

Методическая статья

УДК 372.881.111

## Искусственные нейронные сети в иноязычном образовании в эпоху Web 3.0

Ульяна Леонидовна Кшенювская<sup>1</sup><sup>1</sup>Новосибирский государственный педагогический университет, Новосибирск, Россия

*Аннотация.* Стремительные изменения в области технологий и смена парадигмы в использовании интернета повлекли за собой перемены во всех сферах коммуникации. Развитие искусственного интеллекта способно произвести революцию в образовании, предлагая новые методы в обучении иностранным языкам. В данной статье предлагаются некоторые приемы использования искусственных нейронных сетей в иноязычном образовании в эпоху третьего поколения Интернета Web 3.0, отличающегося демократизацией сети, персонализацией контента, интероперабельностью, интеллектуализацией и виртуализацией среды, в том числе образовательной.

*Ключевые слова:* цифровые технологии, искусственные нейронные сети, искусственный интеллект, GPT, Web 3.0, иноязычное образование, персонализированное обучение

*Для цитирования:* Кшенювская У.Л. Искусственные нейронные сети в иноязычном образовании в эпоху Web 3.0 // Актуальные проблемы филологии и методики преподавания иностранных языков. 2024. Т. 18, № 1. С. 159–164.

Methodical article

## Artificial neural networks for language education in Web 3.0 paradigm

Uliana L. Kshenoskaya<sup>1</sup><sup>1</sup>Novosibirsk State Pedagogical University, Novosibirsk, Russia

*Abstract.* Rapid technological changes and the paradigm shift in the ways the internet is used have evoked dramatic changes in all spheres of communication. Artificial intelligence has the potential to revolutionise communication and generate new methods of teaching and learning languages. The current paper gives an overview of some ways artificial neural nets can be exploited for language education in Web 3.0 paradigm. The core mechanism of Web 3.0 is Me-onomy or user behaviour which denotes a user paradigm where the user is the centre point of the metaverse with all other services and technologies.

*Keywords:* ICT, artificial neural networks, artificial intelligence, GPT, Web 3.0, language education, personalised learning

*For citation:* Kshenoskaya U.L. Artificial Neural Networks for Language Education in Web 3.0 Paradigm. *Topical issues of philology and methods of foreign language teaching*, 2024, vol. 18, no. 1, pp. 159–164. (In Russ.)

Massive technological changes and consequential social changes that have been taking place throughout the 20–21st centuries have manifested themselves in all spheres of real and virtual life. Paradigm shifts in the ways the internet is used have brought the split of reality into online and

offline, the two interconnected, reciprocally dependent, reflective and instantaneously impacting one another. That has evoked dramatic changes in the spheres where communication occurs, be it real or virtual communication. Notwithstanding the aforementioned changes that are logical,

highly expectable and observable on a daily basis, little attention has been given to communication from linguistic and methodological perspectives.

Special attention should be paid to the sphere of education, where communication aims at the intellectual and social development of a person. Education system in the world of rapid changes and increased complexity should meet its new demands. Language education in the modern educational context is becoming more complicated for both parties. The educational process should be structured and delivered in accordance with the recent achievements of educational experience as well as modern sciences, in particular, cognitive psychology, cognitive linguistics, psycholinguistics and digital technologies.

The continuously appearing challenges in the educational sphere include digitalising education, implementing technology in language learning and teaching, discovering and exploring new means of engaging the 21st century learners (the so-called 'digital natives' [6].) in the learning process, facilitating the incentive for their self-education, and establishing new interaction forms (e.g., instant connectivity [7]) between students and teachers.

In the sphere of foreign language teaching the aforementioned socio-linguistic processes acquire specific emphasis for the objective reason of the never subsiding impact of the internet on a language as a means of communication. As distinguished from other subjects, where a language serves as a tool, in foreign language teaching it is both the source and the target. Accordingly, while in other classrooms communication constitutes an indispensable tool of teaching, in a foreign language class it is both the tool and the aim. It is obvious that the new means of self-expression adopted from the internet will largely influence the ways communication proceeds in a real-life classroom.

