Article

Application of Artificial Intelligence in Teaching Bulgarian Literature

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ABSTRACT

The aim of the study was to identify the possibilities of effective use of intelligent digital technologies in teaching the Bulgarian literature and analysing literary texts within the framework of philological education. The research involved a comprehensive study of the state of digitalisation of literary education in Bulgaria, as well as experimental testing of a number of digital tools in the learning environment of Sofia University. As a result, it was found that the most common digital solutions at the school level were adaptive educational platforms with the possibility of individualising the learning process and providing real-time feedback, while in higher education the spread of such technologies remained fragmented and mainly concentrated in technical specialities. The experimental implementation of language processing tools in teaching literature has shown a positive impact on the depth of students' interpretive skills. There was an increase in the accuracy of the analysis of literary content, the ability to identify latent themes and semantic connections, and an increase in motivation to learn. According to the survey, 94% of students confirmed an improved understanding of the author's ideas, 86% identified new themes and interpretive lines, 72% showed an increased interest in literature, and an expert assessment showed a 27% increase in the accuracy of students' written interpretations. The study also revealed significant limitations, including technical inequality between regions of the country, insufficient support for the Bulgarian language from mainstream linguistic models, risks of losing transparency in assessment, and the lack of clear ethical regulations for the use of technology in education.

I. INTRODUCTION

The intensive introduction of artificial intelligence (AI) technologies in the field of education has led to significant transformations in teaching methods, including language and literature teaching. The Bulgarian language as an academic discipline is at the intersection of traditional philological training and innovative digital approaches based on the use of intelligent language models, analytical algorithms, and adaptive learning platforms. Despite the growing number of technical solutions driven by the development of AI in the educational environment, the introduction of AI in the field of Bulgarian language and literature has not yet received a proper systematic analysis.

It is this circumstance that has shaped the need to investigate not only the available tools, but also the pedagogical effectiveness of their use in academic teaching.

Previous studies have shown the active interest of the scientific community in the topic of AI in language teaching. Thus, Kuddus (2022) conducted a thorough review of existing practices of using AI in language teaching, focusing on the potential of deep learning and automated task generation. The author emphasised the importance of an adaptive approach to learners with different levels of language proficiency. In the context of foreign language teaching in the age of digital

transformation, Yang (2024) outlined the main challenges for teachers, including the need to rethink their professional role and develop new digital skills. Equally important is the problem of the impact of automated tools on the authenticity of writing. Alharbi (2023) emphasised that while such tools improve the quality of texts, they can also reduce the individuality of students' writing style.

In a systematic review of the use of AI in language learning through LMS platforms, Ayotunde et al. (2023) concluded that these technologies have a positive impact on student engagement and allow for individual pace of learning, although the researchers also pointed out the language limitations of most models. The issue of flexibility of AI tools and their effectiveness in teaching was considered in Bruckner and Chiriac (2024), who at the same time expressed doubts about their ability to analyse complex literary content. The study by I. Borisova (2024) focuses on the analysis of the benefits and risks of using AI in teaching English as a foreign language, as well as the need to introduce ethical regulations in the handling of students' personal data.

As for Bulgaria, a review of educational AI integration by Simeonov et al. (2024) showed a significant imbalance between technical and humanities majors in terms of digital readiness. In the field of text analysis in the Bulgarian language, the prospects for the development of deep analytics tools were considered by G. Hristova (2021), who outlined the areas of automation of syntactic analysis and semantic processing. In the field of translator training, as noted by Stoyanova Georgieva (2021), one of the key needs is to develop a critical attitude towards machine translation results, which requires appropriate post-editing skills. Although innovative strategies for integrating AI are already being actively implemented in STEM disciplines, as described by Terzieva et al. (2024b), the authors acknowledged the insufficient level of interdisciplinary interaction with the humanities. The same problem – the lack of practical digital competences – was raised by Aleksieva (2025), who studied the readiness of university teachers for transformation in the context of digitalisation and found a gap between theoretical approaches and real educational practices.

Despite a considerable number of interdisciplinary works, the issue of holistic and systematic integration of AI into the teaching of Bulgarian language and literature remains insufficiently developed. Existing research focuses mainly on English or Chinese, which does not take into account the morphological and syntactic specifics of Bulgarian as a language with an inflectional structure and a limited machine corpus. Equally important is the lack of clear pedagogical models for using AI tools in the field of literary analysis, in particular, the analysis of narratives, symbolic structures, stylistic figures and intertextuality, which are the basis for studying Bulgarian literature in an academic context.

The aim of this study was to analyse the possThe aim of this study was to explore the potential of AI in analysing Bulgarian literary texts, with a particular emphasis on applying AI tools for thematic modelling, semantic processing, and intertextual comparison in literature studies. The objectives of the study are the following:

1. To examine the effectiveness of NLP models in analysing thematic structures, semantic nuances, and intertextual connections in Bulgarian literature.

2. To evaluate the impact of AI-driven analysis on students' interpretive skills, their ability to identify latent themes, and their motivation to engage with literary texts.

