Understanding Concerns in The Adoption of Artificial Intelligence Technologies Among College Students

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ABSTRACT

This research aims to analyze the perceptions of undergraduate students from the Management Study Program at the Faculty of Business and Economics, Universitas Islam Indonesia, regarding artificial intelligence (AI) technology and its potential impacts. Using a sample of 200 students who responded to an open-ended questionnaire, the study used the Orange Data Miner software to analyse topic modelling. The Latent Dirichlet Allocation (LDA) technique was used to uncover hidden topics within the responses, revealing five main topics related to AI's influence on human life, education, and future employment. The findings provide insights into student perceptions, highlighting both positive and negative implications of AI.

Keywords: Artificial Intelligence, Education, Employment

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INTRODUCTION

The rapid advancements in artificial intelligence have sparked a growing debate about the potential impact on traditional employment (Popenici & Kerr, 2017). As AI systems become more sophisticated, concerns have emerged about their ability to automate various tasks, potentially displacing human workers across a wide range of industries (Wang & Lester, 2023). This phenomenon holds significant implications for higher education, as the future workforce must adapt to the changing job market and acquire new skill sets to remain competitive.

Artificial Intelligence (AI) has emerged as a disruptive force in today's technological landscape, potentially transforming industries, economies, and work. Some researchers define Artificial Intelligence (AI) as human-like intelligent machines in the form of computer programs. According to Krittanawong, Zhang, Wang, Aydar, & Kitai (2017), Artificial Intelligence is the ability of a machine to imitate human behaviours. It uses computers to duplicate human memory, knowledge, learning, analysis, and creative thinking. AI itself can significantly help humans, from simple tasks to advanced problems. AI technologies are not just influencing specific sectors; they are becoming everywhere, affecting almost every field, from healthcare to finance, manufacturing to enterprising.

The pervasive influence of AI on society is underpinned by its ability to analyse datasets, recognise patterns, and make predictions, even in autonomous decision-making. As it becomes significantly sophisticated, it enables organisations to streamline operations, enhance productivity, and create innovative solutions. It means that the possible impact of AI on future careers must be

balanced. Consequently, AI can give rise to numerous and complex ethical issues such as sociocultural changes, responsibility allocation, job displacement, information bias, fairness, privacy, and many more. Recent studies have explored the educational implications of AI's transformative potential. Universities are crucial in preparing students for AI-driven careers and responsible AI usage. The higher education landscape is poised to undergo a profound transformation as institutions grapple with the challenge of preparing their students for a future where AI may displace or significantly alter traditional occupations. Therefore, it is imperative to investigate and address ethical challenges when university students interact with AI technologies.

As the future workforce, higher education students have a vested interest in understanding the implications of AI on employment. Their perspectives on this issue are vital, as they will navigate the job market and adapt to the changing skill requirements. Examining the perceptions and concerns of higher education students can provide valuable insights into the evolving landscape of employment and the role of AI in shaping the future of work. These studies emphasize the pressing need for higher education institutions to proactively address the impending labour market shifts, underscoring the necessity to equip their students with the necessary competencies to thrive in an AI-driven economy (Popenici & Kerr, 2017).

This exploration aims to gain insight into how young people, especially university students, perceive and navigate ethical concerns related to AI, including the general issues of AI's benefits and harmful impact on their careers. This research is significant as it addresses the evolving landscape of AI integration in universities and its ethical implications for students. Later findings can inform educational institutions and policymakers on how to prepare students to navigate the moral complexities of AI, ensuring responsible AI usage and fostering ethical leadership among future professionals. There is still limited research on how university students perceive and navigate these concerns. Therefore, to fill in the gap, there needs to be more research that delves into the nuanced perspectives and experiences of university students regarding ethical concerns with AI, especially in Indonesia.

LITERATURE REVIEW

State of Artificial Intelligence in Indonesia

Indonesia was making strides in the field of artificial intelligence (AI). The Indonesian government has shown interest in promoting AI development, and there were initiatives to integrate AI into various sectors, including education. Academic institutions in Indonesia were increasingly emphasising AI education and research. Collaborations between universities, research institutions, and industry players were helping to advance AI capabilities. AI can influence students' character and morals, increase mental sharpness, and provide new insights (Wahyudi, 2023). According to Sobron and Lubis (2021), artificial intelligence is an essential factor for the future of government in Indonesia. Its potential applications are public policy making, government management, the utility industry and the professional field. Artificial intelligence has made document processing easier in government administration through script text and voice recognition. Artificial intelligence also helps analyse laws and regulations (Pakpahan, 2021). Artificial intelligence in public services enables the development of public service complaints that can verify reports, refer complaints to competent authorities and respond to complaints.

