جامعة مصر للمعلوماتية
EGYPT UNIVERSITY
OF INFORMATICS

Egypt University of Informatics
Computer and Information Systems
Data Analysis Course

The Analysis of the Challenges Faced by Computer Science Students

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Introduction

This project analyses the challenges faced by Computer Science students in the EUI across different academic levels. It explores key factors such as stress levels, career preparedness, academic struggles, and coding difficulties to understand how students' experiences evolve throughout their education. By visualizing categorical and quantitative data, and computing statistical measures like mean, median, and mode, this study aims to identify patterns that can help improve support systems and resources for CS students at various stages of their academic journey.

Research Question

What are the primary challenges faced by Computer Science students at EUI in terms of stress levels, career preparedness, academic struggles, and coding difficulties, and how do these challenges vary across different academic levels?

Hypothesis

CS students experience higher levels of stress and academic struggles during their initial years, but as they progress in their studies, career preparedness and coding difficulties become more prominent.

Population of Interest:

The population of interest consists of Computer Science students at EUI, across all academic levels (Freshmen, Sophomores, Juniors, Seniors)

Sampling Method:

The sampling method used in this survey is **convenience sampling**, where the survey was distributed to university groups. This approach allows for quick data collection but may not fully represent the entire CS student population, as it primarily includes students who are readily accessible and active in those groups. Although efforts were made to include participants from different academic levels (Freshmen, Sophomores, Juniors, Seniors), convenience sampling may introduce bias, limiting the diversity of the sample.

Bias Identification:

In designing this survey, I made an effort to identify and reduce potential sources of bias. One primary source of bias could be **selection bias**, as the survey was sent to specific university groups, which may not fully represent the diverse range of CS students. Additionally, **response bias** could occur if students provide socially desirable answers or downplay their struggles. To minimize these biases, we ensured the survey was anonymous to encourage honest responses. I also made an effort to ensure participants came from various academic levels to gather data from different stages of the student experience. Despite these efforts, convenience sampling still introduces a risk of bias that should be considered when interpreting the results.

Survey Questions:

1. What is your academic level?
2. What area of Computer Science are you most interested in?
3. How difficult do you find CS coursework?
4. What are your biggest academic struggles in CS?
5. How confident are you in your coding skills?
6. What are your biggest struggles when coding?
7. How prepared do you feel for CS-related internships or jobs?
8. What challenges do you face when preparing for a CS career?
9. How stressful do you find being a CS student?
10. What mental or social challenges do you face as a CS student?

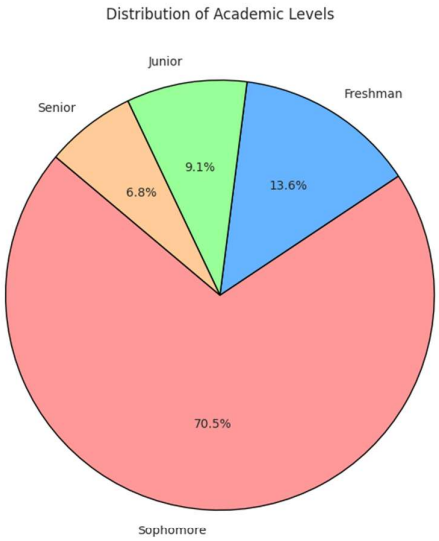
Online survey link: https://forms.gle/YXmDAkpBWXT8CeUY6