II. METHODS

Study designed

The study used an experimental methodology to examine the effectiveness of AI in teaching the Bulgarian literature. It involved an empirical approach with undergraduate students participating in a four-month-long experiment. To evaluate students' motivation and interpretive abilities both before and after they were exposed to AI technology, the study also included a survey. The purpose of this mixed-methods approach, which combined qualitative and quantitative data collecting, was to assess how AI affected students' use of digital tools, critical thinking, and literary interpretation in the setting of the humanities.

Participants

For the purpose of practically investigating the effectiveness of applying AI technologies in the analysis of Bulgarian literary works, an experimental study was conducted over four

months (February-May 2024) at the Department of Bulgarian Philology and Applied Linguistics of Sofia University St. Kliment Ohridski. 33 fourth-year undergraduate students from the "Bulgarian Philology" programme, aged between 21 and 23, participated. Participant selection was based on a competitive process using academic performance and a motivational essay in which students had to justify their interest in using digital technologies in philology. All participants were native speakers of Bulgarian, ensuring homogeneity in language proficiency, which was crucial for evaluating the impact of AI technologies on their interpretative skills and learning outcomes.

Materials and Instruments

Three classic works of Bulgarian literature in the original language were selected for analysis: "Under the Yoke" by Vazov (2006), "Old mountain legends" – by Jovkov (1980), and "Antichrist" by Stanev (1970). In the first stage, students in the experimental group created a corpus of digital texts in .txt and .json formats, cleaned of annotations and prepared for machine processing. The next stage involved morphological and syntactic analysis using the spaCy library, adapted for Bulgarian. Lemmatisation and a frequency analysis of parts of speech were carried out, and syntactic trees were constructed to identify grammatical and semantic structures.

In the following stage of the research, Latent Dirichlet Allocation (LDA) based on the Gensim library was applied for topic modelling of Jovkov's short stories. Students divided the texts into logical segments, trained the model on thematic distributions, and identified six dominant themes: dignity, pain, sin, redemption, nature, and tradition. The pyLDAvis tool was used to visualise the thematic fields, which made it possible to clearly demonstrate the distribution of themes across text fragments and reveal latent semantic structures. Semantic analysis was implemented using the BERT tool, which allowed for the analysis of Stanev's novel "Antichrist". Separately, an analysis of keywords in the short story "Shibil" from Jovkov's collection "Old mountain legends" was carried out, and the most important lexemes within it were identified. In the process of thematic modelling of Jovkov's novel "Shibil", students used the LDA algorithm to build a probabilistic model that made it possible

to automatically identify hidden themes in the text corpus based on the use of words. The source material for the analysis was the literary text itself, which was previously tokenised, i.e. transformed into a sequence of individual words – the so-called "document corpus". Among the lexemes identified as a result of the processing were such key units as "Shibil", "father", "love", "honour", "trap", "robber", "betrayal", "look", "blood".

Multilingual models were used for spaCy and BERT since language-specific models struggle with Bulgarian's intricate morphology and syntactic structure. Despite their lower accuracy in processing the language's inflectional morphology, the multilingual versions of spaCy and BERT were used because there were few high-quality models specifically designed for Bulgarian. Though its efficacy was hampered by the comparatively small number of digital resources accessible for the Bulgarian language, LDA was utilised for thematic modelling on a pre-processed Bulgarian text corpus. When evaluating the analysis results, these language constraints were taken into consideration.

In the final stage, the participants completed a questionnaire containing 9 questions in three thematic blocks: motivation, interpretative skills, and attitude towards digital technologies. Each question was formulated using a five-point Likert scale (1-5), allowing participants to rate their responses from "strongly disagree" to "strongly agree". To ensure content validity, the questionnaire underwent a validation procedure that comprised a pilot test with a small group of students, expert comments, and a review by faculty members with expertise in educational psychology and digital pedagogy. Cronbach's alpha was used to evaluate the questionnaire's internal consistency; the result was 0.85, indicating satisfactory reliability. This score implies that the questionnaire's components were reliably assessing the desired constructs of motivation, interpretive abilities, and attitudes regarding the application of AI in literature learning.

In the theoretical and practical part of the study, a range of educational and technical tools was used, as well as a review of educational platforms (Table 1).

In the theoretical part of the research, a review was conducted of strategic government documents: the "National Programme Digital Bulgaria 2025" (Ministry of Transport…, 2019), the "Concept for

Table 1. AI tools used in teaching Bulgarian language and literature analysed in this study.

Category	Tool / Platform	Functions / Purpose
Educational platforms	Ucha.se	Adaptive AI algorithms, individualised learning
Educational platforms	Mondly	Speech recognition, augmented reality (AR)
Educational platforms	Replika	AI bot for training conversational practice
Educational platforms	Bulgaro.io	Learning Bulgarian as a foreign language
Adaptive language trainers	Bla-Bla.AI	Speech analysis, feedback
Adaptive language trainers	Talkio AI	Speech synthesis, simulated dialogues
Adaptive language trainers	Talkpal AI	Adaptive learning, personalised sessions
Adaptive language trainers	ASR – Automatic Speech Recognition	Automatic speech recognition
Adaptive language trainers	Gliglish	Role-playing simulations, conversational practice
Large language models and chatbots	ChatGPT	Example generation, grammar explanation, translation, writing feedback
Large language models and chatbots	Bing Copilot	Writing, translating, editing texts
Large language models and chatbots	Claude (Anthropic)	Writing practice, translation, comprehension in a cultural context
Tools for analysis	spaCy	Morphological, syntactic and lexical analysis of Bulgarian texts
Tools for analysis	BERT – Bidirectional encoder representations from transformers	In-depth semantic analysis, identifying changes in meaning in context
Tools for analysis	Gensim	Topic modelling with Latent Dirichlet Allocation
Tools for analysis	pyLDAvis	Visualisation of topic fields and latent connections in the text

