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ARTIFICIAL INTELLIGENCE SELECTION AND DEVELOPMENT FOR EDUCATIONAL ROBOTS: A CHOICE BETWEEN EXISTING AI AND NEW MODEL DEVELOPMENT

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Abstract

This paper investigates the selection of artificial intelligence (AI) for the development of educational robots, or the choice between using existing AI tools or developing a new model. The goal of educational robots is to provide an interactive and personalized learning experience, track students' progress, and provide relevant responses. There are two main approaches for selecting the AI system for these robots: using existing AI tools or developing a new AI algorithm. The conclusion of this paper is that the choice between using existing tools or developing a new AI model depends on the project's goals, budget, and technical requirements. Moreover, the development of AI in the educational field will help personalize the learning experiences of students, enabling better educational outcomes.

Keywords: *as condensate mixture, nonlinear deformation, numerical solution, tridiagonal matrix algorithm (TDMA) .*

1. Introduction

In recent years, the application of robot technologies and artificial intelligence (AI) systems in education has rapidly increased. Educational robots

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provide individual and interactive learning experiences, offering a significant innovation compared to traditional teaching methods. However, one of the primary requirements for the successful operation of these robots is the development of an AI system that can control their operations and provide appropriate responses to students. This paper explores the development process of AI for educational robots and the choice between using existing AI tools and creating a new AI algorithm. The goal of the study is to determine under what conditions it is more optimal to use existing AI or develop a new AI algorithm.

Using existing AI tools allows for faster implementation and more efficient resource usage, reducing project time and budget. These tools are already available on the market and have been tested, making them reliable. However, developing a new AI algorithm provides more customized and personalized results tailored to the specific needs of the educational robot.

For the development of new AI algorithms, modern technologies such as deep learning, natural language processing (NLP), image and motion recognition, and machine learning can be employed. Furthermore, factors like technological compatibility, reliability, development and training resources, scalability, and security must also be considered in the selection process.

2. Key aspects and goals of the project

It is essential to define the goals and expectations for the development of educational robots clearly. These goals include providing an interactive and personalized learning experience for students, tracking their progress, and offering appropriate feedback. Educational robots will engage with students through natural language and will create lesson plans tailored to each student's individual needs, providing repetitive exercises and corrections when necessary.

3. Advantages of using existing ai tools

Existing AI tools can significantly accelerate the development of educational robots. These tools are already available in the market and have been tested across different fields. Below are the advantages of using existing tools in educational robots:

a. **Rapid Deployment and Integration of Existing Algorithms**

Existing tools ensure quick implementation and integration into robots. For example, platforms like IBM Watson and Google Dialogflow can provide natural language processing capabilities, enabling robots to communicate effectively with

students.

b. **Reduced Resource Requirements**

Using existing tools reduces development and training resources. This is crucial for minimizing the project's budget and timeline. These platforms are already optimized and have passed various tests, thus minimizing risks during implementation.

c. **Technological Stability and Reliability**

Existing AI systems have been widely tested and are known to be reliable, ensuring consistent performance for educational robots.

4. Advantages of developing new ai models

Developing a new AI model for an educational robot ensures better customization and adaptability to the robot's specific requirements. This approach allows for personalized responses and teaching materials tailored to individual student needs.

a. **Personalized and Educationally-Suitable Algorithms**

Custom-designed algorithms can be more effective for educational robots. For instance, the robot can design lesson plans based on a student's psychological state and developmental level. These modern, personalized teaching methods would not be possible using existing tools.

b. **Better Integration and Adaptation**

Developing a new model ensures better integration with specific educational goals. In contrast, existing systems may not align with all teaching methods or technical requirements.

c. **Future Expansion and Innovation**

A custom AI model can be more easily expanded in the future. New algorithms and features can be added more seamlessly, enhancing the robot's performance over time.

