subject matter experts involved in the review process to ensure technical accuracy and compliance with industry standards is invaluable (Konger, 2024). This partnership allows for the fusion of linguistic needs with technical expertise, creating a more trustworthy translated document.

Finally, when it comes to cultural adaptation, it is often ignored in technical translation, but is still vital in user acceptance and understanding. This entails adjusting not just units of measurements and date formats, but also pictorial elements, to afford congruence with local cultural norms and expectations (Vandepitte, 2008). Ultimately, the successful translation of technical texts hinges on a diverse methodology that integrates linguistic competence with technical knowledge and thoughtful employment of technological resources, all while retaining a strong sense of the intended reader and their cultural background.

## PART 2

### THE ENTIRE PROCESS OF FORMING NEW WORDS

We have already mentioned that words continue to emerge as languages are constantly evolving, but what exactly is word formation and what concepts underlie this entire process? Before entering the dictionary, words are developed, conceptualised, acquire their meaning, and only then they are entered into language use, and if possible, into the dictionary. Therefore, in this section we will analyse the process of word formation, the notion of word meaning, and finally we will delve into neologisms. This chapter covers neologisms, including their meanings, classification, and well-known ways of their translation.

#### 2.1. The Primary Word Formation Process

Before we focus on neologisms, we take a brief overview of how their history begins and how new words usually appear. The science that deals with the history and origin of words is etymology, which according to the dictionary of Merriam Webster Dictionary(n.d.) is “the history of a linguistic form (such as a word) shown by tracing its development since its earliest recorded occurrence in the language where it is found, by tracing its transmission from one language to another, by analysing it into its component parts, by identifying its cognates in other languages, or by tracing it and its cognates to a common ancestral form in an ancestral language”. The beginning of a word's development is its formation, so in this section we will look at the processes of word formation that we know.

The history of language formation covers centuries and is deeply connected to other languages. As Yule (2014) noted in the fifth edition of his book ‘The study of language’, one of the largest sources of new words in the English language is borrowing. In the same way, other languages borrow words from English.

For instance, Kristo (2021) studied neologisms in German. He argued that despite the fact that a large number of new words originate in German, the number of Anglicisms has increased significantly. Plechko et al. (2022) also argued that the reason for this phenomenon is the lack of equivalents to denote newly formed phenomena. Thus, Lukianova (2017) identifies the following types of borrowings: International Words, Etymological Doublets and Translation-Loans.

Yule (2014) also distinguishes a special type of borrowing: Loan-translation or calque, as he noted, this process is a direct translation of word elements. As Marynenko (2017) specified, the basis of this process is a foreign language unit, but the formation takes place by means of non-borrowed elements of the language. The author also distinguishes several types of calques, such as lexical, semantic, phraseological and semi-calques.

Another author, Radoslav Pavlík (2017) in his textbook “A Textbook of English Lexicology I. Word Structure, Word-Formation, Word Meaning” classified the ways of word formation according to the number of newly formed lexemes in the process, and they are grouped as follows: primary (major), secondary (minor), and marginal word-formation types.

According to the author, the most productive ways of word formation are conversion, compounding, and affixation. Similarly, Bogachyk and Bihunov (2020) in their study found that affixation and compounding are productive in the computer terms formation processes. On the other hand, blending was the least productive. As Pavlík (2017) states, the process of affixation is characterised by adding, to at least one root lexeme, derivational affixes. As noted by Lukianova (2017) the role of affixes in this process is highly important. Affixes add additional meaning to a word and show to which large group of concepts it belongs and what is more important, they change the tone of the whole word.

The second process highlighted by Pavlík (2017) is called compounding, he describes it as a process that requires at least two morpheme roots. As noted by Yule (2014), this process is typical for German and English.

The third process identified by Pavlík (2017) is conversion. This process does not require affixation and at the same time completely changes the class of the word, it is also called zero derivation. Yule (2014) likewise called this method very productive and gave many examples of how verbs can become nouns, adjectives and vice versa. Similarly, Lukianova (2017) noted that this method is particularly relevant to Modern English.

To the secondary ways of word formation Pavlík (2017) referred shortening, blending, back-formation, reduplication and lexical ellipsis. Lukianova (2017) distinguished two types of shortening: in the case of the first, words may lose their beginning, end or even both. And the second one, also known as initial shortening, characterised by the formation of words using the initial letter. Pavlík (2017), on the other hand, divides shortenings into four subtypes: Clipping, acronym, initialism and graphical abbreviation. Clipping in this case is the first type, and acronym is the second type distinguished by Lukianova (2017). Similarly, Pavlík (2017) outlined, initial, medial, final or their combination as possible clipping methods. There are also initialisms,

formed in the same way as acronyms, but they are spelled out in all cases. And the last one, referred only to written language. In this type of shortening words are abbreviated graphically, but in spoken language they are always pronounced in their full form.

The second minor type suggested by Pavlík (2017) called blending. This process involves merging of two words into one. As noted by Yule (2014), in most cases, the beginning of one word and the end of another is used, however, combining the beginnings of two words may also happen.

Back-formation is defined by Yule (2014) as ‘a very specialised type of reduction process’ (p.54). In addition, Pavlík (2017) explained that this process involves removing suffix-like elements. Therefore, shorter forms of the words appear later than the longer one.

According to Pavlík (2017), reduplication represents a combination of two morphemes, commonly similar or identical. In addition, the last procedure in minor group is lexical ellipsis. Omission of a word or group of words is a key feature of this process.

Finally, the marginal types, which were characterised by a limited ability to produce new words. Pavlík (2017) distinguishes between sound interchange (phoneme mutation that leads to a modification in word category); eponymy (use of proper names); shift of stress and sound symbolism (onomatopoeia and iconism).

Thus, in this section, we considered the processes of word formation. These processes play a crucial role in language enrichment and affect changes in society, science and culture. They contribute to the renewal of the lexical structure, providing a means of expressing new notions and phenomena.

## **2.2. Meanings of Words**

To begin with, it is important to review the theory of what lies behind the meaning of a word and the process of naming, specifically, the assumption. It was the concept of assumption that brought Ferdinand de Saussure to the idea that two terms united by an associative relationship constitute a linguistic unit with a double essence. (Saussure,1916/1959). According to author, the linguistic sign unites the signifier and the signified, with an arbitrary bond between them (p. 67) and a linear nature of the signifier. He also argues that language evolves as both elements maintain a degree of independence, shaped by forces affecting either sound or meaning (p. 76).

For more than a century, scholars continued to debate about the definition of meaning. For example, one of those who tried to explain the essence of this word were Odgen and Richards (1946) in their book ‘The Meaning of Meaning’. They outlined at least 16 definitions of this concept, from different fields, and concluded that it is difficult to define a single meaning that would be universal, so they decided not to use the term ‘meaning’ and suggested replacing it with such terms as ‘*value*’ or ‘*referent*’, etc.

However, as Hasan (2023) notes, the problem is still relevant, and there are many existing concepts, each of which defines the word ‘meaning’ in its own way. In his article, the author considers that meaning is defined in terms of references, concepts, mental representations, brain states, use, etc.

Geoffrey Leech in 1981 in the second edition of his book “Semantics, the study of meaning” distinguishes seven types of meaning. Conceptual Meaning, and the other six- connotative, social, affective, reflected, collocative and thematic meanings.

Thus, the author considers the first one to be primary. Conceptual meaning/denotative/cognitive, as stated by the author, is based on two principles: contrastive and structural. Contrastive features underlie the classification of sounds (the author clarified that phonetic symbols can be explained by a set of contrastive features, positive and negative), so the conceptual meanings of language, as the author argued, can be studied in terms of contrastive features. The principle of structure is that all larger language structures are built from smaller ones. As an example, the author cited a tree-diagram, which is used to illustrate the hierarchy of structures in a sentence.

The second type, Connotative Meaning. Leech (1981) defined this type of meaning as “the communicative value an expression has by virtue of what it refers to, over and above its purely conceptual content” (p.12). According to the author, this meaning is not common to all, but differs depending on the person's perceptions, has many different forms and values, may include different properties and characteristics, and changes over time.

The author defines the third type as follows: “Social Meaning is that which a piece of language conveys about social circumstances” (p.14). According to the author, this type consists in decoding different meanings that we distinguish in one text. For example, Crystal and Davy (1969) in their book ‘Investigating English Style’ identified the following types of variations: time, modality, dialect, status, province, singularity, etc. Leech (1981) points out that there are different styles within one language.

The fourth type, according to Leech (1981), Affective meaning, represents the speaker's personal feelings, his or her attitude towards what is said and towards the audience, specifically how this is reflected in the language. An important aspect of this type is the speaker's intonation and tone of voice.

The fifth and sixth types are interrelated at the lexical level, as the author notes. Reflected meaning refers to when a word has multiple conceptual meanings, and one of these meanings influences how we understand another meaning of the same word. The most prominent examples of this, according to the author, are words with taboo meanings. Collocative meaning represents associative concepts that have been formed by the words surrounding it.

According to the author, associative meaning is summative, because it is generalised, and brings together collocative, connotative, affective, reflected, and social meaning. This type of meaning is not stable and changes according to the individual's experience (p.19).

The final type, thematic meaning, which depends on how the communicator structures the message in terms of word ordering, focus and emphasis.

Additionally, Palmer (1981) in his book 'Semantics' distinguishes two types of relationship between words and meaning: syntagmatic and paradigmatic. "By syntagmatic is meant the relationship that a linguistic element has with other elements in the part of speech in which it occurs, while by paradigmatic is meant the relationship that it has with elements by which it can be replaced or substituted" (p.93). The author argues that words acquire their meaning referentially, as parts of sentences.

In this section, we have discussed several theories related to the meaning of the word. Despite the fact that scholars still have struggled to reach agreement on a general definition of the term, and this topic requires further study and discussion, a considerable contribution has been made to the classification of the concept.

### **2.3. Analysis of Definitions of Neologisms**

Neologisms can be defined in a myriad of different ways. To find the meaning of a word, people primarily turn to the well-known dictionaries. In the case of the word "neologism", we will begin with some definitions from dictionaries.

Dictionary entries describe neologism in terms of its basic feature - novelty. According to Merriam-Webster Dictionary(n.d.) neologism is "a new word, usage, or expression", while

Cambridge University Press (n.d.) define neologisms as “a new word or expression, or a new meaning for an existing word”. Similarly, Collins Dictionary(n.d.) describes them as “a new word or expression in a language, or a new meaning for an existing word or expression”. This minimalist approach reflects the general understanding of the term, but it lacks depth when applied to linguistic research or translation studies.

The development of this phenomenon should begin with the earliest references, gradually moving on to more recent studies. One of the first authors to define neologism was Peter Newmark (1988). Author describes neologisms as “a newly coined lexical units or existing lexical units that acquire new sense” (p. 140). While this definition is clear and practical, it does not address factors such as the societal perception of novelty or the duration for which a unit retains its neologistic status.

More recent academic contributions highlight a greater complexity. Slaba (2014) describes this term as “new in their meaning or form, or form and meaning, units of the lexical system of a language that are identified as such by representatives of a given language community and reflected in the dictionary of new words” (p.152).

Dziubina (2017) emphasizes that neologisms should be considered to be a new word or a stable word combination, new either in form or in content, or in form and content, possessing the seme of novelty over a certain period of time. These are units that have entered the lexical and semantic system of a language, a linguistic sphere and did not exist in the previous period in the same language, sublanguage, linguistic sphere, formed according to the word-formation laws of the respective language, sublanguage or borrowed from another language in connection with the need for communication, or which have passed from the passive voice of the language. They possess established semantic, pragmatic and stylistic properties (features) and are perceived by speakers and society as new and recorded in the dictionary of new words.

Similarly, Styshov (2019) believes that the most complete definition is: “Neologisms (from the Greek νέος - young, new and λογισμός - judgement, statement) are words, collocations, phraseological units, their individual meanings that appeared at a certain stage of language development to denote new realities and concepts, peripheral nominations, the actualisation of which is caused by social and territorial factors of the functioning of the literary language, as well as occasionalisms (individual authorial innovations) used once in the language practice a particular author, edition, editorial board or in a particular text; the novelty of these nominations is still recognised by speakers and they belong to the passive layer of the lexicon” (p.32).

A broader perspective is offered by Borys (2015) who defines a neologism “as a unit of the lexical or phraseological level characterised by absolute or relative novelty in terms of actualisation, genetic, glossary, denotative and/or linguistic and speech parameters” (p.59). Rets (2016) furthers this multi-theoretical approach by outlining five theories that defined the term neologisms from distinct angles: stylistic, denotation, structural, etymological and lexicographic. According to the author, each theory took a unique view of neologisms: the stylistic theory focused on their novelty, while the denotative theory described their new denotative meaning, the structural theory dealt with their new structure and new sound, the etymological theory concentrated on the evolution of meaning, and finally, the lexicographic theory dealt with the absence of these words in dictionaries.

Several authors focus on the transitional status and functional aspect of neologisms. Stezhko (2012) argued that the word ‘neologism’ was used as a synonym for ‘innovation.’ Investigating the process of neologisation of speech, the author referred to neologisms as lexical and semantic new formations—words, phrases, phraseologisms, slangisms, jargon, which were used in the vernacular of certain social groups, author's innovations (okazionalisms), etc., which were used by the speaker outside the normative language regardless of the nature of their origin and time of functioning. However, every ‘new’ word had the status of a neologism until it was integrated into the generally accepted common language (p.118). Ustinova (2015) similarly emphasised that at that time, the concept of ‘neologism’ acquired a wider meaning since, there were a large number of units of its system (terms, professionalisms, slangisms, jargonisms, etc.). The transformation of such units into units of the common language made them innovations both from the point of view of vocabulary development and in connection with their perception as neologisms by the majority of speakers, since they had been known only to a small part of them (p.155).

The complexity of the term is underscored by Stolyarchuk (2023) who in the study of the problem of defining the term neologisms identified a number of contradictions, such as the conflict over the concept of novelty; uncertainty of the linguistic levels at which neologisms are implemented; inaccuracies in determining the period of time during which a new term remains a neologism; the contradiction of the relation of occasionalisms, phraseological units and other types of new formations to neologisms.

Despite the diversity of perspectives, certain recurring features can be observed. All definitions, implicitly or explicitly, revolve around the idea of novelty. Many scholars stress the duality of form and meaning as key indicators. There is also a growing recognition of the importance of social perception and the dynamic, often temporary nature of neologisms. The

notion of origin—whether through native word formation or borrowing—further enriches the understanding of the term. Additionally, various theoretical approaches illustrate that neologisms are not a homogeneous category but rather a complex linguistic phenomenon shaped by internal language development and external sociocultural influences.

Since there are numerous approaches and theories, defining new linguistic elements remains a challenging task. Researchers often disagree: some emphasize the novelty of form, others focus on meaning, and some consider social and communicative factors. These differing perspectives lead to contradictions in interpretation. As a result, the number of attempts to define neologisms is comparable to that of other complex linguistic concepts. Nevertheless, it is reasonable to expect a gradual convergence of views in the future, which may lead to a more unified and precise definition.

#### **2.4. Neologism Types and Their Classification**

Peter Newmark in his book “A Textbook of Translation” in 1988 distinguishes the following types of neologisms:

1. Old words with new senses
2. Collocations
3. Abbreviations
4. Eponyms
5. Transferred words
6. Acronyms
7. Collocations
8. Phrasal words
9. Pseudo- neologisms
10. New coinages
11. Derived words

There are many scholars who devoted their works to neology, specifically to attempts to classify neologisms. For example, Zabotkina (2018), discussed the classification of neologisms, determined that they can be classified according to various features, such as: the feature of a linguistic unit (neolexemes, neophrases, neosemes), the degree of novelty (absolute and relative), the type of reality denoted (denoting a new or old reality), the method of creation (borrowed, word-forming, semantic).

Similarly, Minya Károly (2022), a Hungarian scholar, classifies neologisms according to their purpose of creation (neologisms of necessity and stylistic neologisms). Firstly, according to their intentionality (spontaneous neologisms and conscious neologisms). Secondly, according to the form of communication (oral and written neologisms). Thirdly, neologisms by conceptual content (political, IT, health sector, entertainment, gastronomy, beauty, economy, pandemic). Moreover, neologisms by style and language stratification (conversational, fiction, official-legal, scientific, publicistic, student language, slang). Additionally, according to their category (verb, noun, adjective, pronoun etc.) Finally, according to their frequency:

1. A widespread neologism (is one that has over 1000 hits in the Google internet search on Hungarian language sites).
2. Occasional neologisms (those with less than 1000 hits in Google Internet search on Hungarian-language sites).

Additionally, recent study by Fang (2021) shows that in terms of their functions, processes of coinage, formation, and sources, neologisms can be classified.

Moreover, Khyzhun and Dyshleva (2023), generalised the opinions of neologists, based on the typology of neologisms of the Ukrainian language, analysed different approaches to the classification of neological vocabulary and classified neologisms of modern English as follows:

First of all, according to the form of the linguistic unit:

- a) single words or compound names (lexical neologisms).
- b) new stable combinations (lexical-phraseological).

Secondly, by origin:

- a) native English vocabulary (formed in various ways from English morphemes or constituents).
- b) borrowed vocabulary.

In addition, borrowings can be:

- a) External (from other languages).
- b) Internal (dialects, professional jargon, etc.).

Thirdly, according to the method of nomination, neologisms can be divided into:

- a. phonological.
- b. loanwords.
- c. semantic.
- d. syntactic, which are divided into morphological (word formation) and phraseological (phrase combinations).

Moreover, by purpose:

- a) neologisms - nominations of new concepts and realities that did not exist before in the socio-cultural experience of the people.
- b) neologisms - nominations of phenomena that already existed in the socio-cultural experience of the people and did not have their own name for one reason or another.
- c) neologisms - nominations of realities that do not exist in real life, but are predictable, possible in fantasies, with further development of science and technology.
- d) neologisms-synonyms, complete or ideographic, which are identical in meaning and stylistic colouring to words already existing in the English language.

Furthermore, by the nature of the interaction between the expression plan and the content plan:

- a) innovations, where the novelty of form is combined with the novelty of content.
- b) transformation, which combines the novelty of form with the meaning that was previously conveyed in another form.
- c) semantic innovations or reinterpretations.

Also, according to the degree of novelty gradation at the level of material organisation:

- a) strong neologisms, the novelty of which is expressed in the form itself, due to the unusual order of phonemes, morphological inseparability. Strong neologisms include borrowings, phonological neologisms.
- b) weak neologisms composed of primordial or widely known foreign language morphemes and therefore characterised by a transparent structure that makes the word understandable and as if it were previously known, compound and affixed neologisms).
- c) transitional neologisms that combine the features of strong and weak innovations (mergers, acronyms).

Additionally, according to the sphere of use of neologisms:

- a) Interstylistic lexical units, in other words, used in all functional styles of language.
- b) Specific to a particular functional style (scientific, business, colloquial).

Some neologisms have an even narrower sphere of use: in economics, politics, computer science, popular culture, sports, religion, etc.

Finally, according to stylistic colouring:

- a) Neutral.
- b) Containing a tone of degradation or elevation.

The classification of new linguistic units into categories is an extremely important stage of their research, because it helps to harmonise the various approaches to linguistic systematisation. Despite the existing differences between the approaches, further development of

linguistic research may contribute to the harmonisation of classification principles. In fact, many scholars have made contributions to the classification of neologisms, and this is especially evident in the work of Ukrainian authors, as they have considered this topic from various angles.

## **2.5. Computer Neologisms and Their Translation**

As was stated by Dieter (2002) the new words and terms occur in computer or internet areas. 21 years later, Khyzhun and Dysheva (2023) identified the growing informatisation and computerisation of society, globalisation, as well as new forms of socio-economic and legal structures as the most significant factors that have led to the emergence of neologisms in the modern version of English. Chornovyi (2024) analysis reveals rapid expand of computer technology vocabulary, driven by innovation.

Yenko (2024) defined computer neologisms as “words or phrases that appeared in the language at a certain stage of its development to denote a new concept in the field of information technology, the novelty of which is perceived by language speakers.” (p.46). Author also divided computer abbreviations into three groups: “proper names”, “programming and communication using the Internet”, and “trade and industrial names” (p.46).

Another study was conducted by Bogachyk and Bigunov (2020), who identified the following six semantic groups among computer terms denoting types of computers and computer components; denoting types of computer language, symbols and signs; denoting software; denoting work with a computer related to actions and commands; denoting computer users and programmers; lexical items related to the Internet.

As we have previously discussed, neologisms pose one of the most difficult challenges for translators, and computer neologisms are no exception. Many researchers argue that the translation of computer neologisms is the hardest task a professional translator faces.

Udovychenko and Mitsenko (2019) concluded that neologisms are one of the most difficult tasks to translate. Their research indicates that the main complexity of translating is transferring the meaning of a neologism.

Abdujalovna (2023) critically assessed the translation of neologisms, calling it the most demanding process that carries more problems than any of the other.

According to a study of the difficulties faced by translation students by Awadh and Shafiull (2020), the translation challenges associated with neologisms can occur due to the

complex nature of terms, specifically those related to the field of technology. As a result, they cannot be easily identified in ordinary dictionaries.

Yenko (2024) argues, for instance, that computer-generated texts often have an element of novelty, bringing in new terms which are not yet recorded in dictionaries, and thus create considerable complexity for translators.

For example, Dobrovolska et al. (2024) argued that the term translation is a significant task in the field of translation studies, since terms are a dynamic vocabulary that is constantly evolving and becoming enriched with new words. IT term translations require a deep knowledge of the computer science field.

In addition to identifying the problems of translating neologisms, the authors managed to find or propose solutions to these problems in the course of their research. Moghadam and Sedighi (2012) conducted a study to identify the most suitable procedures for translating computer neologisms. According to their study, transposition and lexical synonymy were the main translation norms, and transposition was the most common technique used at that time. They also concluded, through analysing the different types of neologisms and methods of their translation, that neologisms in the computer discourse are highly diverse, and translators used various methods while translating between languages.

Based on the results of the research, Udovychenko and Mitsenko (2019) argued that researchers used the following main methods of translating neologisms: transliteration and transcription; calquing; borrowing; descriptive method; direct inclusion; approximate translation.

Similarly, Dobrovolska et al. (2024) stated that IT terms can be translated using a variety of methods: calquing, descriptive translation, equivalent translation, and transcoding, with calquing being the most widely used method for translating English terms.

However, sometimes leaving a neologism as it is may be the best solution for translation if there is simply no alternative solution in the target target language according to Frleta and Frleta (2019).

Finally, Dobrovolska et al. (2024) suggested that in order to keep neologisms as authentic as possible, one should take into account their context and be creative in searching for appropriate alternatives. Translators must be able to detect changes in semantics and connotations in order to accurately render novel meanings of words in the source language. Additionally, the employment of clarifying inserts or glossary of terms may help the target audience understand brand new terms. IT terms can be translated using a variety of methods:

calquing, descriptive translation, equivalent translation, and transcoding, with calquing being the most widely used method for translating English terms.

One of the most detailed instructions for translating modern neologisms is provided in the third edition of the translation coursebook called 'In Other Words' by Mona Baker (2018). In the book, author describes each of the points in detail, but highlights the essential ones:

1. Translation by more general word
2. Translation by more neutral
3. Translation by cultural substitution
4. Translation by using loan words plus explanations
5. Translation by paraphrase using related word
6. Translation by paraphrase using unrelated words
7. Translation by omission
8. Translation by illustration

Despite the fact, that the topic of computer neologism translation is still not completely researched, scholars continue to study this topic and answer previously raised questions and achieve previously set objectives. Recalling again the fact that the language is rapidly advancing, we may assume that soon new complexities may appear and require innovative solutions to be found.