the Development of Artificial Intelligence until 2030" (Ministry of Transport…, 2020), as well as the report from the European initiative "Bulgaria AI Strategy" (European Commission, 2021), which define the foundations of the digitalisation of education, particularly the implementation of AI in the learning process. The subsequent stage of the review block was dedicated to the identification and analysis of educational digital platforms used for teaching Bulgarian.

Procedure

The methodological strategy of this study combined theoretical analysis of digital educational tools with empirical testing of the hypothesis about the impact of AI technologies on the quality of the learning process, students' analytical thinking and the development of philological competences. The study covered the Bulgarian educational system. An initial analysis of government digital strategies and available educational platforms was conducted. Another goal was to assess how AI could improve the analysis of Bulgarian literary texts through the use of intertextual comparison and semantic processing technologies.

The experimental phase lasted four months and involved 33 fourth-year students from Sofia University. The students participated in a series of activities, including the creation of a digital corpus of classical Bulgarian literature, followed by extensive analysis using AI. The students then completed a questionnaire designed to assess their attitudes toward digital technologies in the classroom, their motivation, and their interpretation skills. Teachers evaluated the students' work, and all responses were analysed to determine the correlation between AI use and academic performance.

Data Analysis

The students' responses from the questionnaire were evaluated using descriptive statistics and Pearson's correlation coefficient to establish the relationship between motivation and perceived usefulness of AI. At the same time, five professors from the Department of Bulgarian Philology, each with more than ten years of experience, conducted an expert evaluation of the students' work based on the criteria of analytical depth, validity of conclusions, and appropriateness of AI use. The assessment was conducted on a five-point scale, and the reliability of the experts' opinions was verified using Kendall's coefficient.

Bloom's taxonomy was used to assess the "depth of analysis," with a particular emphasis on higher-order cognitive skills such as analysis, synthesis, and evaluation. This method facilitates a structured assessment of students' ability to perceive content more deeply and critically, going beyond basic understanding and moving on to complex analytical processes. The concept of "interpretive skills" is based on reader response theory, which emphasizes the active role of the reader in extracting meaning from a text. This method assumes that students' reading of literary texts is largely determined by their own responses, prior knowledge, and cultural context. The criterion of "accuracy" refers to the accuracy and validity of students' interpretive responses when analyzing literary texts, as assessed by both AI tools and professional experts. It refers to the degree to which students' interpretations correspond to recognized literary analyses based on textual evidence, thematic coherence, and analytical depth. It assesses students' ability to identify meaningful themes, symbols, and narrative structures in the text, as well as the alignment of their interpretations with professional standards of literary merit.

III. RESULTS

AI in the analysis of Bulgarian literary works

In the in-depth semantic analysis of Stanev's novel "Antichrist" (Figure 1), students analysed the dynamic changes in the meaning of the concepts "sin", "salvation", "soul", and "vocation" depending on the context. The result was the creation of a semantic map of the main character's image, which showed a transformation – from religious exaltation to an internal moral crisis, illustrating the conflict between dogmatic faith and lived experience.
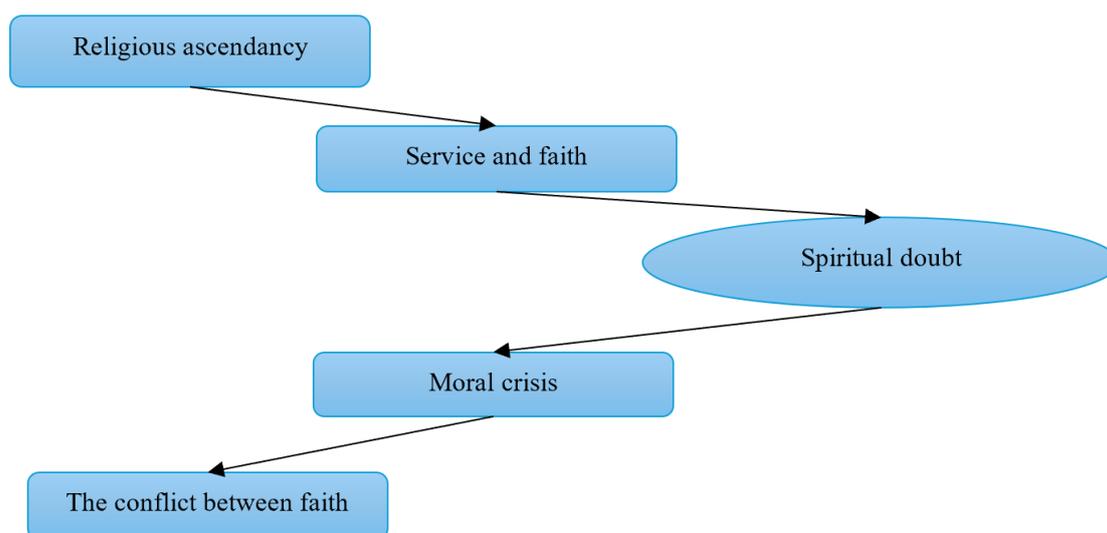