Many organisations have begun accelerating their adoption in various fields in response to market changes. Recent advances in this technology have great potential to create and improve personalised learning for students, optimise strategies for learning outcomes, and increase accessibility with more diverse populations. AI claims describe the skills universities should teach their students to prepare them for the AI-related jobs of the future (Grace Ufuk, 2020). Today, student expectations require universities to support the teaching and learning process with advanced technology.

Therefore, integrating educational technology innovation to improve the quality of education is the responsibility of higher education. To achieve this goal, several educational technologies exist, including cloud technology, mobile technology, virtual reality and classrooms, audio and video, artificial intelligence, and many more (Fulton, 2019).

Future uses of AI will include Enabling engaging and interactive education anytime, anywhere. Personalised AI mentors help students identify and achieve their goals, and mass customisation will allow AI to be tailored to each student's learning style, level, and needs.

College Student's Perception of Artificial Intelligence in Indonesia

The presence of AI technology is a breakthrough in educational technology in supporting the learning process. Careful and controlled use of technology can help speed up the process of education. The emergence of artificial intelligence technology can also stimulate independent traits in students. The teacher is not responsible for this leading role, but his duties are more specific: providing insight using essential keywords. The basis for every use of technology by teachers is to continue prioritising the essence of teaching, especially the regulation of student ethics and behaviour.

Meanwhile, educational technology can help students control and monitor their learning, helping them live and work well in the future as a tutor for each student. The existence of intelligent technology that can adapt content to individual students has been widely used in many classrooms in the form of intelligent tutoring systems (Molenaar, 2021). Integrating artificial intelligence (AI) into teaching and learning in higher education has potential in several areas. Using artificial intelligence in teaching can improve the quality of teaching, support learning and teaching, provide better support services for students and train students with the skills necessary for further development.

Facing these technological changes, educators must be ready to adapt and participate in applying artificial intelligence in education. By understanding and addressing relevant ethical considerations and wisely maximising the benefits of AI, higher education can create an optimal environment for students and faculty (Hutson et al., 2022). With the correct ethical approach, using artificial intelligence in higher education can positively improve the quality of teaching and create quality human resources ready to face future challenges. The application of artificial intelligence in education raises ethical challenges that must be considered. These ethical considerations are data protection and privacy, AI decision-making transparency, bias avoidance, academic integrity, and accountability (Kennedy, 2023).

HYPOTHESES DEVELOPMENT

AI teaching systems can provide adaptive, personalised teaching and help students understand the course material better. A student engagement analysis system can help teachers understand and increase student engagement in learning. According to (Afrita, 2023), some types of AI used in education include chatbots, AI tutoring systems, student engagement analysis systems, and plagiarism detection systems. Chatbots can be virtual assistants to help students solve problems and provide feedback around the clock. Another Intelligence Application currently used by both lecturers and students is ChatGPT. ChatGPT, according to (Ramadan, 2023), can increase productivity and quality in learning. For students, this artificial intelligence technology provides a potential replacement for search engines that deliver maximum results, thereby providing the same opportunity to develop ideas. Based on research (Suciati et al., 2023), students' perceptions of learning to speak with the help of artificial intelligence applications regarding the importance of artificial intelligence in learning to speak, 30.8% strongly agree, 38.5% and 30.8% are neutral. Villasenor (2019) stated that AI appears to be a new tool to improve access to education. Thus, the researcher proposed:

Hypothesis 1: Artificial intelligence impacts college student's learning process.

