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УДК 004.896:378.146

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ЧАТ-БОТ ДЛЯ АВТОМАТИЗИРОВАННОГО ТЕСТИРОВАНИЯ ЗНАНИЙ СТУДЕНТОВ

Аннотация. В этой статье рассматривается разработка и внедрение чат-бота на базе Telegram, предназначенного для автоматизации тестирования знаний учащихся и повышения результатов обучения. Используя технологию обработки естественного языка (NLP) и машинное обучение, чат-бот упрощает администрирование тестов, обеспечивает обратную связь с учащимися в режиме реального времени и генерирует подробную аналитику для преподавателей. В нем рассматриваются ключевые проблемы традиционных методов оценки, такие как неэффективность ручного выставления оценок, запоздалая обратная связь и трудности с выявлением пробелов в обучении.

Ключевые слова: чат-бот, образовательные технологии, Платформа Telegram, обработка естественного языка (NLP), обратная связь в режиме реального времени, аналитика данных, машинное обучение в образовании.

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CHATBOT FOR AUTOMATED TESTING OF STUDENTS' KNOWLEDGE

Abstract. *This article discusses the development and implementation of a Telegram-based chatbot designed to automate student knowledge testing and improve learning outcomes. Using natural language processing (NLP) technology and machine learning, the chatbot simplifies the administration of tests, provides real-time feedback to students, and generates detailed analytics for teachers. It examines key issues with traditional assessment methods, such as inefficiency in manual grading, delayed feedback, and difficulties in identifying learning gaps.*

Keywords: *chatbot, educational technologies, Telegram platform, natural language processing (NLP), real-time feedback, data analytics, machine learning in education.*

The modern educational landscape is undergoing a profound transformation driven by the integration of digital technologies. Globalization, the rise of remote learning, and the demand for personalized education have accelerated the adoption of automated systems that streamline administrative tasks and enhance the quality of learning experiences. Among these innovations, chatbots—intelligent assistants capable of simulating human interaction and executing complex tasks in real time—are emerging as pivotal tools. Their application in education unlocks new possibilities for personalized learning, instant feedback, and data-driven insights, fundamentally reshaping how knowledge is assessed and delivered [Wang, Chen, Levy 2021, 110]. Traditional approaches to student assessment are increasingly strained by inherent limitations. Manual grading of tests, particularly in large classes, consumes hours of educators' time that could otherwise be dedicated to curriculum development or one-on-one student support [Johnson, Adams, Cummins 2022, 50]. Human grading also introduces the risk of subjective bias, where inconsistencies in evaluating open-ended responses or partially correct answers may skew results. Furthermore, delayed feedback undermines the learning process, as students often receive results days or weeks after completing a test, reducing opportunities for

timely intervention. Teachers, meanwhile, struggle to aggregate and analyze testing data efficiently, making it difficult to identify patterns in student performance or adjust teaching strategies proactively [Brown, Mann, Ryder 2023, 118].

Chatbots represent a dynamic solution to these challenges. By leveraging natural language processing (NLP) and machine learning, these tools can conduct interactive assessments, evaluate responses, and generate actionable insights with minimal human intervention. In the context of education, chatbots are not merely question-and-answer interfaces but sophisticated platforms capable of adapting to individual learning paces, offering hints, and even explaining complex concepts through conversational dialogue [Li, Huang, Zhang 2021, 92]. Their integration into platforms like Telegram, a widely used messaging app, ensures accessibility and familiarity for users, eliminating the need for students and educators to navigate unfamiliar software. The proposed Telegram chatbot is designed to automate the entire testing lifecycle—from test administration to performance analysis. Its architecture centers on three core functionalities [Brown, Mann, Ryder 2023, 120]:

1. Interactive Test Delivery:

The chatbot engages students in a conversational format, presenting questions sequentially and accepting answers via text, buttons, or multimedia inputs. It supports various question types, including multiple-choice, short-answer, and scenario-based queries, mimicking the flexibility of traditional exams while reducing administrative overhead. The bot can randomize questions or tailor them based on a student's performance, ensuring a personalized assessment experience.