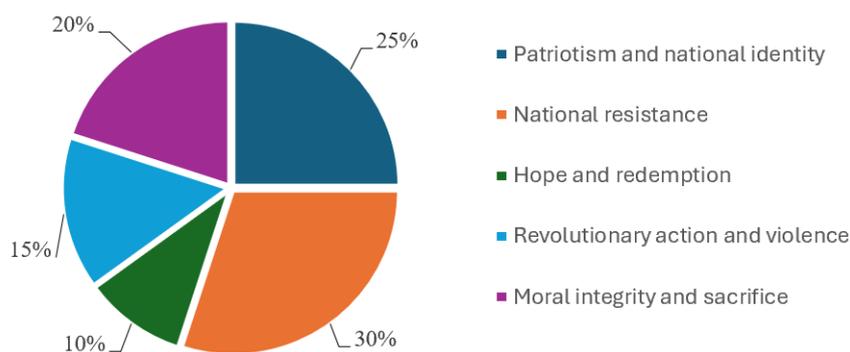**Fig. 1. Semantic map of the character in the novel "Antichrist".**

Fig. 2. Quantitative thematic analysis of "Under the Yoke".

Figure 2 visually represents the proportional distribution of key themes identified in the novel. This visual representation provides a clear overview of the thematic structure of the novel, emphasising the dominant ideas of struggle, patriotism, and sacrifice in the context of Bulgaria's fight for independence.

Figure 3 illustrates the results of the LDA analysis applied to Jovkov's short stories. This thematic modeling process identifies the dominant themes present within the text, with the respective percentage distribution of each theme.

In the analysis of novel "Shibil", the LDA model generated three main themes (thematic clusters), each characterised by a specific set of words exhibiting a high degree of co-occurrence probability. These themes can be provisionally described as follows in Figure 4.

Each word in the corpus had a certain probability of belonging to one theme or another. For instance, the word "honour" has a 30% probability of being associated with the theme of conflict (Theme 2), while the word "death" is 45%

associated with the theme of tragedy (Theme 3) (Table 2). Furthermore, the LDA model allowed for the estimation of how much each theme is represented in the entire document – this is the so-called Document-Topics Probability Distribution. These values are combined into a vector θ (theta), which reflects the probabilistic structure of the text's thematic content. Specifically, it is interpreted as: "this document is 40% about love, 35% about death, and 25% about conflict". Thus, θ acts as a quantitative indicator of the semantic composition of the literary work, derived from a statistical model.

Following the completion of the experiment, students filled out a questionnaire to assess their learning motivation, acquired analytical skills, and attitude towards digital technologies in education. Analysis of the results using descriptive and correlational methods showed a statistically significant relationship between the level of interest and the perception of the usefulness of AI ($r=0.68$, $p<0.01$). The reliability of expert assessments was evaluated using Kendall's coefficient of
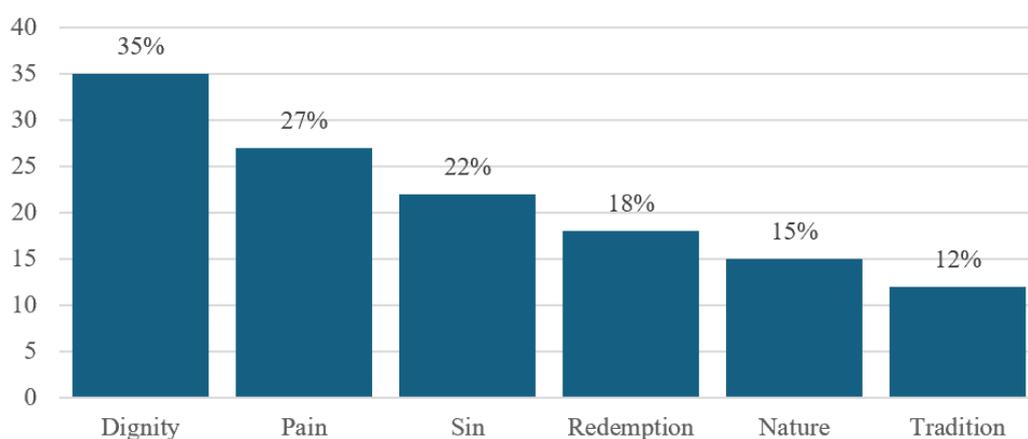

