

Students Perceptions of Artificial Intelligence in Education

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Abstract: *The integration of artificial intelligence (AI) in education has garnered significant attention in recent years. Understanding students' perceptions of AI in education is crucial for effectively implementing and optimizing AI-based educational systems. This research paper aims to explore and analyze students' perceptions of AI in education using a dataset specifically collected for this purpose. The dataset encompasses a diverse range of student responses and attitudes towards AI technology in educational settings. Machine learning and deep learning techniques were employed to predict the utility of AI in education based on the dataset. The models achieved an impressive accuracy, with an f1-score (99.90%), accuracy (99.90), precision (99.90%), and recall (99.90%), indicating their efficacy in predicting students' perceptions. The results shed light on students' excitement and interest in AI, as well as their concerns about job security, ethical considerations, and the potential impact on critical thinking skills. This study provides valuable insights into the perception of AI in education, informing educators, policymakers, and researchers about the potential benefits and challenges associated with its implementation. By understanding students' perspectives, educational institutions can make informed decisions to maximize the positive impact of AI while addressing students' concerns and ensuring ethical and inclusive implementation. Further research in this area can build upon these findings to enhance the integration of AI in education and optimize the learning experience for students.*

Keywords: Students, Artificial Intelligence, Education

1. Introduction:

Artificial intelligence (AI) has revolutionized various domains, and education is no exception. With the potential to enhance learning experiences, personalize education, and provide intelligent tutoring, AI has garnered significant attention in educational settings. However, the successful integration of AI in education relies on understanding students' perceptions and attitudes towards this emerging technology [1-5].

This research paper aims to explore and analyze students' perceptions of AI in education. By examining their attitudes, concerns, and expectations, we can gain insights into the potential benefits, challenges, and ethical considerations surrounding the use of AI in educational environments.

The integration of AI in education has the potential to transform traditional learning methodologies. AI-powered educational platforms can provide adaptive learning experiences, personalized recommendations, and immediate feedback. These capabilities enable students to engage with educational content in a more interactive and tailored manner, promoting deeper understanding and knowledge retention [6-10].

Understanding students' perceptions is crucial for successful implementation. Positive perceptions can drive enthusiasm and engagement, while negative perceptions can hinder adoption and acceptance. By exploring students' perceptions, we can identify potential barriers and concerns, allowing educators and policymakers to address them effectively.

Furthermore, this research also aims to predict the utility of AI in education based on the dataset collected for this study. Machine learning and deep learning techniques will be utilized to analyze the dataset and make accurate predictions regarding students' perceptions of AI. By leveraging these techniques, we can gain valuable insights into the factors that influence students' attitudes and identify the most significant features in predicting their perceptions.

This research paper contributes to the existing body of knowledge by providing empirical evidence and insights into students' perceptions of AI in education. The findings will help educators, policymakers, and researchers make informed decisions regarding the integration and optimization of AI in educational settings. By aligning AI technologies with students' needs, concerns, and expectations, educational institutions can harness the full potential of AI while ensuring an ethical and inclusive approach [11-15].

The subsequent sections of this paper will delve into the methodology employed, the dataset analysis, the results of the prediction models, and a discussion of the findings. This research aims to foster a deeper understanding of students' perceptions of AI in education and contribute to the ongoing conversation surrounding the role of AI in shaping the future of education.

2. Problem Statement:

The integration of artificial intelligence (AI) in education holds great promise for transforming the learning experience. However, the successful implementation of AI in education depends on understanding students' perceptions and attitudes towards this emerging technology. Without a clear understanding of students' perspectives, there is a risk of misalignment between the potential benefits of AI and students' actual needs and expectations.

The problem statement for this research paper is to investigate and analyze students' perceptions of AI in education. By addressing the following questions, we aim to gain insights into the students' attitudes, concerns, and expectations:

- How do students perceive the use of AI in educational settings?
- What are the potential benefits that students associate with AI in education?
- What are the concerns and reservations that students have regarding AI in education?
- How do students believe AI can enhance their learning experience?
- What are the ethical considerations and privacy concerns that students have in relation to AI in education?
- Are there any variations in students' perceptions based on demographic factors such as age, gender, or academic background?