Considering some risks arising from AI, another question is to what extent will AI automate tasks performed by humans? This consideration for this phenomenon is whether humans will be replaced entirely by artificial intelligence technology. According to Bassen (2018), technology has partially transformed the nature of humans' jobs. Another study by Agrawal et al. (2017) mentioned that artificial intelligence seems to be targeted at automating some tasks performed by specific jobs. Some evidence that AI potentially impacts employment opportunities is that many job categories that used to exist in the past are eliminated due to technological obsolescence, such as postman, typewriter, telegraph operator, and many more. A study by Smith and Anderson (2014) stated that AI will not create massive unemployment but will likely eliminate specific tasks in some jobs while creating new occupations simultaneously. A significant point is that AI usage for various business sectors can be promising. However, the demand for human workers will continue to diminish (Bassen, 2018). According to Ghotbi et al. (2022), the top concern of college students in Japan was increasing unemployment related to AI usage. Therefore, the following hypothesis is:

Hypothesis 2: Unemployment is the most potential risk arising from AI implementation.

METHOD

This study is descriptive quantitative research based on a text analysis approach utilizing two Python programming libraries: TextBlob and Voyant Tools. TextBlob is a Python library that provides a simple interface for text-processing tasks such as tokenization, word splitting, sentiment analysis, and phrase recognition (Python Software Foundation, 2024b). Meanwhile, Voyant Tools is an online software for digital text analysis consisting of a series of text visualization tools (Sinclair & Rockwell, 2024).

The data source for this study was obtained from an open-ended questionnaire distributed to undergraduate students of the Management Study Program, Faculty of Business and Economics, Universitas Islam Indonesia, through Google Form with the research questions as follows:

1. In your opinion, what is artificial intelligence technology?
2. Explain your opinion about the effects of using AI technology in the learning process on campus. (can provide positive or negative responses)
3. Explain your opinion about the impact of using AI technology on human careers in the future.
4. The World Economic Forum has identified nine potential ethical issues raised by artificial intelligence in the future. Choose one of the most serious impacts of AI.

In this study, TextBlob was used to detect positive, negative, and neutral sentiments throughout the research instrument. Meanwhile, Voyant Tools was utilized to analyse the most frequent words in the corpus, Wordcloud, Keyword Trend, and Text Link. The flowchart algorithm for TextBlob analysis and the Process Diagram for data processing in Voyant Tools are presented in Figure 1.

The flowchart algorithm outlined above describes the steps involved in sentiment analysis using Python libraries such as Pandas, re, NLTK, TextBlob, and Matplotlib. Here's a breakdown of each step:

1. Start: The beginning of the algorithm.
2. Import Python Library: Import necessary Python libraries, including Pandas, re (regular expressions), NLTK (Natural Language Toolkit), TextBlob, and Matplotlib for text processing and visualization tasks (NLTK Project, 2023; Python Software Foundation, 2024b, 2024a; The Matplotlib development team, 2024; The pandas development team, 2020).
3. Data Preparation:
    - Data Upload: Upload the dataset or data source.
    - Display DataFrame: Display the dataset in a DataFrame format for inspection and exploration.

4. Data Pre-Processing:
   - Text Cleaning: Perform cleaning operations on the text data, such as removing special characters and eliminating non-ASCII characters, punctuation, or irrelevant information.
   - Text Normalization: Normalize the text data by converting all characters to lowercase words to their base form.
5. Sentiment Analysis:
   - Perform sentiment analysis using TextBlob or similar libraries to analyze the text data's sentiment (positive, negative, or neutral).
   - Visualize the sentiment analysis results using a bar chart.
   - Output the sentiment analysis results using Pandas.
6. End: The end of the algorithm.