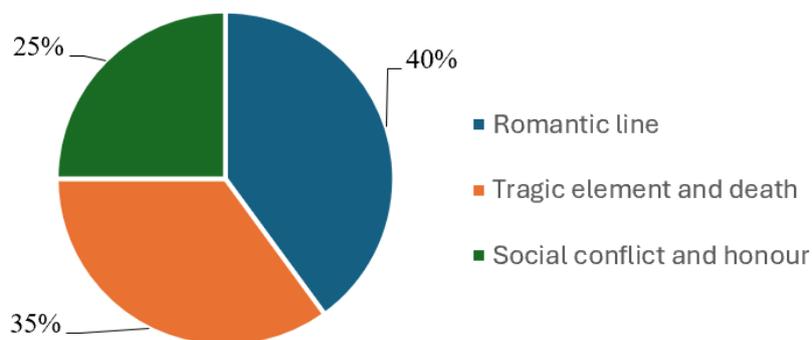**Fig. 3. Thematic modelling by LDA for Jovkov's short stories.**

Fig. 4. Thematic distribution for the story "Shibil"

Table 2. Thematic modelling by LDA for the story "Shibil"

Theme	Short description	Keywords (tokens)
1. Romance and the meeting of two worlds	Love between a robber and a Turk's daughter. Sensual descriptions, intense intimacy	"look", "flowers", "fascination", "beauty", "silence", "heart", "smile"
2. Honour, pride and transformation of the hero	Shibil as a figure of honour, changes in him after love. His attempt to "become a man"	"honour", "robber", "word", "man", "agreement", "path", "choice", "will"
3. Betrayal, death and fatalism	The final trap. The father's conspiracy. The cruel outcome as the inevitability of fate	"father", "betrayal", "shooting", "blood", "horse", "ambush", "death", "silence"
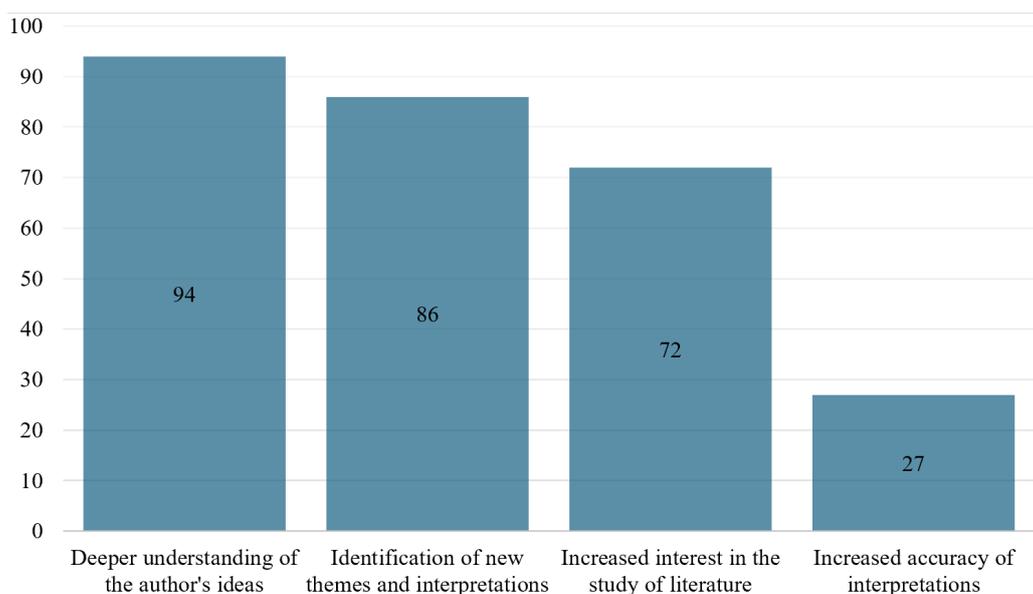
Fig. 5. Results of the survey and expert assessment of the impact of AI in the educational process.

concordance (W=0.84), which confirmed a high level of agreement among the experts. After the project's completion, students participated in a survey. The results revealed the following trends in Figure 5.

The results of the study confirmed that digital tools for humanitarian analysis, such as semantic and thematic models, improve the quality of the learning process. Students not only better mastered the content of a literary work, but also developed interdisciplinary skills related to the analysis of language structures, contextual changes in meaning, and intertextual connections. The advantages of BERT and spaCy in working with large corpora are worth emphasising. The models are able to recognise lexical items in context, determine the frequency of concepts, and identify associative fields (Abdrakhmanov et al., 2024a; Issakova et al., 2025). For example, in the novel "Under the Yoke", the BERT model effectively identified dominant themes (fatherland, struggle, dignity) and

correlated them with narrative nodes, characters, and geographical loci, thereby building a map of national identity that evolved from individual to collective resistance. In Jovkov's works, the LDA model helped to identify not only the themes, but also the specifics of their combination within traditional Bulgarian folklore. The thematic clustering algorithm made it possible to compare the images of characters (hunter, monk, shepherd) with the corresponding concepts (atonement, death, honour), revealing non-obvious semantic parallels. The analysis of stylistic constructions and repetitive syntactic patterns made it possible to recreate the logic of the ideological and spiritual unfolding of the protagonist's internal conflict (Issakova et al., 2023; Tukhtarova et al., 2021).