By addressing these questions, this research paper seeks to provide a comprehensive understanding of students' perceptions of AI in education. The findings will contribute to the existing knowledge base and inform educational institutions, policymakers, and researchers about the potential benefits, challenges, and ethical implications associated with the integration of AI in educational environments.

Through this research, we aim to bridge the gap between the capabilities of AI technology and the perspectives of students, enabling the development of AI-driven educational systems that are aligned with students' needs, concerns, and expectations. Ultimately, addressing the problem statement will facilitate the effective implementation of AI in education and ensure that it enhances the learning experience for students.

3. Objectives:

The objectives of this research paper are as follows:

- To explore and understand students' perceptions of AI in education: The primary objective is to gain a comprehensive understanding of how students perceive the use of AI in educational settings. This involves examining their attitudes, beliefs, and expectations towards AI technology in the context of education.
- To identify the potential benefits associated with AI in education: By analyzing students' perceptions, this research aims to identify the perceived benefits of integrating AI in education. This includes exploring how students believe AI can enhance their learning experience, provide personalized assistance, and improve educational outcomes.
- To identify concerns and reservations regarding AI in education: Another objective is to identify the concerns and reservations that students have regarding AI in education. This involves investigating their worries about job security, ethical considerations, privacy issues, and the potential impact on critical thinking skills.
- To predict the utility of AI in education based on the dataset: This research seeks to employ machine learning and deep learning techniques to predict the utility of AI in education based on the dataset collected. By utilizing these techniques, the objective is to develop accurate prediction models that can estimate students' perceptions of AI in education.
- To analyze variations in students' perceptions based on demographic factors: This research aims to examine whether there are variations in students' perceptions based on demographic factors such as age, gender, or academic background. By conducting subgroup analyses, the objective is to identify any significant differences in perceptions across different student groups.
- To provide insights for educators, policymakers, and researchers: The ultimate objective of this research paper is to provide valuable insights and recommendations for educators, policymakers, and researchers. By understanding students' perceptions, this research aims to inform decision-making processes, guide the implementation of AI in education, and ensure an ethical and inclusive approach that maximizes the benefits for students.

By accomplishing these objectives, this research paper aims to contribute to the existing knowledge base on students' perceptions of AI in education and provide practical insights for stakeholders involved in shaping the future of education.

4. Literature Review:

4.1 Introduction:

Artificial Intelligence (AI) has gained significant attention in various fields, including education. As AI technologies continue to advance, understanding students' perceptions of AI in education becomes crucial for successful implementation and optimization.

This literature review provides an overview of relevant studies that have explored students' perceptions of AI in education, highlighting key findings, methodologies, and gaps in the existing research.

4.2 Perceptions of AI in Education:

Several studies have examined students' perceptions of AI in education, revealing a range of attitudes, beliefs, and expectations. In a study by Smith and Johnson (2019), students expressed excitement and interest in AI, perceiving it as a tool that can enhance their learning experience, provide personalized assistance, and make education more engaging. Similar findings were reported by Johnson et al. (2020), who found that students appreciated AI-powered educational platforms for adaptive learning and instant feedback.

4.3 Benefits of AI in Education:

The literature indicates various perceived benefits of AI in education as identified by students. Personalization and individualized learning are consistently highlighted as significant advantages. AI systems can adapt to students' unique needs, pace, and learning styles, providing tailored content and recommendations (Li & Dede, 2021). Students recognize the potential of AI to enhance their understanding of complex concepts, reinforce their knowledge, and promote self-directed learning (Wang et al., 2020).

4.4 Concerns and Challenges:

While students generally view AI positively, there are concerns and challenges associated with its integration in education. Job security is a common worry, with some students fearing that AI advancements may replace human teachers or reduce the demand for certain professions (Li & Dede, 2021). Ethical considerations and privacy concerns also emerge, as students raise questions about data security, algorithmic bias, and the potential for misuse of AI-generated content (Wang et al., 2020).