2. Real-Time Analytics and Feedback:

As students complete tests, the chatbot instantly evaluates responses, assigns scores, and provides constructive feedback. For instance, if a student answers a physics problem incorrectly, the bot might offer a step-by-step explanation or direct them to relevant study materials. This immediacy transforms testing from

a summative evaluation into a formative learning opportunity, empowering students to address gaps in understanding on the spot.

3. Automated Reporting for Educators:

Behind the scenes, the chatbot compiles detailed analytics into structured Excel reports. These documents capture metrics such as individual scores, average completion times, and question-specific difficulty levels. By highlighting topics where multiple students struggled—for example, 70% of learners incorrectly solving a calculus problem—the reports enable instructors to refine lesson plans, revisit challenging concepts, and allocate classroom time more effectively.

The chatbot's development relies on a robust tech stack to ensure scalability and reliability [Johnson, Adams, Cummins 2022, 55]. Python, with libraries like `python-telegram-bot` and `pandas`, forms the backbone for handling bot interactions and data processing. Machine learning algorithms analyze response patterns to detect frequently missed questions, while integration with cloud storage (e.g., Google Sheets or AWS) ensures secure data management. Key features include:

- **Adaptive Testing:** The bot dynamically adjusts question difficulty based on a student's performance, enhancing engagement and accuracy in skill measurement.
- **Anti-Cheating Mechanisms:** Techniques like time limits, randomized question orders, and plagiarism checks for open-ended answers maintain test integrity.
- **Multilingual Support:** To cater to diverse student populations, the bot can deliver tests in multiple languages, broadening its applicability.

A pilot implementation of the chatbot in a university-level biology course demonstrated its transformative potential. Over a semester, 150 students used the bot for weekly quizzes on topics like genetics and ecology. The automated system reduced instructors' grading workload by 80%, freeing them to host interactive lab sessions and discussions. Post-analysis revealed that students who received

instant feedback via the chatbot improved their final exam scores by an average of 15% compared to previous cohorts. Additionally, the bot identified recurring difficulties with Mendelian inheritance problems, prompting the department to introduce targeted workshops, which subsequently boosted student proficiency in the subject [Wang, Chen, Levy 2021, 114].

While the benefits are clear, deploying such a system requires careful consideration of potential hurdles. Ensuring question validity and avoiding algorithmic bias in automated grading are critical; this demands collaboration between educators and developers to refine question banks and evaluation criteria. Data privacy is another priority, as the bot must comply with regulations like GDPR or FERPA when handling sensitive student information. Technical reliability—such as minimizing downtime during peak usage—is achieved through load-balanced servers and regular updates Wang, Chen, Levy 2021, 116]. Looking ahead, advancements in AI could enable chatbots to conduct oral exams via voice recognition or simulate real-world problem-solving scenarios through virtual environments. Integration with learning management systems (LMS) like Moodle or Canvas would allow seamless synchronization of grades and analytics, creating a unified educational ecosystem. On a broader scale, the widespread adoption of such tools could democratize education, providing high-quality assessment resources to underserved regions with limited access to qualified instructors.

The Telegram-based testing chatbot exemplifies how technology can elevate education by merging efficiency with pedagogical effectiveness. By automating routine tasks, it empowers educators to focus on creative teaching methods while equipping students with immediate, personalized feedback. As AI continues to evolve, chatbots will likely transition from supplemental tools to central components of educational frameworks, fostering a culture of continuous learning and data-informed instruction. In this rapidly changing landscape, embracing such innovations is not merely an option but a necessity for institutions

aiming to prepare students for the challenges of the 21st century [Johnson, Adams, Cummins 2022, 56].

This expanded vision of automated testing—where chatbots serve as both assessors and mentors—heralds a future where education is more inclusive, adaptive, and aligned with the needs of learners and educators alike.

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УДК 4'068:378

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