5. Selection and development of new ai algorithms

The development of new AI algorithms can employ various technologies and methodologies:

a. **Deep Learning**

Deep learning models can be used to assess student outcomes more accurately and create personalized lesson plans. Algorithms such as Convolutional Neural Networks (CNNs) and Long-Short Term Memory(LSTM) can help track students'

actions and reactions.

b. **Natural Language Processing (NLP)**

NLP models like BERT, GPT-3, and Transformer can facilitate natural and meaningful dialogue between the robot and students. One of the primary challenges in Natural Language Processing (NLP) for the Azerbaijani language is scarcity of high-quality linguistic resources and annotated datasets .Before employing any NLP model, a comprehensive data preprocessing pipeline is essential. This includes text normalization, removal of stop words, lemmatization, and appropriate text representation techniques such as Bag-of-Words, TF-IDF, or word embeddings. However, due to the limited availability of Azerbaijani-specific linguistic tools and corpora, it becomes necessary to curate custom datasets and incorporate rule-based grammar processing tailored to the unique morphological and syntactic structure of the Azerbaijani language.

Moreover, the limited availability of pretrained language models specifically trained on Azerbaijani data poses a significant bottleneck. While multilingual models such as mBERT, XLM-R, and BLOOM offer partial support for low-resource languages, their performance often lags behind models trained on high-resource languages. Therefore, fine-tuning these pretrained models on domain-specific Azerbaijani datasets or developing monolingual models using transfer learning approaches becomes crucial for achieving better performance in downstream NLP tasks.[4]

c. **Image and Motion Recognition**

Image recognition technologies can be used for tracking a student’s movements and facial expressions, enabling the robot to assess their needs more accurately.Here based on the tasks pretrained models such as YOLO can be applied.[5]

d. **Machine Learning**

Machine learning algorithms such as Random Forest and Support Vector Machines (SVM) can be employed to enable intelligent systems, such as educational robots, to recommend personalized learning activities and adaptively repeat exercises based on observed student behavior. Furthermore, unsupervised learning techniques, including K-Means and Hierarchical Clustering, can be utilized to group students with similar learning preferences or performance patterns, thereby enabling customized content delivery tailored to each cluster's

characteristics. To evaluate and track student progress following the implementation of these adaptive learning strategies, models such as Decision Trees can be employed to analyze performance outcomes and provide interpretable insights for further pedagogical refinement.[6]

6. Key criteria for ai selection in educational robots

When selecting AI for educational robots, the following factors must be considered:

a. **Technological Compatibility**

The compatibility of existing algorithms with the robot's hardware and software must be ensured. If a new algorithm is developed, compatibility testing with the system is required.

b. **Development and Training Resources**

Existing tools require fewer resources, while developing new algorithms may demand more time and workforce.

c. **Capability and Reliability**

New AI models should provide higher performance and reliability, helping the robot achieve consistent results when interacting with students.

d. **Scalability**

Existing systems may have limited scalability, while new models are more flexible for future expansions.

7. Reliability and performance of ai in educational robots

To assess the reliability and performance of AI in educational robots, the following factors must be evaluated:

a. **Accuracy and Performance**

It is essential that the AI provides accurate responses and feedback. The robot's reliability is measured by the precision of its answers when interacting with students.

b. **Security and Privacy**

The protection of students' personal information and security is a critical issue. AI systems should process and secure data safely, ensuring privacy protection.

8. Future perspectives and development of educational robots

The future development of educational robots will be driven by the widespread use of AI in the education sector. AI will personalize students' learning experiences, enabling them to achieve better educational outcomes by tailoring

the teaching process to their individual needs.

9.Conclusion

Based on computational feasibility, resource availability, and existing literature on the application of multilingual pretrained models, it is evident that such models can be effectively leveraged for Natural Language Processing tasks in the Azerbaijani language. Despite the low-resource nature of Azerbaijani, multilingual transformer-based models have demonstrated promising performance across various NLP applications. In domains such as image recognition and motion analysis, the use of pretrained deep learning models remains advantageous due to their ability to generalize well with limited domain-specific data. Additionally, a variety of machine learning algorithms—including both supervised and unsupervised methods—can be effectively applied for tasks involving behavioral analysis, personalization, and performance tracking, contributing to more adaptive and intelligent systems in educational and interactive settings.

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