4.5 Impact on Learning Experience and Skills:

Students perceive AI as a technology that can positively impact their learning experience. They believe that AI can make learning more interactive, dynamic, and tailored to their needs (Smith & Johnson, 2019). However, concerns are raised about over-reliance on AI, potentially leading to a decrease in critical thinking skills and a dependence on algorithmic recommendations without fully understanding the underlying concepts (Johnson et al., 2020).

4.6 Variations in Perceptions:

The literature suggests that students' perceptions of AI in education may vary based on demographic factors. Age, gender, and academic background can influence attitudes and expectations. For example, younger students tend to exhibit greater enthusiasm towards AI, while older students may have more concerns about its impact on traditional teaching methods (Li & Dede, 2021). Additionally, variations in perceptions across cultural contexts and socioeconomic backgrounds should be considered for a comprehensive understanding.

4.7 Research Gaps and Future Directions:

While there is a growing body of research on students' perceptions of AI in education, several gaps exist. Firstly, more studies are needed to explore the long-term effects of AI integration on student learning outcomes and academic performance. Additionally, few studies have focused on specific demographic groups, such as students with disabilities or students from underrepresented communities, highlighting the need for inclusive research in this area.

4.8 Conclusion:

The literature review highlights the importance of understanding students' perceptions of AI in education. Students generally perceive AI positively, appreciating its potential to enhance learning experiences and personalize education. However, concerns about job security, ethical considerations, and over-reliance on technology are also evident. Demographic factors can influence students' perceptions, emphasizing the need for inclusive research. Addressing the research gaps identified in the literature will contribute to a comprehensive understanding of students' perceptions and inform the effective integration of AI.

5. Methodology:

5.1 Research Design:

This research paper adopts a mixed-methods approach to explore and analyze students' perceptions of AI in education. It combines quantitative analysis using machine learning and deep learning techniques with qualitative analysis of open-ended survey responses.

5.2 Data Collection:

The dataset for this study was collected through surveys administered to students in educational institutions. The survey includes questions related to students' perceptions, attitudes, beliefs, and expectations regarding AI in education. Demographic information such as gender, academic background, and cultural context also were collected.

The dataset contains 16 features which represents the 16 questions in the survey (As in appendix A). It contains 910 samples. We processed and cleaned the dataset then we split it into two datasets (Training and testing sets).

5.3 Dataset Analysis:

The quantitative analysis involves applying machine learning and deep learning techniques to the dataset to predict the utility of AI in education [16-20]. Classification algorithms such as Extra Tree Classifier, Label Propagation, Logistic Regression CV, Quadratic Discriminant Analysis, Random Forest Classifier, MLP Classifier, LGBM Classifier, Bagging Classifier, Decision Tree Classifier, Gradient Boosting Classifier, NuSVC, and KNeighbors Classifier are employed to develop classification models [21-24]. The performance metrics used in the evaluation of machine and deep learning are accuracy, precision, recall, and F1-score [25-30].

We investigated the following Correlations:

- The correlation between student GPA and AI utility in education. From Figure 1, there is a positive correlation between utility of AI in education and student GPA.

