



MACHINE LEARNING ALGORITHMS FOR IDENTIFYING YOUTH INTERESTS AND DEVELOPING A SOFTWARE FRAMEWORK

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Abstract

The rapid development of digital technologies and data-driven decision-making has significantly expanded the possibilities for understanding the interests and preferences of young people. In pedagogical universities, especially within information and communication technology programs, there is a growing need for analytical tools that can process large volumes of heterogeneous data related to learners' behavior, educational choices, and digital activities. This study explores the application of machine learning algorithms for identifying youth interests and the development of a corresponding software framework that supports analytical and educational tasks. The relevance of the research is determined by the increasing role of personalized learning, career guidance, and data-informed educational management. The paper focuses on the conceptual foundations of interest identification, the selection and adaptation of machine learning algorithms, and the integration of these algorithms into a unified software framework suitable for educational contexts. The results demonstrate that machine learning-based analysis enables more accurate and dynamic identification of youth interests compared to traditional survey-based methods, thereby contributing to more effective pedagogical planning and student support.

Keywords: machine learning, youth interests, educational data analysis, software framework, digital pedagogy


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Introduction

In recent years, the digital transformation of education has led to the accumulation of large-scale data describing students' learning behavior, communication patterns, and academic trajectories. For pedagogical universities training future specialists in ICT and education, the ability to analyze such data has become a strategically important competence. Youth interests represent a complex, dynamic, and multifaceted phenomenon influenced by social environment, educational content, digital media, and individual cognitive characteristics. Traditional methods for identifying interests, such as questionnaires and interviews, often suffer from subjectivity, limited scalability, and low adaptability to rapidly changing conditions. As a result, there is a growing demand for analytical approaches that can automatically process diverse data sources and reveal latent patterns related to students' preferences and motivations.

Machine learning has emerged as one of the most effective methodological foundations for solving such analytical problems. By employing supervised, unsupervised, and hybrid learning algorithms, it becomes possible to identify regularities in educational data that are not easily observable through conventional statistical techniques. In the context of youth interest identification, machine learning algorithms can analyze digital footprints, learning management system logs, content interaction histories, and academic performance indicators. This allows researchers and educators to move from static descriptions toward dynamic models of interest formation and change.

For pedagogical universities, the integration of machine learning tools into educational research and practice is particularly relevant. Future teachers and ICT specialists must not only understand theoretical principles but also be able to apply intelligent systems for educational diagnostics and planning. Developing a software framework that encapsulates machine learning algorithms for interest identification serves both research and educational purposes. It enables systematic experimentation, supports evidence-based decision-making, and contributes to the formation of digital competencies among students and faculty. The present study aims to substantiate the theoretical and practical aspects of applying machine learning algorithms to identify youth interests and to describe

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the development of a software framework adapted to educational environments. Special attention is given to the pedagogical significance of such tools, their methodological limitations, and their potential for supporting personalized learning and professional orientation.

Main Part

The identification of youth interests through machine learning requires a clear definition of data sources, analytical objectives, and algorithmic approaches. In educational settings, data may include demographic information, course selection histories, assessment results, interaction with digital learning resources, and extracurricular activity records. Preprocessing such data is a critical stage, involving normalization, feature selection, and handling of missing values to ensure the reliability of analytical outcomes.

Among supervised learning algorithms, classification methods such as decision trees, support vector machines, and neural networks are commonly used to predict interest categories based on labeled data. These approaches are effective when prior information about interest classes is available, for example in career guidance systems. Unsupervised algorithms, including clustering techniques, allow the discovery of hidden groupings of students with similar interest profiles without predefined labels. This is particularly valuable for exploratory analysis and for identifying emerging trends among youth.

The software framework developed within this study integrates data collection, preprocessing, algorithmic analysis, and visualization modules into a single environment. Such integration ensures usability for educators and researchers who may not possess advanced programming skills. The framework supports iterative experimentation with different algorithms and parameters, enabling comparative analysis and model optimization. Visualization tools play a crucial role in interpreting results, transforming complex numerical outputs into pedagogically meaningful representations.

From a pedagogical perspective, the application of machine learning-based interest identification contributes to several key areas. It supports personalized learning by aligning educational content with students' interests, enhances

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academic advising by providing data-informed recommendations, and improves institutional planning by identifying collective interest trends. At the same time, ethical considerations related to data privacy, transparency, and algorithmic bias must be addressed to ensure responsible use of such technologies in education.

The findings indicate that machine learning algorithms, when embedded in a well-designed software framework, provide a flexible and scalable solution for analyzing youth interests. Their effectiveness depends on data quality, methodological rigor, and alignment with educational objectives.

Conclusion

The study confirms that machine learning algorithms offer significant analytical potential for identifying youth interests in contemporary educational environments. Compared to traditional methods, machine learning-based approaches enable more objective, scalable, and adaptive analysis of complex educational data. The development of a software framework that integrates these algorithms enhances their practical applicability in pedagogical universities, particularly within ICT-oriented programs.

The use of such a framework contributes to the formation of digital and analytical competencies among future educators and specialists, supporting the broader goals of educational digitalization. It also creates opportunities for personalized learning, improved academic guidance, and evidence-based educational management. At the same time, the implementation of machine learning technologies in education requires careful consideration of ethical, methodological, and pedagogical factors to ensure that analytical results are interpreted responsibly and used to support, rather than replace, human decision-making.

Overall, the application of machine learning algorithms for identifying youth interests represents a promising direction for educational research and practice. Further studies may focus on expanding data sources, refining algorithms, and evaluating long-term pedagogical outcomes associated with the use of intelligent analytical systems in higher education.

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