### **PART 3**

## **CORPUS-BASED ANALYSIS - NEW HORIZONS FOR THE STUDY OF NEOLOGISMS**

Such lexical innovations, as neologisms, are indeed crucial for communication in a world that is arguably moving faster than it ever has before, especially in specialized fields such as academia and technology. Such fields that are at the frontier of knowledge or practice are inevitably in need of ever-changing vocabulary to encompass emerging ideas, operations, and mechanisms. In particular, studying these neologisms reflects cognitive strategies of specialists, changing nature of scientific and technical communication and patterns of language change (Lehrer, 1992). The methodology, benefits, and contributions of this corpus-based approach to the identification of neologisms in academic and technical texts will be explored further in this paper, emphasizing its applications for both language change analysis and management of knowledge dissemination.

Traditionally, the study of neologisms was based on intuition a lot, dictionary extraction, and manual text processing (Algeo, 1991; Barnhart, 1980). Although they provide useful insights, such approaches are too vague, too subjective on what defines a research idea, and lack the specificity and repeatability necessary for scientists. Corpus linguistics, focused on empirical data and computational analysis, provides a highly effective and comprehensive means of examining neologisms in a systematic manner (Atkins, Clear, & Ostler, 1992). A corpus is a large, well-defined body of texts that is representative of language use so that researchers can track the patterns of word occurrence, co-occurrence and contextualization (Sinclair, 1991). This enables us to identify and analyze emerging lexicon objectively, rather than relying on our intuition or, drawing conclusions from measurable linguistic phenomena.

The study of neologisms has long been of interest. The early efforts in lexicography, devoted considerable energy toward the discovery and documentation of neologisms entering the English lexicon. But then corpus-based methods changed everything. Scholarly work started investigating the contribution of particular domains to the production of neologisms, illustrating the rich resources science and technology-enabling fields offer in this regard. This line of research was further catalyzed by the emergence of large, subject-specific corpora, collections of written work (e.g. scientific articles, technical manuals and web forum data) (Park, 2023). These resources lay the basis for observing neologisms in the wild and naturalistic contexts and examining their function, frequency and evolution.

Moreover, neologisms are also necessarily connected to the theories of language change and innovation. We are typically limited to the data, however, theories such as functionalism, which stress the importance of communicative needs in determining language, offer a useful summary of the informative premises of new word-formation and of the processes through which new words come to be used. As a reflection of this spread, the so-called diffusion of innovations concept, taken from sociology and epidemiology, offers an understanding of how neologisms extend from their point of originality to broad groups of speakers innovations. First, corpus linguistics provides a powerful, empirical methodology for testing such theories, able to trace the emergence, diffusion, and eventual entrenchment (or decay) of neologisms through time (and across discourse communities).

The studies on the analysis of neologisms used in academic and technical texts also highlight the cognitive and communicative challenges faced by scientists. Linguistic studies showing how these neologisms are formed, where they have their etymological roots and how their semantics relate to other known words should provide us with valuable clues about the conceptual structures and knowledge structure of experts in the field (Styshov, 2019). In addition, the study of neologisms provides insight into the interaction between language and thinking, where new terminology is both an indication and a catalyst for the evolution of our conceptual structure.

Despite the rich potential of corpus-based neologism analysis, it is not always easy to establish what counts as a neologism, given the uncertainty around how to differentiate between extant words and newly formed pieces. The exact date of first usage of a neologism calls for painstaking historical research and analysis of large corpora of texts. Additionally, automatic neologism detection poses a problem for natural language processing (NLP), since new words do not exist in existing dictionaries or vocabularies (by definition). The next sections describe some of these methodological elements more thoroughly, explaining the actual steps involved in corpus-based neologism work, as well as the techniques used to navigate around these challenges.

By analysing neologisms across academic and technical corpora, corpus-based research reveals not only the mechanisms of knowledge and language, but also the evolution of communication practices for specific communities. This systematic approach has allowed researchers to uncover the patterns of language innovation, and to trace the diffusion of language change, providing deeper insight into how our language is changing to meet the needs of the modern era.

### 3.1. Corpus Preparation and Creation

For our study, we have chosen computer-related texts from various fields, including medicine, engineering, geology, and programming. A sample of almost 200 texts was used for the research. All the texts were academic studies with technical topics in various fields and were publicly accessible. The corpora were created according to the month of publication of the text. Each corpus consisted of at least 12 computer-related texts. To begin with, we decided to analyse the key terms in the corpora using the online programme SketchEngine, which contains a keyword function. Each corpus was analysed separately. This was done to identify specific keywords in academic texts. Firstly, we selected texts from websites such as Google Scholar, Research Gate, and Elsevier. For convenience, we placed them in different folders by month. Then we uploaded the texts from each folder separately to the SketchEngine website in the corpus creation section. After uploading the files, the case is compiled to create the corpus, which allows selecting functions and settings in the finished corpus. The number of words in

Language	Name ↑	Words
English	April 2024	145,505 ...
English	February 2024	132,626 ...
English	January 2024	89,318 ...
English	June 2024	200,682 ...
English	March 2024	190,778 ...
English	May 2024	201,492 ...
English	August 2024	152,270 ...
English	December 2024	131,841 ...
English	July 2024	182,130 ...
English	November 2024	185,994 ...
English	October 2024	187,729 ...
English	September 2024	147,746 ...

Figure 1. Table of Separate Corpora

each corpus ranged from eighty-nine thousand to more than two hundred thousand (see Figure 1).

The first corpus was January 2024, and in the advanced settings we chose the keywords function, because the trends function should include texts from a long period of time and cannot include only one month. As for the settings for the corpus, the reference corpus was English Web 2021 (enTenTen21), the focus was chosen for frequently used words with unlimited number of uses in the text. The keywords were extracted using the lemmas. This corpus included 14 texts, with 89318 words. This corpus includes the following articles (see Table 1):

Time span	Publications
January 2024	Bakosi, J. (2024). Open-source complex-geometry 3D fluid dynamics for applications with unpredictable heterogeneous dynamic high-performance-computing loads. <i>Computer Methods in Applied Mechanics and Engineering</i> , 418, 116586. [25]; Singh, G., Singh, P., Motii, A., & Hedabou, M. (2024). A secure and lightweight container migration technique in cloud computing. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(1), 101887. [253]; Li, B., Zhao, H., Jiang, Y., & Meng, L. (2024). Real-time simulation for detailed wind turbine model based on heterogeneous computing. <i>International Journal of Electrical Power &amp; Energy Systems</i> , 155(B), 109486. [177]; Tavana, M., & Sorooshian, S. (2024). A systematic review of the soft computing methods shaping the future of the metaverse. <i>Applied Soft Computing</i> , 150, 111098. [270]; AbuAli, N., & Sabir, Z. (2024). Designing a heuristic computing structure to solve the human balancing model. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(1), 101890. [3]; Hannan, A., Cheema, S. M., & Pires, I. M. (2024). Machine learning-based smart wearable system for cardiac arrest monitoring using hybrid computing. <i>Biomedical Signal Processing and Control</i> , 87(B), 105519. [118]; Marasinghe, R., Yigitcanlar, T., Mayere, S., Washington, T., & Limb, M. (2024). Computer vision applications for urban planning: A systematic review of opportunities and constraints. <i>Sustainable Cities and Society</i> , 100, [196]; Wang, Y., Han, Y., Wang, C., Song, S., Tian, Q., & Huang, G. (2024). Computation-efficient deep learning for computer vision: A survey. <i>Cybernetics and Intelligence</i> , 1(1), 1–24. [282]; Tan, K., Wu, J., Zhou, H., Wang, Y., & Chen, J. (2024). Integrating advanced computer vision and AI algorithms for autonomous driving systems. <i>Journal of Theory and Practice of Engineering Science</i> , 4(1), 41–48. [269]; Alhakami, H. (2024). Enhancing IoT security: Quantum-level resilience against threats. <i>Computers, Materials &amp; Continua</i> , 78(1), 329–356. [9]; Zhao, S., Yan, H., Lin, Q., Feng, X., Chen, H. et al. (2024). Hybrid hierarchical particle swarm optimization with evolutionary artificial bee colony algorithm for task scheduling in cloud computing. <i>Computers, Materials &amp; Continua</i> , 78(1), 1135–1156. [314]; Deng, J., Shen, W., Feng, Y., Lu, G., Shen, G. et al. (2024). Lightweight intrusion detection using reservoir computing. <i>Computers, Materials &amp; Continua</i> , 78(1), 1345–1361. [75]; Zhang, T., Chen, Z., Guo, H., Ren, B., Xie, Q. et al. (2024). A secure and cost-effective training framework atop serverless computing for object detection in blasting sites. <i>Computer Modeling in Engineering &amp; Sciences</i> , 139(2), 2139–2154. [306]; Mavaluru, D., Caric, C. A., Alutaibi, A. I., Anamalumi, S., Narapreddy, B. R. et al. (2024). IoT task offloading in edge computing using non-cooperative game theory for healthcare systems. <i>Computer Modeling in Engineering &amp; Sciences</i> , 139(2), 1487–1503. [200];

Table 1. Publications Included in the Corpus – January 2024

The next corpus, titled February 2024, consisted of twelve articles, with a total of one hundred thirty-two thousand six hundred and twenty-six words. It was created on the same principle as the previous corpus and consisted of the following texts (see Table 2):

Time span	Publications
February 2024	Coyle, D., & Hampton, L. (2024). 21st century progress in computing. <i>Telecommunications Policy</i> , 48(1), 102649. [68]; Ouhssini, M., Afdel, K., Agherrabi, E., Akouhar, M., & Abarda, A. (2024). DeepDefend: A comprehensive framework for DDoS attack detection and prevention in cloud computing. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(2), 101938. [226]; Birhanie, H. M., & Adem, M. O. (2024). Optimized task offloading strategy in IoT edge computing network. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(2), 101942. [32]; Ngeni, F., Mwakalonge, J., & Siuhi, S. (2024). Solving traffic data occlusion problems in computer vision algorithms using DeepSORT and quantum computing. <i>Journal of Traffic and Transportation Engineering (English Edition)</i> , 11(1), 1–15. [219]; Muhamad, W. N. W., Aris, S. S. M., Dimyati, K., Javed, M. A., Idris, A., Ali, D. M., & Abdullah, E. (2024). Energy-efficient task offloading in fog computing for 5G cellular network. <i>Engineering Science and Technology an International Journal</i> , 50, 101628. [210]; Nandhakumar, A. R., Baranwal, A., Choudhary, P., Golce, M., & Gill, S. S. (2024). EdgeAISIM: A toolkit for simulation and modelling of AI models in edge computing environments. <i>Measurement Sensors</i> , 31, 100939. [215]; Nafca, A. A., Alameri, S. A., Majeed, R. R., Khalaf, M. A., & AL-Ani, M. M. (2024). A short review on supervised machine learning and deep learning techniques in computer vision. <i>Babylonian Journal of Machine Learning</i> , 2024, 48–55. [214]; Svanberg, M., Li, W., Fleming, M., Gochring, B., & Thompson, N. (2024, January 19). Beyond AI exposure: Which tasks are cost-effective to automate with computer vision? <i>SSRN</i> . [266]; Karim, N. A., Khashan, O. A., Abdurrahman, W. K., Alazab, M., Kanaker, H. et al. (2024). Performance comparison of Hyper-V and KVM for cryptographic tasks in cloud computing. <i>Computers, Materials &amp; Continua</i> , 78(2), 2023–2045. [150]; Xu, H. (2024). Traffic-aware fuzzy classification model to perform IoT data traffic sourcing with the edge computing. <i>Computers, Materials &amp; Continua</i> , 78(2), 2309–2335. [290]; Chandrashekar, C., Krishnados, P., Poornachary, V. K., & Ananthkrishnan, B. (2024). MCVWOA scheduler: Modified Chimp-Whale optimization algorithm for task scheduling in cloud computing. <i>Computers, Materials &amp; Continua</i> , 78(2), 2593–2616. [62]; Cao, Y., Chen, X., He, Y., Liu, L., Che, Y. et al. (2024). A post-quantum cross-domain authentication scheme based on multi-chain architecture. <i>Computers, Materials &amp; Continua</i> , 78(2), 2813–2827. [57];

Table 2. Publications Included in the Corpus – February 2024

The third corpus, entitled March 2024, contained fifteen articles with a word count of one hundred ninety thousand seven hundred and seventy-eight words, and contained the following texts (see Table 3):

Time span	Publications
March 2024	Abdo, N., Karamany, T. S., & Yakoub, A. (2024). A hybrid approach to secure and compress data streams in cloud computing environment. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(3), 101999. [1]; Zhang, X., Huang, Z., Huang, L., & Yang, H. (2024). Resource allocation strategy based on service function chaining in multi-access edge computing network. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(3), 102001. [308]; Ullah, I., Adhikari, D., Su, X., Palmieri, F., Wu, C., & Choi, C. (2024). Integration of data science with the intelligent IoT (IIoT): Current challenges and future perspectives. <i>Digital Communications and Networks</i> . [271]; Zhou, Z., Tian, Y., Xiong, J., Peng, C., Li, J., & Yang, N. (2024). Blockchain and signcrypton enabled asynchronous federated learning framework in fog computing. <i>Digital Communications and Networks</i> . [319]; He, Y., Yang, Y., Wang, C., Xie, A., Ma, L., Wu, B., & Wu, Y. (2024). A verifiable EVM-based cross-language smart contract implementation scheme for matrix calculation. <i>Digital Communications and Networks</i> . [124]; Zhang, H., Zhang, Z., & Chen, L. (2024). Toward zero trust in 5G industrial internet collaboration systems. <i>Digital Communications and Networks</i> . [302]; Gill, S. S., Wu, H., Patros, P., Ottaviani, C., Arora, P., Pujol, V. C., Haunschild, D., Parlikad, A. K., Cetinkaya, O., Lutfiyya, H., Stankovski, V., Li, R., Ding, Y., Qadir, J., Abraham, A., Ghosh, S. K., Song, H. H., Sakellariou, R., Rana, O., . . . Buyya, R. (2024). Modern computing: Vision and challenges. <i>Telematics and Informatics Reports</i> , 13, 100116. [106]; Khaleel, M., & Abdullatif, J. (2024). Artificial intelligence in computer science. <i>International Journal of Electrical Engineering and Sustainability</i> , 2(2), 1–21. [153]; Chakraborty, P. (2024). Computer, computer science, and computational thinking: Relationship between the three concepts. <i>Human Behavior and Emerging Technologies</i> , 2024, 1–6. [61]; Ho, M., & Vuong, Q. (2024). Five premises to understand human-computer interactions as AI is changing the world. <i>AI &amp; Society</i> . [128]; Zhao, X., Wang, L., Zhang, Y. et al. (2024). A review of convolutional neural networks in computer vision. <i>Artificial Intelligence Review</i> , 57, 99. [315]; Mettes, P., Ghadimi Atigh, M., Keller-Ressel, M. et al. (2024). Hyperbolic deep learning in computer vision: A survey. <i>International Journal of Computer Vision</i> , 132, 3484–3508. [203]; Wu, J., Wang, Y., Li, Z., Lu, L., Li, Q. (2024). A review of computing with spiking neural networks. <i>Computers, Materials &amp; Continua</i> , 78(3), 2909–2939. [286]; Garmendia-Orbegozo, A., Nunez-Gonzalez, J. D., & Anton, M. A. (2024). Task offloading in edge computing using GNNs and DQN. <i>Computer Modeling in Engineering &amp; Sciences</i> , 139(3), 2649–2671. [102]; Liu, R., Zenke, C., Liu, C., Holmes, A., Thornton, P., & Malan, D. J. (2024). Teaching CS50 with AI: Leveraging generative artificial intelligence in computer science education. <i>Association for Computing Machinery</i> . [184];

Table 3. Publications Included in the Corpus – March 2024

The fourth corpus, entitled April 2024, contained twelve articles with a word count of one hundred forty-five thousand five hundred and five words. This corpus included the following texts (see Table 4):

Time span	Publications
April 2024	Lin, Y. (2024). Application and challenges of computer networks in distance education. <i>Computing Performance and Communication Systems</i> , 8(1). [180]; Maia, A., Boutouchent, A., Kardjadja, Y., Gherari, M., Soyak, E. G., Saqib, M., Boussekar, K., Cilbir, I., Habibi, S., Ali, S. O., Ajib, W., Elbiaze, H., Erçetin, O., Ghamri-Doudane, Y., & Glitho, R. (2024). A survey on integrated computing, caching, and communication in the cloud-to-edge continuum. <i>Computer Communications</i> , 219, 128–152. [193]; Prishchukhina, O., Gordicjeva, D., & Rainer, A. (2024). Delivering computing module for the large part-time software development class from pre- to post-pandemic: An online learning experience. <i>Journal of Systems and Software</i> , 210, 111959. [232]; Gallicchio, C. (2024). Euler state networks: Non-dissipative reservoir computing. <i>Neurocomputing</i> , 579, 127411. [99]; Alvarez-Horcajo, J., Martínez-Yelmo, I., Rojas, E., Carral, J. A., & Noci-Luna, V. (2024). MuHoW: Distributed protocol for resource sharing in collaborative edge-computing networks. <i>Computer Networks</i> , 242, 110243. [13]; D’Aniello, G., Gaeta, M., Gravina, R., Li, Q., Rehman, Z. U., & Fortino, G. (2024). Situation identification in smart wearable computing systems based on machine learning and context space theory. <i>Information Fusion</i> , 104, 102197. [70]; Brunet, T., Tolley, E., Corda, S., Ilic, R., Broekema, P., & Kneib, J. (2024). Quantum radio astronomy: Data encodings and quantum image processing. <i>Astronomy and Computing</i> , 47, 100796. [40]; Alzoubi, Y. I., & Mishra, A. (n.d.). Blockchain consensus mechanisms comparison in fog computing: A systematic review. <i>ICT Express</i> , 10(2), 342–373. [16]; Wu, B., Xu, J., Zhang, Y., Liu, B., Gong, Y., & Huang, J. (2024). Integration of computer networks and artificial neural networks for an AI-based network operator. <i>Applied and Computational Engineering</i> , 64, 114–119. [285]; Mamatanbiyev, Z., Chronis, C., Varlamis, I., Himeur, Y., & Zhaparov, M. (2024). A holistic approach to use educational robots for supporting computer science courses. <i>Computers</i> , 13(4), 102. [194]; Zhang, W., Fan, Y., Zhang, J., Ding, X., & Kim, J. Y. (2024). Computing resource allocation for blockchain-based mobile edge computing. <i>Computer Modeling in Engineering &amp; Sciences</i> , 140(1), 863–885. [307]; Ma, Y., Zhao, H., Guo, K., Xia, Y., Wang, X., et al. (2024). A fault-tolerant mobility-aware caching method in edge computing. <i>Computer Modeling in Engineering &amp; Sciences</i> , 140(1), 907–927. [190];

Table 4. Publications Included in the Corpus – April 2024

The fifth corpus, dated May 2024, consisted of seventeen articles with a word count of two hundred and one thousand four hundred and ninety-two words. The corpus included the following articles (see Table 5):

Time span	Publications
May 2024	Ma, P., Garg, S., & Barika, M. (2024). Research allocation in mobile volunteer computing system: Taxonomy, challenges and future work. <i>Future Generation Computer Systems</i> , 154, 251–265. [189]; Aslanpour, M. S., Toosi, A. N., Cheema, M. A., Chhetri, M. B., & Salehi, M. A. (2024). Load balancing for heterogeneous serverless edge computing: A performance-driven and empirical approach. <i>Future Generation Computer Systems</i> , 154, 266–280. [19]; Rezasafat, M., Li, H., & Hogan, J. D. (2024). Prediction of microstructural-dependent mechanical properties, progressive damage, and stress distribution from X-ray computed tomography scans using a deep learning workflow. <i>Computer Methods in Applied Mechanics and Engineering</i> , 424, 116878. [240]; Arouj, A., & Abdelmoniem, A. M. (2024). Towards energy-aware federated learning via collaborative computing approach. <i>Computer Communications</i> , 221, 131–141. [18]; Schmidt, A., Mohareri, O., DiMaio, S., Yip, M. C., & Salcudean, S. E. (2024). Tracking and mapping in medical computer vision: A review. <i>Medical Image Analysis</i> , 94, 103131. [248]; Damsgaard, H. J., Grenier, A., Kataré, D., Taufique, Z., Shakibhamedan, S., Troccoli, T., Chatzitsompanis, G., Kanduri, A., Ometov, A., Ding, A. Y., Taherinejad, N., Karakonstantis, G., Woods, R., & Nurmi, J. (2024). Adaptive approximate computing in edge AI and IoT applications: A review. <i>Journal of Systems Architecture</i> , 150, 103114. [73]; Dilanchian, R., Bohlooli, A., & Jamshidi, K. (2024). Adjustable random linear network coding (ARLNC): A solution for data transmission in dynamic IoT computational environments. <i>Digital Communications and Networks</i> . [78]; Zhao, J., Ren, R., Wu, Y., Zhang, Q., Xu, W., Wang, D., & Fan, L. (2024). SEAttention-residual based channel estimation for mmWave massive MIMO systems in IoV scenarios. <i>Digital Communications and Networks</i> . [311]; Raza, A., Iqbal, Z., Aadil, F., Khan, M. A., Kadry, S., & Albarakati, H. M. (2024). Wideband communications through drone-assisted cognitive radio VANETs using SURF channel selection. <i>Digital Communications and Networks</i> . [238]; Zhang, P., Tan, L., Yang, Z., Huang, F., Sun, L., & Peng, H. (2024). Device-edge collaborative occluded face recognition method based on cross-domain feature fusion. <i>Digital Communications and Networks</i> . [304]; Li, Q., Liu, G., Zhang, Q., Han, L., Chen, W., Li, R., & Xiong, J. (2024). Efficient and fine-grained access control with fully-hidden policies for cloud-enabled IoT. <i>Digital Communications and Networks</i> . [178]; Giovinnesi, L., Mattia, G. P., & Beraldi, R. (2024). OptDNN: Automatic deep neural networks optimizer for edge computing. <i>Software Impacts</i> , 20, 100641. [107]; Kruger, F., Queen, Z., Radelva, O., & Lawrence, N. (2024). Comparative analysis of scientific approaches in computer science: A quantitative study. <i>International Transactions on Education Technology (ITEE)</i> , 2(2), 120–128. [164]; Kadam, P., Fang, G., & Zou, J. J. (2024). Object tracking using computer vision: A review. <i>Computers</i> , 13(6), 136. [149]; He, Q., Zhang, F., Bian, G., Zhang, W., & Li, Z. (2024). Research on performance optimization of Spark distributed computing platform. <i>Computers, Materials &amp; Continua</i> , 79(2), 2833–2850. [123]; Zheng, D., Xv, J., Yue, F., Du, Q., Wang, Z., et al. (2024). A novel scheduling framework for multi-programming quantum computing in cloud environment. <i>Computers, Materials &amp; Continua</i> , 79(2), 1957–1974. [316]; Ye, J., Cheng, W., Liu, X., Zhu, W., Wu, X., et al. (2024). SCIRD: Revealing infection of malicious software in edge computing-enabled IoT networks. <i>Computers, Materials &amp; Continua</i> , 79(2), 2743–2769. [293];