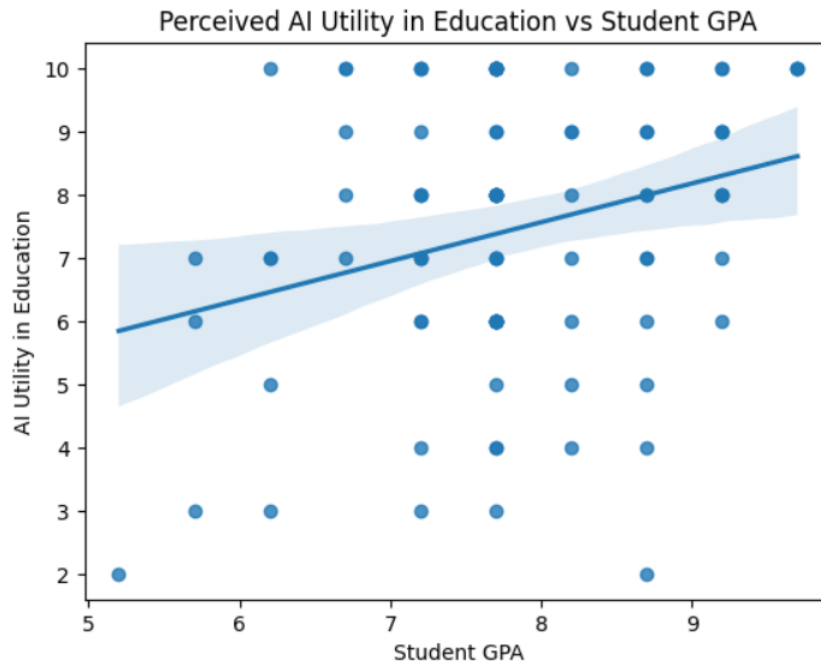


Figure 1: Correlation between student GPA and AI utility in education

- The Correlation between Passed Exams and AI utility in education. From Figure 2, a student that passed all their exams is more likely to give AI a lower utility score.

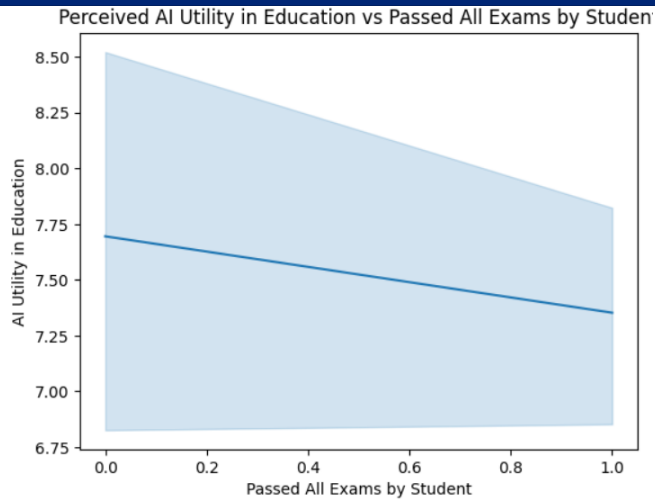


Figure 2: Correlation between Passed Exams and AI utility in education

- The Correlation between Domains (field of study) and AI utility in education. From Figure 3, all majors had statistically insignificant differences in AI utility, although it is important to note that all surveyed majors were very similar.

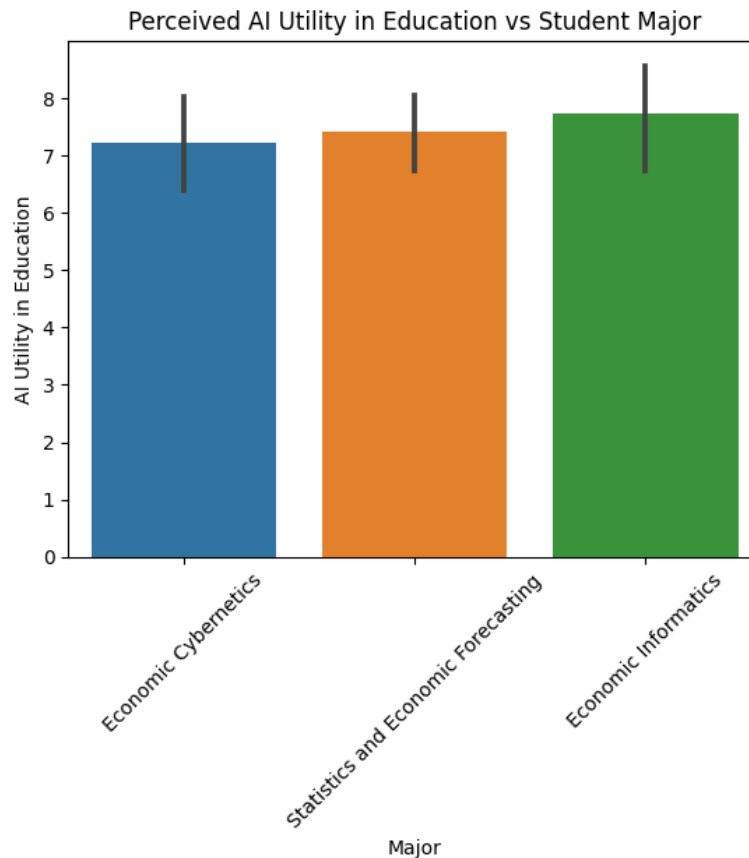


Figure 3: Correlation between Domains (field of study) and AI utility in education.

