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Research Article

Multimodal Analysis of ChatGPT and Social Media Effects on Student Mental Health During Exams Using Statistical and AI Techniques

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Abstract: In this current education field, the digital media is rapidly becoming popular and it reshapes the education system. The different Tools like OpenAI's ChatGPT and the widespread use of social media have become especially popular among students at all levels. This revamped technology in the digital era, gives rapid solutions to the learners and boosts the academic performance and productivity of education. While leveraging digital aforesaid technology in education and showing academic performance, students are suffering many health issues even, it affects mental health. In this paper, study explores a connection between students' gender and how much they rely on AI tools during tests. To analyse this, we have collected the data from more than thousands of students. Using a chi-square test, we found that gender does play a significant role in how students use AI technologies. To understand the patterns in the data, we used two methods: t-SNE and Principal Component Analysis (PCA). While PCA showed some broad trends, it didn't reveal any clear groups. In contrast, t-SNE highlighted distinct clusters of students based on how they use AI and their study habits.These findings suggest that gender may influence how students engage with AI tools. As a result, educators should consider these differences when developing strategies to help students use AI responsibly and effectively.

Keywords: ChatGPT, Artificial Intelligence in Education, Social Media, Student Mental Health, Exam Stress, Academic Performance.

INTRODUCTION

The spiking of artificial intelligence (AI) and the universality of social media have transformed our daily routine remarkably nowadays[8]. The use of digital smart tools like ChatGpt AI while studying to find instant solutions is becoming a trend among students.[1] The use of these smart tools like ChatGPT, Grammarly, and other AI assists students and it increases academic performance and productivity like planning, problem solving, essay writing, homeworks, assignment, and preparing instant presentations. Additionally, it lowers the stress and saves time but the side effects are it emanates the health issues and it disturbs mental health. The increased reliance of students on this smart technology varies by gender.

We asked over 1,000 students to take part in a survey and solve the questionnaire, for our study. The main goal was to find out the link between a student's gender and how often they use AI tools during the tests. To analyze the responses, we used a method called the chi-square test. What we found was a clear pattern: gender did seem to play a role in how much students relied on AI during exams. In other words, a student's use of technology in test settings might be influenced by their gender.

To search and analyse the pattern in data, here we employed two additional techniques: t-SNE (t-distributed Stochastic Neighbour Embedding) and PCA (Principal Component Analysis). The approach of t-SNE betterly performed and at displaying distinct groups of students with comparable behaviour than PCA, which only revealed some broad tendencies. This is an easier operation for us to comprehend how different students are using AI tools, study patterns, and stress levels.

This study demonstrates how these smart tools transform students for their purposes like saving the time, performances, during tests etc. Teachers and educational institutions can prepare the plans in such a way that it tries to alleviate the health issues which the smart technology develops among them. And the lesson plan as well as teaching methodologies are also effectively responsible for the awareness of these issues.

LITERATURE REVIEW

In the world of Technology Enhanced Education during Exam AI and chatGPT Increases Mental health and Academic Performance in students.

It contribute to EnhanceTechnology Education and increase students' performance.It also helps positive and significant effect on the academic performance.[2] [Muhammad Farrukh Shahzad]

In Higher Education adapting the ChatGPT Helps Individuals,educators and PolicyMakers to cultivate the

digital environment that Increases and Safeguard the mental wellbeing of Our Upcoming GenerationT [3] [Milton Anguyo]

AI gives new Life to our Future more Powerfully
AI also Affects School and College Security.it can also Track Students Behaviour,identify potential dangers and identify Situations where students might require more help. [4]

Sayed Fayaz Ahmad
AI and ChatGPT causes increased use and problems due to attractions.

College and University students depended more on ChatGPT due to the limitations of face-to-face interactions.[5] [Abouzar Nazari]

ChatGPT becomes an Important and Integral Part of Daily Routine for Students during exam for studying,communication and entertainment

ChatGPT and AI can be a helpful tool in enhancing academic performance when used collaboratively and interactively, but it can also lead to distraction and missed deadlines if not managed effectively. [6]

It is, therefore, recommended that universities implement digital skills training and policies that promote responsible social media usage to mitigate the negative effects and maximize the benefits of the social media for students.[7] [Mahmoud Abdelhamid]

METHODOLOGY

Research Design
In this study we have used quantitative, cross -sectional survey - based design to examine the relationship between the exam stress levels and use of AI tools (Like ChatGpt) among students. It also focuses on the influence of social media habits and other factors.