AI also plays an important role in recognising keywords and narrative motifs (Dziundziuk et al., 2024; Kotukov et al., 2025). The algorithms made it possible to quickly and accurately identify semantic nodes, create lexical maps, and

compare the stylistic dominants of the works. In the story "Shibil", such automation was effective in identifying moralistic oppositions between "honour" and "love", "escape" and "trial". The final tool was semantic similarity, which provided an in-depth intertextual analysis between works by different authors and eras.

The use of AI in the educational process allowed students not only to analyse texts from a philological point of view, but also to master basic skills in working with digital language technologies. As part of the course, they learnt how to pre-process text corpora independently, perform morphological and syntactic markup, interpret thematic clustering data and visualise the results in the form of semantic graphs and maps. Learning Bulgarian in this way was combined with the practice of using modern NLP tools, which contributed not only to a deeper understanding of the linguistic structure of the works, but also to the mastery of the principles of linguistic modelling, statistical thinking and critical evaluation of data. Students gained experience of interdisciplinary activities at the intersection of humanities, computer science and pedagogy, which is valuable both in the context of studying Bulgarian literature and general digital competence.

Thus, the results of the study prove the feasibility and practical effectiveness of using AI in literary education. AI models help to deepen the understanding of literature, form digital literacy, develop analytical thinking and critical reading. This creates the preconditions for transforming the methods of teaching humanities, in particular Bulgarian literature, and opens up the prospect of building new courses at the intersection of philology, IT, and educational technologies.

Challenges and prospects of using AI in the educational system of Bulgaria

The integration of artificial intelligence into the Bulgarian education system opens up new perspectives for improving the learning process, although it is accompanied by a number of significant obstacles. These difficulties have technical, ethical, and social dimensions, requiring a comprehensive approach to their resolution. Bulgarian, like many other languages with limited resources, faces challenges in the field of natural language processing (NLP). Modern language models such as BERT and GPT were developed primarily for English, which leads to reduced accuracy when used with Bulgarian texts (Martynenko et al., 2024; Shevchuk & Hunaza, 2025). Research by the Bulgarian Institute of Informatics and Artificial Intelligence (INSAIT) (2025) has shown that modern models demonstrate low efficiency in recognizing the morphological forms and syntactic structures of the Bulgarian language. This limitation affects the quality of text analysis, automated translation, and various applications of artificial intelligence in education. The lack of high-quality language models hinders the creation of effective educational tools for the Bulgarian language, thus limiting the ability of students and teachers to use AI in the learning process.

The introduction of AI to automate the assessment of student assignments raises concerns about the deterioration of critical thinking skills among students (Abdrakhmanov et al., 2024b; Bakhtibaeva et al., 2016). Automated assessment systems may not take into account the subtleties of originality and personal presentation style, which are critical components of humanities education (Luzan et al., 2021). Research by Chinta et al. (2024), conducted as part of the FairAIED initiative, highlights the danger of bias and inequality in AI algorithms, which can lead to misjudgments of student performance. Moreover, over-reliance on AI in the educational process can reduce students' motivation to think and analyze independently. This is particularly relevant in the humanities, where the development of critical thinking is a fundamental educational goal.

Digital inequality remains a significant problem in Bulgaria, especially in rural and remote areas. This limits the possibilities for integrating AI into education in these areas, as many AI tools require a reliable and high-speed internet connection to function. The rural population's lack of digital literacy hinders the integration of new technologies into the education system (Seidaliyeva and Smailov, 2025; Sultanbaeva et al., 2015). This creates additional barriers to equal access to quality education and exacerbates existing social inequalities. Despite progress in internet accessibility in rural areas, significant digital divides remain. The publication "Digital Decade 2024: Broadband Coverage in Europe 2023" (European Commission, 2024) indicates that fixed very high capacity network coverage in rural

Bulgaria is only 28%, which is significantly below the EU average. Bulgaria has revised its National Broadband Infrastructure Development Plan with the aim of improving access to high-speed internet in sparsely populated areas and introducing 5G networks (European Commission, 2020).

Some AI models operate as "black boxes," making their decision-making processes incomprehensible to users (Thalpage, 2023). This makes it difficult to understand AI decision-making processes, which is particularly important in an educational environment where the legitimacy of assessments and recommendations must be transparent to both students and teachers. The lack of explanation can cause skepticism about AI systems and limit their successful application in education. The use of AI in education often involves the aggregation and analysis of large amounts of personal data about students, including detailed information about their academic achievements, behavior, and other confidential information (Ismail & Aloshi, 2025). This increases the risk of data privacy and security breaches. The use of chatbots and other AI technologies may lead to data collection without proper user consent, which is contrary to the norms of ethical use of technology in education. Bulgaria's National Strategy on AI (European Commission, 2021) recognizes the need to create a legal framework to regulate the use of AI in various sectors, including education. Currently, there are no clear rules and recommendations for the ethical and safe implementation of AI in education. This creates legal uncertainty and may lead to misuse or ineffective application of technologies (Kulyk, 2023; Ji et al., 2023).