Table 5. Publications Included in the Corpus – May 2024

The sixth corpus, June 2024, contained a little over two hundred thousand words, namely two hundred thousand six hundred and eighty-two words, and consisted of fourteen texts. The corpus included the following texts (see Table 6):

Time span	Publications
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<b>June 2024</b>	<p>Fuda, C., &amp; Hormann, K. (2024). A new stable method to compute mean value coordinates. <i>Computer Aided Geometric Design</i>, 111, 102310. [97]; Fraga, E., Cortés, A., Margalef, T., Hernández, P., &amp; Carrillo, C. (2024). Cloud-based urgent computing for forest fire spread prediction. <i>Environmental Modelling &amp; Software</i>, 177, 106057. [94]; Nguyen, T., Nguyen, H., &amp; Gia, T. N. (2024). Exploring the integration of edge computing and blockchain IoT: Principles, architectures, security, and applications. <i>Journal of Network and Computer Applications</i>, 226, 103884. [221]; Ahmad, A., Altamimi, A. B., &amp; Aqib, J. (2024). A reference architecture for quantum computing as a service. <i>Journal of King Saud University - Computer and Information Sciences</i>, 36(6), 102094. [4]; Yin, Y., Sun, Z., Ruan, P., Li, R., &amp; Duan, F. (2024). Learned distributed image compression with decoder side information. <i>Digital Communications and Networks</i>. [295]; Feng, H., Xu, C., Jin, B., &amp; Zhang, M. (2024). A deployment optimization for wireless sensor networks based on stacked auto encoder and probabilistic neural network. <i>Digital Communications and Networks</i>. [92]; Zhu, Y., Li, H., Li, M., &amp; Yu, Y. (2024). Adaptor signature based on randomized EdDSA in blockchain. <i>Digital Communications and Networks</i>. [320]; Zhang, Q., Zhao, Y., Dong, H., &amp; Zhao, J. (2024). A reconstruction and recovery network-based channel estimation in high-speed railway wireless communications. <i>Digital Communications and Networks</i>. [305]; Li, B., Wu, B., Shen, M., Peng, H., Li, W., Zhang, H., Gan, J., Tian, Z., &amp; Xu, G. (2024). Algorithms for online fault tolerance server consolidation. <i>Digital Communications and Networks</i>. [175]; Ghazal, S., Munir, A., &amp; Qureshi, W. S. (2024). Computer vision in smart agriculture and precision farming: Techniques and applications. <i>Artificial Intelligence in Agriculture</i>, 13, 64–83. [103]; Zheng, J.-J., Li, Q.-Z., Wang, Z., Wang, X., Zhao, Y., &amp; Gao, X. (2024). Computer-aided nanodrug discovery: Recent progress and future prospects. <i>Chemical Society Reviews</i>, 53(18), Article d3cs00575c. [317]; Liu, J. (2024). ChatGPT: Perspectives from human–computer interaction and psychology. <i>Frontiers in Artificial Intelligence</i>, 7, [182]; Magnus, P. D. (2025). On trusting chatbots. <i>Episteme</i>, 1–11. [191]; Alwabel, A., &amp; Swain, C. K. (2024). Hybrid approach for cost efficient application placement in fog-cloud computing environments. <i>Computers, Materials &amp; Continua</i>, 79(3), 4127–4148. [14];</p>
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Table 6. Publications Included in the Corpus – June 2024

Thirteen texts were also used as the basis for the seventh corpus, entitled July 2024. The total number of words in the corpus was one hundred and eighty-two thousand one hundred and thirty words. The corpus included the following articles (see Table 7):

Time span	Publications
<b>July 2024</b>	<p>Huang, S., Yan, D., &amp; Chen, Y. (2024). An online algorithm for combined computing workload and energy coordination within a regional data center cluster. <i>International Journal of Electrical Power &amp; Energy Systems</i>, 158, 109971. [136]; Zaki, A., Chang, L., Manzella, I., Van Der Meijden, M., Girgin, S., Tanyas, H., &amp; Fadel, I. (2024). Automated Python workflow for generating Sentinel-1 PSI and SBAS interferometric stacks using SNAP on Geospatial Computing Platform. <i>Environmental Modelling &amp; Software</i>, 178, 106075. [300]; Fujimori, S., Oshiro, K., Nishiura, O., Hasegawa, T., &amp; Shiraki, H. (2024). Integration of a computable general equilibrium model with an energy system model: Application of the AIM global model. <i>Environmental Modelling &amp; Software</i>, 178, 106087. [98]; Guitart, J. (2024). Practicable live container migrations in high performance computing clouds: Diskless, iterative, and connection-persistent. <i>Journal of Systems Architecture</i>, 152, 103157. [114]; Cheng, B., Luo, L., He, Z., Zhu, C., &amp; Tao, X. (2024). Perceptual point cloud quality assessment for immersive metaverse experience. <i>Digital Communications and Networks</i>. [63]; Sun, J., Wang, L., Kang, M., &amp; Ye, K. (2024). A fast and accurate multi-keyword sorted searchable scheme based on blockchain. <i>Digital Communications and Networks</i>. [263]; Zhang, P., Li, Y., Vasilakos, A. V., Kostromitin, K. I., Zhang, J., &amp; Guizani, M. (2024). Optimizing network resource allocation with graph pointer neural network in large-scale AI systems. <i>Digital Communications and Networks</i>. [303]; Ajagekar, A., &amp; You, F. (2024). Variational quantum circuit learning-enabled robust optimization for AI data center energy control and decarbonization. <i>Advances in Applied Energy</i>, 14, 100179. [6]; Gu, X., Wang, S., Wei, Z., &amp; Feng, Z. (2024). Cluster-based RSU deployment strategy for vehicular ad hoc networks with integration of communication, sensing and computing. <i>Journal of Information and Intelligence</i>, 2(4), 325–338. [111]; Sun, R., Wen, Y., Cheng, N., Wang, W., Chai, R., &amp; Hui, Y. (2024). Structural knowledge-driven meta-learning for task offloading in vehicular networks with integrated communications, sensing and computing. <i>Journal of Information and Intelligence</i>, 2(4), 302–324. [264]; Gill, S. S., &amp; Buyya, R. (2024). Transforming Research with Quantum Computing. <i>Journal of Economy and Technology</i>. [105]; Gan, T., Dong, S., Wang, S., Li, J. (2024). Distributed Resource Allocation in Dispersed Computing Environment Based on UAV Track Inspection in Urban Rail Transit. <i>Computers, Materials &amp; Continua</i>, 80(1), 643–660. [101]; Yari, M., Khandelwal, M., Abbasi, P., Koutras, E.I., Armaghani, D.J. et al. (2024). Applications of Soft Computing Methods in Backbreak Assessment in Surface Mines: A Comprehensive Review. <i>Computer Modeling in Engineering &amp; Sciences</i>, 140(3), 2207–2238. [292];</p>

Table 7. Publications Included in the Corpus – July 2024

The eighth corpus, August 2024, consisted of more than one hundred and fifty thousand words, namely one hundred and fifty-two thousand two hundred and seventy words, contained in sixteen articles. Here is a list of these articles (see Table 8):

Time span	Publications
<b>August 2024</b>	<p>Zhang, Z., Zhang, Y., Bao, W., Li, C., &amp; Yuan, D. (2024). Coarse-to-Fine: A hierarchical DNN inference framework for edge computing. <i>Future Generation Computer Systems</i>, 157, 180–192. [310]; Pyzner-Knapp, E. O., &amp; Curioni, A. (2024). Advancing biomolecular simulation through exascale HPC, AI and quantum computing. <i>Current Opinion in Structural Biology</i>, 87, 102826. [236]; Dorduncu, M., Ren, H., Zhuang, X., Silling, S., Madenci, E., &amp; Rabczuk, T. (2024). A review of peridynamic theory and nonlocal operators along with their computer implementations. <i>Computers &amp; Structures</i>, 299, 107395. [82]; Gulakala, R., Bhaskaran, V., &amp; Stoffel, M. (2024). A generative learning and graph-based framework for computing field variables in Finite Element simulations. <i>Computer Methods in Applied Mechanics and Engineering</i>, 428, 117111. [115]; Zuccolini, M. V., Cabiddu, D., &amp; Pittaluga, S. (2024). PHREESQL: A toolkit to efficiently compute and store geochemical speciation calculation. <i>Computers &amp; Geosciences</i>, 190, 105640. [321]; Kilic, O. A., &amp; Tarim, S. A. (2024). A simple heuristic for computing non-stationary inventory policies based on function approximation. <i>European Journal of Operational Research</i>, 316(3), 899–905. [158]; Khan, Z., Khan, N., Koubaa, A., Ammar, A., &amp; Bouilla, W. (2024). RADAR: A rapid discovery algorithm for routes in SDN-based IoV. <i>Digital Communications and Networks</i>. [155]; Hu, X., Gui, M., Cheng, G., Li, R., &amp; Wu, H. (2024). Multi-class Bitcoin mixing service identification based on graph classification. <i>Digital Communications and Networks</i>. [134]; Khan, F. A., Umar, Z., Jolfaei, A., &amp; Tariq, M. (2024). Explainable AI for epileptic seizure detection in Internet of Medical Things. <i>Digital Communications and Networks</i>. [154]; Sun, W., Dedahanov, A. T., Li, W. P., &amp; Shin, H. Y. (2024). Sanctions and opportunities: Factors affecting China's high-tech SMEs adoption of artificial intelligence computing leasing business. <i>Heliyon</i>, 10(16), e36620. [265]; Ju, D., &amp; Kim, S. (2024). Volatile tin oxide memristor for neuromorphic computing. <i>iScience</i>, 27(8), 110479. [148]; You, D. (2024). Application of cloud computing detection based on sensor networks in enterprise economic statistics. <i>Measurement Sensors</i>, 34, 101254. [296]; Golec, M., Hatay, E. S., Golec, M., Uyar, M., Golec, M., &amp; Gill, S. S. (2024). Quantum cloud computing: Trends and challenges. <i>Journal of Economy and Technology</i>, 2, 190–199. [109]; Damar, M., Özen, A., Çakmak, Ü. E., Özoğuz, E., &amp; Erenay, F. S. (2024). Super AI, Generative AI, Narrow AI and Chatbots: An assessment of artificial intelligence technologies for the public sector and public administration. <i>Journal of AI</i>, 8(1), 83–106. [72]; He, F., Ding, K., Yan, D., Li, J., Wang, J., et al. (2024). A novel quantization and model compression approach for hardware accelerators in edge computing. <i>Computers, Materials &amp; Continua</i>, 80(2), 3021–3045. [122]; Sánchez, B. B., Alcarria, R., &amp; Robles, T. (2024). A probabilistic trust model and control algorithm to protect 6G networks against malicious data injection attacks in edge computing environments. <i>Computer Modeling in Engineering &amp; Sciences</i>, 141(1), 631–654. [245];</p>

Table 8. Publications Included in the Corpus – August 2024

The ninth corpus of September 2024 contained almost one hundred and fifty thousand words, namely one hundred and forty-seven thousand seven hundred and forty-six words, and consisted of the following 15 texts (see Table 9):

Time span	Publications
September 2024	Mansouri, M., Eskandari, M., Asadi, Y., & Savkin, A. (2024). A cloud-fog computing framework for real-time energy management in multi-microgrid system utilizing deep reinforcement learning. <i>Journal of Energy Storage</i> , 97, 112912. [195]; Leenders, L., Sollich, M., Reinert, C., & Bardow, A. (2024). Integrating quantum and classical computing for multi-energy system optimization using Benders decomposition. <i>Computers &amp; Chemical Engineering</i> , 188, 108763. [169]; Savoia, M., Prezioso, E., Mele, V., & Piccialli, F. (2024). Eco-FL: Enhancing Federated Learning sustainability in edge computing through energy-efficient client selection. <i>Computer Communications</i> , 225, 156–170. [247]; Glisic, S., & Lorenzo, B. (2024). Quantum computing and neuroscience for 6G/7G networks: Survey. <i>Intelligent Systems With Applications</i> , 23, 200346. [108]; Ali, S., Wadhwa, S. A., Yichiet, A., Gan, M. L., & Lee, C. K. (2024). Advancing cloud security: Unveiling the protective potential of homomorphic secret sharing in secure cloud computing. <i>Egyptian Informatics Journal</i> , 27, 100519. [10]; Yao, Y., Chen, H., Wang, K., Yu, H., Wang, Y., & Wang, Q. (2024). Efficient iNTRU-based public key authentication keyword searchable encryption in cloud computing. <i>Journal of Systems Architecture</i> , 154, 103231. [291]; Bisht, G., Riley, W. J., & Mills, R. T. (2024). Development of a multi-layer canopy model for E3SM Land Model with support for heterogeneous computing. <i>Journal of Computational Science</i> , 81, 102366. [33]; Srivastava, S., Kansal, K., Sai, S., & Chamola, V. (2024). Secure cognitive health monitoring using a directed acyclic graph-based and AI-enhanced IoMT framework. <i>Digital Communications and Networks</i> . [257]; Koh, W. L., Koh, J. B. Y., & Dai, B. T. (2024). Robust image classification system via cloud computing, aligned multimodal embeddings, centroids and neighbours. <i>Machine Learning With Applications</i> , 17, 100583. [159]; Hairani, H., Janhasmadja, M., Tholib, A., Guterres, J. X., & Ariyanto, Y. (2024). Thesis Topic Modeling Study: Latent Dirichlet Allocation (LDA) and Machine Learning Approach. <i>International Journal of Engineering and Computer Science Applications (IJECSA)</i> , 3(2), 51–60. [117]; Alqahtani, R. N., & Almassaad, A. Z. (2024). A proposed vision for electronic training for computer teachers according to the TAWOCK model. <i>Journal of Education and Learning</i> , 13(6), 100. [11]; Efe, A. (2024). Evolution of management information systems by super artificial intelligence revolutions. <i>Uluslararası Yönetim Bilişim Sistemleri Ve Bilgisayar Bilimleri Dergisi</i> . [86]; Jabbar, N. I., Shnain, S., & Imarah, A. O. (2024). Role of artificial intelligence in the computer network: Review. <i>Journal of University of Babylon for Pure and Applied Sciences</i> , 32(3), 274–282. [144]; Alzahrani, H., Sheltami, T., Barnawi, A., Imam, M., & Yaser, A. (2024). A Lightweight Intrusion Detection System Using Convolutional Neural Network and Long Short-Term Memory in Fog Computing. <i>Computers, Materials &amp; Continua</i> , 80(3), 4703–4728. [15]; Alybay, A., & Tokmagambetov, N. (2024). Numerical Simulation and Parallel Computing of Acoustic Wave Equation in Isotropic-Heterogeneous Media. <i>Computer Modeling in Engineering &amp; Sciences</i> , 141(2), 1867–1881. [12];

Table 9. Publications Included in the Corpus – September 2024

The following sixteen texts formed the basis for the tenth corpus, October 2024, which consisted of one hundred and eighty-seven thousand seven hundred and twenty-nine words, and consisted of the following texts (see Table 10):

Time span	Publications
October 2024	Huaranga-Junco, E., González-Gerpe, S., Castillo-Cara, M., Cimmino, A., & García-Castro, R. (2024). From cloud and fog computing to federated-fog computing: A comparative analysis of computational resources in real-time IoT applications based on semantic interoperability. <i>Future Generation Computer Systems</i> , 159, 134–150. [137]; Carrizales-Espinoza, D., Sanchez-Gallegos, D. D., Gonzalez-Compean, J., & Carretero, J. (2024). StructMesh: A storage framework for serverless computing continuum. <i>Future Generation Computer Systems</i> , 159, 353–369. [58]; Doga, H., Bose, A., Sahin, M. E., Bettencourt-Silva, J., Pham, A., Kim, E., Andress, A., Saxena, S., Parida, L., Robertus, J. L., Kawaguchi, H., Soliman, R., & Blankenberg, D. (2024). How can quantum computing be applied in clinical trial design and optimization? <i>Trends in Pharmacological Sciences</i> , 45(10), 880–891. [81]; Huang, J., Yang, C., Yang, F., Zhang, S., Tolba, A., Jolfaei, A., & Yu, K. (2024). Deep reinforcement learning-based spectrum resource allocation for the web of healthcare things with massive integrating wearable gadgets. <i>Digital Communications and Networks</i> . [135]; Hou, H., & Ismail, A. (2024). EETS: An energy-efficient task scheduler in cloud computing based on improved DQN algorithm. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(8), 102177. [131]; Zhao, L., Liu, C., Qi, E., & Shi, S. (2024). Multi-objective optimization in order to allocate computing and telecommunication resources based on non-orthogonal access, participation of cloud server and edge server in 5G networks. <i>Journal of King Saud University - Computer and Information Sciences</i> , 36(8), 102187. [312]; Katsigiannis, M., & Mykoniatis, K. (2024). Enhancing industrial IoT with edge computing and computer vision: An analog gauge visual digitization approach. <i>Manufacturing Letters</i> , 41, 1264–1273. [152]; Xiao, S., Huang, X., Deng, X., Cao, B., & Chen, Q. (2024). DB-FL: DAG blockchain-enabled generalized federated dropout learning. <i>Digital Communications and Networks</i> . [288]; Fu, B., Tang, T., Wu, D., & Wang, R. (2024). Interest-aware joint caching, computing, and communication optimization for mobile VR delivery in MEC networks. <i>Digital Communications and Networks</i> . [96]; Ergen, M., Saoud, B., Shayea, I., El-Saleh, A. A., Ergen, O., Inan, F., & Tuysuz, M. F. (2024). Edge computing in future wireless networks: A comprehensive evaluation and vision for 6G and beyond. <i>ICT Express</i> , 10(5), 1151–1173. [90]; Al-Dulaimy, A., Jansen, M., Johansson, B., Trivedi, A., Iosup, A., Ashjaei, M., Galletta, A., Kimovski, D., Prodan, R., Tserpes, K., Koussioris, G., Giannakos, C., Brandic, I., Ali, N., Bondi, A. B., & Papadopoulos, A. V. (2024). The computing continuum: From IoT to the cloud. <i>Internet of Things</i> , 27, 101272. [7]; Xiao, J., Wang, Y., Zhang, X., Luo, G., & Xu, C. (2024). Multi source data security protection of smart grid based on edge computing. <i>Measurement Sensors</i> , 35, 101288. [287]; Banerjee, C., Nguyen, K., Fookes, C., & Karniadakis, G. (2024). Physics-informed computer vision: A review and perspectives. <i>ACM Computing Surveys</i> , 57(1), Article 17, 1–38. [27]; Shi, L., Ding, A.-C., & Choi, I. (2024). Investigating Teachers' Use of an AI-Enabled System and Their Perceptions of AI Integration in Science Classrooms: A Case Study. <i>Education Sciences</i> , 14(11), 1187. [251]; Liu, J., Wei, J., Luo, R., Yuan, G., Liu, J. et al. (2024). Computation Offloading in Edge Computing for Internet of Vehicles via Game Theory. <i>Computers, Materials &amp; Continua</i> , 81(1), 1337–1361. [183]; Zheng, S., Fischer, V., Luckner, N., & Purgathofer, P. (2024). Learning from designing a board game for policy thinking in computer science. <i>Proceedings of the 18th European Conference on Games Based Learning</i> , 18(1). [318];

Table 10. Publications Included in the Corpus – October 2024

The eleventh corpus, November 2024, consisted of one hundred eighty-five thousand nine hundred and ninety-four words, with eighteen texts (see Table 11):

Time span	Publications
November 2024	Guerrero, C., Lera, I., & Juiz, C. (2024). Distributed genetic algorithm for application placement in the compute continuum leveraging infrastructure nodes for optimization. <i>Future Generation Computer Systems</i> , 160, 154–170. [112]; Desdentado, E., Calero, C., Moraga, M. A., Serrano, M., & García, F. (2024). Exploring the trade-off between computational power and energy efficiency: An analysis of the evolution of quantum computing and its relation to classical computing. <i>Journal of Systems and Software</i> , 217, 112165. [76]; Bálint, C., Bán, R., & Valasek, G. (2024). Computing the cut locus, Voronoi diagram, and signed distance function of polygons. <i>Computer Aided Geometric Design</i> , 114,

	<p>102388. [26]; Stirbu, V., Kinanen, O., Haghparast, M., &amp; Mikkonen, T. (2024). Qubernetes: Towards a unified cloud-native execution platform for hybrid classic-quantum computing. <i>Information and Software Technology</i>, 175, 107529. [259]; Zhang, Y. (2024). An intelligent management and decision model of operational research for edge computing aided planning. <i>Alexandria Engineering Journal</i>, 109, 603–609. [309]; Liu, X., &amp; Liu, J. (2024). A truthful randomized mechanism for task allocation with multi-attributes in mobile edge computing. <i>Journal of King Saud University - Computer and Information Sciences</i>, 36(9), 102196. [186]; Mahdizadeh, M., Montazerolghaem, A., &amp; Jamshidi, K. (2024). Task scheduling and load balancing in SDN-based cloud computing: A review of relevant research. <i>Journal of Engineering Research</i>. [192]; Jin, B., Chen, X., Xiong, J., Li, X., Lin, L., &amp; Yao, Z. (2024). BCAS: Blockchain-based secure access and sharing scheme for EHR data. <i>Digital Communications and Networks</i>. [146]; Liu, W., Bilal, M., Shi, Y., &amp; Xu, X. (2024). Distributed service caching with deep reinforcement learning for sustainable edge computing in large-scale AI. <i>Digital Communications and Networks</i>. [185]; Awais, M., Ghayvat, H., Geddam, R., Nkenyereye, L., &amp; Dev, K. (2024). AiCareNeonates: Artificial intelligence powered adaptation of transfer learning models to classify neonate's sleep-wake states for pediatricians in the loop. <i>Digital Communications and Networks</i>. [22]; Zhao, S., &amp; Guo, M. (2024). Electric vehicle power system in intelligent manufacturing based on soft computing optimization. <i>Heliyon</i>, 10(21), e38946. [313]; Firoozi, A. A., Firoozi, A. A., Alashker, Y., &amp; Ahmad, S. (2024). Advancing Civil Engineering: The transformative impact of neuromorphic computing on infrastructure resilience and sustainability. <i>Results in Engineering</i>, 103487. [93]; Shah, Z., Raja, M. A. Z., Shahzad, F., Waqas, M., Alblehai, F., Nooh, S., Jamal, S. S., Zamri, N., Saydaxmetova, S., &amp; Nasr, A. (2024). Stochastic computing with Levenberg-Marquardt neural networks for the study of radiative transportation phenomena in three-dimensional Carreau nanofluid model subjected to activation energy and porous medium. <i>Chemical Engineering Journal Advances</i>, 20, 100639. [249]; Williamson, S. M., &amp; Prybutok, V. (2024). Integrating human-centric automation and sustainability through the NAToRM framework: A neuromorphic computing approach for resilient Industry 5.0 supply chains. <i>International Journal of Information Management Data Insights</i>, 4(2), 100278. [284]; Elnagar, S., Bryson, K. M. O., &amp; Thomas, M. (2024). SAFERIDES: Application of decentralized control edge-computing to ridesharing monitoring services. <i>International Journal of Information Management Data Insights</i>, 4(2), 100282. [88]; Xiong, J., Wei, M., Lu, Z., &amp; Liu, Y. (2024). Assessing the effectiveness of crawlers and large language models in detecting adversarial hidden link threats in meta computing. <i>High-Confidence Computing</i>, 100292. [289]; Anand, A., Srivastava, S., Gangopadhyay, S. et al. (2024). Simulating quantum chaos on a quantum computer. <i>Scientific Reports</i>, 14, 26890. [17]; Hussain, A., Li, S., Hussain, T., Lin, X., Ali, F. et al. (2024). Computing challenges of UAV networks: A comprehensive survey. <i>Computers, Materials &amp; Continua</i>, 81(2), 1999–2051. [138];</p>
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Table 11. Publications Included in the Corpus – November 2024