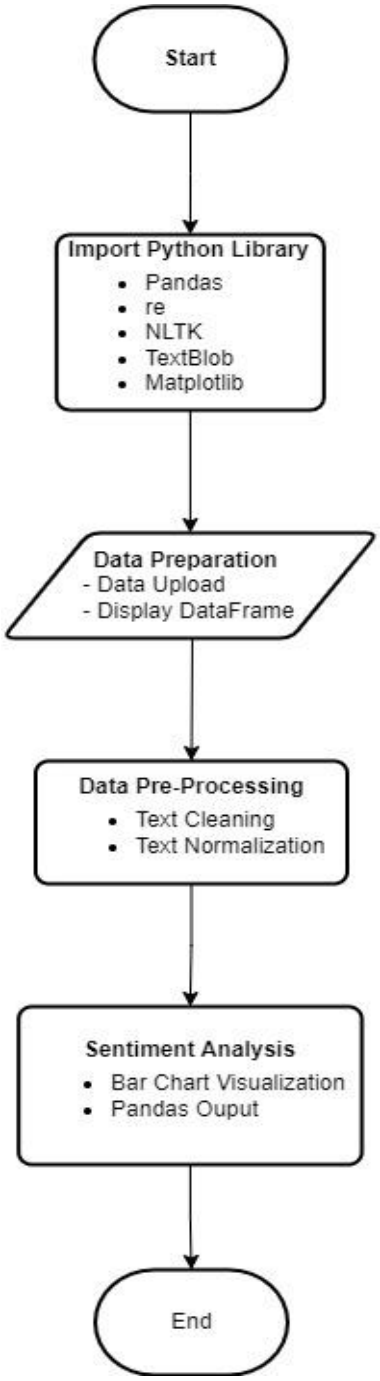

Figure 1. Algorithm Flowchart

Source: Author (2024)

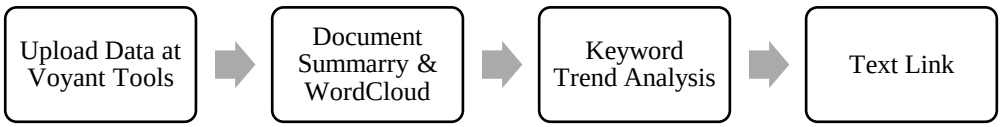

Figure 2. Data Processing Stages in Voyant Tools
Source: Author (2024)

Data Processing Stages in Voyant Tools:

1. Upload Data: Users input text into Voyant Tools to prepare for analysis and visualization, either by direct entry or file upload. This step ensures the data is ready for subsequent processing.
2. Document Summary & WordCloud: Document Summary in Voyant Tools offers statistical information as word count, aiding in understanding the document's characteristics. Voyant Tools generates a WordCloud, visually representing frequently occurring words in the text corpus. The size of each word corresponds to its frequency, offering a quick insight into dominant themes or topics.
3. Corpus Trend Analysis: Users can analyze the frequency changes of specific corpus over time, revealing temporal patterns or shifts in emphasis within the text corpus. This analysis aids in understanding evolving themes or topics.
4. Corpus Link: Voyant Tools visualizes connections between corpus, revealing semantic relationships or associations. By displaying these connections in a network diagram, users gain insights into the underlying structure and content of the text corpus, facilitating deeper analysis.

RESULTS

Sentiment Analysis on Question 1: In your opinion, what is artificial intelligence technology?

Based on the following TextBlob analysis, the sentiment distribution for answers to question 1 is presented below:

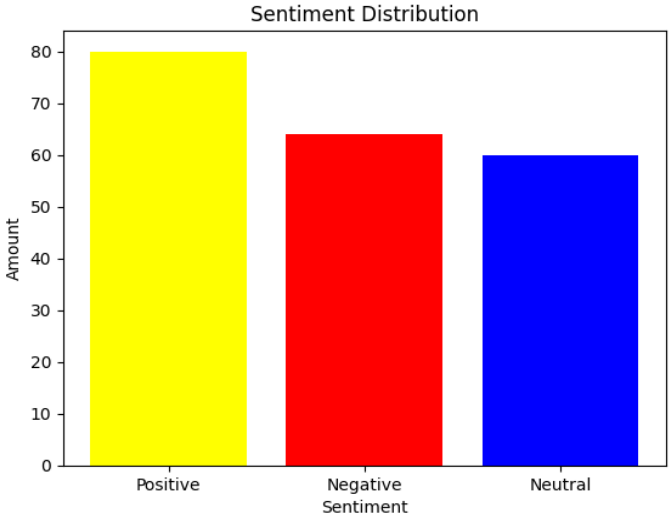

Figure 3. Question 1 Sentiment Distribution
Source: Processed Primary Data (2024)

Table 1. Question 1 Sentiment Distribution

Sentiment	Ammount
Negative	64
Neutral	60
Positive	80

Source: Processed Primary Data (2024)

Based on the sentiment analysis of responses to the question "In your opinion, what is artificial intelligence technology?", it appears that the majority of respondents hold a positive sentiment (80), followed by a negative sentiment (64), and finally, a neutral sentiment (60).

