



Master's Programme in Data Science

# **Understanding Student Stress: A Data-Driven Approach to Mental Health Support**

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# 1. Introduction

In recent years, the world of higher education has undergone significant changes, bringing the problem of student stress into sharp focus. This paper seeks to thoroughly investigate the numerous factors that cause stress in students, which include not only academic hurdles but also the challenges involved in adjusting to different environments. Recognizing and understanding these stress factors is crucial to provide the right kind of support and to cultivate an educational atmosphere that is both supportive and conducive to student success. A major source of stress is examinations. Empirical evidence indicates that examination periods are associated with both psychological stress and psychological changes, which reflects anticipatory stress and withdrawal effects [14]. Student stress is a complex issue influenced by a variety of factors, including academic pressures, socio-cultural influences, environmental conditions, and psychological aspects [14]. Research further supports this view, showing that negative attitudes or excessive stress can intensify anxiety related to exams, which can then have a detrimental effect on academic performance [6]. Additionally, studies have delved into the relationship between academic stress, psychological resilience, and anxiety in college students, revealing a significant positive correlation between stress and anxiety [5].

This paper aims to explore these various aspects, scrutinizing the complex nature of student stress and evaluating how data-driven interventions, like mental health apps, can contribute to mitigating this stress.





## 2. Understanding Student Stress Factors

In the rapidly evolving landscape of higher education student, stress has emerged as a crucial concern warranting detail exploration. This chapter delves into the myriad respects that contribute to stress and students ranging from the pressure suffocate academic performance to the challenges of adapting to new environments. Recognizing and understanding these varied stressors is fundamental to providing appropriate support and fostering a conducive learning environment.

### 2.1 Assessment-Related Tension

Examination stresses stands out as one of the most prominent sources of anxiety among students. This stress encompasses not only the intellectual challenge of preparing for and sitting exams but also the emotional weight of performance expectations and the suspense associated with awaiting results. A significant number of students report experiencing high levels of stress during exam periods, which can manifest in both mental strain and physical symptoms affecting their overall well-being and academic performance [23]. Students frequently report physical symptoms like nausea and sleep disturbances, which can severely impact their ability to concentrate and perform optimally [18]. Interestingly, the period leading up to exams often carries more stress than the exams themselves, implying a need for better preparatory support and stress management techniques [10].

### 2.2 Financial Burdens

Financial pressure and increasingly prominent stressor in today's educational environment. The rising costs of tuition and living expenses pose significant challenges for students often necessitating part-time employment, which can create a conflict between work and academic commitments [13]. The pressure to manage these financial

responsibilities while maintaining academic performance can lead to chronic stress that can adversely affect students mental health and academic outcomes [21]. Furthermore, the looming burden of student debt post-graduation adds a long-term dimension to this stress, which underscores the need for more comprehensive financial support and counseling services for students.

## 2.3 Adapting to University Environment

The transition to university life is a critical and often stressful phase for many students. It entails adjusting to a new academic environment, managing increased workloads, and, for many, adapting to living away from home for the first time. These challenges can create a sense of dislocation and anxiety [9][16]. For international students, this transition is compounded by the challenges of cultural adaptation and language barriers, which can exacerbate feelings of isolation and stress [2][12]. Educational institutions need to provide robust support systems, including orientation programs and counseling services, to ease this transition and help students build a new support network.

## 2.4 Educational Demands and Stress

Academic tasks such as coursework, assignments, and strict deadlines are significant contributors to student stress. The pressure to complete these tasks often leads to feelings of being overwhelmed, with students struggling to balance academic requirements with other aspects of university life [1][7]. The fear of not meeting academic expectations for failing courses adds to this stress. Time management emerges as a crucial skill in this context, with students who feel in control of their schedules reporting lower stress levels [17][20]. Effective time management strategies, therefore, play a critical role in mitigating study-related stress.

## 2.5 Scholastic Success and Its Stress Implications

In highly competitive academic fields like dentistry and medicine, the pressure to excel academically is a major source of stress. The competitive environment, coupled with high stakes of professional training, creates a demanding atmosphere where students often feel overwhelmed [22][8][24]. The quality of relationships with faculty members and perceived level of support can also significantly influence students' stress levels and academic performance, emphasizing the need for faculty to engage positively with

students.

## 2.6 Influences of Stress in Personal Circumstances

Personal life issues, particularly in demanding academic programs, can be a significant source of stress for students. Social support networks are often disrupted when transitioning to university, and the challenge of building new relationships can be daunting [24][19][3][4][15]. The reduction in opportunities for social and recreational activities further compounds this stress, potentially leading an increased symptoms of depression and affecting academic success. Peer relationships, crucial for a positive university experience, can be negatively impacted in these high-pressure environments, which highlights the importance of fostering supportive and inclusive campus community [11].



