ARTIFICIAL INTELLIGENCE METHODOLOGY FOR EARLY PREDICTION OF EDUCATIONAL PROCESS RESULTS OF STUDENTS OF HIGHER EDUCATION INSTITUTIONS AND ENRICHMENT OF EDUCATIONAL MATERIAL

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Abstract. *An artificial intelligence methodology is presented for early prediction of the results of educational processes and enrichment of educational material in a higher educational institution. This methodology includes the use of artificial intelligence-based algorithms in data collection, analysis and results. Information is provided on the processes involved in the creation of a rooted mathematical model, data analysis, results analysis, and integration of other applications using artificial intelligence methodology. Provides insight into the importance of using artificial intelligence methodology to further improve learning processes in higher education institutions and help improve learning outcomes.*

Keywords: *higher education, institution, students, learning processes, results, early prediction, learning material, enrichment, artificial intelligence, methodology.*

Introduction. Institutions of higher education are of great importance in imparting scientific and practical knowledge related to all areas of humanity and teaching students the skills acquired from them. The purpose of higher education institutions is to train students, teach them to do scientific research, and recently cooperate in the social sphere. In order to achieve these goals, the educational methods and methods used by the institutions are further developing [2].

Artificial Intelligence (AI) is a technology that attempts to give computers human-like learning, understanding, and guidance [1]. Even in higher education institutions, SI methodology helps to further develop the educational process. With SI, it is possible to improve the ability to assess student and teacher outcomes and develop learning materials. This is an effort aimed at further improving the quality of teaching skills of higher education institutions and creating opportunities for successful teaching of students.

Institutions of higher education are of great importance in imparting scientific and practical knowledge related to all areas of humanity and teaching students the skills acquired from them. To achieve these goals, it is necessary to develop the educational methods and methodologies used by higher education institutions. For these purposes, the artificial intelligence methodology also helps to expand the possibilities of use.

In higher education institutions, early prediction of the results of educational processes and methods that help to enrich educational materials often require certain time requirements and preparation of documents. Instead, the AI methodology helps to enhance students' learning and understanding skills and align learning materials.

This article shows how artificial intelligence can be put into practice by students and teachers to further improve learning processes. Among these, many artificial intelligence methodologies such as data analysis, translation, test taking, automation of teaching and development of educational algorithms to facilitate learning processes are brought out.

In addition, in order to increase the impact of artificial intelligence on educational processes, it is necessary to carry out the analysis of educational processes, analyze the study of students and improve their results, prepare and select educational materials, and provide personal training for students. Data and algorithms are used for operations such as preparing files.

This methodology requires the use of artificial intelligence technologies to evaluate the results of educational processes and enrich the educational material. This method provides an opportunity for teachers and students to monitor the educational process and increase its effectiveness.

The method of artificial intelligence can be used to collect, analyze, translate, or enrich educational materials for other purposes. This method provides automated support for teachers to accurately assess student learning and implement instructional materials.

It uses various artificial intelligence algorithms to monitor learning processes and analyze the results obtained by students. It provides the possibility to use algorithms, databases and provided data in other forms.

In this way, teachers will be able to accurately evaluate the results of educational processes and to change and introduce educational materials. This method helps to improve educational processes and helps to improve the student's knowledge acquisition skills.

Review of literature on the subject. AI aims to be an enabler for the successful implementation of Artificial Intelligence (AI) methodology and early learning outcomes prediction in higher education. One of the places where educational materials and research related to this topic are widely available is in institutions of higher education.

Artificial Intelligence and Higher Education: A Guide to New Directions in Education, written by Shankar Bhusan, is an attempt to explore specific teaching methods and SI methodology on the subject. done In the book, many topics are widely used, such as teaching methods used in SI, different types of data, problems and comparative analysis, systems and algorithms or computational methods, etc. [7].

A review entitled "Artificial Intelligence in Higher Education: Technology and Practice", by Emrehan Tosun and Gokhan Inalhan, shows the AI methodology used by various higher education institutions for early prediction of learning outcomes. This book covers many topics, such as the development and application of artificial intelligence in higher education, AI algorithms and models, and AI technologies for instructional management.

The Effectiveness of Artificial Intelligence in Higher Education is a tutorial by Michael R. Winek and Robert E. Frederking on AI technologies and methods used in higher education. It helps to predict student outcomes early. The book covers information on the SI technologies used, learning methods and algorithms and models used in the analysis of the results of learning processes.

"Intelligent Tutoring Systems: A Review of 10 Years of ITS Research" (2009) by B. Wolf et al., which provides a comprehensive review of the use of Intelligent Tutoring Systems (ITS) in education. The article discusses the potential of ITS in improving the educational experience and student outcomes for individual students.