A tremendous leap in the development of the internet environment manifested itself in the result of the transition from Web 1.0 (also referred to as static web) to Web 2.0 (also referred to as dynamic web) a decade ago and, more recently and relevantly for our research, to Web 3.0 (semantic web), that is currently going on and needs devoting attention to. The core mechanism of Web 3.0 is Me-onomy (also referred to as "user behaviour") which denotes a user paradigm where the user is the centre point of the universe with all other services/technologies as enablers of a user experience [10]. In simpler terms, in contrast to Web 2.0, which is central on communities and the employment of the so-called read-write web, Web 3.0 is highly individualised, central on the dynamics of content, i.e., creation, consolidation and adaptation, and characterised by infinite customisation capacity.

Along with the designated evolutionary changes, Web 3.0 introduces new, previously technically unachievable concepts of search that include contextual, personalized and customised queries [5]. While most of these are yet in the beta-testing phase, the advent of open AI-mediated resources, such as *ChatGPT* [9], encourages educators to take a closer look at the changes that designate the Web 2.0-Web 3.0 shift in attempt to relate them to the alternations in different spheres of real life with a greater emphasis on education.

The core specificity that Web 3.0 inflicts on the educational sphere is unrestricted flexibility and ubiquity of educative processes, where a teacher is no longer a person who would communicate knowledge, but a facilitator that ignites learners' educational drive and equips them with technological tools to satiate it. Learners thus are entrusted with their learning process under their teacher's guidance and support when and where needed. Thereby students acquire multidimensional knowledge and skills

(subject knowledge, language systems and skills, digital skills, learning and teaching skill, problem solving and critical thinking skills, goal setting, time management skill, self- and peer assessment skills, etc.) that can be further applied in other areas of life.

Thus, the appropriate implementation of Web 3.0 in education equips learners with life skills and knowledge for lifelong learning while building a massive educational network, in which particular nodes – individuals – are capable of functioning on a standalone basis and, being linked together, cooperate and collaborate with others. Being part of such networks, learners understand the way artificial neural networks function as those are circuits of artificial neurons or nodes that imitate the human brain through a set of algorithms, i.e. mimic human cognitive skills. Artificial neural networks are a series of algorithms that teaches computers to process data in a way that the human brain does [1]. Artificial intelligence (AI) is the capability of a computer system to mimic biological brain, namely, its cognitive functions (e.g., learning, problem-solving, decision-making, etc.) [11]. Combining maths, data analysis, statistics, logics, etc., a computer system through AI simulates human reasoning “to learn from new information and make decisions” [2]. Artificial Intelligence in Education (AIED) is focused on designing those computers that “execute cognitive tasks, such as learning and problem-solving, that are often associated with human minds” [3, p. 1].

Therefore, the technology-driven shift in the educational sphere is evident: the media-native students demand learning experiences that are based on the prerequisite of their routine, i.e., technology that is growing almost exponentially. The Age of AI is imminent, if not there already. As Web 3.0 era has become the internet rather than computer referent, the ultimate aim of Web 3.0 education is to teach people to think and process information critically

(cognitive skills: analysis, synthesis), establish priorities (critical thinking skills: evaluation) and take agency to learn (metacognitive skills). AI can be implemented in the educational process to represent knowledge models and direct cognitive learning when learners observe AI-mediated tools generate texts and images; to support learning while learners collaborate with AI; to empower learning while students take responsibility for their learning process.

Performing queries and collaborating with AI learners need to comprehend information decoded by the means of a foreign language (listening, reading) and communicate (application) it further (writing, speaking) by the means of the same language. Therefore, if used the right way, AI may simplify, enhance, and optimise language practice both inside and outside the classroom. The meaningful and creative implementation of AI-mediated tools and resources in regular EFL teaching will facilitate the learning process, while simultaneously simplifying the teaching process.