## 3. Data-Informed Design of a Mental Health App for Students

In today's fast-paced digital technology landscape, utilizing data-driven methods is increasingly important for solving complex problems, such as student mental health concerns. As stress among students grows, there's a clear need for fresh, effective approaches. This chapter shows how analyzing data can deeply enhance our understanding of what stresses students, and this knowledge is pivotal in crafting a mental health app tailored to their needs. By looking closely at real-life data, we can spot trends and key factors that contribute to student stress, and use these insights to shape app features that directly address their specific challenges.

### 3.1 Methodology

The methodology for this research involved a comprehensive approach, beginning with the collection of data through a structured survey targeting students. The survey was meticulously designed to capture a wide range of information, encompassing demographic details, academic backgrounds, mental health challenges, and preferences for a mental health app. This breadth of data was essential to ensure a holistic understanding of the factors contributing to student stress.

Following data collection, the dataset underwent a thorough processing phase. This phase included crucial steps such as data cleaning, where missing values were addressed, inconsistencies corrected, and the data formatted to facilitate effective analysis. The exploratory data analysis (EDA) followed, where the dataset was examined to summarize its main characteristics. This process involved visual methods to uncover patterns, identify anomalies, and test hypotheses.

Statistical techniques were then employed to delve deeper into the relationships between different variables. The focus was particularly on how demographic and academic factors correlate with mental health challenges. Data visualization played a key role in effectively communicating these findings. Techniques such as bar charts, and pie charts were employed to present the data in a comprehensive manner to facilitate

a understanding of the data, highlighting significant student stressors.

For the analysis and visualization, Python was the chosen tool, leveraging its powerful libraries such as Pandas for data manipulation, Matplotlib and Seaborn for visualization, and NumPy for numerical computations. These tools are widely acclaimed for their efficiency and comprehensive analytical capabilities, making them ideal for handling and analyzing large datasets like the one used in this study.

## 3.2 Analysis Report

The dataset comprises responses from a survey targeted at students, capturing a wide range of information including demographic details, education level, mental health challenges, and preferences for a mental health app. Key columns include age, location, education level, field of study, mental health challenges, and app-related preferences. The data analysis provides a comprehensive overview of the dataset, offering valuable insights into the demographic and academic backgrounds of the respondents, the range of mental health challenges they face, and their preferences for a mental health app.

To proceed with the analysis, we'll focus on the following aspects:

**Main Mental Health Challenges:** Identifying the most common stressors reported by students.

**Academic Level and Stress:** Analyzing stress levels across different academic years.

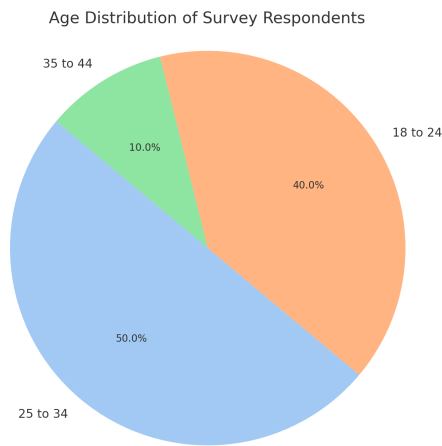
**Preferences for App Features:** Understanding desired features that could assist in managing stress.

### 3.2.1 Visualizations

Creating effective visualizations is crucial for interpreting and communicating the insights derived from the dataset. For this study, focusing on student mental health challenges and preferences for a mental health app, we present different visualization for extracting valuable insights.

#### Visualizing age distribution

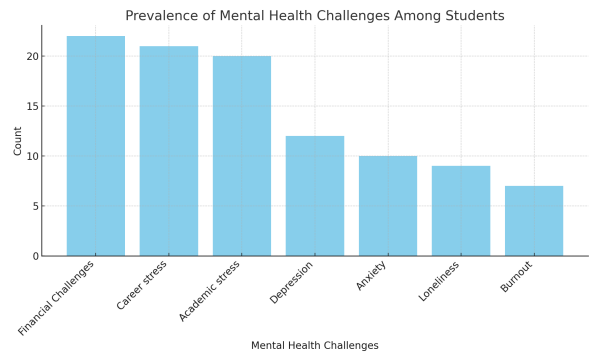
The pie chart provides a clear visual representation of the age distribution among the survey respondents. The majority of the respondents fall within the '25 to 34' age group, accounting for a significant portion of the sample. This is followed by the '18 to 24' age group, and a smaller representation from the '35 to 44' age group. This age distribution is crucial in understanding the demographic context of the stress challenges faced by the student population. The prominence of the '25 to 34' age group suggests