Number of samples collected: 52

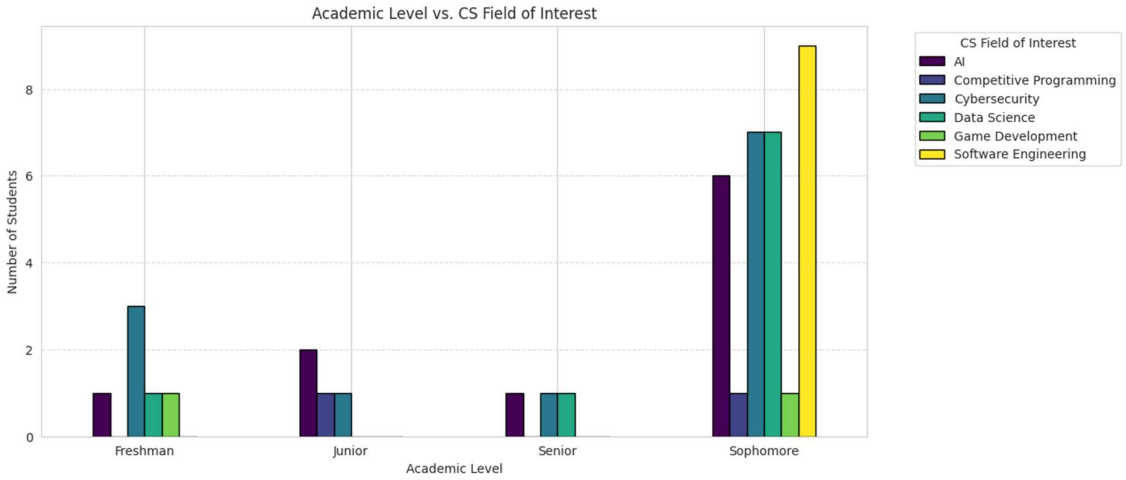
Analysis:

Distribution of Academic levels

The distribution shows that the majority of participants are Sophomores (31), followed by Freshmen (6), with fewer Juniors (4) and Seniors (3). This suggests a skewed representation towards students in the earlier stages of their academic journey



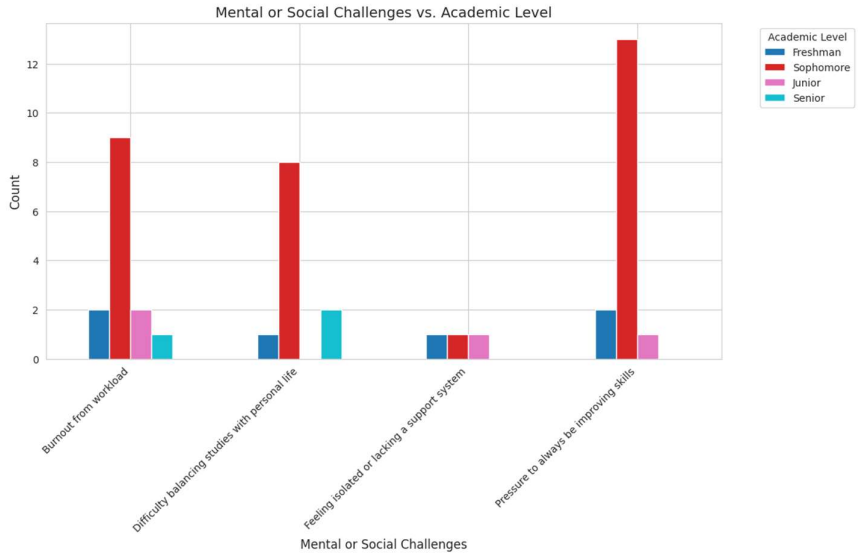
Fields of interest



The chart indicates that Software Engineering has the highest level of interest among students, particularly at the sophomore level. Cybersecurity and AI also attract significant attention. In contrast, fields like Game Development and Competitive Programming show comparatively lower levels of interest across academic levels. This suggests that students are more inclined toward industry-driven fields, while niche or specialized areas may attract fewer students