The last, twelfth corpus, December 2024, consisted of one hundred thirty-one thousand eight hundred and forty-one words, in 12 articles, here is a list of these articles (see Table 12):

Time span	Publications
<b>December 2024</b>	<p>Yu, L., Xu, H., Zeng, Y., &amp; Deng, J. (2024). Delay-aware resource allocation for partial computation offloading in mobile edge cloud computing. <i>Pervasive and Mobile Computing</i>, 105, 101996. [297]; Li, X., Zheng, H., He, C., Tian, X., &amp; Lin, X. (2024). Robust beamforming design for energy harvesting efficiency maximization in RIS-aided SWIPT system. <i>Digital Communications and Networks</i>. [179]; Li, F., Zhao, Y., Zhang, K., Xu, H., Wang, Y., &amp; Wang, D. (2024). Blockchain-based lightweight trusted data interaction scheme for cross-domain IIoT. <i>Digital Communications and Networks</i>. [177]; Sai, S., Sharma, P., Gaur, A., &amp; Chamola, V. (2024). Pivotal role of digital twins in the metaverse: A review. <i>Digital Communications and Networks</i>. [243]; Moses Setiadi, D. R. I., Rijati, N., Muslikh, A. R., Vicky Indriyono, B., &amp; Sambas, A. (2024). Secure image communication using Galois field, hyper 3D logistic map, and B92 quantum protocol. <i>Computers, Materials &amp; Continua</i>, 81(3), 4435–4463. [209]; Broy, M., Brucker, A. D., Fantechi, A., &amp; Gleirscher, M. (2024). Does every computer scientist need to know formal methods? <i>Formal Aspects of Computing</i>, 37(1), Article 6, 1–17. [39]; Chicano, F., Luque, G., Dahi, Z. A., &amp; Gil-Merino, R. (2025). Combinatorial optimization with quantum computers. <i>Engineering Optimization</i>, 57(1), 208–233. [64]; Haghparast, M., Moguel, E., Garcia-Alonso, J., Mikkonen, T., &amp; Murillo, J. M. (2024). Innovative approaches to teaching quantum computer programming and quantum software engineering. <i>2022 IEEE International Conference on Quantum Computing and Engineering (QCE)</i>, 251–255. [116]; Khudhur, A. F., Kurnaz Türkben, A., &amp; Kurnaz, S. (2024). Design and develop function for research-based application of intelligent internet-of-vehicles model based on fog computing. <i>Computers, Materials &amp; Continua</i>, 81(3), 3805–3824. [156]; Murali, J. A., &amp; T. B. (2024). A multi-objective clustered input oriented Salp Swarm Algorithm in cloud computing. <i>Computers, Materials &amp; Continua</i>, 81(3), 4659–4690. [211]; Wang, D., Bakar, K. B. A., Isyaku, B., &amp; Lei, L. (2024). An asynchronous data transmission policy for task offloading in edge-computing enabled ultra-dense IoT. <i>Computers, Materials &amp; Continua</i>, 81(3), 4465–4483. [281]; Gan, C., Xiao, X., Zhu, Q., Jain, D. K., &amp; Saini, A. (2024). Blockchain-assisted electronic medical data-sharing: Developments, approaches and perspectives. <i>Computers, Materials &amp; Continua</i>, 81(3), 3421–3450. [100];</p>

Table 12. Publications Included in the Corpus – December 2024

The second important step in identifying neologisms for us was diachronic analysis. Since each of these corpora does not have a long-time reference, the trend function, which is also one of the auxiliary methods for identifying neologisms, is not effective in this case, as it requires larger corpora. Therefore, we decided to build one additional corpus.

To create this corpus, we decided to include texts from the previous corpora. We randomly selected 5 documents from each month. We created a new folder separately, in which we arranged these articles chronologically to avoid mistakes in the process. Thus, each month corresponded to five articles, this was done in order to identify both neologisms and the approximate common themes of the texts, and therefore the directions in which new words or new meanings for old words were formed. To increase the timespan a bit, since this is the main requirement for this study, we added 5 more texts published in the months of January 2025, February 2025 and March 2025, accordingly. In total, we added the following 15 texts (see Table 13):

Time span	Publications
<b>January 2025</b>	Davidson, K. (2025). Super AI: The next frontier in artificial intelligence research. <i>QIT Press - International Journal of Super AI Research and Development (QITP-IJSARD)</i> , 6(1), 1–5 [74]; Salah, M., Abed, J., Mohamed, H., Al-Yasiri, Y., & Adil, A. (2025). Human to chatbot text classification using multi-source AI chatbots and machine learning models. <i>Journal of Intelligent Systems and Internet of Things</i> , (in press), 152–165 [244]; Efe, A. (2025). A discussion on potential integration of quantum encryption with super artificial intelligence. <i>Bilgişim Teknolojileri Dergisi</i> , 18(1), 63–76 [87]; Lysova, N., Solari, F., & Montanari, R. (2025). Investigating research trends in computer vision for food quality control: A bibliometric approach. <i>Procedia Computer Science</i> , 253, 1923–1932 [188]; Öztürk, A., Günay, S., Ateş, S., Yiğit, Y., & Yigit, Y. (2025). Can GPT-4.0 accurately diagnose trauma X-rays? A comparative study with expert evaluations. <i>The Journal of Emergency Medicine</i> [227];
<b>February 2025</b>	Brom, C., Drobná, A., Yagobová, A., Šťastný, D., Zábrodská, K., & Urban, M. (2025). From servers to satellites: Understanding internet principles among new computer science teachers. <i>ACM Transactions on Computing Education</i> , 25(1), Article 4, 1–33 [38]; Kumar, Y. (2025). Artificial Super Intelligence (ASI): A major milestone in reasoning and self-learning. <i>Decima Technologies</i> [165]; Promsiri, T., Wuttiappinyo, N., & Keeratitwiset, V. (2025). Enhancing chatbot service user satisfaction. <i>TEM Journal</i> , 14(1), 216–225 [235]; Peng, H., Wang, X., Wu, H., & Huang, B. (2025). Human-computer interaction empowers construction safety management: Breaking through difficulties to achieving innovative leap. <i>Buildings</i> , 15(5), 771 [231]; Wang, Y., Yu, J., & Zou, J. (2025). Evaluation of the theranostic performance of Chat-GPT in tonsillectomy in children. <i>Asian Journal of Surgery</i> [283];
<b>March 2025</b>	Kyrimi, E., McLachlan, S., Wohlgenut, J. M., et al. (2025). Explainable AI: Definition and attributes of a good explanation for health AI. <i>AI Ethics</i> [166]; J. Anandraj. (2024). Transforming Education with Industry 6.0: A Human-Centric Approach. <i>International Journal of Computational and Experimental Science and Engineering</i> , 10(4) [143]; Sudbury, Q. S. (2025). Advancing conversational AI: Investigating AI-to-AI voice dialogue through hybrid active inference (HAI) and adaptive reasoning. <i>Preprint</i> [262]; Jin, W., Vincent, N., & Hamarneh, G. (2025). AI for just work: Constructing diverse imaginations of AI beyond “replacing humans.” <i>arXiv</i> [147]; Calabrese, G., Maselli, R., Maida, M., Barbaro, F., Morais, R., Nardone, O. M., Sinagra, E., Di Mitri, R., & Sferrazza, S. (2025). Unveiling the effectiveness of Chat-GPT 4.0, an artificial intelligence conversational tool, for addressing common patient queries in gastrointestinal endoscopy. <i>iGIE</i> , 4(1), 21–25 [43];

Table 13. Additional Publications Included in the Diachronic Analysis Corpus – January, February, March 2025

In summary, we received a folder with seventy-five PDF files, each of which was renamed according to the month of publication. Since we used the trial version, as we mentioned above, we had a one million word limitation for the corpora. This corpus after compilation included seven hundred and ninety-six thousand five hundred words (see Figure 2).



Figure 2. General Corpus for Diachronic Analysis

In order to start using this type of corpus, it was not enough to simply upload all the files to the site, the trend function was not available under the standard configurations. For this purpose, we press the “manage corpus” button and then “change corpus configuration”. In the next window, we selected “expert configurations” and wrote “DIACHRONIC ‘doc.date’” in the first line of the code and saved the changes. But at this stage, we still could not start compiling. Next, we had to click on “browse” again in the “manage corpus” menu and edit the metadata of each file. In the metadata editor, we added new attributes to each file and values for these attributes corresponding to the date of publication. This stage was very important, because if you enter an incorrect character or differences in the form of values and attributes, all subsequent compilation attempts will fail. Therefore, it is important to pay attention to the attribute to ensure that all files have the same attribute. In our case, the attribute is called “date”. The value of the attribute in each file in our corpus was “YYYY-MM” for example, for the June 2024 article, the value of the attribute was “2024-06”. After that, if the expert mode is enabled, the compilation will fail again. Therefore, it is important to disable the expert mode before compiling. After successful compilation of the case, the ‘trends’ button appears in the main menu of the corpus.

As we have already mentioned in the previous paragraph, this function is designed specifically for diachronic analysis.

Thus, all corpora have been successfully compiled and prepared for research, and at this stage the creation of corpora for further analyses is complete. In the next section, we will discuss in detail the analyses of all the corpora.

## 3.2. Keywords Analysis Process

We analysed each corpus in two stages. The first stage included keyword analysis. The second stage focused on two-word definitions. SketchEngine automatically analyses and creates tables of keywords and definitions, this analysis does not depend on the subject matter of the words, so based on the ready-made tables, we had to analyse and identify computer-related words.

### 3.2.1. January 2024

The first corpus we analysed was the January 2024 corpus. To start the corpus analysis, we select the Keywords function in the main menu. In the advanced settings, we select an additional corpus for comparison, similarly to the subsequent corpora, we chose English Web 2021 (enTenTen21), which is one of the largest corpora available in English language on the platform. Based on the texts listed above, the software calculates the frequency of words in the documents and builds keyword tables based on the results as shown in Figure 3. The analysis of single-word keywords revealed the following words: *'network'*, *'vision'*, *'quantum'*, *'algorithm'*, *'IoT'*.

Word	Word	Word	Word	Word
1 et	11 networks	21 image	31 neural	41 cvpr
2 urban	12 deflection	22 computer	32 based	42 liu
3 data	13 model	23 techniques	33 segmentation	43 machine
4 computing	14 network	24 using	34 algorithms	44 chen
5 learning	15 pages	25 training	35 iot	45 application
6 algorithm	16 n	26 efficient	36 analysis	46 object
7 cv	17 vision	27 quantum	37 models	47 systems
8 planning	18 security	28 design	38 spatial	48 system
9 deep	19 wang	29 zhang	39 proposed	49 task
10 t	20 resource	30 li	40 process	50 cloud

Figure 3. Keyword Analysis of Single-Word Terms – January 2024 Corpus

The program then created a table of multi-word terms (see Figure 4). From this table, we selected a sample of multi-word definitions. Based on the results, we identified the following word combinations that had characteristic features of the computer theme: *'computer vision'*,

*'neural network', 'deep learning', 'quantum computing', 'cloud computing', 'machine learning', 'Internet of Things', 'edge computing', 'serverless computing', 'convolutional network'.*

Term	Term	Term	Term
1 urban planning	14 knowledge distillation	27 virtual machine	40 street view image
2 computer vision	15 machine learning	28 architecture search	41 device n
3 neural network	16 deep learn	29 learning model	42 edge computing
4 object detection	17 resource allocation	30 heart disease	43 energy consumption
5 deep learning	18 built environment	31 arxiv preprint arxiv	44 instance segmentation
6 quantum computing	19 intrusion detection	32 preprint arxiv	45 serverless computing
7 semantic segmentation	20 convolutional neural network	33 arxiv preprint	46 image segmentation
8 planning process	21 eabc algorithm	34 nectar source	47 deep neural network
9 cv technique	22 vision transformer	35 internet of things	48 social medium
10 resource unit	23 ieee transaction	36 spatial association	49 neural architecture
11 urban planning process	24 deep network	37 optimal solution	50 convolutional network
12 cloud computing	25 resource scheduling	38 street view	
13 machine learn	26 gao huang	39 access control	

Figure 4. Keyword Analysis of Multi-Word Terms – January 2024 Corpus

### 3.2.2. February 2024

The second analysed corpus was February 2024. The list of keywords is presented in Figure 5. According to the results, in this corpus, we found a smaller number of computer-related words in both single-word and multi-word analyses. Based on the analysis of single keywords, we were able to identify the following words: *'dataset', 'authentication', 'server', 'tracking', 'simulation'*.

Word	Word	Word	Word	Word
1 comput	11 quantum	21 automation	31 scores	41 int
2 parameters	12 efficiency	22 comparison	32 figure	42 multiple
3 cmc	13 processing	23 simulation	33 automate	43 various
4 matching	14 efficient	24 scheme	34 forecasting	44 resources
5 dataset	15 challenges	25 authors	35 real-time	45 function
6 computational	16 identity	26 node	36 helc	46 p
7 authentication	17 servers	27 costs	37 test	47 woa
8 index	18 framework	28 journal	38 solution	48 neural
9 intrusion	19 tracking	29 mcwoa	39 internet	49 apfed
10 fuzzy	20 d	30 evaluation	40 shown	50 li

Figure 5. Keyword Analysis of Single-Word Terms – February 2024 Corpus

Figure 6 shows twenty-two key multi-word terms. This means that the number of word combinations in the table is fewer. The following ones had a computer theme: *'task offload', 'network traffic', 'edge server', 'IoT device', 'fog computing', 'cloud environment'*.

Term	Term	Term
1 task offload ...	11 fog computing ...	21 resource allocation ...
2 network traffic ...	12 mobile device ...	22 machine learning ...
3 intrusion detection ...	13 task scheduling ...	
4 edge server ...	14 traffic datum ...	
5 computing environment ...	15 deep learning ...	
6 power consumption ...	16 neural network ...	
7 data point ...	17 cloud environment ...	
8 iot device ...	18 electronic copy ...	
9 vision task ...	19 network traffic datum ...	
10 slifc model ...	20 ieee trans ...	

Figure 6. Keyword Analysis of Multi-Word Terms – February 2024 Corpus

### 3.2.3. March 2024

As for the analysis of the March 2024 corpus, the number of words was higher than in the previous analysis, however, the number of computer-generated words was not (see Figure 7). The following words were selected for further analysis: ‘*computing*’, ‘*system*’, ‘*AI*’, ‘*user*’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 et ...	11 ai ...	21 use ...	31 node ...	41 deep ...
2 network ...	12 task ...	22 application ...	32 user ...	42 security ...
3 computing ...	13 device ...	23 method ...	33 t ...	43 access ...
4 datum ...	14 learning ...	24 layer ...	34 process ...	44 machine ...
5 model ...	15 edge ...	25 internet ...	35 technique ...	45 smart ...
6 computer ...	16 hyperbolic ...	26 learn ...	36 processing ...	46 p ...
7 iot ...	17 j ...	27 neural ...	37 propose ...	47 function ...
8 algorithm ...	18 data ...	28 science ...	38 technology ...	48 volume ...
9 system ...	19 ieee ...	29 page ...	39 fog ...	49 architecture ...
10 cloud ...	20 resource ...	30 industrial ...	40 s ...	50 result ...

Figure 7. Keyword Analysis of Single-Word Terms – March 2024 Corpus

Figure 8 shows that during the analysis of the March 2024 multi-word analysis, the program identified forty-nine words, of which we selected the following ones for further analysis: ‘*collaboration system*’, ‘*hyperbolic space*’, ‘*artificial intelligence*’, ‘*computational thinking*’.

Term	Term	Term	Term
1 neural network	34 edge device	27 google scholar	40 pattern recognition
2 cloud computing	35 resource allocation	28 machine learn	41 trust assessment
3 computer vision	36 fog computing	29 industrial network	42 fog node
4 smart contract	37 object detection	30 iot datum	43 image classification
5 data science	38 artificial intelligence	31 convolutional neural network	44 energy consumption
6 edge computing	39 international conference	32 ieee transaction	45 mobile edge computing
7 computer science	40 big datum	33 data analytic	46 mobile edge
8 deep learning	41 computational thinking	34 task processing	47 fog server
9 collaboration system	42 vnf node	35 data center	48 gradient descent
10 hyperbolic space	43 access control	36 task offload	49 success rate
11 machine learning	44 iot device	37 iot application	
12 internet of things	45 spiking neural network	38 learning algorithm	
13 sfc task	46 computing system	39 ieee internet	

Figure 8. Keyword Analysis of Multi-Word Terms – March 2024 Corpus

### 3.2.4. April 2024

The following Figure 9 shows the results of the word analysis for April 2024, in this case, since many words are repeated, we have highlighted only a couple of words such as: ‘signcryption’, ‘optimize’, ‘transaction’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 cross-language	11 calculation	21 distribute	31 consumption	41 direction
2 arxiv	12 programming	22 optimize	32 latency	42 capability
3 methodology	13 h	23 chen	33 transaction	43 scholar
4 analytic	14 cluster	24 thinking	34 parallel	44 analyze
5 allocation	15 real-time	25 mec	35 query	45 g
6 v	16 prediction	26 convolutional	36 proceedings	46 wu
7 cs50	17 embed	27 scenario	37 enhance	47 random
8 authentication	18 communications	28 interaction	38 optimal	48 simulation
9 signcryption	19 utilize	29 secure	39 aggregation	49 asset
10 quantum	20 vnf	30 networks	40 ann	50 i

Figure 9. Keyword Analysis of Single-Word Terms – April 2024 Corpus

Figure 10 displays a large number of word combinations, many of which are computer-related. We have selected the following words for further analysis: ‘IoT data’, ‘convolutional neural network’, ‘fog node’.

Term	Term	Term	Term
1 hyperbolic space	11 big datum	21 iot datum	31 pattern recognition
2 machine learning	12 computational thinking	22 convolutional neural network	32 trust assessment
3 internet of things	13 vnf node	23 ieee transaction	33 fog node
4 sfc task	14 access control	24 data analytic	34 image classification
5 edge device	15 iot device	25 task processing	35 energy consumption
6 resource allocation	16 spiking neural network	26 data center	36 mobile edge computing
7 fog computing	17 computing system	27 task offload	37 mobile edge
8 object detection	18 google scholar	28 iot application	38 fog server
9 artificial intelligence	19 machine learn	29 learning algorithm	39 gradient descent
10 international conference	20 industrial network	30 ieee internet	40 success rate

Figure 10. Keyword Analysis of Multi-Word Terms – April 2024 Corpus

### 3.2.5. May 2024

May 2024, compared to the previous tables, had a fairly large number of computer-related words (see Figure 11). Therefore, the following words were distinguished: ‘*computation*’, ‘*mobile*’, ‘*software*’, ‘*internet*’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 offload ***	11 situation ***	21 fc ***	31 distance ***	41 dataset ***
2 fig. ***	12 latency ***	22 software ***	32 h. ***	42 reservoir ***
3 quantum ***	13 cloud ***	23 technology ***	33 processing ***	43 zhang ***
4 y. ***	14 mobile ***	24 architecture ***	34 internet ***	44 computational ***
5 sensor ***	15 educational ***	25 data ***	35 method ***	45 challenge ***
6 fog ***	16 teaching ***	26 improve ***	36 function ***	46 z. ***
7 iot ***	17 transaction ***	27 table ***	37 neural ***	47 delay ***
8 context ***	18 c. ***	28 security ***	38 i. ***	48 consider ***
9 mec ***	19 environment ***	29 distribute ***	39 author ***	49 integration ***
10 module ***	20 computation ***	30 pow ***	40 value ***	50 eusn ***

Figure 11. Keyword Analysis of Single-Word Terms – May 2024 Corpus

In the same month, the analysis of multi-word terms showed a small number of words, only twenty-eight items, as shown in Figure 12, but this did not prevent us from identifying phrases with a computer theme. For further analysis of neologisms, we selected the following expressions: ‘*educational robot*’, ‘*mobile edge*’, ‘*cloud-to-edge continuum*’, ‘*mock exam*’, ‘*edge continuum*’.

Term	Term	Term
1 edge computing ***	11 fog computing ***	21 reinforcement learn ***
2 resource allocation ***	12 ieee trans ***	22 deep reinforcement ***
3 consensus mechanism ***	13 computing resource ***	23 mock exam ***
4 edge server ***	14 mobile edge ***	24 activity recognition ***
5 computer network ***	15 online learning ***	25 new block ***
6 distance education ***	16 mobile edge computing ***	26 use case ***
7 neural network ***	17 cloud-to-edge continuum ***	27 international conference ***
8 academic year ***	18 computer science ***	28 same time ***
9 educational robot ***	19 task offload ***	
10 base station ***	20 computation offload ***	

Figure 12. Keyword Analysis of Multi-Word Terms – May 2024 Corpus

### 3.2.6. June 2024

The analysis of the June 2024 corpus identified new words that were not found in previous samples, as can be seen in the Figure 13, so we selected such words for further analysis of neologisms: ‘*Chat GPT*’, ‘*blockchain*’, ‘*nanoparticle*’, ‘*chatbot*’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 chatgpt ***	11 ai ***	21 ligand ***	31 blockchain-based ***	41 computational ***
2 nanodrug ***	12 iot ***	22 liu ***	32 hydrolysis ***	42 node ***
3 chem ***	13 ieee ***	23 replica ***	33 unported ***	43 simulation ***
4 blockchain ***	14 chatbot ***	24 et ***	34 prediction ***	44 α ***
5 nanoparticle ***	15 ξ ***	25 ε ***	35 nguyen ***	45 gao ***
6 adsorption ***	16 estimation ***	26 sig ***	36 comput ***	46 mater ***
7 nanomaterial ***	17 nanosurface ***	27 π ***	37 catalytic ***	47 compression ***
8 quantum ***	18 algorithm ***	28 adaptor ***	38 zhao ***	48 y ***
9 computing ***	19 wang ***	29 fog ***	39 neural ***	49 interaction ***
10 σ ***	20 zhang ***	30 li ***	40 adsorb ***	50 architecture ***

Figure 13. Keyword Analysis of Single-Word Terms – June 2024 Corpus

Both in the analysis of single-word and multi-word corpora of June 2024, the program identified some phrases for the first time (see Figure 14), such as: ‘unported licence’, ‘blockchain-based edge’, ‘smart contract’, ‘sensor network’, ‘wireless sensor’, ‘blockchain technology’.