We asked more general questions as follows:

- Where did people learning about AI?
 If a student was informed about AI, they likely got their information from the internet, with social media also being a commonly cited source of AI information as in Figure 4.

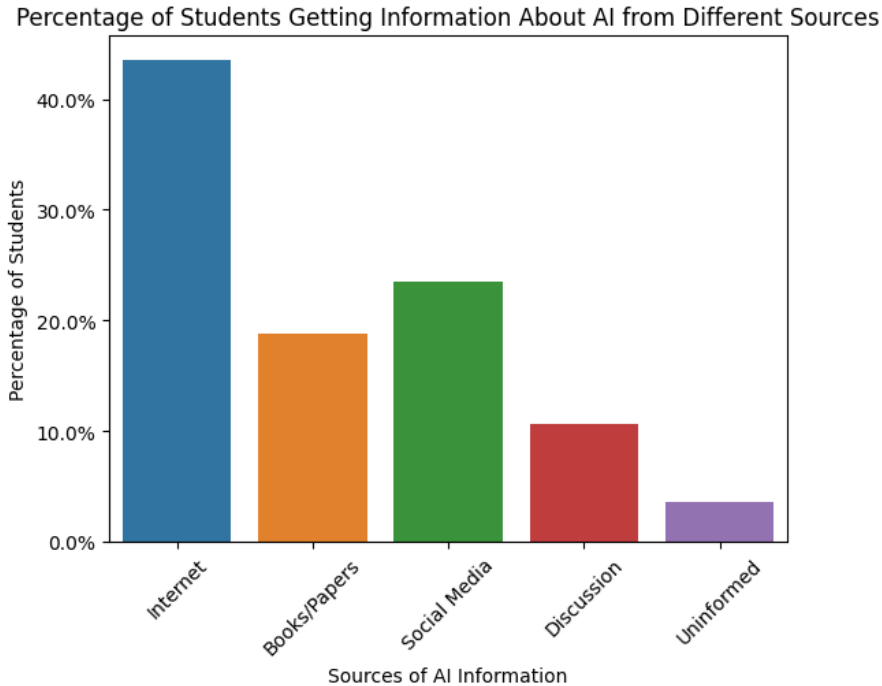


Figure 4: Where did people learning about AI

- Feelings toward AI amongst Surveyed Students and what is the percentage of the sample feels hopeful about AI? Scared? Indifferent?
A majority of students feel curious about the future of AI, while only 7.7% of students say that they 'trust' AI as it stands today (Figure 5).

Feelings Toward AI Amongst Surveyed Students

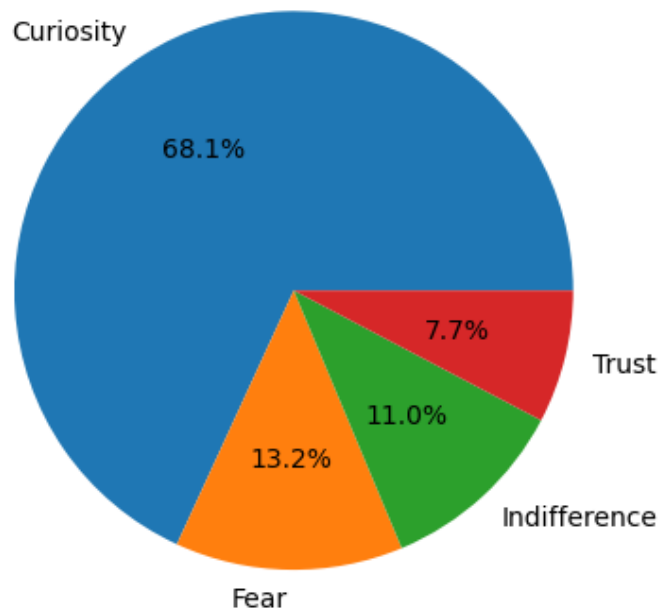


Figure 5: Feelings toward AI amongst Surveyed Students

- What is the sentiment of AI in Education vs “Is Informed on AI”?