**Figure 3.1:** Age distribution of survey respondents.

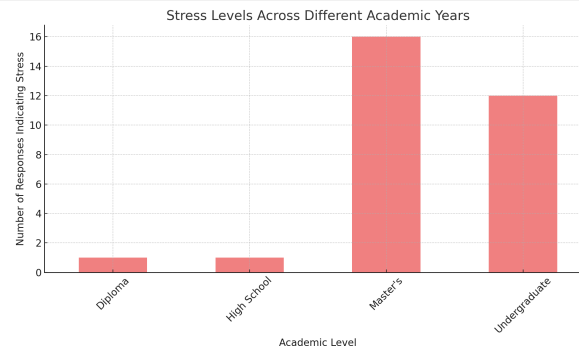
that our analysis and resultant app development should consider the unique challenges faced by this demographic, which may include balancing higher education with other life responsibilities.

Visualizing different mental health challenges



**Figure 3.2:** Prevalence of mental health challenges among students.

The bar chart effectively quantifies the various mental health challenges experienced by students. It reveals that 'Financial Challenges' are the most frequently reported, indicating a significant impact on a substantial segment of the surveyed group. This primary concern is closely followed by 'Career Stress' and 'Academic Stress,' suggesting that these areas are critical stressors for students. The prevalence of 'Depression,' 'Anxiety,' 'Loneliness,' and 'Burnout' is also depicted, with each category represented by individual bars in descending order of frequency.

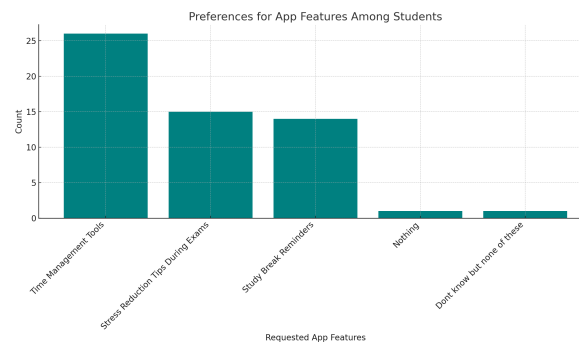


**Figure 3.3:** Stress levels across different academic years.

### Visualizing stress at different academic levels

The bar chart conveys the stress levels reported by students across different academic years. From the visualization, it's apparent that the most stress is reported by students at the Master's level, as indicated by the tallest bar. Undergraduate students also report a high level of stress, as shown by the next tallest bar. In contrast, students in High School and those holding a Diploma report significantly lower levels of stress. This visualization reveals that undergraduate and Master's level students are the most represented groups in terms of experiencing stress, highlighting the need for tailored interventions at these education levels.

### Visualizing feature preference in the app



**Figure 3.4:** Students' preferred features in a mental health app.

Finally, we will explore the preferences for app features among the respondents. Understanding these preferences is crucial for developing an app effectively addresses the identified stress challenges. The bar chart showcases the various features students desire in a mental health app. Time management tools, study break reminders, and stress management resources are among the most sought-after features. This indicates a strong demand for an app that not only addresses mental health concerns but also integrates practical tools to manage academic stress.



The analysis of data has revealed financial challenges as the primary stressor for students, surpassing academic stress, anxiety, and depression. This key finding highlights the necessity of addressing financial stress in mental health interventions, including our app. The data also point to the importance of a flexible approach in mental health support, tailored to different academic years. Additionally, a strong preference for practical features, such as time management tools and study break reminders, underscores the need for an app that combines mental health support with tools to manage the unique challenges of student life. Thus, our app development will focus on comprehensive support, integrating psychological and financial management resources to meet the diverse needs of students, enhancing their overall mental health and well-being. This chapter emphasizes the critical role of data analysis in shaping an effective and pertinent mental health app solution.



## 4. Conclusions

In our digital world, we are collecting more data than ever. As we delve into the difficulties of Big Data, it becomes evident that conventional databases, designed mainly for single data model, struggle with the existing varied data formats. This vast array of data formats presents significant difficulties in storage, retrieval, and analysis. That is where multi-model databases have emerged as a potential solution to this conundrum through supporting multiple data models within a single database engine. As they offer an integrative approach, it eliminates the need for several database management systems.

To sum up, in Big Data landscape, multi-model databases stand out as a promising tool to shape the future of data management and analytics. Their performance, scalability, and capacity to address the data variety challenge paves the way for more efficient and insightful data-driven decision-making.



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