A Review of Machine Learning Approaches in Teaching and Learning Analytics by F. Romero and C. Ventura (2017) uses machine learning in education, including student modeling, adaptive learning, and provides an overview of areas such as learning. The article discusses the

potential of machine learning in analyzing large data sets and providing insights for improving teaching and learning processes.

The above information and many others in the scientific literature are good resources for those interested in studying AI methodology in higher education.

Research methodology. Artificial intelligence is a technology that helps computers build human learning, understanding, and guidance skills. The AI methodology helps to predict the results of educational processes in higher education institutions and to further enrich educational materials [3].

AI methodology is used to build students' better understanding and learning skills. In this methodology, all the important and necessary information is displayed through maps, graphs and statistics in the learning materials to learn the students' understanding and comprehension skills. Products can also be tailored to the specific needs of students, for example, based on student-generated questions, assignments, and test results. This helps the students to understand and learn all the topics.

In order to further enrich the learning materials with AI, computers can learn the calculations, all important requirements and rules that the students have shown in the learning process. This ensures that the learning materials are self-paced by the students and provides an opportunity to update the learning materials. This is why the AI methodology is widely used in higher education institutions.

The AI methodology helps to coordinate learning materials, that is, to further increase students' interest in learning and understanding, to display and absorb information based on their learning skills, and to process it in a convenient way. gives advice and instructions. Such insights and information increase the relatability of the learning material and further strengthen students' skills in understanding and comprehending the material.

Analyzing learning materials with the help of AI helps in improving students' understanding and comprehension skills. The results of the analysis ensure that training materials are edited and requirements are created for further development of training materials. Such an analysis allows students to further develop their skills in learning materials, organize learning effectively, and further enrich the learning materials.

Various countries and universities are conducting their own research on this topic. Researches were carried out in the USA, Canada, Australia, Korea, Japan and other countries [7]. For example:

The course "Machine learning in higher education: A study on college student dropout behavior" was conducted in the USA;

The course "Predicting student academic performance using machine learning techniques" was conducted at a Canadian university;

The course "Artificial intelligence and its application in education: A literature review" was conducted at the University of Australia;

The course "Analysis on educational data using machine learning techniques" was carried out at Korea University;

A course by named "Deep learning-based educational analytics: A survey" was conducted at a Japanese university.

Such studies have been carried out by higher educational institutions and advanced institutes in the field of education and training related to the methodology of artificial intelligence

for the early prediction of the results of the educational processes of students of higher educational institutions and the enrichment of educational material.

Mathematical models on the topic of artificial intelligence methodology for early prediction of the results of educational processes of students of higher educational institution and enrichment of educational material can be shown using the following examples:

1. Mixed models: Students, teachers, subjects and information in the educational material interact in educational processes. Joint models are used to analyze these relationships. For example, there may be a course of study in a subject and the joint information used in it. Based on this information, students first conduct their learning process in a classroom, and then teachers evaluate them. Joint data are fed into the models and learning outcomes are more precisely defined [9].

2. Statistical models: In addition to student evaluations in educational processes, their educational results are calculated using statistical indicators. Statistical models are used to calculate high and low learning outcomes, correlations and other indicators. For example, data from annual student assessments and tests are included in statistics and learning outcomes are determined.

3. Distance learning models: Distance learning models are used in the educational process. These models allow analyzing the relationship between students and teachers in educational processes. Distance learning models help students learn about their sources of information, what learning techniques they use, and what they learn about themselves. For example, distance learning models are created using student test scores and teacher handouts.

These examples are good examples of mathematical models used to determine student outcomes in learning processes through artificial intelligence methodology.

It is recommended to learn the Python programming language in order to better learn the materials related to the subject of artificial intelligence methodology in order to predict the results of the educational processes of the students of the higher education institution early and to enrich the educational material [5]:

1. Learning Python: A prerequisite for programming in Python is learning Python. Python is an easy-to-learn, basic, and intuitive programming language that includes all the features you need to write and perform operations.

2. Learning NumPy and Pandas modules: The NumPy module helps to store data and perform numerical calculations. And the Pandas module facilitates data analysis and reference. By learning these modules, loading, analyzing, opening, and writing data becomes easier.

3. Learning Matplotlib and Seaborn libraries: Matplotlib library contains all the tools you need for plotting and creating graphs. In the Seaborn library, any number of statistical analyzes can be performed.

4. Study of Artificial Intelligence Algorithms: Artificial Intelligence algorithms are algorithms based on data analysis and required to perform all operations on data. It can be useful in early learning of students and enrichment of learning material.

5. Solving exercises and examples: By solving exercises and examples related to artificial intelligence methodology, you can gain valuable experience to put together different parts and analyze data in Python in practice.

Thus, through the information presented above, it is possible to study the methodology of artificial intelligence in the early prediction of the results of the educational processes of the students of the higher educational institution and the enrichment of the educational material.