Term	Term	Term	Term
1 edge computing ***	14 drug molecule ***	27 sensor network ***	40 edge server ***
2 r sign ***	15 open access article ***	28 smart contract ***	41 drug loading ***
3 adaptor signature ***	16 artificial intelligence ***	29 blockchain-based edge ***	42 forest fire ***
4 channel estimation ***	17 r pre ***	30 quantum computing ***	43 maintenance management ***
5 reference architecture ***	18 computer vision ***	31 stress detection ***	44 edge layer ***
6 neural network ***	19 fog computing ***	32 reserved capacity ***	45 blockchain technology ***
7 image compression ***	20 md simulation ***	33 server s ***	46 deep learning ***
8 commons attribution ***	21 fire spread ***	34 mean value ***	47 cloud server ***
9 unported licence ***	22 machine learning ***	35 protein adsorption ***	48 american chemical society ***
10 royal society ***	23 quantum service ***	36 wireless sensor ***	49 interfacial interaction ***
11 view article ***	24 cloud computing ***	37 signature scheme ***	50 random value ***
12 quantum software ***	25 energy barrier ***	38 ieee transaction ***	
13 iot system ***	26 machine learn ***	39 nanodrug discovery ***	

Figure 14. Keyword Analysis of Multi-Word Terms – June 2024 Corpus

### 3.2.7. July 2024

Figure 15 refers to the analysis of the July 2024 corpus, although the program identified a lot of words, there were many times fewer new words compared to the analysis of June 2024, so we chose only three words ‘GPT-4’, ‘generate’ and ‘workload’.

Lemma	Lemma	Lemma	Lemma	Lemma
31 should	31 memory	71 d	81 index	91 last
32 performance	32 r	72 o	82 iteration	92 neural
33 image	33 computation	73 e	83 search	93 figure
34 container	34 executed	74 x	84 control	94 description
35 id	35 item	75 software	85 k	95 bound
36 gpt-4o	36 wang	76 follow	86 doi	96 ci
37 aim	37 operation	77 ui	87 consumption	97 workload
38 radle	38 allocation	78 computational	88 zhang	98 system
39 input	39 target	79 point	89 overall	99 scheme
40 prompt	40 grid	80 scenario	90 generate	100 technology

Figure 15. Keyword Analysis of Single-Word Terms – July 2024 Corpus

Analysis of the July 2024 corpus revealed a slightly larger number of results that we need for further research (see Figure 16), and we have identified several of the following phrases: ‘point cloud’, ‘screenshot’, ‘optimization’, ‘AI assistant’.

Term	Term	Term	Term	Term
1 data center	11 current task	21 index tree	31 ai assistant	41 neighboring region
2 executed action	12 current screenshot	22 target task	32 helpful ai assistant	42 other information
3 point cloud	13 previous action	23 o n	33 helpful ai	43 wide range
4 last executed action	14 back end	24 data owner	34 ai data center	
5 last action	15 quantum computing	25 label id	35 ui item	
6 c radle	16 ieee transaction	26 energy system	36 energy management	
7 resource allocation	17 current situation	27 valid action	37 current subtask	
8 neural network	18 quality assessment	28 computing resource	38 task inference	
9 overall task	19 energy consumption	29 optimization problem	39 task offload	
10 bounding box	20 live migration	30 c j	40 local neighboring region	

Figure 16. Keyword Analysis of Multi-Word Terms – July 2024 Corpus

### 3.2.8. August 2024

Figure 17 shows there are several words in the August 2024 corpus that are computer-related and were not mentioned in any of the previous case studies. We have selected two of them: ‘modeling’, ‘bitcoin’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 radar	11 analyze	21 int	31 compression	41 discovery
2 equation	12 phreesql	22 enhance	32 generate	42 sector
3 wang	13 predict	23 operator	33 ξ	43 bitcoin
4 bmsi-gc	14 failure	24 demonstrate	34 server	44 madenci
5 optimal	15 stress	25 plate	35 identification	45 volume
6 modeling	16 interaction	26 oterkus	36 enterprise	46 conference
7 u	17 obtain	27 cluster	37 coarse	47 v
8 transaction	18 mechanic	28 prediction	38 sci	48 kb
9 composite	19 domain	29 damage	39 ren	49 introduce
10 chen	20 engineering	30 bond-based	40 dorduncu	50 paridynamics

Figure 17. Keyword Analysis of Single-Word Terms – August 2024 Corpus

The number of phrases for this month is large, as can be seen in the Figure 18. We have identified the following five key terms: ‘*AI computing*’, ‘*AI computing power*’, ‘*anomaly detection*’, ‘*biomolecular simulation*’, ‘*neuromorphic computing*’.

Term	Term	Term
1 artificial intelligence ***	16 quantum computer ***	31 non-ordinary state-based peridynamic ***
2 mixing service ***	17 quantum computing ***	32 model compression ***
3 computing power ***	18 material point ***	33 anomaly detection ***
4 finite element ***	19 deep learning ***	34 finite element method ***
5 cloud computing ***	20 public administration ***	35 graph classification ***
6 peridynamic model ***	21 tin memristor ***	36 t heta ***
7 power leasing ***	22 element method ***	37 ai computing power leasing ***
8 neural network ***	23 route discovery ***	38 computing technology ***
9 computing power leasing ***	24 machine learning ***	39 boundary condition ***
10 comput method ***	25 peridynamic theory ***	40 open access ***
11 c2f model ***	26 ai computing ***	41 differential equation ***
12 state-based peridynamic ***	27 ai computing power ***	42 edge device ***
13 crack propagation ***	28 differential operator ***	43 fine model ***
14 edge computing ***	29 machine learn ***	44 p p ***
15 service identification ***	30 biomolecular simulation ***	45 neuromorphic computing ***
18 cost function ***	31 molecular dynamics ***	46 eeg signal ***
19 mixing service identification ***	32 international conference ***	

Figure 18. Keyword Analysis of Multi-Word Terms – August 2024 Corpus

### 3.2.9. September 2024

As we can see in Figure 19, September 2024 highlighted many words and phrases, but it becomes more difficult to identify unique words that have not been used before. Therefore, we managed to select only one word from this analysis: ‘*encryption*’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 et ***	11 computing ***	21 scheme ***	31 propose ***	61 page ***
2 model ***	12 problem ***	22 j ***	32 journal ***	62 analysis ***
3 network ***	13 energy ***	23 ai ***	33 m ***	63 machine ***
4 use ***	14 cloud ***	24 approach ***	34 data ***	64 computational ***
5 datum ***	15 learning ***	25 n ***	35 q ***	65 volume ***
6 t ***	16 computer ***	26 neural ***	36 mi ***	66 encryption ***
7 system ***	17 k ***	27 dataset ***	37 science ***	67 computation ***
8 quantum ***	18 security ***	28 learn ***	38 accuracy ***	68 base ***
9 algorithm ***	19 method ***	29 optimization ***	39 layer ***	69 process ***
10 training ***	20 s ***	30 ieee ***	40 application ***	70 ml ***

Figure 19. Keyword Analysis of Single-Word Terms – September 2024 Corpus

As for the phrases, Figure 20 shows a small number of them, but we managed to identify two multi-word terms that had not been used before. Based on the results of this analysis, we chose the following words: ‘*Super AI*’, ‘*quantum annealler*’.

Term	Term	Term
1 neural network ***	11 master problem ***	21 international journal ***
2 cloud computing ***	12 quantum computer ***	22 federated learning ***
3 energy consumption ***	13 quantum annealer ***	23 intrusion detection ***
4 super ai ***	14 optimization problem ***	24 internet of things ***
5 artificial intelligence ***	15 complex network ***	
6 secret sharing ***	16 benders decomposition ***	
7 machine learning ***	17 fog computing ***	
8 computer science ***	18 international conference ***	
9 machine learn ***	19 ieee transaction ***	
10 training program ***	20 homomorphic encryption ***	

Figure 20. Keyword Analysis of Multi-Word Terms – September 2024 Corpus

### 3.2.10. October 2024

Based on the analysis of our tenth corpus, namely October 2024, we managed to select one word for further analysis, as in the previous case. As we can see from Figure 21, the words were either already selected earlier or were not related to the computer sphere. As a result, we chose the word ‘*storage*’ for further neologisms analysis.

Lemma	Lemma	Lemma	Lemma	Lemma
1 computing ***	11 system ***	21 function ***	31 learning ***	41 learn ***
2 datum ***	12 ieee ***	22 teacher ***	32 process ***	42 fog ***
3 network ***	13 application ***	23 storage ***	33 processing ***	43 1 ***
4 edge ***	14 server ***	24 communication ***	34 proposa ***	44 quantum ***
5 cloud ***	15 user ***	25 iot ***	35 m ***	45 delay ***
6 task ***	16 device ***	26 node ***	36 ai ***	46 energy ***
7 resouroe ***	17 architecture ***	27 optimization ***	37 computer ***	47 parameter ***
8 algorithm ***	18 allocation ***	28 data ***	38 scheduling ***	48 consumption ***
9 model ***	19 use ***	29 method ***	39 offload ***	49 approach ***
10 et ***	20 base ***	30 n ***	40 performance ***	50 different ***

Figure 21. Keyword Analysis of Single-Word Terms – October 2024 Corpus

However, in the analysis of the October 2024 corpus, we managed to select several multi-word terms from Figure 22 for further analysis of neologisms. We selected the following phrases: ‘cloud server’, ‘edge-cloud server’, ‘virtual machine’.

Term	Term	Term	Term
1 resource allocation ***	14 data center ***	24 computing model ***	40 allocation algorithm ***
2 cloud computing ***	15 clinical trial ***	26 optimization problem ***	41 international conference ***
3 edge computing ***	16 use case ***	26 arxiv preprint arxiv ***	47 mobile edge ***
4 energy consumption ***	17 task offload ***	26 preprint arxiv ***	43 policy maker ***
5 edge server ***	18 fog computing ***	21 arxiv preprint ***	31 resource allocation algorithm ***
6 neural network ***	19 ieee trans ***	24 cloud server ***	45 iot architecture ***
7 task scheduling ***	20 fog node ***	23 mobile device ***	46 scheduling algorithm ***
8 internet of things ***	21 reinforcement learn ***	24 vcc server ***	47 machine learning ***
9 computing continuum ***	21 deep learning ***	26 spectrum resource ***	46 scientific inquiry ***
10 iot device ***	22 deep reinforcement ***	26 semantic interoperability ***	49 machine learn ***
11 edge node ***	24 reference architecture ***	27 core level ***	50 edge-cloud server ***
12 response time ***	25 computing resource ***	28 virtual machine ***	
13 computer vision ***	25 vr service ***	28 edge level ***	

Figure 22. Keyword Analysis of Multi-Word Terms – October 2024 Corpus

### 3.2.11. November 2024

Figure 23 shows the results of the keyword analysis for November 2024. Unfortunately, November 2024 also did not show a large number of new words that were not repeated in previous months. Therefore, we again selected only one word ‘attack’.

Lemma	Lemma	Lemma	Lemma	Lemma
1 computing ***	11 edge ***	21 optimization ***	31 efficiency ***	41 infrastructure ***
2 datum ***	12 task ***	22 performance ***	32 e ***	42 engineering ***
3 algorithm ***	13 solution ***	23 neuromorphic ***	33 result ***	43 ieee ***
4 quantum ***	14 uav ***	24 approach ***	34 communication ***	44 enhance ***
5 network ***	15 computer ***	25 problem ***	35 execution ***	45 environment ***
6 et ***	16 resource ***	26 design ***	36 management ***	46 analysis ***
7 system ***	17 consumption ***	27 uavs ***	37 m ***	47 link ***
8 model ***	18 application ***	28 technology ***	38 j ***	48 attack ***
9 t ***	19 data ***	29 use ***	39 these ***	49 table ***
10 energy ***	20 cloud ***	30 challenge ***	40 propose ***	50 method ***

Figure 23. Keyword Analysis of Single-Word Terms – November 2024 Corpus

In contrast, the analysis of multi-word terms shows better results for words that have not been previously used in the analyses, as can be seen in Figure 24. We managed to identify six such words: ‘hidden link’, ‘supply chain’, ‘attack vector’, ‘chain management’, ‘supply chain management’, ‘web page’.

Term	Term	Term	Term
1 energy consumption ***	11 hidden link attack ***	21 adversary hidden link attack ***	31 success rate ***
2 neuromorphic computing ***	12 load balancing ***	22 attack vector ***	32 big datum ***
3 quantum computer ***	13 civil engineering ***	23 energy efficiency ***	33 neuromorphic system ***
4 hidden link ***	14 execution time ***	24 internet of things ***	34 data collection ***
5 edge computing ***	15 uav system ***	25 md i ***	35 genetic algorithm ***
6 supply chain ***	16 quantum computing ***	26 smart contract ***	36 pareto front ***
7 electric vehicle ***	17 adversary hidden link ***	27 deep learning ***	37 visual inspection ***
8 cloud computing ***	18 resource allocation ***	28 power system ***	38 web page ***
9 mec server ***	19 task scheduling ***	29 chain management ***	
10 link attack ***	20 neural network ***	30 supply chain management ***	

Figure 24. Keyword Analysis of Multi-Word Terms – November 2024 Corpus

### 3.2.12. December 2024

And the last corpus we analyse separately, December 2024. Figure 25 shows that the number of computer-related words is not large, but we managed to find three words that can be used for further analysis of neologisms, specifically: *‘metaverse’*, *‘qubit’*, *‘virtual’*.

Lemma	Lemma	Lemma	Lemma	Lemma
1 task ***	11 algorithm ***	21 b ***	31 qubit ***	41 qj ***
2 network ***	12 digital ***	22 metaverse ***	32 problem ***	42 et ***
3 resource ***	13 computation ***	23 datum ***	33 n ***	43 virtual ***
4 computing ***	14 node ***	24 optimization ***	34 environment ***	44 performance ***
5 model ***	15 offload ***	25 twin ***	35 propose ***	45 approach ***
6 j ***	16 cloud ***	26 ieee ***	36 use ***	46 processing ***
7 quantum ***	17 formal ***	27 a ***	37 allocation ***	47 server ***
8 system ***	18 queue ***	28 π ***	38 computational ***	48 doi ***
9 method ***	19 t ***	29 device ***	39 volume ***	49 base ***
10 g ***	20 edge ***	30 computer ***	40 mobile ***	50 scheduling ***

Figure 25. Keyword Analysis of Single-Word Terms – December 2024 Corpus

And accordingly, in the analysis of multi-word terms of December 2024, we also managed to highlight several phrases such as: *‘digital twin’*, *‘intrusion detection system’*.

Term	Term	Term	Term
1 formal method ***	12 computer science ***	23 objective function ***	34 mobile edge computing ***
2 digital twin ***	13 quantum computer ***	24 intrusion detection system ***	35 computing resource ***
3 resource allocation ***	14 j j j ***	25 arrival rate ***	36 quantum computing ***
4 computation offload ***	15 processing queue ***	26 reinforcement learn ***	37 mobile computing ***
5 j j ***	16 mobile edge ***	27 eh model ***	38 energy consumption ***
6 cloud computing ***	17 service time ***	28 data transmission ***	39 mobile device ***
7 time step ***	18 detection system ***	29 ieee trans ***	40 partial computation ***
8 edge computing ***	19 optimization problem ***	30 resource utilization ***	41 internet of things ***
9 intrusion detection ***	20 fog computing ***	31 end-to-end delay ***	
10 task offload ***	21 tandem queue ***	32 neural network ***	
11 computation speed ***	22 computational resource ***	33 check node ***	

Figure 26. Keyword Analysis of Multi-Word Terms – December 2024 Corpus

### 3.2.13. Diachronic Corpus Analysis

The last stage of our analysis was to conduct a diachronic corpus analysis, which would show us what words were used in our corpora with the highest frequency of increase. Having chosen the Trends function, we started by selecting our corpus and advanced settings. In the settings, we chose a minimum frequency of 58 and a minimum p-value of 0.05. Unfortunately, as can be seen in Figure 27, not a single computer-related neologism was detected. We assume that this result is related to the subject matter of the texts, since all the texts in our samples were

scientific articles, the program extracts academic vocabulary from the text as the most frequently used.

Lemma	Trend ↓	Frequency	Sample	Lemma	Trend ↓	Frequency	Sample	Lemma	Trend ↓	Frequency	Sample
1 outside	✓	2.25	34	18 approval	✓	1.54	22	35 alternate	✓	1.38	18
2 systematically	✓	2.14	15	19 educator	✓	1.54	37	36 strong	✓	1.33	84
3 consent	✓	2.05	18	20 opinion	✓	1.54	25	37 independent	✓	1.33	89
4 theme	✓	1.96	56	21 bridge	✓	1.48	50	38 merely	✓	1.33	18
5 impossible	✓	1.96	21	22 automated	✓	1.43	92	39 how	✓	1.28	610
6 lifecycle	✓	1.88	15	23 clear	✓	1.43	86	40 sometimes	✓	1.28	37
7 topic	✓	1.80	193	24 call	✓	1.43	167	41 easily	✓	1.28	48
8 century	✓	1.80	24	25 underlie	✓	1.43	93	42 simply	✓	1.28	22
9 explain	✓	1.73	124	26 technological	✓	1.43	126	43 view	✓	1.23	218
10 publication	✓	1.73	202	27 special	✓	1.43	68	44 evidence	✓	1.23	69
11 material	✓	1.66	116	28 conceptual	✓	1.43	64	45 income	✓	1.23	17
12 put	✓	1.66	29	29 abstract	✓	1.38	125	46 participant	✓	1.19	202
13 articulate	✓	1.60	19	30 those	✓	1.38	166	47 expectation	✓	1.19	35
14 who	✓	1.54	181	31 strength	✓	1.38	74	48 weakness	✓	1.19	22
15 consistency	✓	1.54	39	32 risk	✓	1.38	390	49 concept	✓	1.15	297
16 themselves	✓	1.54	49	33 achievement	✓	1.38	22	50 regard	✓	1.15	190
17 personnel	✓	1.54	21	34 solid	✓	1.38	22				

Figure 27. Diachronic Analysis Results – General Corpus

But we did not stop there and decided to analyse keywords in the General Corpus. As in the previous analyses, we chose the English Web 2021 (enTenTen21) as a reference corpus. In this case, the result will show what is typical for one corpus compared to the reference corpus. This function allows us to identify unique words in the text, and then compares them with the reference corpus to identify keywords, multi-word phrases, terms, and n-grams. In other words, the analysis will be carried out according to the same principle as the previous separate corpora.

We decided to further tweak the parameters of the reference corpus, specifically, we chose the years 2024, 2025, the first and second quarters of these years, and it includes all months (see Figure 28).

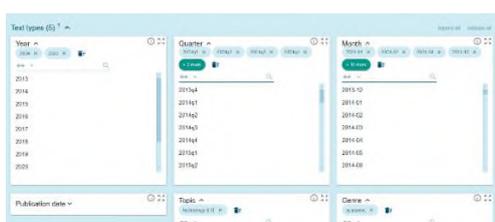


Figure 28. General Corpus Parameter Setup for Keyword Analysis

Figure 29 shows the results of the analysis. The analysis of this corpus showed positive results, as we managed to identify six one-word words that have a computer theme, three of which were not found in previous analyses. So, we have selected the following words: 'xAI', 'Ddos', 'LSTM'.

SINGLE-WORDS ✓		MULTI-WORD TERMS ✓	
reference corpus: English Web 2021 (enTenTen21)			
Lemma	Lemma	Lemma	Lemma
1 ChatGPT ...	11 Syst ...	21 α ...	31 Inq-ITS ...
2 Comput ...	12 GPT-4o ...	22 chatbot ...	32 physics-informed ...
3 arXiv ...	13 Radle ...	23 quantization ...	33 preprint ...
4 qubit ...	14 CrossRef ...	24 convolutional ...	34 executed ...
5 Qj ...	15 kj ...	25 AxC ...	35 SFC ...
6 Π ...	16 offload ...	26 metaverse ...	36 ECloTN ...
7 subtask ...	17 SLIFC ...	27 CVPR ...	37 Commun ...
8 neuromorphic ...	18 IEEE ...	28 XAI ...	38 classifier ...
9 UAVs ...	19 computing ...	29 IoT ...	39 j ...
10 UAV ...	20 ξ ...	30 CMC ...	40 DDoS ...
			41 Intell ...
			42 Aj ...
			43 convolution ...
			44 Appl ...
			45 Netw ...
			46 ψ ...
			47 quantum ...
			48 VNF ...
			49 LSTM ...
			50 self-efficacy ...

Rows per page: 50 1-50 of 100 < > 1 / 2 > >1

Figure 29. Keyword Analysis of Single-Word Terms – General Corpus

As for the phrases shown in Figure 30, the result is also positive, and a large number of phrases have the characteristic features of computer terminology. We managed to extract the following phrases: ‘*soft computing*’, ‘*AI system*’, ‘*autonomous driving*’.

SINGLE-WORDS ✓		MULTI-WORD TERMS ✓	
reference corpus: English Web 2021 (enTenTen21)			
Term	Term	Term	Term
1 edge computing ...	11 point cloud ...	21 computer anxiety ...	31 king saud university ...
2 quantum encryption ...	12 deep learning ...	22 task offload ...	32 intrusion detection ...
3 formal method ...	13 last executed action ...	23 last action ...	33 ddos attack ...
4 computer vision ...	14 fog computing ...	24 ai system ...	34 sfc task ...
5 executed action ...	15 object detection ...	25 r sign ...	35 overall task ...
6 neuromorphic computing ...	16 ieee trans ...	26 neural network ...	36 artificial intelligence ...
7 arxiv preprint arxiv ...	17 jj ...	27 object tracking ...	37 computational thinking ...
8 soft computing ...	18 super ai ...	28 adaptor signature ...	38 resource allocation ...
9 preprint arxiv ...	19 c radle ...	29 deep learn ...	39 live migration ...
10 arxiv preprint ...	20 computer self-efficacy ...	30 ieee access ...	40 educational robot ...
			41 computing continuum ...
			42 cloud computing ...
			43 autonomous driving ...
			44 quantum computer ...
			45 uav system ...
			46 edge server ...
			47 iot datum ...
			48 bounding box ...
			49 quantum computing ...
			50 stm teacher ...

Rows per page: 50 1-50 of 100 < > 1 / 2 > >1

Figure 30. Keyword Analysis of Multi-Word Terms – General Corpus

And now we move on to the third and final stage of our analysis in SketchEngine, in which we used the Word Sketch function. This function allows us to determine the modifiers of words that are most often used with a lemma in texts. In the additional settings, we had to select the part of speech under consideration. So far, the programme can analyse nouns, verbs, adjectives and adverbs. Therefore, we will analyse two forms of the word computer, one noun and one verb.

First, we have chosen the word ‘*computer*’ as a noun. This program has a visualisation function that perfectly displays the results of the analysis in the form of a circle diagram. In the settings, it is possible to choose modifiers that will be shown and others that will not. We chose the most commonly used word combinations for visualisation.

The closer the circle is and the larger it is, the more often the word was a modifier of our lemma. The visualisation shows that the program suggested many modifiers for this word(see Figure 31). The most common combinations were the following: ‘quantum computer’, ‘gate-based computer’, ‘personal computer’, ‘classical computer’, ‘central computer’, ‘host computer’, ‘digital computer’, ‘universal computer’ etc.

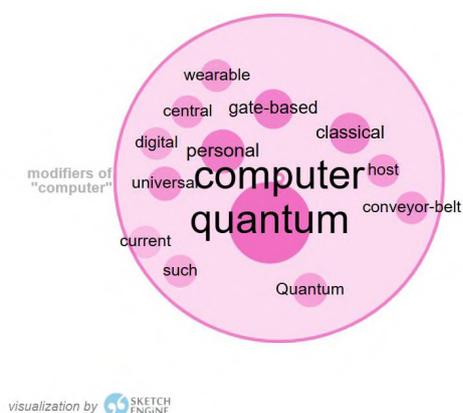


Figure 31. Word Sketch Visualization for ‘Computer’

Figure 32 shows the results of the analysis of the word ‘computing’ as a noun. And it shows not only the lemma modifiers, but also its noun modifiers, among them: ‘edge computing’, ‘fog computing’, ‘cloud computing’, ‘neuromorphic computing’, ‘quantum computing’, ‘computing system’, ‘computing continuum’, ‘computing environment’, ‘computing resource’, ‘computing architecture’ etc.