This suggests that while a significant portion of respondents view artificial intelligence technology positively, there is also a notable proportion with negative sentiments. The neutral sentiment indicates that some respondents may have provided neutral or mixed opinions. Overall, the respondents seem to have a range of perspectives on artificial intelligence technology.

Sentiment Analysis on Question 2: Explain your opinion about the effects of using AI technology in the learning process on campus (can provide positive or negative responses)

Based on the following TextBlob analysis, the sentiment distribution for answers to question 2 is presented below:

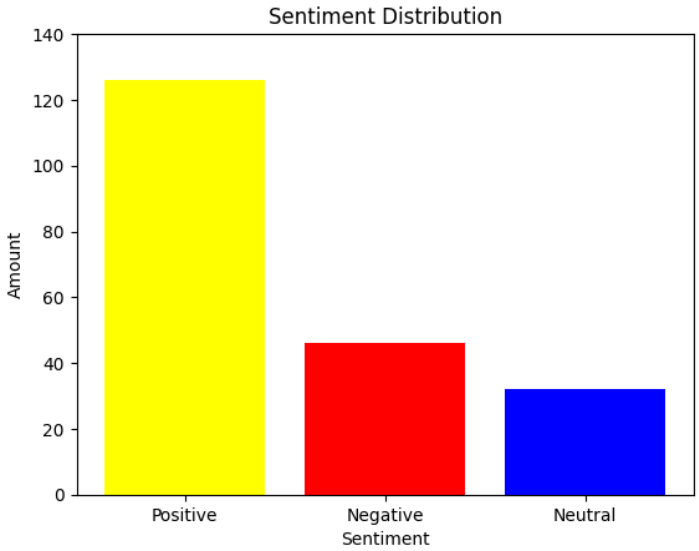

Figure 4. Question 2 Sentiment Distribution
Source: Processed Primary Data (2024)

Table 2. Question 2 Sentiment Distribution

Sentiment	Ammount
Negative	46
Neutral	32
Positive	126

Source: Processed Primary Data (2024)

The sentiment analysis of responses to the question "Explain your opinion about the effects of using AI technology in the learning process on campus?" indicates predominantly positive sentiments (126), followed by negative sentiments (46), and a smaller proportion of neutral sentiments (32). This suggests that a significant majority of respondents perceive the impact of AI technology on the learning process positively, while a notable portion expresses concerns or negative views.

Sentiment Analysis on Question 3: Explain your opinion about the impact of using AI technology on human careers in the future.

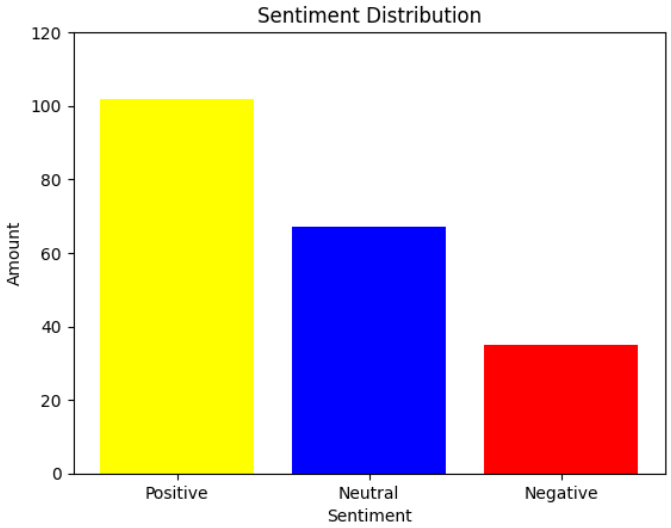

Figure 5. Question 3 Sentiment Distribution
Source: Processed Primary Data (2024)

Table 3. Question 3 Sentiment Distribution

Sentiment	Ammount
Negative	35
Neutral	67
Positive	102

Source: Processed Primary Data (2024)

The sentiment analysis of responses to the question "Explain your opinion about the impact of using AI technology on human careers in the future" suggests a mixed outlook. While there's a notable positive sentiment (102), indicating optimism about AI's potential benefits, there are also concerns expressed with a significant amount of negative sentiment (35) and a substantial portion remaining neutral (67). This reflects divergent perspectives on AI's future impact on careers.

Sentiment Analysis on Question 4: The World Economic Forum has identified nine potential ethical issues raised by artificial intelligence in the future. Choose one of the most serious impacts of AI.