The successful integration of AI into the Bulgarian education system requires consideration of existing barriers and the continuous application of strategies to overcome them. The initial stage is the creation and implementation of high-quality language models adapted to the morphological, syntactic, and lexical features of the Bulgarian language. This will significantly improve the accuracy of automated text analysis, which is extremely important in philological education. At the same time, it is necessary to establish clear ethical rules and a legislative framework governing the use of AI in education. Particular attention should be paid to the protection of the personal data of students and teachers, as well as to ensuring the transparency of algorithms that influence decision-making in the educational process, such as assessment, recommendation, or performance analysis systems.

Equally important is the removal of infrastructure barriers. Investing in the development of digital infrastructure in remote and sparsely populated areas can ensure equal access to modern educational tools, thereby reducing digital inequality. The lack of a reliable internet connection and the necessary technological infrastructure makes the comprehensive integration of AI into education impossible for a significant part of the population. In addition, the digital literacy of all participants in the educational process is an important aspect for the successful application of the latest technologies. The introduction of structured training courses and seminars for students and teachers will contribute to the improvement of basic competencies in working with AI tools and their critical and informed use. The psychological aspect requires special attention. During the transition to a digital environment, students may experience fear, uncertainty, or decreased motivation. Therefore, it is extremely important to provide psychological support, promote the creation of an inclusive learning environment, and continuously assess the psycho-emotional state of students.

IV. DISCUSSION

In Bulgaria, there is growing interest in integrating artificial intelligence technologies into education. A 2024 survey of more than 2,200 Bulgarian educators found that 72% of them are familiar with artificial intelligence technologies, and 53% use them in teaching, especially for task automation, individualized learning, and language model assistance, such as ChatGPT (Kurshumova, 2024). Artificial intelligence is more commonly used by teachers of natural sciences and mathematics, while teachers of humanities, especially Bulgarian philology, use it less frequently, which highlights the need for special training for philologists in working with artificial intelligence. Age affects flexibility, as younger teachers (20-29 years old) show greater adaptability in the use of digital tools. In higher education, the use of AI is mainly concentrated in technical disciplines, with a minimal number of humanities disciplines, such as Bulgarian philology, integrating AI (Terzieva et al., 2024a). Some universities, such as Sofia University St. Kliment Ohridski, are launching pilot courses

on the use of AI in education; however, the lack of centralized plans and inter-agency coordination hinders wider implementation (Sofronieva et al., 2025).

The institutional framework for the digitization of the educational process in Bulgaria is laid down in several strategic documents. The most important initiative is the national program "Digital Bulgaria 2025" (Ministry of Transport..., 2019), approved by the government with the aim of modernizing digital infrastructure, promoting innovative development, and integrating information technologies into critical sectors, including education. The program aims to improve access to digital platforms, develop the digital skills of students and teachers, and equip educational institutions with the technological resources necessary to implement modern educational models. In addition, in 2020, Bulgaria ratified the Concept for the Development of Artificial Intelligence until 2030 (Ministry of Transport..., 2020), which contains a separate component dedicated to education. It emphasizes the need to develop curricula that include artificial intelligence, promote research in the field of humanities education, and create a regulatory framework for the ethical use of algorithms in an educational context. This plan includes funding for innovative pedagogical projects that use machine learning, natural language processing, and intelligent text analysis.

The European Commission (2021) classifies Bulgaria as a country with an average level of AI development in education, with significant growth potential, particularly thanks to its IT infrastructure and public institutions. Currently, the implementation of AI in humanities education is limited, requiring interdisciplinary strategies and innovative pedagogical approaches. The application of AI in Bulgarian literary education is mainly limited to informal forms of learning, where adaptive language systems are widespread. This is consistent with the findings of Huang and Li (2023), who found that AI tools such as ChatGPT increase student motivation, especially in the field of literary analysis, although the focus was on informal contexts.

Nikolova et al. (2024) corroborate this claim, pointing out that digital platforms influence language proficiency in Bulgarian educational institutions. The present study extends this phenomenon to cover both primary and higher education, highlighting broader digital changes. Amur et al. (2023) emphasize the importance of high-quality datasets for AI accuracy, while the lack of linguistic resources in Bulgarian is a critical issue for AI effectiveness in literary analysis. This limitation is particularly relevant for languages with complex morphology.

Research on semantic and thematic analysis tools such as LDA and BERT (Keikhosrokiani & Asl, 2023) illustrates the potential of AI in literary studies. In this study, these approaches are used to identify themes and characters in Bulgarian literature in line with international trends, taking into account the national linguistic perspective. However, the ability of AI to comprehensively understand the cultural and historical context in literature remains a challenge. Mihăluţe and Mititelu (2025) warn that AI may misinterpret literary materials, compromising the integrity of scientific research. This highlights the need for clear criteria and validation processes in AI-based literary evaluation.

Asrifan (2025) highlights the dual function of AI in expanding analysis and challenging traditional notions of authorship. As AI blurs the line between human- and machine-generated content, Holopainen et al. (2025) advocate for mechanisms that would ensure that AI enhances rather than replaces human creativity in literary interpretation. Slimi and Carballido (2023) express similar concerns, arguing that opaque AI decision-making processes create ethical dilemmas in creative evaluation, especially in Bulgaria, where algorithm transparency is significantly limited.