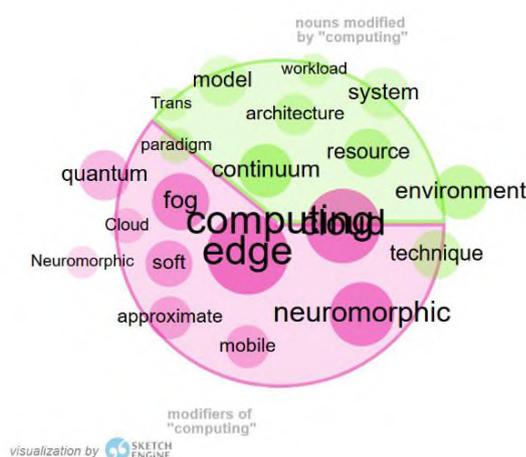


Figure 32. Word Sketch Visualization for ‘Computing’

Lastly, we analysed the word ‘computational’ as an adjective (see Figure 33). The diagram shows the noun modifiers used in the texts with the lemma, here are a few of them: ‘computational thinking’, ‘computational resource’, ‘computational cost’, ‘computational requirement’, ‘computational qubit’, ‘computational complexity’ etc.

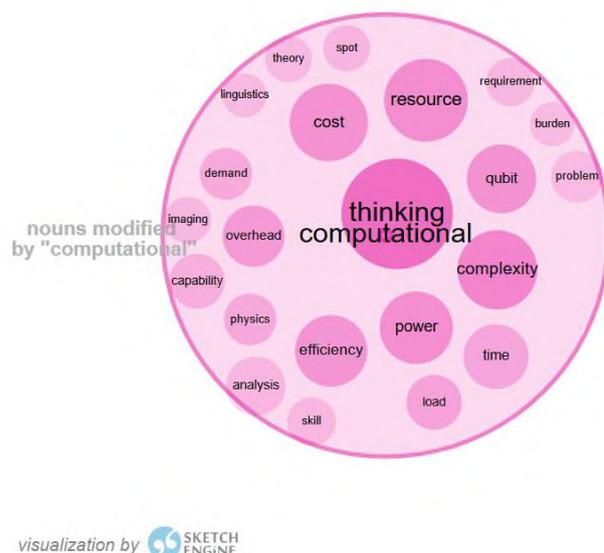


Figure 33. Word Sketch Visualization for 'Computational'

We have managed to select a fairly large number of computer-related words and phrases for further analysis in order to find neologisms among them. At this stage of the study, we can conclude that the number of two-word terms is significantly higher than the one-word terms. In the next section, we will analyse the graphs of the frequency of word or multi-word terms, and these graphs will help to identify and further classify neologisms.

### 3.3. Identification of Neologisms

Consequently, from the above corpora, we selected words and phrases that potentially could be neologisms, and each of them was checked using Google Books Ngram Viewer. This programme is a graphical visualiser of Google Books corpus. It also has more functions for different analyses, and allows displaying not only the single word analysis, but also multiple ones. It also helps to find the most frequently used words, word forms, context determinants, and parts of speech. For our analysis, we will use the usual single-word and multiple-word graphs. At the time of the study, the programme offers analysis from 1500 to 2022. Therefore, we have chosen a time period of one hundred years from 1922 to 2022.

For example, as we can see from Figure 34, we entered the word 'computer'. The graph shows that until 1985, the use of the word computer was growing rapidly, and after that it began to gradually decrease.

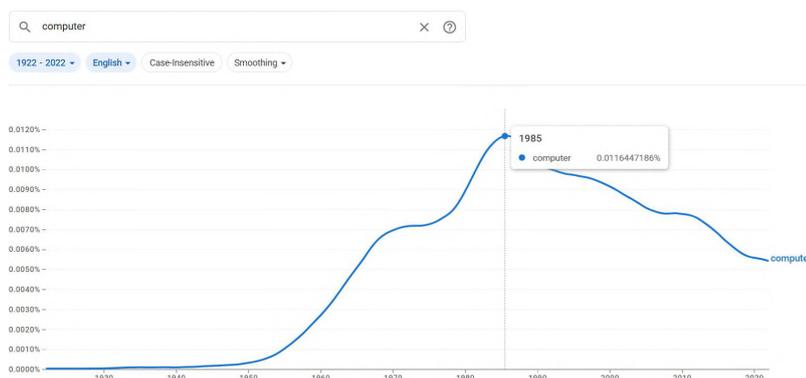


Figure 34. Word Frequency Over Time – ‘Computer’

We analysed all the words selected in the previous paragraph of this section. By looking at the graphs of the forty single-word terms, we can divide them into three groups: those that show a decline, those that have been growing slowly over a long period of time, and those that have been growing rapidly in recent period. A large number of them have a clear slow decline in usage, for example, such words are: ‘*authentication*’, ‘*server*’, ‘*simulation*’, ‘*system*’, ‘*user*’, ‘*signcryption*’, ‘*transaction*’, ‘*computation*’, ‘*mobile*’, ‘*software*’, ‘*storage*’.

A significant number of single-word indicators also show a gradual increase in usage, but the word itself began to exist decades ago. We cannot consider such words as neologisms, because we need an extremely rapid increase in recent years to assume that the word is a neologism. Among such words were: ‘*network*’, ‘*vision*’, ‘*quantum*’, ‘*algorithm*’, ‘*dataset*’, ‘*tracking*’, ‘*computing*’, ‘*optimize*’, ‘*internet*’, ‘*nanoparticle*’, ‘*generate*’, ‘*workload*’, ‘*modeling*’, ‘*encryption*’, ‘*attack*’, ‘*qubit*’, ‘*virtual*’.

Only ten single-word terms showed a significant increase in usage in the last few years, so each of them will be analysed separately.

First of all, we reviewed the acronym ‘*IoT*’, which stands for ‘*Internet of Things*’. We have introduced the word and the graph shows a rapid growth in usage in recent years, even though the word itself has only recently appeared(see Figure 35).

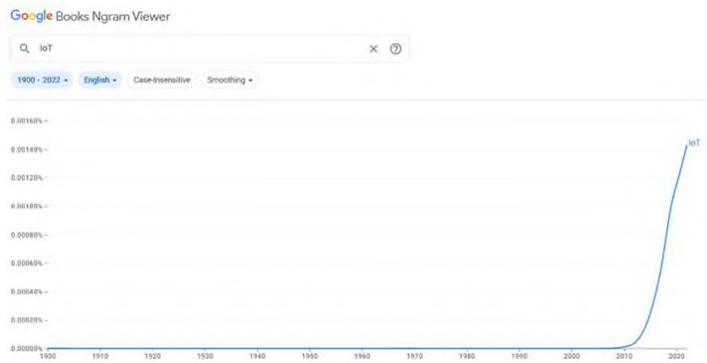


Figure 35. Word Frequency Over Time – 'IoT'

The next acronym, 'AI', which stands for artificial intelligence, appeared long ago according to Figure 36. We can observe that the graph shows a significant increase since 2013, which is an indicator of the growing use of this acronym. Similar results can be observed in the following graphs.

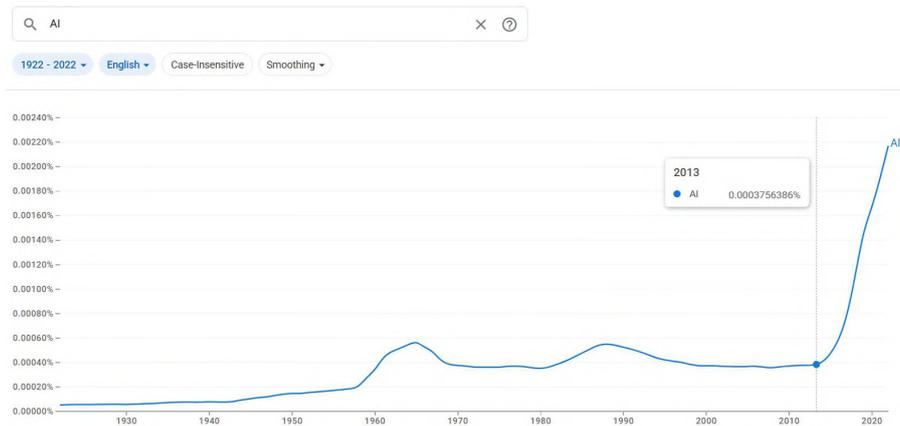


Figure 36. Word Frequency Over Time – 'AI'

Another acronym that stands for 'Generative Pretrained Transformer', 'Chat GPT' and 'GPT-4o'. So, the next one we considered was Chat GPT. The word came into existence recently, and in the past few years, we have seen a very rapid growth in its use (see Figure 37).



Figure 37. Word Frequency Over Time – 'Chat GPT'

An additional finding is that in the case shown in Figure 38, if we simultaneously view the two indicators, the ‘GPT-4’ indicator shows a much higher value, most likely due to the fact that this is the name of the latest version of ‘Chat GPT’, and since its release, the use of the previous name has been decreasing



Figure 38

For the word ‘Blockchain’, as in the previous cases, we can see a sharp rise on the chart. And the starting point of the graph indicates the novelty of the word (see Figure 39).



Figure 39. Word Frequency Over Time – ‘Blockchain’

Figure 40 indicates that the word ‘Chatbot’, although it started to exist earlier, and there are rare cases of use, once again, the trend has started to grow rapidly only recently

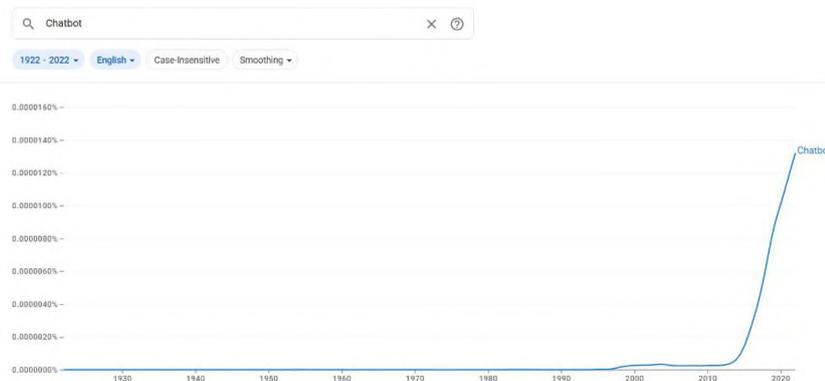


Figure 40. Word Frequency Over Time – ‘Chatbot’

The word *'Bitcoin'*, despite the fact that it started to be used later than the word chatbot, has a significant increase in usage (see Figure 41).

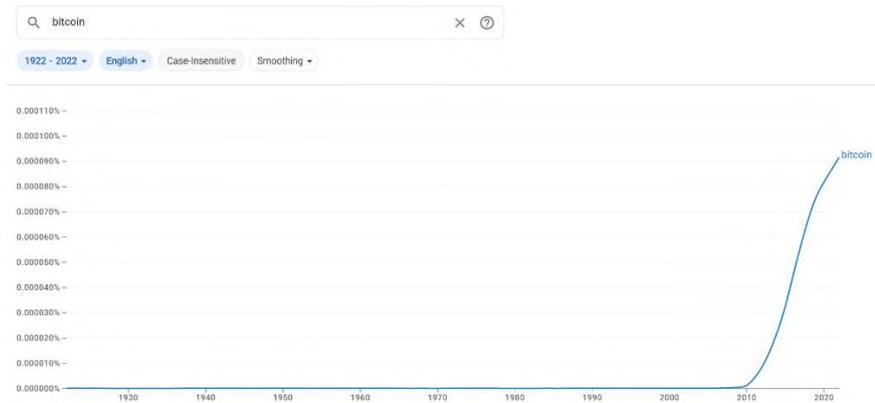


Figure 41. Word Frequency Over Time – *'Bitcoin'*

According to Figure 42, the word *'Metaverse'* started to exist at the beginning of this century, but in 2017 there was a sharp increase in usage, which may be due to the emergence of a new meaning of the word.

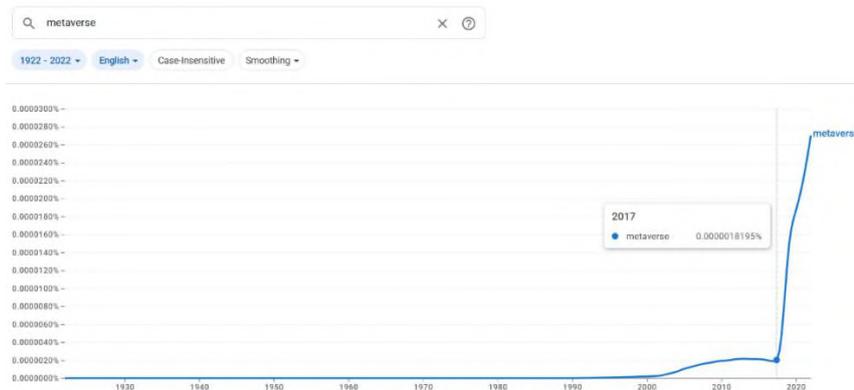


Figure 42. Word Frequency Over Time – *'Metaverse'*

The word *'XAI'* is also distinguished by growth, as Figure 43 shows a rapid increase since 2015, which continues to grow.

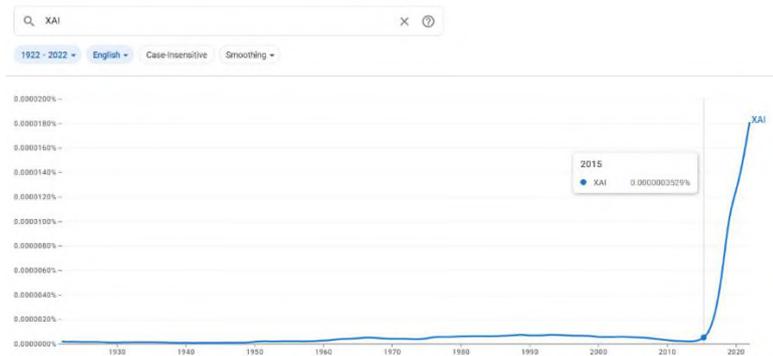


Figure 43. Word Frequency Over Time – 'XAI'

One of the most notable graphs in this sample is the one shown in Figure 44, which depicts the use of the acronym 'Ddos'. According to the graph, the word began its existence a long time ago, as it grew steadily until a certain point between 2010 and 2013. Specifically, in 2013, the word seems to have acquired a novel meaning, which can explain the rapid growth in the graph.

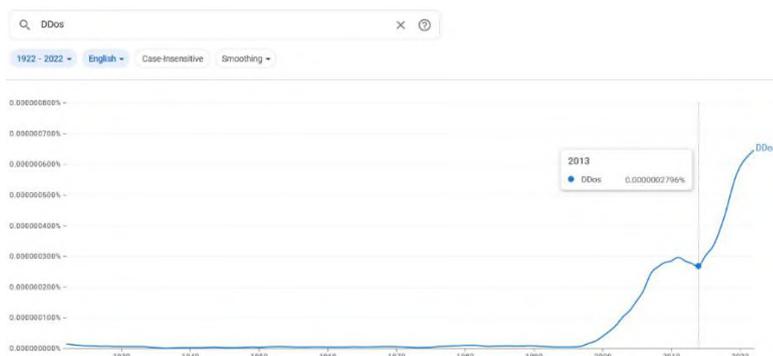


Figure 44. Word Frequency Over Time – 'DDos'

In the second stage, we analysed all two-word terms and phrases. Since more than sixty combinations were selected at the previous stage of the study, we will show only some of them graphically.

According to the analysis of the graphs, a gradual increase in the use of words over a long period of time was noticed in the following words: 'computer vision', 'machine learning', 'network traffic', 'cloud environment', 'computational thinking', 'cloud-to-edge continuum', 'mock exam', 'unported license', 'point cloud', 'optimization', 'anomaly detection', 'biomolecular simulation', 'hidden link', 'supply chain', 'attack vector', 'chain management', 'supply chain management', 'intrusion detection system', 'soft computing'.

For example, consider one of these words. Although Figure 45 shows an almost constant increase in the use of the term 'network traffic', we can see a decline after 2000. Since

2015, the trend has started to grow again, but steadily, which may also indicate the emergence of a new sense, but still lack of active use.

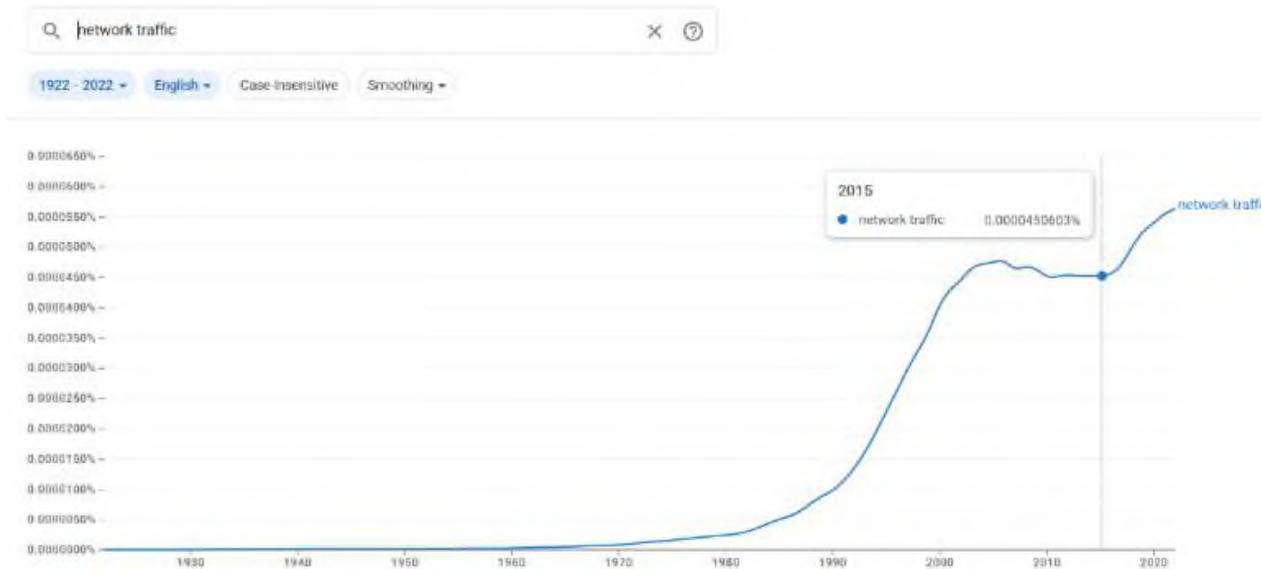


Figure 45. Word Frequency Over Time – ‘Network Traffic’

According to the graphs, the following word combinations showed a decrease in growth and a drop in indicators: ‘collaboration system’, ‘hyperbolic space’, ‘sensor network’, ‘wireless sensor’, ‘screenshot’, ‘virtual machine’, ‘web page’.

The following graph is an example of a declining trend. Figure 46 illustrates the sharp decline in the use of the word ‘hyperbolic space’ since 2004, and it can also be noted that the difference between the highest and the last index is quite significant. This fact suggests that the phrase may become obsolete in the near future.

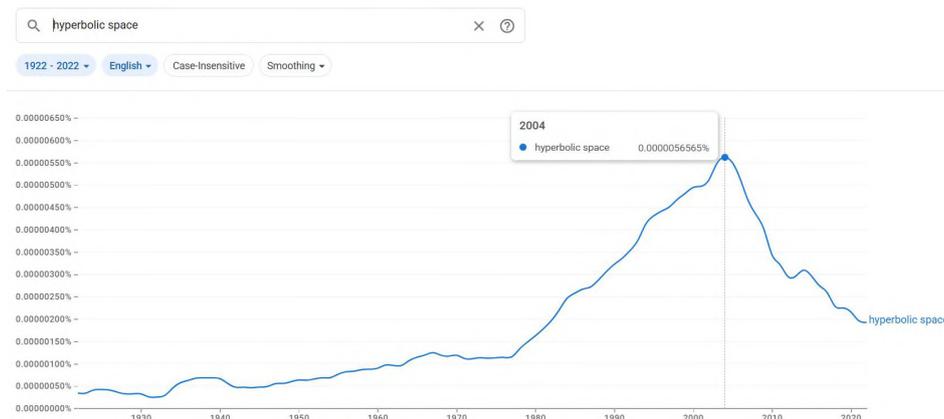


Figure 46. Word Frequency Over Time – ‘Hyperbolic Space’

The graph of the term ‘web page’ looks similar (see Figure 47). Compared to the previous graph, the word appeared not so long ago, but since 2011, the indicators have been

declining. If the graph continues to decline in the near future, the word might be on the way out of use.

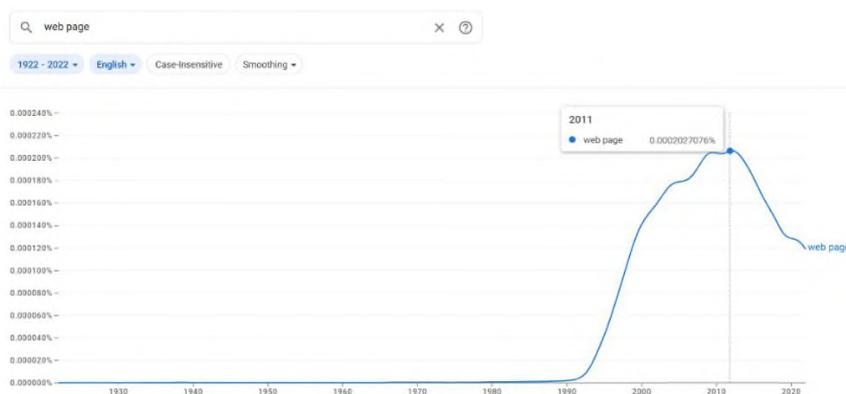


Figure 47. Word Frequency Over Time – ‘Web page’

A significant result of the analysis was the number of multi-word terms with a sharp increase in frequency, which included more than half of the words, specifically thirty-four words. The words included are as follows: ‘*neural network*’, ‘*deep learning*’, ‘*quantum computing*’, ‘*cloud computing*’, ‘*Internet of Things*’, ‘*edge computing*’, ‘*serverless computing*’, ‘*convolution network*’, ‘*task offload*’, ‘*edge offload*’, ‘*edge server*’, ‘*IoT device*’, ‘*fog computing*’, ‘*artificial intelligence*’, ‘*mobile edge computing*’, ‘*IoT data*’, ‘*convolutional neural network*’, ‘*fog node*’, ‘*educational robot*’, ‘*mobile edge*’, ‘*edge continuum*’, ‘*blockchain-based edge*’, ‘*smart contract*’, ‘*blockchain technology*’, ‘*AI assistant*’, ‘*AI computing*’, ‘*AI computing power*’, ‘*neuromorphic computing*’, ‘*Super AI*’, ‘*quantum annealer*’, ‘*cloud server*’, ‘*edge-cloud server*’, ‘*digital twin*’, ‘*AI system*’, ‘*autonomous driving*’.

Now, we will examine three cases with high scores on the graph. Figure 48 shows the results of the term ‘*AI assistant*’. As in other cases of neologisms, the graph shows the recent emergence of the word and the rapid growth of the indicators. Also, it should be noted that in the first years of the term's existence, it seemed to be unused, and the growth began only after 2010.