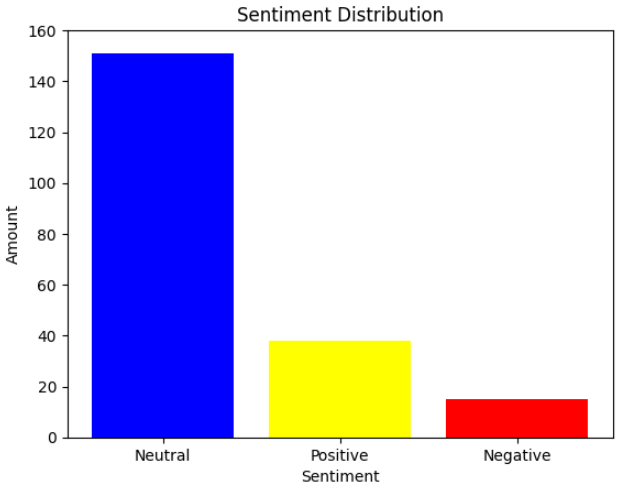

Figure 6. Question 4 Sentiment Distribution
Source: Processed Primary Data (2024)

Table 4. Question 4 Sentiment Distribution

Sentiment	Ammount
Negative	15
Neutral	151
Positive	38

Source: Processed Primary Data (2024)

The sentiment analysis of responses to the question "The World Economic Forum has identified nine potential ethical issues raised by artificial intelligence in the future. Choose one of the most serious impacts of AI" indicates a predominantly neutral sentiment (151). This suggests that the respondents may have provided a balanced perspective or remained unsure about the chosen ethical issue. Additionally, there are fewer negative sentiments (15) and a modest amount of positive sentiments (38), reflecting varying levels of concern and optimism regarding AI's ethical implications.

Voyant Tools Document Summarry & WordCloud

This corpus has 1 document with 16,654 total words and 1,385 unique word forms.
Vocabulary Density: 0.083
Readability Index: 13.453
Average Words Per Sentence: 38.6

Most frequent words in the corpus:

ai (691); technology (334); human (313); unemployment (235); students (177)

Figure 7. WordCloud
Source: Processed Primary Data (2024)

The most frequent words in the corpus include "ai" (691 occurrences), "technology" (334 occurrences), "human" (313 occurrences), "unemployment" (235 occurrences), and "students" (177 occurrences), indicating key topics or themes present in the document. The most frequent words are, of course, also clearly visible on WordCloud.

Corpus Trend Analysis

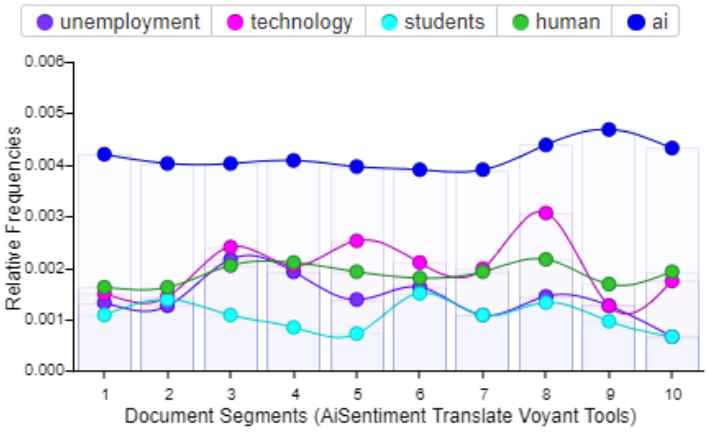

Figure 8. Keyword Trend
Source: Processed Primary Data (2024)

The trend graph above displays the five terms with the highest frequency in the corpus. Trend corpus (ai) is a corpus whose trend tends to be stable, corpus (unemployment) and (student) is a corpus whose trend tends to decrease, then corpus (technology) and (human) is a corpus whose trend tends to be fluctuating/volatile.