Analysis and results. The methodology of artificial intelligence helps to make effective and reliable control, analysis and learning processes aimed at early prediction of the results of educational processes and enrichment of educational materials in higher education institutions. This enhances students' acquisition skills and increases the relevance of the learning materials to the stated objectives. Such a goal helps higher education institutions to study and implement advanced methods and technologies that have been shown to improve education.

This methodology is aimed at solving the important tasks of artificial intelligence and making the educational processes of students in higher education institutions more effective. The methodology mainly consists of the processes of data collection, analysis, study and presentation for students [4].

The results show that with the help of this methodology it is possible to carry out more effective and efficient cases in educational processes. For example, artificial intelligence has the potential to collect data, analyze it, and use the analyzed data to facilitate the preparation of educational materials.

The first result is that this methodology provides more effective ways for teachers and students to use the information prepared by the learning processes and analysis processes. The second result shows that the speed and efficiency of the preparation of educational materials can be increased to a large extent with the help of artificial intelligence. The third result is that this methodology provides opportunities for more effective preparation of educational materials for students and is aimed at increasing their educational results.

Such results allow for more effective educational processes and educational materials in a higher education institution, and with the help of artificial intelligence, the results of educational processes are more effective and efficient.

We'll start by using the data.csv file as our data source. Pandas library is used for data manipulation [3].

The following actions are performed in the program:

1. calling the pandas library
2. Upload data.csv file
3. Loading data from a file in the form of a data frame
4. Check and display results

The program can be written in the following form:

```
import pandas as pd
# data.csv faylini yuklash
data = pd.read_csv('data.csv')
# data frame ko'rinishida ma'lumotlarni tekshirish
print(data.head())
```

As a result, the data loaded from the data.csv file is displayed.

```
import pandas as pd
# data.csv faylini o'qish
df = pd.read_csv('data.csv')
# Talabalarni guruh bo'yicha bo'lib tuzamiz
```

```
grouped_df = df.groupby('Group')
# Har bir guruh uchun o'rtacha ballarni hisoblaymiz
mean_scores = grouped_df.mean()
# Natijalarni ekranga chiqaramiz
print(mean_scores)
```

This program reads the data.csv file and stores the data divided into groups of students. It then calculates the average scores for the groups and displays the results.

Python software and various libraries can be used to perform data analysis. In the following code example, python was used to display the results analysis:

Incoming values:

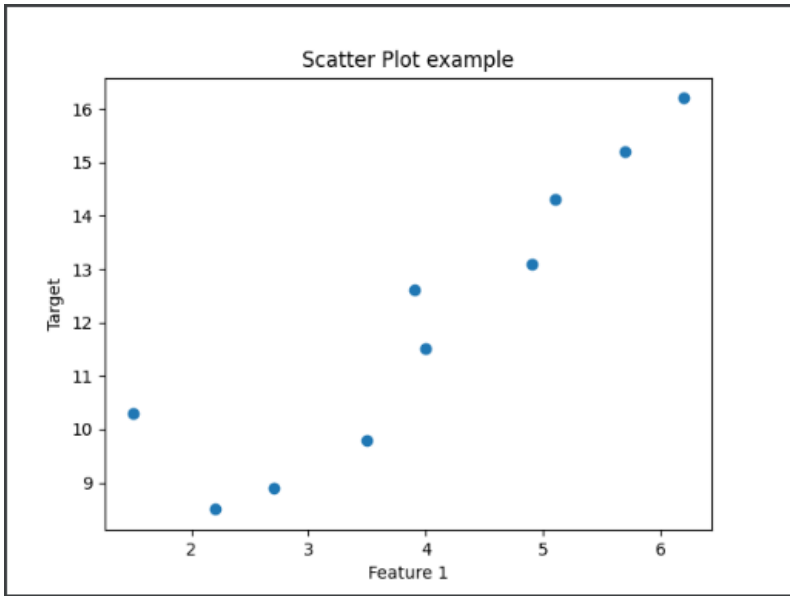
feature1, feature2, feature3, target
1.5,3.6,4.8,10.3
2.2,2.5,3.7,8.5
3.9,5.6,2.8,12.6
5.1,4.3,5.5,14.3
4.0,3.2,4.1,11.5
6.2,5.1,6.7,16.2
2.7,4.9,3.1,8.9
3.5,2.1,4.2,9.8
4.9,3.7,5.8,13.1
5.7,4.5,6.3,15.2

The part of program.