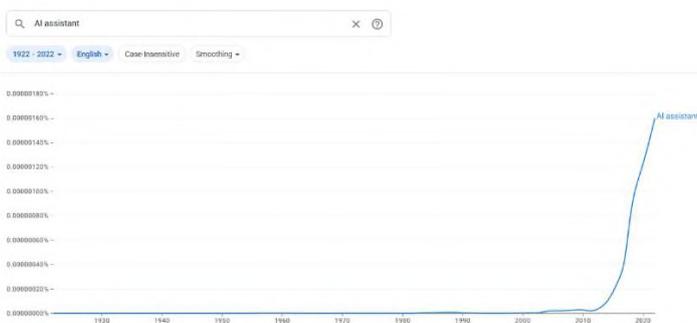


Figure 48. Word Frequency Over Time – ‘AI assistant’

The same applies to the term *'fog computer'*, the result is similar to the previous graph, the only difference is that the concept of *'fog computer'* appeared much later and experienced a rapid growth (see Figure 49).

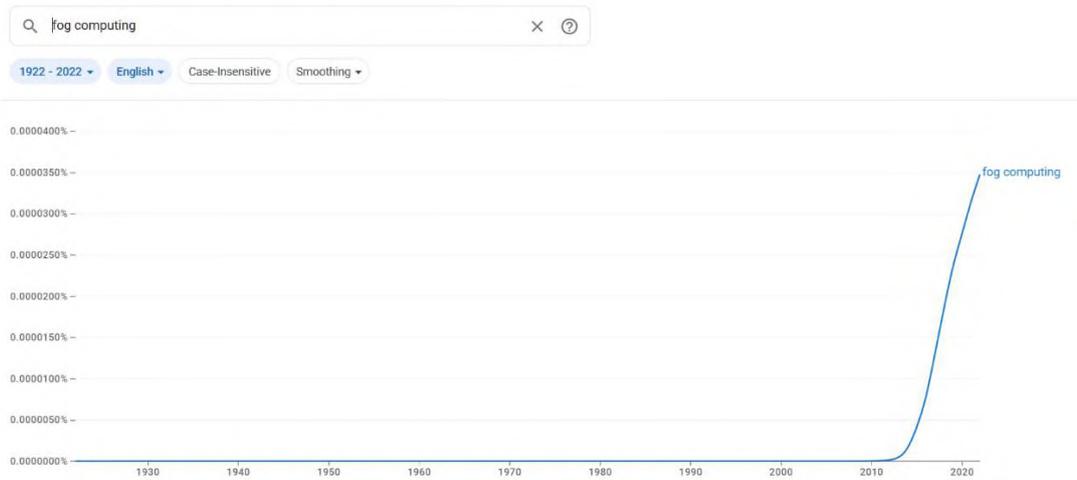


Figure 49. Word Frequency Over Time – 'Fog Computing'

Then, we introduced the term *'quantum computer'*. The Figure clearly shows that although the word began its existence several decades ago, its active use began only after 2014. Moreover, Figure 50 shows a very rapid growth. This may indicate that the word has begun to be used with a new meaning.

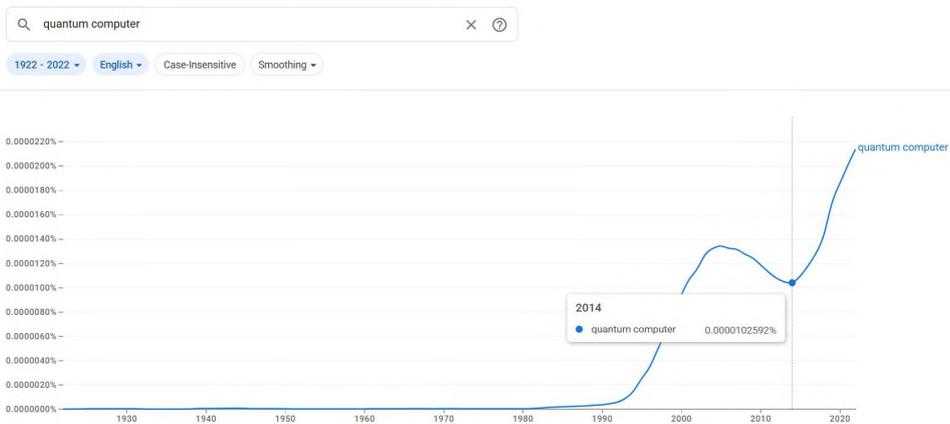


Figure 50. Word Frequency Over Time – 'Quantum Computer'

We would also like to draw attention to the following graphs, which are slightly distinct from the previous ones. The first one is the word *'neural network'*. Figure 51 shows that the word exists for quite a long period of time. Then we can observe a gradual decline in the trend over a long period of time. However, some changes affected the trend in 2014, after which the line began to grow very rapidly. Most probably, the word got a new context of use.

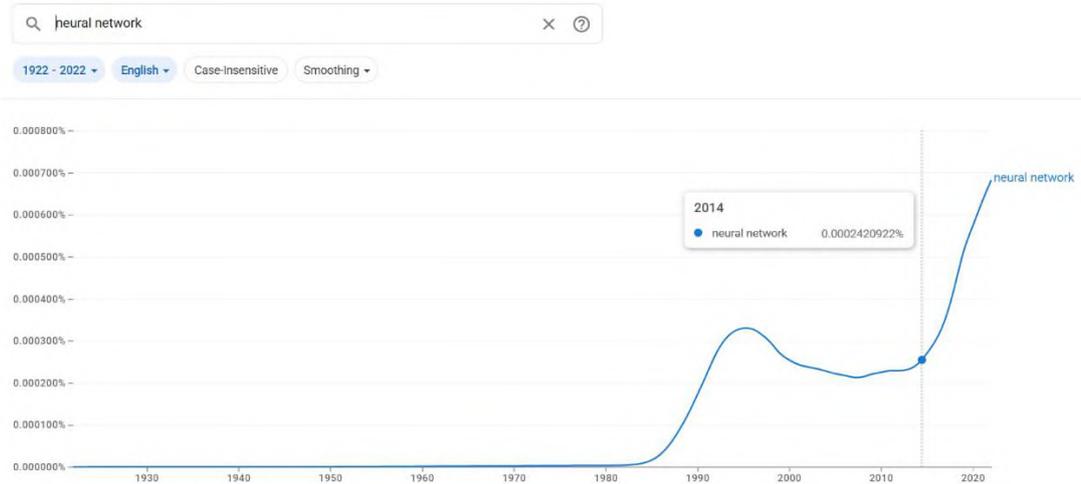


Figure 51. Word Frequency Over Time – ‘Neural Network’

The graph of the term ‘task offload’ is interesting and unique (see Figure 52). Over the period of its existence, the word has had two sharp declines and three rapid increases. Since 2017, there has been a very sharp and significant increase. As in other similar cases, we can assert the emergence of a novel sense.

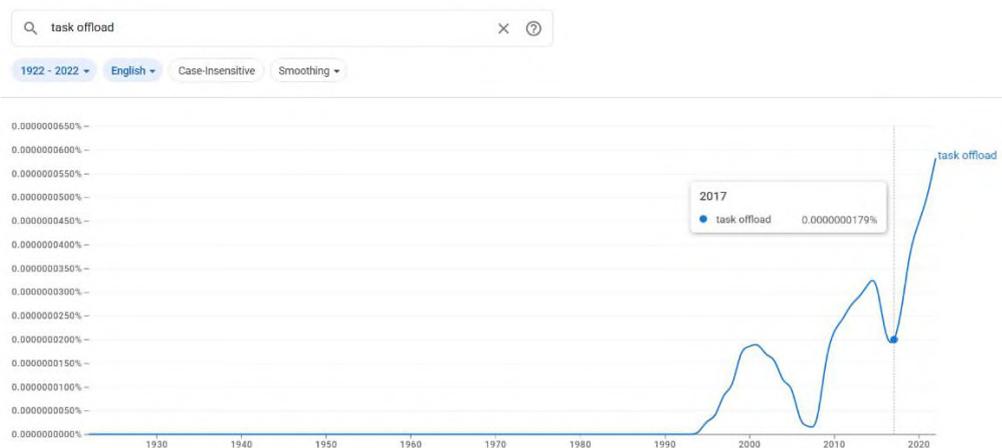


Figure 52. Word Frequency Over Time – ‘Task Offload’

The last and most unusual chart was that of the term ‘edge continuum’ (see Figure 53). There were no such number of trends shifts in any of the approximately one hundred charts we analysed. This graph shows more than five increases in the indicators, three of which are extremely sharp. At the same time, each significant increase was followed by an equally major decline. The latest increase began in 2016 and is the highest among the previous ones.

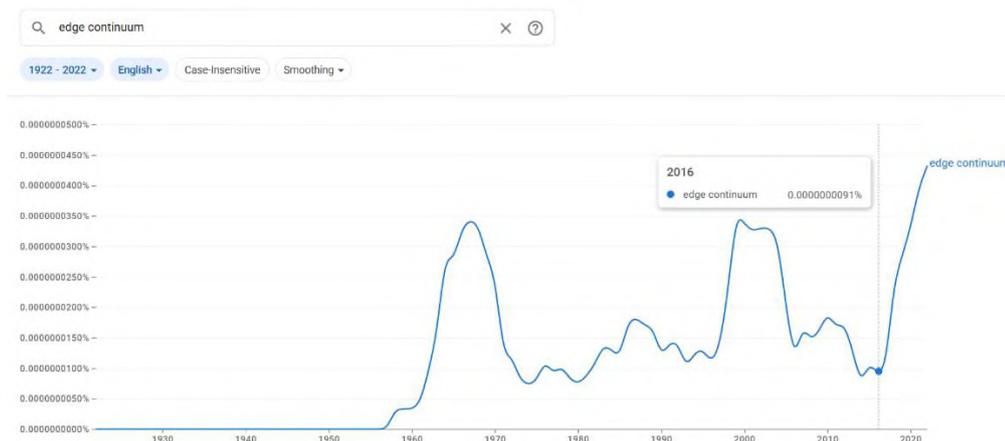


Figure 53. Word Frequency Over Time – ‘Edge Continuum’

After analysing about a hundred graphs, we selected the words for the final analysis. In order to confirm our assumptions, in the next section we will conduct an additional dictionary analysis to determine the level of integration of the terms into the target language, in our case into Ukrainian.

### 3.4. Dictionary Analysis of Neologisms

Since the topic of our research highlights the problem of neologisms' translation, the next stage of our study will be related to translation. For this purpose, we will find in the English-Ukrainian dictionaries of neologisms the translation options for the neologisms identified in the previous section. The main sources of translation analysis will be two English-Ukrainian dictionaries of neologisms: Kramar (2022) and Zatsnyi and Yankov (2008).

While planning our research, we wanted to divide the words into two subgroups: one-word terms and multi-word terms. However, analysing the dictionaries, we almost immediately came to the conclusion that most of the words are absent in both printed dictionaries and online dictionaries of the target language. Looking ahead, what we really did not expect was the same in the case of English dictionaries. Only a small number of terms were recorded in lexicographical sources. Therefore, given the dynamic development of technology, the most relevant and contextually accurate definitions were found in the latest online publications. Therefore, we decided to begin with the definitions we could find in dictionaries.

First of all, we find the acronym ‘AI’ translation in two online dictionaries with different meaning. So, the term ‘AI’ or ‘Artificial Intelligence’ is rendered differently in Ukrainian lexicographic sources. For instance, Horot et al. (2011) suggest the translation “*штучний розум*”, which emphasizes the cognitive or intellectual capacity of artificial systems. However,

this version may be considered semantically broader, as it can be interpreted not only as intelligence but as ‘mind’ or even ‘consciousness’, which can lead to overgeneralization or misinterpretation. In contrast, the online source e2u.org.ua (n.d.) offers “*штучний інтелект*”, a more accurate equivalent that aligns with the English word intelligence, denoting analytical and problem-solving capabilities. The definition provided by the Cambridge University Press (n.d.) expands on this by specifying that ‘AI’ involves systems with human-like abilities such as language use, generation, learning from data etc. This aligns more closely with “*штучний інтелект*”, as it reflects functionality over abstract reasoning or consciousness. Thus, based on both lexical and conceptual criteria, “штучний інтелект” appears to be the more precise Ukrainian equivalent.

The term ‘*Blockchain*’ is represented in Ukrainian language as ‘*блокчейн*’. Kramar (2022), in her dictionary explains this term by the following definition: “*розподілена база даних, яка зберігає інформацію про всі транзакції учасників системи у вигляді ланцюжка блоків*” (p.106). This translation preserves the international form of the term through transliteration and includes an explanatory definition based on the technology’s structure and function. It accurately conveys the decentralized nature of the system, essential for understanding its role in cryptocurrency. Overall, the Ukrainian translation ‘*блокчейн*’ is both functionally accurate and consistent with global usage trends, and its descriptive explanation adds conceptual clarity.

According to Kramar (2022), ‘*DDoS*’ means “*розподілена атака на відмову в обслуговуванні – напад на комп’ютерну систему з метою зробити комп’ютерні ресурси недоступними користувачам, для яких комп’ютерна система була призначена*” (p.39). This Ukrainian translation captures the essence of the term ‘*distributed denial-of-service attack*’, explaining both the mechanism (distribution of the attack across multiple sources) and the goal (disruption of service). Additionally, Ukrainian version takes a fully descriptive approach. This enhances clarity, especially for readers outside the IT field. The definition is conceptually accurate and aligns well with the original English meaning.

Another translated acronym we identified was ‘*IoT*’. Thus, Kramar (2022) literally translated the term as “*інтернет речей*” and explained its meaning as: “*концепція мережі об’єктів, які під’єднані до інтернету та здатні збирати дані й обмінюватися ними*” (p.55). This translation reflects the core functional and structural idea behind the term ‘*Internet of Things*’. The Ukrainian version highlights connectivity “*під’єднані до інтернету*” and the two-way process of interaction “*збирати дані й обмінюватися ними*”, which accurately expresses the English concept. While the term “*інтернет речей*” might sound unusual in non-

technical Ukrainian discourse, it has become standardized in professional usage and maintains consistency with the original abbreviation 'IoT'. The provided definition avoids ambiguity and successfully communicates both the scope and the purpose of the technology.

The following term '*digital twin*', Kramar (2022), translates literally as "цифровий двійник" and explains the word as follows: "цифрова копія фізичного об'єкта або процесу, що допомагає оптимізувати бізнес" (p.42). This Ukrainian translation directly mirrors the English term in both form and meaning. The word "двійник" emphasizes the notion of an exact duplicate, which is central to the concept of a digital twin. The inclusion of "оптимізувати бізнес" highlights the practical function of such technology, focusing on its real-world utility. Although the term might be relatively new in Ukrainian linguistic practice, the translation accurately conveys the technological and functional essence of the original.

According to Cambridge University Press (n.d.) '*cloud computing*' refers to the "use of services, computer programs, etc. that are on the internet rather than ones that you buy and put on your computer". The Ukrainian Online Dictionary linux.org.ua (n.d.) provides many translations of the term, so we will take a closer look at some of them. The Ukrainian translations vary in scope and precision. Terms like "хмарова технологія" and "хмарова інформаційна технологія" convey the general idea but are broader and less specific. "Хмарова архітектура" shifts the focus to network design, which is related but not equivalent. The most accurate and context-appropriate translation is "хмарові обчислення", as it directly reflects the concept of remote computing services.

And the final term from our sample that was recorded in the Ukrainian dictionary was '*fog computing*'. According to Kramar (2022) term '*fog computing*' is defined as „туманні обчислення - модель обчислення та зберігання даних, що поєднує хмарні обчислення і локальні мережі” (p.47). The Ukrainian translation "туманні обчислення" is a direct calque from English, which follows a common approach in Ukrainian IT terminology. The word "туманні" metaphorically depicts that data processing resources located between the cloud and local networks. This translation maintains both terminological precision and conceptual clarity, making it accessible and contextually appropriate for Ukrainian users.

The following ten words do not yet have lexicographically recorded equivalents in the Ukrainian language, but we managed to find their meanings in English dictionaries to be able to explain their definitions in Ukrainian and consider possible translation strategies and alternatives. So, '*bitcoin*' is a brand name for a type of cryptocurrency, defined by Cambridge University Press (n.d.) as "a digital currency that is produced by a public network rather than any

*government and uses special codes to keep it secure*". In Ukrainian, it can be described as: *'захищений спеціальними кодами, бренд криптовалюти, що існує у децентралізованій мережі'*. Regarding the spelling of the word in Ukrainian, we managed to find the answer in an article by BBC News Ukraine. In an interview, Doctor of Philology Oleksandr Ponomariv answered readers' questions: "Bitcoin in Ukrainian should be pronounced and written as follows: *біткоїн*" (Ponomariv, 2017).

'*Chat GPT*' is acronym of 'Generative Pretrained Transformer' which according to the Cambridge University Press (n.d.) explains as "*a complex mathematical representation of text or other types of media that allows a computer to perform some tasks, such as interpreting and producing language, recognizing or creating images, and solving problems, in a way that seems similar to the way a human brain works*". '*Chat GPT*' is a proper name, therefore it is not translated into Ukrainian. Also, the BBC News Україна article (2023) explains it as a „*новий чатбот*”.

The next term under consideration is '*Chatbot*' defined by Cambridge University Press (n.d.) as a "*software program that uses artificial intelligence to mimic conversation with the user*". In Ukrainian, a suitable equivalent would be '*чат-бот*' or '*розмовний бот*'. To clarify the meaning, an explanation can be added: *'програмне забезпечення, яке імітує спілкування з користувачем за допомогою штучного інтелекту'*.

Another important term is '*Metaverse*'. According to Cambridge University Press (n.d.) it is a "*shared online space where people, represented by avatars, can take part in many different activities, using virtual reality and augmented reality technology*". A fitting Ukrainian equivalent would be '*метавсесвіт*'. To clarify the concept: *'віртуальний простір, де користувачі можуть взаємодіяти між собою за допомогою аватарів, використовуючи технології доповненої та віртуальної реальності'*.

Moving on to the term '*XAI*' or '*Explainable Artificial Intelligence*' defined by Cambridge University Press (n.d.) as a "*type of artificial intelligence designed to make its decisions and processes easier for humans to understand*". A relevant Ukrainian equivalent is '*пояснюваний штучний інтелект*'. Alternatively, the transliteration '*ІКС-ЕЙ-АЙ*' can be used with an additional explanation: *'штучний інтелект, здатний надавати користувачеві зрозумілі пояснення до своїх дій і рішень'*.

The following term is '*deep learning*'. According to Cambridge University Press (n.d.) it is a "*type of machine learning that uses many layers of data processing*". In Ukrainian, it can

be rendered as *‘глибинне навчання’*. With clarification: *‘модель машинного навчання, що працює з великими обсягами даних через багатопшарову структуру обробки’*.

Another widely used term is *‘neural network’*. Cambridge University Press (n.d.) defined term as a *“mathematical representation of text or other types of media that is designed to operate in a similar way to a group of connected nerve cells in an organism”*. A suitable Ukrainian equivalent is *‘нейронна мережа’*.

*‘Quantum computing’* is another term worth examining. *‘Quantum computing’* defined by Cambridge University Press (n.d.) as a *“computing that does certain types of complicated calculations much faster than traditional computing, using qubits instead of bits”*. A natural Ukrainian translation is *‘квантові обчислення’*. For clarity: *‘метод обчислень, який базується на використанні квантових бітів і дозволяє здійснювати складні обчислення значно швидше за класичні комп’ютери’*.

*‘Super AI’* or *‘Artificial superintelligence’* is a *“type of artificial intelligence that is much more intelligent than any human and can think, act, learn etc. independently and beyond the abilities of people”*. (Cambridge Words, 2025). This term consists of three words: *‘super’* + *‘artificial’* + *‘intelligence’*. As an analogy to the translation of the word *‘AI’*, we will keep the translation *‘штучний’* and add the particle *‘супер’* to the word *‘інтелект’* to get the translation *‘штучний суперінтелект’*.

All the words listed below do not have equivalents in either Ukrainian or English dictionaries, so as an alternative, we will consider less official sources to find the meanings of such words and possible translations into Ukrainian.

OpenAI (2024) describes *‘GPT-4o’* as *„much more natural human-computer interaction—it accepts as input any combination of text, audio, image, and video and generates any combination of text, audio, and image outputs. It can respond to audio inputs in as little as 232 milliseconds, with an average of 320 milliseconds, which is similar to human response time (opens in a new window) in a conversation.”* The acronym *‘GPT-4o’*, like *‘Chat GPT’*, is a proper name, so it does not need to be translated, but you can add a description in Ukrainian for users who are not familiar with this product. So, taking into account the official information of the company that created it, the term can be explained as follows: *‘система, що забезпечує природну взаємодію між людиною і комп’ютером за допомогою тексту, аудіо та зображень’*.

The following terms are related to ‘*artificial intelligence*’, so after finding some information about these words, it will be clearer what context they needed in the translation. The first term ‘*AI assistant*’ is digital system “*that can be used to automate tasks, process information, or solve problems. They use the principle of artificial intelligence and machine learning*” (Matschnig, 2025). Robinson, Yasar, and Botelho (n.d.) explain that ‘*AI assistant*’, or ‘*digital assistant*’, is “*software that uses artificial intelligence to understand natural language voice commands and complete tasks for the user*”. The abbreviation ‘*III*’ does not sound quite harmonious in Ukrainian, so we may leave the “AI” part in the original language and use the following two translation options: ‘*AI асистент*’ or ‘*цифровий помічник*’.

On the web, we found three different explanations of the term ‘*AI Computing*’. First of all, Merritt (2023) explains ‘*AI computing*’ as the “*math-intensive process of calculating machine learning algorithms, typically using accelerated systems and software. It can extract fresh insights from massive datasets, learning new skills along the way*”. Also, Heim, Anderljung, Bluemke, and Trager (2024) argue that ‘*AI computing power*’ or ‘*AI compute*’ is a “*key driver of AI progress*”. Lastly, ‘*compute*’ refers to the “*hardware resources that make AI models work, allowing them to train on data, process information, and generate predictions. Without sufficient compute, even the most sophisticated models struggle to perform efficiently*” (Guest User, 2024). In this case, the option ‘*обчислення з штучним інтелектом*’ does not fully convey the meaning of the quotes we have selected. Each quote emphasises the importance of the computing process, and this translation makes it seem as if the computing is performed by artificial intelligence itself, rather than being related to it. Therefore, it is better to use the translation ‘*AI обчислення*’ and add a descriptive explanation: ‘*обчислювальні ресурси, необхідні для навчання, обробки інформації та генерації результатів у рамках моделей штучного інтелекту*’.

‘*AI system*’- “*means a machine-based system designed to operate with varying levels of autonomy, that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments*” (Naaia, 2024). This term can be translated as ‘*AI система*’ and ‘*система зі штучним інтелектом*’. A brief description can also be added if necessary: ‘*автономна машинна система, що генерує прогнози або рішення на основі вхідних даних*’.

The term ‘*autonomous driving*’ is not clearly defined as a standalone term, but there is a definition of an ‘*autonomous car*’. Synopsys (n.d.) defines an ‘*autonomous car*’ as a „*vehicle*

*capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all. An autonomous car can go anywhere a traditional car goes and do everything that an experienced human driver does”*. Based on the meaning of the quote, we can explain the term as a ‘метод управління автономним автомобілем’ and translate it as ‘автономне водіння’.