Among some of the ways educators as well as learners can harness the power of AI to unlock its full potential are image generation to visualise any text input, be it a word or a sentence, an idiom or the whole text (*Lexica, Leonardo, Midjourney, StableDiffusion, Hotpot, NVIDIA Canvas* and many others); voice generation to create studio-like voices (*Murf AI, Synthesis, Lovo, Listnr, Respeecher, Speechelo, Streams Speak*, and others); video and presentation generation (*Pictory, Synthesis, Gen-2, Deepbrain AI, Quinvio, Decktopus* and others); text generation (*GPT-3*) or both human-like text and images processing and generating (*GPT-4*) that provide personalised explanations and offer role-playing scenarios based on the learner’s input. *ChatGPT*, a public tool developed by OpenAI, with its access to big data and seemingly limitless reference and

information services, metadata and content generation has the potential to progress education in both exhilarating and unsettling ways, according to Lund and Wang [4]. However, here ethical, as well as legal considerations, such as privacy and bias or piracy and plagiarism should also be taken into account. Currently, no software is able to detect AI-generated content with 100 % certainty. Moreover, there are issues with accuracy of the data that *ChatGPT* generates. So, questions arise regarding how students as well as educators are prepared in using AI. Teachers should employ emerging technologies to address and enhance their students' learning outcomes as well as develop learners' AI digital skills with guidance and support.

Both students and teachers must have a clear understanding of how AI may be used regularly. The latter AI models, such as *ChatGPT* demonstrate outstanding generalisation skills of LLMs, such as in-context learning and chain-of-thoughts reasoning [8], which can be implemented in language teaching and learning to simulate a natural conversation, an interview, a tutorial, a performance; to create plays based on any theme or an original story or in the style of a specific writer; to create role playing interactive fiction (where learners are introduced to a scenario, and then decide what they should do, based on their choices, the narrative progresses); to create poems or song lyrics on a particular topic that include specific vocabulary or language points, or to imitate the style of a specific poet or singer; to guide learners in finding the right vocabulary or grammar, doing translations, transcribing text into phonemic symbols, practising language systems (pronunciation, grammar, vocabulary) and skills (reading, writing, mediated speaking), as well as learning cultural specificities or enhancing their language proficiency by generating parallel texts written in different registers and styles or varieties of English; even

more so, to facilitate learning or working process (making study plans, creating wordlists of, for example, most difficult words from any text they enter, getting advice and feedback, generating agenda, manuals and business plans, preparing for exams), and so many more. *ChatGPT* can be a supportive coach or act as a teacher using a Socratic style (when a teacher does not provide answers or information directly, but instead guides the student through a series of questions designed to encourage them to analyse and evaluate their ideas and thinking processes. This can enable students to do research with *GPT*, helping them to develop their knowledge and to understand where there are gaps in it, to encourage critical thinking and discussion, to develop skills such as analysis, synthesis, evaluation, and inference. A simple prompt (such as, *I want you to act as my English-speaking friend from (specify the country). I will tell you about my life, and you will offer me your friendly support. Do not explain anything, just reply with the advice or supportive words*) can turn *ChatGPT* into learners' English-speaking friend and engage them in regular language practice, provide culture immersion and social connection, support personalised learning.

Recently *GPT-3* and *GPT-4* have been integrated in various applications (*Duolingo*), software (*Excel*), browsers (*Yandex*), etc. and although Google refuses to implement any AI models, there are assistants and extensions and provide human-like answers to Google searches (*Suggesty*, *Sidebar*). One of the biggest issues while working with AI is the input, as AI models generate without understanding. However, there are prompt optimising tools, also operated by AI (*PromptPerfect*, *Promptpal AI*, *PromptGPT*) that help users to improve their input to bring the most out of AI models. Other AI tools allow users to craft film scripts (*Nolan*), music (*WavTools*), generate creative ideas

(*Seenapse*), generate posts and articles (*AI Writer*), simplify complex content, ask follow-up questions, and search for relevant papers (*Scispace*) within seconds.

Among AI-powered tools that are intended to support teachers and enhance their practice one should mention *Twee*, which is designed to make lesson planning easier, offering a wide range of features to create tasks based on texts and video- or audio-scripts, such as questions, quizzes, true/false statements, exercises or to generate dialogues, stories, letters or articles on any topic for any level in a few seconds. Thus, *Twee* provides assistance to teachers in designing content that meets students' needs and tailoring instructions to students' learning levels to personalise learning through task automation. This AI tool helps to increase the efficiency of teachers and to handle their routine administrative tasks, such as repetitive paperwork.