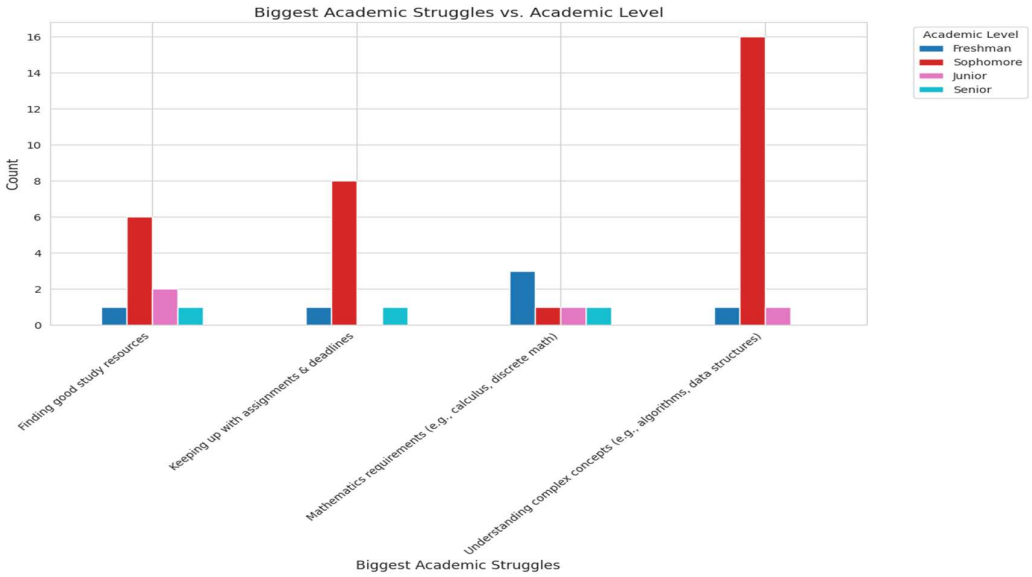
Categorical Data Analyzation:

1) Mental Challenges vs. Academic Levels



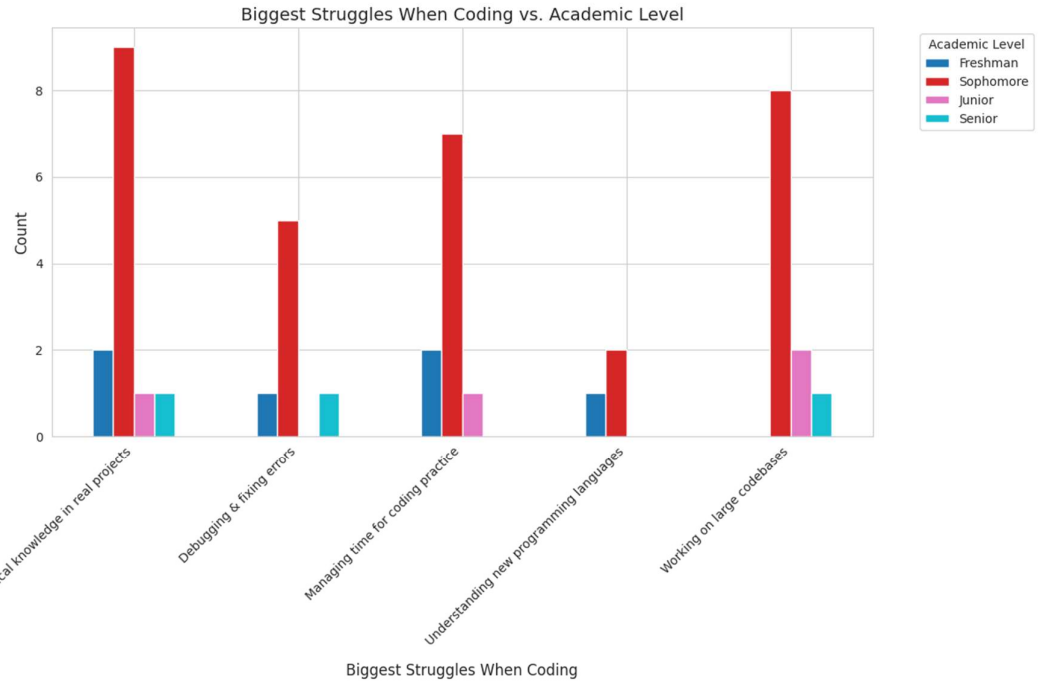
The chart highlights that sophomores experience the highest levels of mental and social challenges, particularly in terms of burnout from workload and the pressure to always be improving skills. These factors may indicate that students at this stage face increased academic expectations and competition. Meanwhile, challenges like feeling isolated or lacking a support system appear to be less common across all academic levels. The differences across levels suggest that as students progress, they might develop coping strategies or gain better support networks.