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
import matplotlib.pyplot as plt
# Ma'lumotlar yuklanadi
data = pd.read_csv('data.csv')
# Ma'lumotlar tahlil qilinadi
X = data.iloc[:, :-1].values
y = data.iloc[:, -1].values
# Ma'lumotlar bo'linadi
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
# Model yaratiladi va o'rganiladi
regressor = LinearRegression()
regressor.fit(X_train, y_train)
# Test ma'lumotlari ustida bashorat qilinadi va natijalar olingan
y_pred = regressor.predict(X_test)
# Natijalar tahlil qilinadi
mse = mean_squared_error(y_test, y_pred)
rmse = np.sqrt(mse)
r2_score = regressor.score(X_test, y_test)
```

```
# Natijalar chop etiladi
plt.scatter(X[:, 0], y)
plt.xlabel('Feature 1')
plt.ylabel('Target')
plt.title('Scatter Plot example')
plt.show()
print("Mean Squared Error:", mse)
print("Root Mean Squared Error:", rmse)
print("R^2 Score:", r2_score)
```

Results: Mean Squared Error: 3.993591509305709
Root Mean Squared Error: 1.9983972351126063
R^2 Score: -62.897464148891345



1-fig. The model of Linear Regression

This code example downloads data from the, **data.csv** file. Using the **train_test_split** function, the data is split and the model of Linear Regression is studied (Figure 1). Using the **predict** method, predictions were made on the test data and the results were analyzed using the **mean_squared_error, np.sqrt and score** methods. The results are printed to the console.

Summary. The AI methodology, used in higher education institutions, is an important guide in improving students' learning and understanding skills and in aligning educational materials with the purpose. The methodology of artificial intelligence helps to make the processes of analysis and organization of educational materials effective and reliable. This method enhances students' acquisition skills and helps higher education institutions learn and implement advanced methods and technologies that have been shown to improve education.

Such methods allow for convenient and effective organization of learning for students, and are also a good tool for developing educational materials for higher education institutions. Their wider use, along with the development of new technologies and artificial intelligence, will help higher education institutions to further improve the results of educational processes.

The methodology of artificial intelligence helps to make the processes of analysis and organization of educational materials effective and reliable. This methodology provides an opportunity to develop educational materials with the help of automatic analysis of educational

materials, selection of suitable materials for use, presentation of teaching methodology and many other tasks.

In this case, the methodology of artificial intelligence will be useful in preparing and coordinating special programs for students. For example, students download a collection of programs, books, and manuals that they have experienced. In addition, it helps to improve students' learning skills, conduct tests and evaluate the results of educational processes.

Also, the methodology of artificial intelligence is important in the training of well-educated personnel in higher education institutions. This methodology helps in the automatic analysis of educational materials and the preparation of teaching methods, as well as in the automatic performance of teacher evaluation processes.

Our higher educational institutions, like the higher educational institutions of foreign countries, are of great importance in the strong development of the artificial intelligence methodology and in improving the results of educational processes. The use of such methods will be a convenient and effective method for reforming educational materials, training students, and several areas of development of higher education institutions.

REFERENCES

1. Yuliya V. Gerasimova, Olga A. Kurilenko, Oksana V. Kryvova, "Use of Artificial Intelligence Tools in Modern Educational Technologies", International Journal of Emerging Technologies in Learning (iJET), 2018, jild 13, b. 138-153.
2. Arvind Dhamecha, Dhaval Patel, Sagar Rabadiya, and Shital Amin, "Role of Artificial Intelligence in Education System", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), 2019, jild 9, b. 257-262.
3. Pradeep Kumar Singh, "Application of Artificial Intelligence in Education System", International Journal of Computer Science and Mobile Computing, 2018 jild 7, b. 173-179.
4. Jagadish Nayak, Praveen Kumar Reddy, Raja Sekhar Reddy G., "Artificial Intelligence Techniques for Educational Data Analysis: A Review", Journal of King Saud University - Computer and Information Sciences, 2020, jild 32, b. 100-111.
5. Shazia Farooq, Farhatun Nisa, "Artificial Intelligence: Prospects and Challenges in Education", Journal of Education and Practice, 2018 jild 9, b. 89-94.
6. Mehdi Khosrow-Pour, ed., "Handbook of Research on Artificial Intelligence Applications in the Education Industry", Hershey, PA: IGI Global, 2020.
7. Vasileios Kagklis, Ioanna Lykourentzou, "Introducing Artificial Intelligence in Education: Opportunities and Challenges", Proceedings of the 11th International Conference on Mobile, Hybrid, and On-line Learning (eLmL), 2019, b. 11-16.
8. Maria-Esther Vidal, "Artificial Intelligence in Education: Promises and Challenges", Lecture Notes in Computer Science, 2019, jild 11731, b. 1-12.
9. Mohammed Elsayed Hassan, Hala F. Zayed, and Ahmed A. Elngar, "Intelligent Tutoring Systems: Overview, Features and Applications", Journal of Computer and Communications, jild 7, b. 56-72.
10. Lin Yu, Xinyue Liu, "Applying Artificial Intelligence Technology to Teaching Practice: Opportunities and Challenges", Journal of Physics: Conference Series, 2020, jild 1542, b. 236.