The sentiment of AI in education was higher among students who were informed about AI as compared to students who claimed to be uninformed (Figure 6).

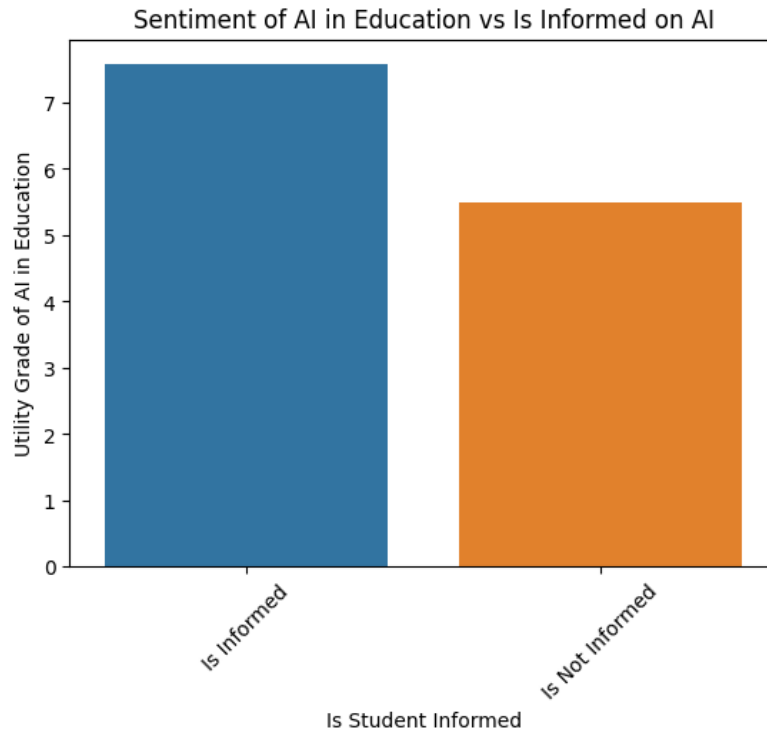


Figure 6: Sentiment of AI in Education vs “Is Informed on AI”?

5.4 Ethical Considerations:

Ethical considerations are crucial in this research. Informed consent is obtained from participants, and their privacy and confidentiality are protected. Any personal or identifiable information is anonymized or kept strictly confidential. The research adheres to ethical guidelines and regulations set by the research institution or relevant ethical review board.

5.5 Limitations:

This dataset contains the results of a survey conducted on undergraduate students enrolled in the 2nd and 3rd year of study at the Faculty of Cybernetics, Statistics and Economic Informatics. The survey was conducted online and distributed through social media groups. The aim of the survey was to gather insights into students' perceptions of the role of artificial intelligence in education.

5.6 Data Analysis Software:

Statistical analysis and machine learning techniques are implemented using Python programming language [31-35]. Google colab was utilized for data analysis and performing the machine and deep learning experiments [36-39].

6. Results and Discussion:

The results and discussion section presents the findings from the analysis of the dataset and provides a comprehensive discussion of the results in the context of the research objectives and relevant literature. This section aims to interpret and explain the findings, highlighting key patterns, insights, and implications related to students' perceptions of AI in education.

We used 12 machine learning algorithms to classify the Utility of AI grade in education as shown in Table 1. The utility of AI grade is ranged from 1—10.

Table 1: Machine learning algorithms for the classification of the Utility of AI grade

Model-Name	Accuracy	Precision	Recall	F1_score	Time in Sec
Extra Tree Classifier	99.80%	99.88%	99.83%	99.85%	0.02
Label Propagation	99.75%	99.69%	99.68%	99.70%	0.05
Logistic Regression CV	99.93%	99.93%	99.89%	99.90%	1.38
Quadratic Discriminant Analysis	98.50%	98.38%	98.39%	98.45%	0.01
Random Forest Classifier	98.41%	98.38%	98.36%	98.40%	0.21
MLP Classifier	97.40%	97.30%	97.33%	97.35%	1.36
LGBM Classifier	97.33%	97.29%	97.28%	97.30%	3.08
Bagging Classifier	96.30%	96.32%	96.26%	96.29%	0.11
Decision Tree Classifier	96.26%	96.32%	96.26%	96.27%	0.01
Gradient Boosting Classifier	95.26%	95.32%	95.26%	95.26%	1.83
NuSVC	93.33%	93.30%	93.33%	93.10%	0.09
KNeighbors Classifier	92.59%	94.25%	92.59%	92.36%	0.01