Despite these concerns, empirical research conducted at St. Kliment Ohridski University demonstrates that AI-based literary analysis outperforms traditional methods, refuting the concerns of Kirov and Malamin (2022) that AI will replace professionals. This study highlights the importance of interdisciplinary skills and critical thinking in AI integration, in line with the ethical concerns of Slimi and Carballido (2023) regarding AI's reduction of creative assessments.

The introduction of AI into Bulgarian education has great potential for improving learning, but also faces significant obstacles. A comprehensive strategy is needed to address these technical, ethical, and social challenges. A major

technological challenge is adapting AI models to the Bulgarian language. Modern NLP models such as BERT and GPT were developed for the English language, which reduces their accuracy when working with Bulgarian texts (Martynenko et al., 2024; Shevchuk & Hunaza, 2025).

AI ethics are important when using AI to assess students. Humanities education requires creativity, presentation style, and other subjective elements that automated systems may overlook. Chinta et al. (2024) found that algorithmic bias in AI can lead to unfair assessment in the FairAIED project. Overuse of AI can also discourage students from independent and critical thinking, which are essential skills in the humanities (Luzan et al., 2021). The use of AI tools in education must be carefully considered so as not to undermine critical thinking.

In rural and remote areas of Bulgaria, digital inequality remains a serious problem. Many AI tools require fast and stable internet, but broadband coverage in rural areas of Bulgaria is much lower than the EU average. In addition, insufficient digital literacy in these areas hinders the integration of AI into education (Seidaliyeva & Smailov, 2025; Sultanbaeva et al., 2015).

The "black box" nature of AI, where users cannot see the decision-making processes, makes it difficult to use in teaching. Without transparency, students and teachers find it difficult to trust AI systems, especially when they make key decisions such as assessments and recommendations (Thalpage, 2023). As AI technologies collect and process vast amounts of personal data, concerns about data privacy and security are growing. Improper data management can violate ethical standards and undermine user trust, which is crucial for the integration of AI into education (Ismail & Aloshi, 2025).

The study confirms that AI in Bulgarian language and literature education is in line with international functional trends, but varies in the degree of its implementation. The implementation of AI depends on the infrastructure, policies, and readiness of the education system. Nevertheless, AI contributes to increased interest in literature, interdisciplinary competencies, and critical thinking; however, these benefits are only realized with the adequate development of technological, legislative, and methodological frameworks.

V. CONCLUSION

The study found that the use of AI in teaching Bulgarian literature has significant potential in both formal and non-formal education. An analysis of existing digital platforms has shown that the integration of AI technologies provides opportunities for personalised, adaptive and interactive learning, contributes to the efficiency of learning and the formation of key literary competencies.

The importance of deep learning models, which were used for semantic and thematic modelling of Bulgarian fiction, is emphasised. The obtained quantitative results confirmed the positive impact of AI: the majority of students (94%) noted a deeper understanding of the author's ideas, 86% – an improved ability to identify new themes and interpretive lines, 72% – an increased interest in Bulgarian literature, and according to teachers, the accuracy of written interpretations increased by an average of 27%. The automated analysis successfully applied the LDA, spaCy, and BERT algorithms, which made it possible to form the thematic structures of the works of J. Jovkov, I. Vazov, and E. Stanev, to identify dominant lexemes and connections between concepts, which confirmed the feasibility of using digital models in teaching literary analysis. Semantic similarity, frequency analysis, construction of syntactic trees and lexical maps have opened up new analytical possibilities for philological education.

In general, the study confirms that AI contributes to improving the quality of language and literary training, activates interdisciplinary thinking, develops analytical skills, and shapes critical reading. These results are important in the context of the digital transformation of education, as they allow combining classical pedagogical goals with innovative technological tools. At the same time, the study identified a number of significant limitations. In particular, the main barrier to the widespread introduction of AI in Bulgarian philology is the insufficient development of high-quality language models adapted to the morphological and syntactic specifics of the Bulgarian language. The article also outlines the risks associated with the opacity of algorithms, threats to data privacy, and insufficient ethical regulation in the educational environment.

Based on the results of the study, the

following practical recommendations are formulated: to develop high-precision language models specifically adapted for the Bulgarian language; to ensure interdisciplinary coordination between philological and technical departments at universities; to expand digital training programmes for teachers of the Bulgarian literature; to improve the legal and ethical framework for the use of AI in the educational process.

A limitation of the study is its small and unrepresentative sample of only 33 students from a single institution, which may affect the generalisability of the findings. Additionally, the lack of a control group or pre-test comparison limits the ability to validate the claims made regarding the impact of AI tools on learning outcomes. Future studies should investigate the novelty effect of AI, evaluating how initial enthusiasm affects long-term learning, as well as how instructor mediation and proficiency affect learning results using AI tools. These elements are crucial to comprehending the long-term efficacy of AI in education.

ETHICS STATEMENT

All procedures performed in the study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individuals included in this study. The research fully complies with the ethical standards and publication guidelines of Jurnal Arbitrer.

CREDIT AUTHOR STATEMENT

Hristo Kamenov was solely responsible for the conceptualization, design, data collection, analysis, and writing of the manuscript. All aspects of the research were independently conducted by the author.

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DECLARATION OF COMPETING INTERESTS

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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