INTELLECTUAL TEACHING SYSTEMS: SOFTWARE ARCHITECTURE AND APPLICATION OF ARTIFICIAL INTELLIGENCE MODELS IN THE EDUCATIONAL PROCESS

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Abstract. Today, artificial intelligence (AI) technologies are increasingly penetrating all aspects of our lives, particularly the education sector. This article discusses the software architecture of intelligent teaching systems, their components, and the possibilities of using AI models in the learning process. It highlights how adaptive learning, large language models (LLMs), and machine learning algorithms enable a personalized approach to students. The article also focuses on software architecture approaches that should be considered when designing AI-based educational systems.

Keywords: artificial intelligence, intelligent teaching system, software architecture, adaptive learning, large language models, machine learning, educational technologies.

Introduction. In the 21st century, digitizing the educational process, personalizing it, and increasing its efficiency are among the most pressing tasks. The development of AI technologies has significantly influenced the field of education. Unlike traditional educational tools, AI-based systems can adapt to the individual needs of students, assess their knowledge levels, analyze learning behaviors, and suggest effective learning strategies.

In recent years, the rapid development of digital technologies has led to significant changes in education. Traditional teaching methods are giving way to

innovative, interactive, and flexible systems tailored to individual student needs. Especially, intelligent teaching systems based on AI technologies are becoming essential tools for making the educational process more efficient, user-centered, and interactive.

The Essence and Tasks of Intelligent Teaching Systems

Intelligent Teaching Systems (ITS) are computer programs or platforms that analyze a student's level of knowledge, learning styles, and needs, and offer personalized learning materials accordingly. These systems do more than just deliver content; they also understand students, guide them, and even automatically generate learning plans.

Software Architecture: Key Components

Modern ITS platforms feature multilayered and modular architectures, which typically consist of the following components:

1. Student Modeling Module

2. Pedagogical Module

3. Domain Model

4. Interface

5. Artificial Intelligence Algorithms

These components can operate based on microservices architecture.

The Role of AI Models in the Learning Process

1. Machine Learning – Activity analysis and individual planning

2. Large Language Models – Written work, contextual Q&A

3. Natural Language Processing (NLP) – Text analysis, error detection, translation

4. Computer Vision – Automatic evaluation of visual tests and image-based tasks.

Practical Applications and Case Studies

The following systems operate based on these technologies:

- Khan Academy

- Coursera

- Duolingo

- Socratic (Google).

These systems create a convenient learning environment for both students and teachers.

Conclusion. The integration of intelligent teaching systems with AI models is taking the education system to a qualitatively new level. Such systems provide personalized approaches to students, accelerate the learning process, and help teachers manage their work more efficiently.

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