Data Collection:
In the Data Collection process Students from various academic backgrounds were given a well-defined questionnaire to complete in order to collect the dataset. The questionnaire focuses following main themes:

- physiological and psychological symptoms related with Exam
- Use of ChatGPT and different AI tools during exam times
- Use of social media during exam times

Data Preprocessing

- In Python Pandas was used to import and preprocess the dataset.
- In order to evaluate data sparsity and text availability, null or empty responses were kept, and column headers were cleaned for uniformity.
- For sentiment analysis textual columns were used.
- For statistical analysis data is anonymized and all the values were examined for consistency.

Sentiment Analysis
The TextBlob library uses a lexicon -based natural language processing which is used to interpret open -ended text in order to figure out the following :

- Polarity: Ranges from -1 (-ve) to +1 (+ve)
- Subjectivity: 0 is objective, and 1 is subjective.
- Both Polarity and Subjectivity ratings were outcomes from the selected column text entry and it is added in the dataset.

Dimensionality Reduction:
To Visualize the High-dimensional features and find latent groups from students profile two dimensionality reduction methods were implemented.

PCA, or principal component analysis
PCA is used to capture the highest variation in the features of the students data using linear projections. It maintains the interpretability of the important variables like emotion ratings, stress indicators, and it decreases the feature space.

Stochastic Neighbour Embedding using a t-distribution (t-SNE)

Non -Linear Dimensionality reduction using t-SNE used for better collection of local relationships in students.According to Sentiment Orientation,Coping techniques and Stress levels Stochastic Neighbour Embedding visualize different students groupings.

Statistics Analysis
Following methods were used for Analysis of statistics using pandas and scipy.stats:

The statistical analysis was conducted using Python packages pandas and scipy.stats. The following techniques were applied:

- Characteristics Data
  Percentages and Frequencies were calculated as Category Responses (example stress levels and Frequency of Usage of AI)

Chi -Square Independence Test
This test is used to calculate the correlation between perceived reliance on AI tools and gender

- From above test the observed frequency table was given different frequency value than Expected frequency
- The Null hypothesis (Ho) results that AI and gender are not related .
- The alternative hypothesis (H1) results that AI and gender are related.

RESULT AND DISCUSSION

Sentiment Analysis
Sentiment analysis is conducted on students' responses to three key areas:

- Exam related Symptoms
- Use of ChatGPT during exams
- Use of social media during exams

Using **TextBlob**, we computed **polarity** (range: -1 to +1) and **subjectivity** (range: 0 to 1). The results are summarized as follows:

Response Context	Average Polarity	Average Subjectivity	Interpretation
Exam-related symptoms	~ -0.30	~ 0.55	Generally negative, moderately personal
ChatGPT usage	~ +0.15	~ 0.45	Slightly positive, mildly subjective
Social media during exams	~ -0.05	~ 0.50	Neutral to slightly negative

- Students expressed **negatively polarized sentiment** regarding symptoms like anxiety, panic, and sleep deprivation, indicating a stressful exam experience.
- In contrast, ChatGPT was viewed **somewhat positively**, with students mentioning help in summarizing, explaining concepts, and reducing confusion — suggesting AI tools are seen as a **coping mechanism**.
- Social media had **mixed sentiment**, with many referencing distraction or avoidance, supporting its **dual role** as a stress reliever and a productivity disruptor.