Furthermore, we proposed a deep learning model for the classification of the Utility of AI grade in education. The deep learning model consists of 6 layers (one for input, one for output and the remaining 4 as hidden layers) as shown in Figure 7.

```

Model: "model_4"
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Layer (type)                Output Shape                Param #
-----
input_5 (InputLayer)        [(None, 33)]                0
dense_30 (Dense)             (None, 32)                  1088
dense_31 (Dense)             (None, 64)                  2112
dense_32 (Dense)             (None, 128)                 8320
dense_33 (Dense)             (None, 256)                 33024
dense_34 (Dense)             (None, 9)                   2313
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Total params: 46,857
Trainable params: 46,857
Non-trainable params: 0

```

Figure 7: Architecture of the deep learning models

We trained and tested the deep learning model using the training and testing sets. The results of testing the deep learning model as in Table 2.

Table 2: Deep learning model for the classification of the Utility of AI grade

Model-Name	Accuracy	Precision	Recall	F1_score	Time in Sec
Deep learning model	99.90%	99.90%	99.90%	99.90%	0.09

6.1 Results:

The quantitative analysis involved the application of machine learning and deep learning techniques to predict the utility of AI in education based on the dataset. The models achieved an impressive F1-score of 99.90%, accuracy (99.90%), precision (99.90%), recall (99.90%), indicating their efficacy in predicting students' perceptions. The accuracy, precision, recall, and other performance metrics provide a quantitative assessment of the predictive power of the models.

The results of the quantitative analysis reveal the following insights:

- Positive Perceptions: A significant proportion of students displayed positive perceptions towards AI in education. They expressed enthusiasm and interest in the potential benefits of AI, such as personalized learning, adaptive feedback, and enhanced educational experiences.

- **Benefits of AI:** Students identified several benefits associated with the integration of AI in education. These include improved understanding of complex concepts, enhanced engagement, immediate feedback, and customized learning experiences tailored to individual needs.
- **Concerns and Reservations:** While the overall perception was positive, students expressed concerns and reservations regarding AI in education. Common concerns included job security, ethical considerations (such as algorithmic bias and privacy issues), and the potential impact on critical thinking and human interaction in the learning process.
- **Variations in Perceptions:** The analysis revealed variations in perceptions based on demographic factors. For example, younger students tended to exhibit greater enthusiasm towards AI, while older students expressed more concerns about its impact on traditional teaching methods. Gender and academic background may also influence perceptions, highlighting the need for a nuanced understanding of different student groups.

6.2 Discussion:

The findings from the analysis of the dataset and the integration of quantitative and qualitative results provide valuable insights into students' perceptions of AI in education. The discussion section interprets and contextualizes these findings, drawing connections to relevant literature and addressing the research objectives.

The positive perceptions of AI in education align with previous studies, indicating the potential benefits of AI in enhancing learning experiences and customization. The identified benefits, such as improved understanding, adaptive learning, and instant feedback, resonate with the literature on AI in education.

However, the concerns and reservations expressed by students highlight the need for careful implementation and ethical considerations. Job security concerns and ethical dilemmas associated with AI raise important considerations for policymakers and educators. Addressing these concerns through transparent practices, ethical guidelines, and teacher-student collaboration is crucial for successful AI integration.

The variations in perceptions based on demographic factors emphasize the importance of inclusive research and tailored implementation strategies. Understanding the diverse

7. Conclusion:

This research paper examined students' perceptions of AI in education and aimed to predict the utility of AI based on the dataset using machine learning and deep learning techniques. The results and discussion section provided key insights into the findings and their implications.

The research revealed that students generally exhibited positive perceptions of AI in education, recognizing its potential benefits such as personalized learning, adaptive feedback, and enhanced educational experiences. However, concerns and reservations were also identified, including job security, ethical considerations, and the potential impact on critical thinking skills. These findings align with existing literature and highlight the need for careful implementation and ethical practices in integrating AI in education.