Corpus Link

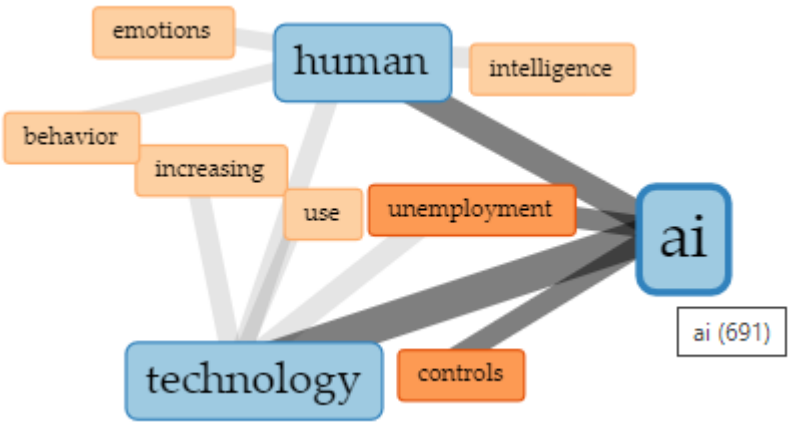

Figure 9. Corpus Link
Source: Processed Primary Data (2024)

The corpus link image above shows the connection between the words (ai), (human), (technology), (unemployment), and (controls). An example of this connection is AI technology and humans can potentially control unemployment through various means, such as automation, skill development programs, and targeted job creation initiatives.

DISCUSSION

Sentiment Analysis on AI Technology

The sentiment analysis of responses to the first question, "In your opinion, what is artificial intelligence technology?", reveals a predominance of positive sentiment among the respondents. This suggests that many students recognize AI technology's potential benefits and transformative power. The significant positive sentiment indicates optimism about AI's capabilities in enhancing efficiency, solving complex

problems, and contributing to various fields. However, the notable proportion of negative sentiment underscores some concerns, possibly related to fears of job displacement, ethical issues, and the misuse of AI. The neutral sentiments indicate a balanced or mixed understanding among some students, reflecting a need for more comprehensive education on AI's implications.

Artificial intelligence impacts college student's learning process.

When examining the sentiment regarding the effects of AI technology on the learning process on campus, a clear majority of respondents express positive views. This finding aligns with the potential benefits of AI in personalizing education, providing adaptive learning tools, and facilitating administrative tasks. The positive sentiment suggests that students appreciate AI's role in enhancing their educational experience by making learning more efficient and tailored to individual needs. However, negative sentiments indicate that some students are wary of potential drawbacks, such as over-reliance on technology, privacy concerns, and the possible devaluation of human interaction in education.

Impact of AI on Future Careers

The sentiment analysis on the impact of AI on future careers presents a mixed outlook among students. While a majority express positive sentiments, indicating optimism about new job opportunities, skill development, and the potential for AI to drive innovation, there is also significant concern reflected in the negative sentiments. These concerns likely stem from fears of job automation, skill obsolescence, and the uncertainties surrounding AI's role in the job market. The substantial neutral sentiment suggests that many students are still unsure or conflicted about AI's long-term impact on their careers, highlighting the need for more career guidance and information on adapting to an AI-driven economy.

Ethical Issues Raised by AI

The responses to the question about AI's most serious ethical impacts, as identified by the World Economic Forum, are predominantly neutral. This suggests that students have a balanced perspective or are uncertain about the ethical implications of AI. The smaller proportions of positive and negative sentiments indicate varying levels of concern and optimism regarding AI's ethical challenges. Issues such as data privacy, algorithmic bias, and transparency in AI decision-making are likely areas of concern that need to be addressed through education and policy.

Trends and Associations in AI Perceptions

The analysis using Voyant Tools highlights key themes such as "ai," "technology," "human," "unemployment," and "students," indicating the central topics of discussion among respondents. The trends and corpus link analysis suggest that students perceive a strong connection between AI technology and its implications for humans, particularly regarding unemployment and control. This reflects an awareness of both the opportunities and challenges presented by AI.

CONCLUSION

Overall, the prevailing sentiment among students concerning artificial intelligence technology is positive. Their favorable views are rooted in aspirations for technological advancement, career prospects, and the potential for enhanced efficiency and convenience in daily life. However, this optimism requires careful guidance and application. Educators and policymakers must address the concerns and ethical issues associated with AI to ensure that students are well-prepared for the future job market. This includes providing comprehensive education on AI's capabilities and limitations,

fostering critical thinking about ethical considerations, and developing strategies to mitigate potential negative impacts such as job displacement.

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