Times change and, presumably, so does education. Artificial intelligence

technologies have the potential to transform the educational landscape. However, there are potential risks of using artificial neural networks for education in general and language education in particular, as students may totally rely on AI instead of developing their own skills, misunderstand the reality as algorithms fail to filter out harmful or inaccurate information, lose interest in real life communication. Therefore, teachers while promoting AI-driven learning environment in their classrooms, enhancing their students' learning experiences, enabling individualised education, automating mundane tasks, should also foster students' digital literacy skills and AI competencies. There are still few studies that promote and evaluate the effectiveness of AI literacy skills (i.e., competencies users need to effectively interact with and critically evaluate AI). However, they are absolutely necessary as artificial neural networks will play a critical role in the next phase of language education in the era of Web 3.0.

#### Список источников

1. Artificial Intelligence and Cognitive Science // Revised Selected Papers from the Conference Proceedings, 30th Irish Conference, AICS 2022, Munster, Ireland (December 8–9, 2022) / ed. Longo L., O'Reilly R. 2022. 540 p. DOI: 10.1007/978-3-031-26438-2
2. *Kshirsagar P., Jagannadham B.V., Alqahtani H., Naveed Q., Islam S., Thangamani M., Dejene M.* Human Intelligence Analysis through Perception of AI in Teaching and Learning // Computational Intelligence and Neuroscience. 2022. DOI:10.1155/2022/9160727.
3. *Luckin R., Holmes W.* Intelligence Unleashed: An Argument for AI in Education. London: UCL Knowledge Lab, 2016. 60 p.
4. *Lund B. D., Wang T.* Chatting about ChatGPT: How may AI and GPT impact academia and libraries? // Library Hi Tech News. 2023. DOI:10.1108/LHTN-01-2023-0009
5. *Mhlanga D.* The Value of Open AI and Chat GPT for the Current Learning Environments and the Potential Future Uses. Mhlanga, David, The Value of Open AI and Chat GPT for the Current Learning Environments and the Potential Future Uses [Online]. URL: <http://dx.doi.org/10.2139/ssrn.4439267> (accessed on: 11.10.2023).
6. *Palfrey J., Gasser U.* Born digital: Understanding the first generation of digital natives. N. Y.: Basic Books, 2010. 400 p.
7. *Prensky M.* Empowered: Re-framing 'Growing Up' for a New Age. Toronto: EAI Press, 2022. 270 p.
8. *Rothman D.* Transformers for Natural Language Processing: Build, train, and fine-tune deep neural network architectures with Python, PyTorch, TensorFlow, BERT, and GPT-3. Birmingham: Packt Publishing, 2022. 564 p.
9. *Russel S., Norvig P.* Artificial Intelligence: A Modern Approach. London: Pearson, 2009. 1152 p.

10. Shadbolt N., Berners-Lee T., Hall W. The Semantic Web Revisited // IEEE Intelligent Systems. 2006. Vol. 21, № 3. P. 96-101. DOI: 10.1109/MIS.2006.62.

11. The Age of Artificial Intelligence: An Exploration (Cognitive Science and Psychology) / ed. Gouveia S. Delaware: Vernon Press, 2020. 402 p.

### **Информация об авторе**

**У.Л. Кшеновская** – старший преподаватель кафедры английского языка, Новосибирский государственный педагогический университет, sj@ngs.ru, ORCID: <https://orcid.org/0000-0001-6979-4724>

### **Information about the author**

**U.L. Kshenovskaya** – Senior Lecturer of the English Language Department, Novosibirsk State Pedagogical University, sj@ngs.ru, ORCID: <https://orcid.org/0000-0001-6979-4724>

*Статья поступила в редакцию 17.10.2023; одобрена после рецензирования 24.10.2023; принята к публикации 27.10.2023.*

*The article was submitted 17.10.2023; approved after reviewing 24.10.2023; accepted for publication 27.10.2023.*