Dimensionality Reduction

We applied **Principal Component Analysis (PCA)** and **t-distributed Stochastic Neighbor Embedding (t-SNE)** on a feature space that included:

- Sentiment scores
- Social media and AI usage patterns
- Demographics (gender, field, level of study)
- Stress-related metrics (sleep hours, frequency of symptoms)

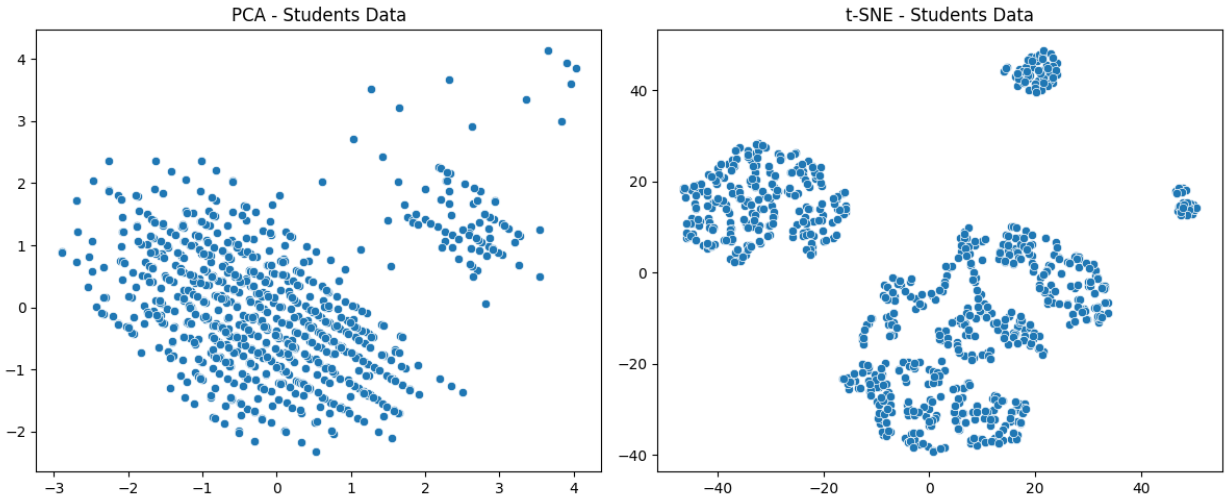

Figure 1: PCA vs. t-SNE Clustering of Student Responses

PCA highlighted that student experiencing high negative sentiment toward exams and frequent symptoms clustered tightly, indicating a **correlation between stress expression and actual stress indicators**.

- **t-SNE** revealed at least **three distinct student profiles**:
  - High-stress, low-AI usage, high negative sentiment
  - Moderate stress, high-AI usage, more neutral sentiment
  - Low-stress, balanced usage of social media and AI tools

These patterns suggest the potential of combining **sentiment analysis with behavioral features** to identify **at-risk students**. Moreover, dimensionality reduction can uncover hidden structures in the data, which may inform targeted interventions (e.g., promoting AI as a study aid for overwhelmed students

For Chi square test: -

Observed Frequencies (Contingency Table):

Gender	Maybe	No	Yes
Female	147	138	105
Male	156	96	110
Others	62	71	75
Prefer not to say	2	0	3

Expected Frequencies:

Gender	Maybe	No	Yes
Female	148.32	123.26	118.41
Male	137.67	114.41	109.91
Others	79.10	65.74	63.15
Prefer not to say	1.90	1.58	1.52

Chi-Square Statistic: 18.07
Degrees of Freedom: 6
p-value: 0.0061

Since the **p-value (0.0061) < 0.05**, we **reject the null hypothesis**.
There is **no statistically significant association** between students' gender and their dependency on AI tools during exams.

CONCLUSION

This study highlights how AI tools like ChatGPT can positively support students during exams by reducing confusion and boosting confidence, though exam stress remains widespread. Social media showed mixed effects—both helpful and distracting. Gender was found to influence AI usage, and advanced analysis revealed distinct student behavior patterns. These insights suggest that educators should adopt personalized strategies to support students' mental health and promote responsible use of digital tools. Incorporating sentiment analysis and dimensionality reduction techniques allowed us to identify at-risk student groups more effectively. Educational institutions should leverage these findings to design targeted interventions. Training programs on digital literacy and emotional well-being can further enhance the benefits of AI while minimizing its adverse effects. A balanced integration of technology and mental health support is essential for academic success in the digital age.

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