‘Blockchain technology’ is a “*type of decentralized public database used to record and share data or transactions securely and transparently*” (Ghimiray, 2025). The best translation option in this case is the calque method with adaptation, which will result in a translation ‘технологія блокчейн’. Or, if necessary, add the following brief explanation: ‘децентралізована база даних для фіксації та обміну транзакціями’.

‘Blockchain-based edge’ is the “*ability to achieve secure communication and data processing without relying on centralized servers or third-party services...Blockchain provides secure, decentralized transactions and data integrity. Edge computing brings processing capabilities closer to data sources and away from centralized servers.*” (Hedera, n.d.) This term combines three words: ‘blockchain’ + ‘based’ + ‘edge’. When translating, it is better to add the word ‘computing’ for clarity. Therefore, as a result, we get the translation ‘периферійні обчислення на основі блокчейну’. Since this term has appeared recently, it is necessary to add an explanation: ‘це спосіб обробляти дані, з участю блокчейн для безпечного збереження даних, ближче до місця, де вони створюються, без потреби передавати все на центральний сервер’.

‘Cloud server’ is a “*virtual servers running in a cloud computing environment that can be accessed on demand by unlimited users*” (Microsoft Azure, n.d.). This term sounds harmoniously in Ukrainian, we can translate it as ‘хмарний сервер’, specifying, if necessary, that it is a ‘віртуальний сервер, який працює у хмарному обчислювальному просторі’.

According to IMDEA Networks (2023) ‘cloud-to-edge continuum’ is a “*fusion of cloud, fog and edge computing that should lead to more effective data management*”. Literally translated, it means ‘континуум від хмари до краю’. This term is difficult to reproduce at once, to make it harmoniously sound in Ukrainian. For the sake of euphony, it is better to use the variant ‘хмарно-периферійний континуум’ and necessarily add an explanation: ‘новітній метод обчислення, який поєднує в собі хмарне, туманне та периферичне обчислення’.

Next, let us focus on ‘convolutional neural network’ which distinguished from other neural networks “*by their superior performance with image, speech or audio signal inputs*”

(IBM, n.d.). In case of a literal translation, the term *‘згорткова нейронна мережа’* will sound completely unnatural for the Ukrainian language and will carry a meaning that is not similar to the context of the quote. It is better to use the transcription method. In this case the best option will be *‘конволюційна нейронна мережа’*. It is definitely preferable to use this term with an explanation: *‘вид нейронної мережі з високою продуктивністю роботи з зображеннями, мовленням та аудіо даними на вході’*.

The next term under analysis is *‘edge computing’*. According to IBM (n.d.) *‘edge computing’* is a *“distributed computing framework that brings enterprise applications closer to data sources such as IoT devices or local edge servers”*. Additionally, Microsoft Azure (n.d.) stated that *“Edge computing allows devices in remote locations to process data at the “edge” of the network, either by the device or a local server. And when data needs to be processed in the central datacentre, only the most important data is transmitted, thereby minimizing latency.”* A literal translation such as *‘крайові обчислення’* would sound unnatural in Ukrainian and may confuse readers, as it does not clearly convey the technological context. Therefore, it is preferable to use the more established term *‘периферійні обчислення’*, which is already recognized in technical discourse. For clarity, it is useful to include an explanation: *‘розподілена модель обчислень, яка дозволяє обробляти дані безпосередньо на пристрої або локальному сервері поруч із джерелом даних, що зменшує затримку передачі інформації до центру обробки даних’*.

Moving on to expression *‘edge continuum’*. According to Latent AI (2025) *‘edge continuum’* is *“a distributed computing ecosystem with a full range of tools - from vast cloud computing hubs to far-edge devices like factory sensors or battlefield drones equipped with cameras. The edge continuum - a hybrid architecture - distributes AI workloads from the edge to the cloud, bringing processing closer to data sources while leveraging the cloud power for heavier tasks”*. A literal translation such as *‘крайовий континуум’* would not be appropriate in Ukrainian, as it sounds abstract and disconnected from the technological context. A more accurate and comprehensible option would be *‘периферійний континуум’* or simply *‘континуум периферії’*, depending on the context. To clarify the meaning, it is recommended to use the term with an explanation: *‘структура, що поєднує хмарні ресурси з пристроями на периферії мережі для розподілу обчислювальних навантажень, особливо в задачах штучного інтелекту’*.

The following section explores *‘edge server’* - defined as *“groups of servers that process data at an edge location, such as on a factory floor or at a commercial fishery. Edge cluster/servers are often tasked with running enterprise apps, enterprise workloads, and an*

*organization's shared services*” (Microsoft Azure, n.d.). A literal translation such as ‘*крайовий сервер*’ would not be suitable in Ukrainian, as it lacks clarity and may be misinterpreted. A more accurate and commonly used equivalent is ‘*периферійний сервер*’. This term conveys the intended meaning more naturally and aligns with existing terminology related to edge computing. For clarity, it is appropriate to include a brief explanation: ‘*сервер, розміщений на периферії мережі, який виконує обробку даних поблизу джерел їхнього надходження та підтримує роботу корпоративних додатків і сервісів*’.

Let us now turn our attention to ‘*educational robots*’ - defined as “*learning tools, some AI-powered, that range from simple programmable units to interactive machines*” (SMOWL, n.d.). A direct translation such as ‘*освітні роботи*’ is appropriate and widely understandable in Ukrainian, as it clearly reflects both the educational function and the robotic nature of the tools.

A new term that deserves attention is ‘*fog node*’ or ‘*fog device*’ - is a “*highly virtualized IoT node that provides computing, storage, and network services between edge devices and the cloud*”. (Baeldung, n.d.). A literal translation such as ‘*туманний вузол*’ or ‘*туманный пристрій*’ would sound unnatural and unclear in Ukrainian. Therefore, it is more appropriate to use the adapted term ‘*вузол туманних обчислень*’ or ‘*пристрій туманних обчислень*’. To enhance understanding, an explanatory phrase can be added: ‘*віртуалізований вузол Інтернету речей, який виконує обчислення, зберігання та обслуговування мережі*’.

The next term under analysis is ‘*IoT data collection*’ described by Enertiv (n.d.) as the “*process of using sensors to track the conditions of physical things. Devices and technology connected over the Internet of Things (IoT) can monitor and measure data in real time. The data are transmitted, stored, and can be retrieved at any time.*” A literal translation such as ‘*збір даних Інтернету речей*’ may be grammatically correct, but it sounds awkward in Ukrainian. A more natural and accurate option is ‘*збір даних IoT-пристроями*’. For clarity, an explanatory phrase may be added: ‘*процес моніторингу фізичних об’єктів за допомогою сенсорів, які в режимі реального часу передають і зберігають дані для подальшого використання*’.

The following section focuses on the term ‘*IoT devices*’. TechTarget (n.d.) defines ‘*IoT devices*’ as “*nonstandard computing hardware (sensors, actuators or appliances) that connect wirelessly to a network and can transmit data*”. A direct translation like ‘*пристрої Інтернету речей*’ is widely accepted and appropriate in Ukrainian. It clearly conveys the meaning and aligns with established terminology.

Another term worth examining is ‘*mobile edge computing*’. Hewlett Packard Enterprise(n.d.) define ‘*mobile edge computing*’ or ‘*multi-access computing*’ as “*near-real-time*

*processing of large amounts of data produced by edge devices and applications closest to where it's captured—in other words, extending the edge of your edge network infrastructure*". A direct translation such as *‘мобільні периферійні обчислення’* or *‘багатодоступні периферійні обчислення’* may sound unfamiliar but is acceptable in the context of technical and academic discourse. For clarity, it is recommended to use one of these terms with a brief explanation: *‘обробка великих обсягів даних у режимі, наближеному до реального часу, поблизу місця їх створення, що розширює можливості периферійної мережевої інфраструктури’*.

Another important term to consider is *‘neuromorphic computing’*. Caballar and Stryker (2024) explain *‘neuromorphic computing’* or *‘neuromorphic engineering’* as approach to computing that *“entails designing hardware and software that simulate the neural and synaptic structures and functions of the brain to process information”*. A literal translation such as *‘нейроморфні обчислення’* or *‘нейроморфна інженерія’* is appropriate and already used in Ukrainian scientific contexts. To ensure clarity for a broader audience, it is advisable to include an explanation: *‘метод побудови апаратного та програмного забезпечення, що імітує роботу нейронів і синапсів мозку для ефективної обробки інформації’*.

The next term under analysis is *‘quantum annealer’*. QuEra Computing (n.d.) defines a *‘quantum annealer’* as a *“type of quantum computer designed to solve optimization problems through a process analogous to simulated annealing in classical computing”*. A direct translation such as *‘квантовий відпалювач’* would sound confusing in Ukrainian. A more suitable option is *‘квантовий відпалювальний комп'ютер’* or combination of *‘квантовий відпалювач’* with clarification. To enhance understanding, it is helpful to add an explanation: *‘тип квантового комп'ютера, призначений для вирішення оптимізаційних задач за допомогою процесу, аналогічного імітації відпалу в класичних обчисленнях’*.

Another term worth examining is *‘serverless computing’*. Google Cloud (n.d.) explains *‘serverless computing’* as *“a cloud computing execution model that allocates machine resources on an as-used basis. It includes any type of service where the server management, configuration, scaling, and billing are abstracted from the end user”*. A direct translation such as *‘безсерверні обчислення’* is commonly used in Ukrainian IT discourse and adequately conveys the concept. But Google Cloud (n.d.) also add that *“‘serverless’ does not mean ‘no servers’”*. So, to provide clarity, it is helpful to add an explanation: *‘модель хмарних обчислень, у якому користувач не взаємодіє безпосередньо з інфраструктурою серверів, оскільки ресурси надаються автоматично відповідно до потреб’*.

The next term under review is *'smart contract'* defined by Investopedia Team (2024) as a *"self-executing program that automates the actions required in a blockchain transaction. Once completed, the transactions are trackable and irreversible"*. In Ukrainian, the term *'смап-контракт'* is already widely used and generally understood in both academic and professional contexts. To ensure clarity, it is advisable to use the term with a short explanation: *'програма, що автоматично виконує умови угоди на блокчейні, забезпечуючи незмінність і прозорість транзакцій'*.

The final term under consideration is *'task offload'*. Ullah et al. (2023) defined *'task offload'* as *"process of transferring a task or workload from a local device to a remote device, such as a server or cloud resource, to improve the local device's performance and efficiency"*. In Ukrainian, a suitable equivalent would be *'делегування завдання'* or *'перенесення обчислювального навантаження'*. To clarify the meaning, an explanation can be added: *'процес передавання завдань від локального пристрою до віддаленого ресурсу з метою підвищення ефективності роботи локального пристрою'*.

The analysis has led to several important insights. To begin with, many modern terms related to digital technologies do not have well-established or universally recognised equivalents in the Ukrainian language, which creates the need for careful selection of translations based on the context, function of the term, and convenience for the target audience. Moreover, literal translation often fails to convey the essence of the concept or sounds unnatural, so it is advisable to use transcription, calculation or adapted versions with explanations. Furthermore, many terms convey complex technical concepts, so explanatory statements play a key role in ensuring the accuracy and comprehensibility of the translation. Finally, the analysis showed that in the absence of established norms, it is important to maintain consistency, logic and terminological unity, relying on Ukrainian language resources and the translator's professional intuition.

### **3.5. Discussion of Research Results**

In the course of the study, corpus, diachronic and dictionary analyses were conducted to identify modern English-language neologisms in academic and technical texts and to study the peculiarities of their translation into Ukrainian.

At the first stage - corpus analysis - a corpus of English-language academic and technical texts of recent years was formed, to be more precise, from January 2024 to December 2024, separate corpora, and one general corpus with texts from January 2024 to March 2025,

mainly in the field of digital and computer technologies. Based on frequency analysis and keyword identification, we selected lexemes of high informative and terminological value for modern scientific discourse.

At the second stage, the diachronic analysis, each of the selected words was checked to determine the time of its active use. Initially, the Trends function was used in the general corpus of academic English from January 2024 to March 2025, but it proved to be ineffective in analysing the whole corpus, as it mainly identified vocabulary typical of the academic style in general, rather than neologisms. Therefore, it was decided to use the Google Ngram Viewer tool, which allowed us to analyse the frequency graphs of individual words in a chronological context. This made it possible to distinguish between regular neologisms and existing words that have acquired new meanings, which is crucial for translation analysis. This analysis made it possible to identify not only neologisms, but also words that may slowly fall out of use. This analysis confirmed the effectiveness of this method in the study of neologisms, which was confirmed by the next stage of the study.

At the third stage, the dictionary analysis, the studied units were checked for their presence in modern English and Ukrainian lexicographical resources. It was found that the vast majority of neologisms were not recorded in any dictionary. The study also revealed the heterogeneous development of the languages. This can be explained by the fact that some terms that are already included in the English dictionary but are not considered as neologisms still do not have their stable equivalent in Ukrainian, which increases the complexity of the translation process. After all, in this case, the translator should not only find the best option for translation, but also be innovative in order to explain the word in a language where such a concept did not exist before.

This stage once again confirmed the effectiveness of keyword corpus analysis in identifying neologisms in corpora of academic, scientific, and technical texts. After all, the keywords that, according to the Google Ngram Viewer graphs, had signs of neologisms were actually absent from dictionaries, which is evidence of their novelty.

After analysing approximately one hundred timelines, we are able to identify the following 45 terms as neologisms: : *'AI'*, *'AI assistant'*, *'AI computing'*, *'AI computing power'*, *'AI system'*, *'artificial intelligence'*, *'autonomous driving'*, *'Bitcoin'*, *'Blockchain'*, *'blockchain technology'*, *'blockchain-based edge'*, *'Chat GPT'*, *'Chatbot'*, *'cloud computing'*, *'cloud server'*, *'convolution network'*, *'convolutional neural network'*, *'deep learning'*, *'Ddos'*, *'digital twin'*, *'edge computing'*, *'edge continuum'*, *'edge offload'*, *'edge server'*, *'edge-cloud server'*,

*'educational robot', 'fog computing', 'fog node', 'GPT-4o', 'Internet of Things', 'IoT', 'IoT data', 'IoT device', 'Metaverse', 'mobile edge', 'mobile edge computing', 'neural network', 'neuromorphic computing', 'quantum annealer', 'quantum computing', 'serverless computing', 'smart contract', 'Super AI', 'task offload', 'XAI'.*

The analysis resulted in the identification of neologisms that are relevant to modern scientific and technical discourse. Given the absence of established translation equivalents, all terms were translated by the authors taking into account the context of their use. Subsequently, these words were classified into thematic groups, which allows us to outline the following key areas of modern neologisation in the English-speaking scientific discourse:

- Artificial intelligence and machine learning: *'AI', "AI assistant", "AI computing", "AI computing power", "AI system", "artificial intelligence", "Chat GPT", "Chatbot", "convolutional network", "convolutional neural network", "deep learning", "GPT-4o", "neural network", "Super AI", "XAI", "educational robot"*
- Internet of Things and devices: *'Internet of Things', "IoT", "IoT data", "IoT device"*
- Cloud computing: *'cloud computing', "cloud server", "serverless computing"*
- Edge computing: *'edge computing', "edge continuum", "edge offload", "edge server", "edge-cloud server", "mobile edge", "mobile edge computing", "task offload"*
- Fog computing: *'fog computing', "fog node"*
- Blockchain and smart contracts: *'Blockchain', "Bitcoin", "blockchain technology", "blockchain-based edge", "smart contract"*
- Quantum engineering: *"quantum annealer", "quantum computing"*
- Other innovative technologies: *'autonomous driving', "digital twin", "Ddos", "Metaverse", "neuromorphic computing"*

In general, the results confirm that the problem of translating neologisms lies not only in the lack of dictionary equivalents, but also in the difficulty of identifying the novelty of the term in the context of language dynamics. This requires both deep professional knowledge and the ability to apply interdisciplinary analysis tools. In conclusion, to summarise all the previous stages of the research, we have managed to achieve our tasks at all stages.

## CONCLUSIONS

The development of technology certainly has an impact on all spheres of life. Education is no exception, as it is in the educational space that the most important and valuable research of mankind is developed, conducted and described. If something previously unknown to people is discovered, this particular process or item must be identified with a specific name. When a language makes unstoppable progress, it is fantastic, but how does it affect other languages? How can other nations keep up with technological progress without being left behind?

Through the work of translators, bridges are constructed between representatives of different countries and cultures to share valuable information such as the latest discoveries. As a result of the fruitful work of translators, barriers between languages disappear. This allows us to communicate, cooperate, and solve urgent issues together, at the international level, and share our experience, academic and technical.

A translator working with technical and academic literature will always face the task of explaining the meaning of concepts that do not fit within the boundaries of previous theoretical concepts. After all, no theory can explain facts for which solutions are not yet stored in the consciousness.

In conclusion, our study has investigated the challenges posed by computer neologisms in academic and technical texts, focusing on their identification, analysis, and translation into Ukrainian. Through a combination of corpus, diachronic, and dictionary analyses, the research has confirmed the presence of a significant number of emerging terms in the academic and technical discourse of 2024–2025. Many of these terms lack standardized Ukrainian equivalents, which creates serious difficulties for translators in ensuring both terminological accuracy and cultural appropriateness.

Returning to the hypothesis posed at the beginning of this study, it is now possible to state that a combined approach of corpus-based keyword extraction, diachronic trend evaluation, and dictionary validation would be effective in identifying neologisms. The keyword method allowed for the selection of relevant terminology from monthly corpora. The diachronic analysis of each term—rather than the entire corpus—proved more accurate in distinguishing between truly new terms and established ones. Additionally, Google Ngram graphs were employed to refine the classification of words as neologisms or as older terms that have acquired new meanings.

The analysis identified 45 computer neologisms, many of which are not yet included in standard dictionaries. These terms were translated manually using a combination of translation strategies, including calquing, transcription, descriptive translation, and contextual adaptation. This process demonstrated the insufficiency of relying solely on existing lexical resources and emphasized the need for creative and context-sensitive translation approaches.

Ultimately, the study provides evidence that the translation of neologisms remains a complex and dynamic task due to the rapid evolution of terminology and the absence of established equivalents. It also confirms that diachronic analysis, when applied at the individual word level, is a highly effective method for identifying neologisms in academic discourse. The practical recommendations developed as part of this work can aid translators and linguists in approaching similar challenges in real-world scenarios.

Our work showed a successful result, confirming all the objectives, purpose, and hypothesis. So, the following conclusions can be drawn from the present study. The professional vocabulary of each field is distinct, so a translator must not only be proficient in the language, but also be able to analyse texts, identify neologisms in them, and be able to interpret them properly in the target language. Another important step is the ability to structure content in order to visualise it in the reader's mind using a minimal number of words.

Overall, this topic requires further in-depth research based on larger corpora with more texts and at the level of different language groups in order to be able to better identify options for intercultural translation, nuances and details as well.

## SUMMARY IN UKRAINIAN

Актуальність цього дослідження зумовлена динамічним розвитком комп'ютерних наук і технологій. Це, в свою чергу, призводить до появи нових термінів та понять в академічному та технічному дискурсі. Крім того, актуальність роботи полягає у стрімкому розвитку цифрових технологій, що призведе до появи значної кількості нових термінів в англійській мові, багато з яких не мають унормованих еквівалентів в українській мові. Ця прогалина перешкоджає ефективній комунікації в науковій, академічній та технологічній сферах. Тому системне вивчення такої термінології та стратегій її точного і культурно адекватного перекладу є нагальною потребою.

Об'єктом дослідження є англійська термінологія, пов'язана з сучасними цифровими та комп'ютерними технологіями.

Предметом дослідження є проблеми та стратегії перекладу комп'ютерних неологізмів в академічному та технічному дискурсі з акцентом на їх лінгвістичну, культурну та контекстуальну адаптацію.

Отже, метою дослідження є виявлення, аналіз та переклад сучасних англійських технічних термінів українською мовою за допомогою корпусного та діахронічного аналізу з метою обґрунтування відповідних перекладацьких стратегій та пропонування точних українських еквівалентів. Крім того, метою дослідження є аналіз особливостей перекладу комп'ютерних неологізмів у науково-технічних текстах. Визначити основні труднощі, з якими стикаються перекладачі при передачі цих термінів іншою мовою, зокрема українською. Крім того, метою дослідження є запропонувати ефективні перекладацькі стратегії для забезпечення точності та зрозумілості передачі спеціалізованої термінології.

Крім того, наша основна гіпотеза полягає в тому, що поєднання корпусного, діахронічного та словникового аналізу є ефективним методом виявлення неологізмів в академічних та технічних текстах.

У дослідженні використано теоретичні та емпіричні методи, такі як аналіз, синтез, порівняння, класифікація та узагальнення, корпусний аналіз, діахронічний аналіз, словниковий аналіз,

Практична цінність дослідження полягає в розробці корисних навчальних матеріалів та практичних рекомендацій для перекладачів і дослідників.

Магістерська робота складається зі змісту, вступу, трьох розділів, висновків, резюме українською мовою, списку використаних джерел та додатків. У першому розділі

представлено теоретичне підґрунтя для дослідження шляхом представлення ключових концепцій та підходів у перекладознавстві. Основна увага приділяється основним видам перекладу, перекладацьким стратегіям та особливостям перекладу нової та новоствореної лексики.

У другому розділі розглядаються теоретичні засади словотвору та неологізмів, обговорюється, як нові лексичні одиниці з'являються в мові, етапи їхнього розвитку та критерії, за якими вони стають частиною лексики. Також розглядається класифікація неологізмів та їх переклад як лінгвістична проблема.

У третьому розділі представлено практичну частину дослідження. Вона включає корпусний аналіз академічних текстів, зосереджений на виявленні ключових неологізмів, їхньої частотності та особливостей вживання. Дослідження також включає діахронічний аналіз вибраних термінів і порівняння їхньої репрезентації в різних словниках. Метою цього розділу є виявлення англійських неологізмів у сфері ІТ та надання їх українського перекладу. Висновки ґрунтуються на теоретичних засадах, а також на результатах емпіричного аналізу, проведеного в третьому розділі.

В результаті аналізу було виявлено 45 комп'ютерних неологізмів, багато з яких ще не включені до стандартних словників. Ці терміни були перекладені вручну з використанням комбінації перекладацьких стратегій, зокрема калькування, транскрипції, описового перекладу та контекстуальної адаптації. Цей процес продемонстрував недостатність покладання лише на наявні лексичні ресурси та підкреслив необхідність творчого та контекстно-чутливого підходу до перекладу.

Зрештою, дослідження доводить, що переклад неологізмів залишається складним і динамічним завданням через швидку еволюцію термінології та відсутність усталених еквівалентів. Воно також підтверджує, що діахронічний аналіз, застосований на рівні окремого слова, є високоефективним методом виявлення неологізмів в академічному дискурсі. Практичні рекомендації, розроблені в рамках цієї роботи, можуть допомогти перекладачам і лінгвістам у вирішенні подібних завдань у реальних ситуаціях.

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## ПОЯСНЮВАЛЬНА ЗАПИСКА

Я, Тирпак Юлія Василівна, підтверджую, що користувалась ChatGPT (<https://chat.openai.com/>) для редагування тексту та перевірки помилок у власній роботі. Я завантажила свою роботу в повному обсязі і ввела наступні дані 7 квітня 2025 року:

1. Покращення академічного стилю та правильності мови, включаючи граматичні структури, пунктуацію та лексику.
2. Отримані таким чином дані були використані для доопрацювання та перероблення тексту з метою отримання кінцевого варіанту роботи.

Тирпак Юлія Василівна \_\_\_\_\_