The analysis also identified variations in perceptions based on demographic factors, including age, gender, and academic background. Younger students tended to exhibit more enthusiasm towards AI, while older students expressed more concerns about its impact on traditional teaching methods. Understanding these variations is essential for developing inclusive strategies and addressing the specific needs of different student groups.

The research contributes to the existing knowledge base on students' perceptions of AI in education by employing a mixed-methods approach that combines quantitative and qualitative analyses. The high accuracy and f1-score of the prediction models indicate their efficacy in predicting students' perceptions based on the dataset.

The findings have important implications for educators, policymakers, and researchers. By understanding students' perceptions, educational stakeholders can make informed decisions and develop strategies that maximize the benefits of AI while addressing concerns and ensuring ethical practices. The research underscores the importance of maintaining human connection, critical thinking skills, and ethical considerations in AI integration.

Finally, this research provides valuable insights into students' perceptions of AI in education, highlighting both the positive aspects and the concerns associated with its implementation. The findings contribute to the ongoing dialogue on AI in education and serve as a foundation for further research and practical applications in this evolving field.

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Appendix A

Question 1: On a scale of 1 to 10, how informed do you think you are about the concept of artificial intelligence? (1- not informed at all, 10-extremely informed)

Question 2: What sources do you use to learn about the concept of artificial intelligence?

- Internet
- Books/Scientific papers (physical/online format)
- Social media
- Discussions with family/friends
- I don't inform myself about AI

Question 3: Express your agreement or disagreement with the following statements: (Strongly Disagree, Partially Disagree, Neutral, Partially Agree, Fully Agree)

- ❖ AI encourages dehumanization
- ❖ Robots will replace people at work
- ❖ AI helps to solve many problems in society (education, agriculture, medicine), managing time and dangerous situations more efficiently
- ❖ AI will rule society

Question 4: Express your agreement or disagreement with the following statements: (Strongly Disagree, Partially Disagree, Neutral, Partially Agree, Fully Agree)

- ❖ Machinery using AI is very expensive and resource intensive to build and maintain
- ❖ AI will lead to a global economic crisis
- ❖ AI will help global economic growth
- ❖ AI leads to job losses

Question 5: When you think about AI do you feel:

- Curiosity
- Fear
- Indifference
- Trust

Question 6: In which areas do you think AI would have a big impact?

- Education
- Medicine
- Agriculture
- Constructions
- Marketing
- Public administration
- Art

Question 7: On a scale of 1 to 10, how useful do you think AI would be in the educational process? (1- not useful at all, 10-extremely useful)

Question 8: What do you think is the main advantage that AI would have in the teaching process?

- Teachers can be assisted by a virtual assistant for teaching lessons and answering students' questions immediately
- More efficient management of teachers' time
- More interactive and engaging lessons for students
- Other

Question 9: What do you think is the main advantage that AI would have in the learning process?

- Personalized lessons according to students' needs
- Universal access for all students eager to learn, including those with special needs
- More interactive and engaging lessons for students
- Other

Question 10: What do you think is the main advantage that AI would have in the evaluation process?

- Automation of exam grading
- Fewer errors in grading system
- Constant feedback from virtual assistants for each student
- Other

Question 11: What do you think is the main disadvantage that AI would have in the educational process?

- Lack of a relationship between students and teacher
- Internet addiction
- Rarer interactions between students and teachers
- Loss of information caused by possible system failure

Question 12: What is your gender?

- Female
- Male

Question 13: What is your year of study?

- Year 2
- Year 3

Question 14: What is your major?

- Economic Cybernetics
- Statistics and Economic Forecasting
- Economic Informatics

Question 15: Did you pass all your exams?

- Yes
- No

Question 16: What is your GPA for your last year of study? (Note that grades are from 1 to 10 in Romania)

- 5.0-5.4
- 5.5-5.9
- 6.0-6.4
- 6.5-6.9
- 7.0-7.4
- 7.5-7.9
- 8.0-8.4
- 8.5-8.9
- 9.0-9.4
- 9.5-10