2) Academic Struggles vs. Academic Level



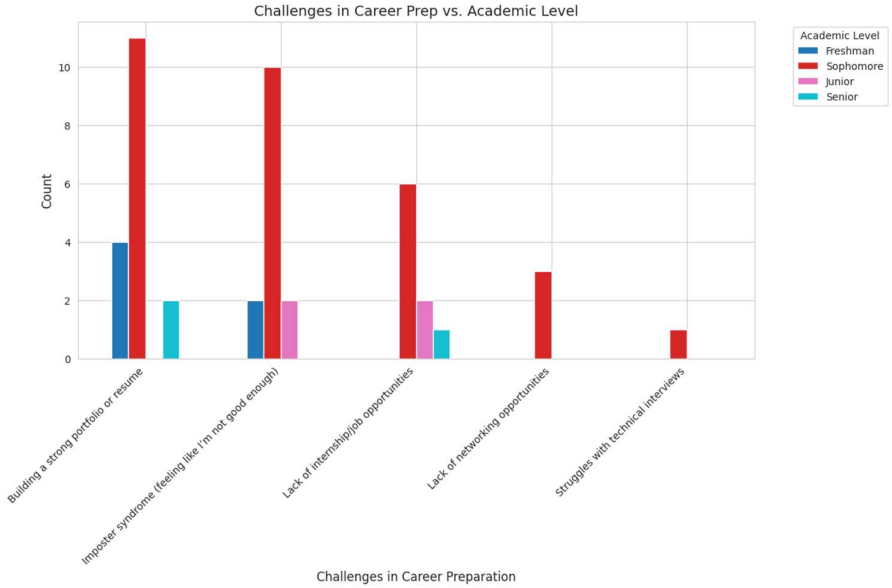
The chart shows that sophomores struggle the most with understanding complex concepts like algorithms and data structures, as well as keeping up with assignments and deadlines. This suggests that coursework intensity significantly increases at this stage. Finding good study resources is also a notable challenge, particularly among sophomores, indicating a potential gap in accessible learning materials. Meanwhile, freshmen report more struggles with math requirements, which could be due to the transition from high school to university-level coursework. The struggles appear to decrease in higher academic levels, suggesting students adapt over time.

3) Coding Struggles vs. Academic Level



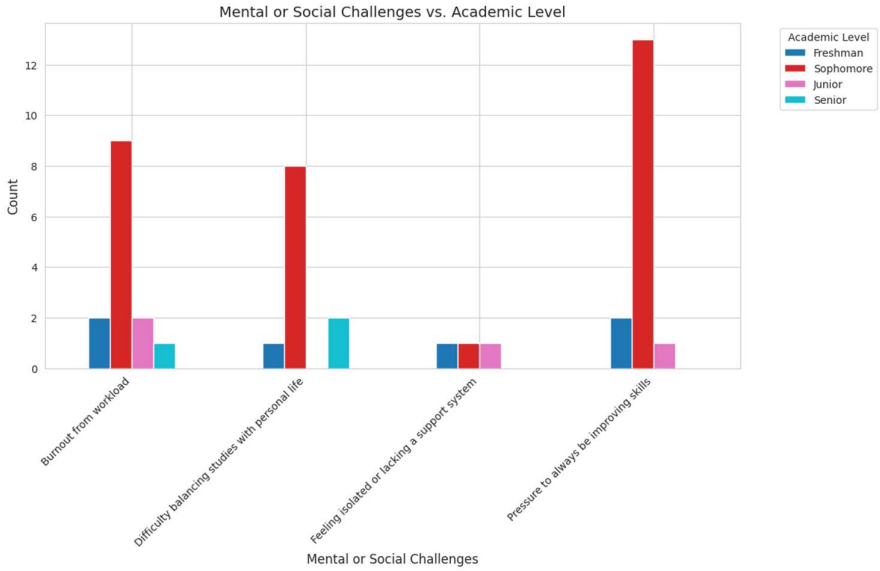
This suggests Freshmen and sophomores struggle the most, with sophomores finding applying theory to projects and working on large codebases especially challenging. Freshmen mainly struggle with debugging and time management. Juniors and seniors face fewer difficulties, likely due to increased experience, making coding tasks more manageable.

4) Challenges in Career Preparation vs. Academic Level



Sophomores struggle the most, especially with building a strong portfolio and imposter syndrome. Freshmen also face these challenges but to a lesser extent.
Juniors and seniors experience fewer difficulties, likely due to gained experience and better preparation.

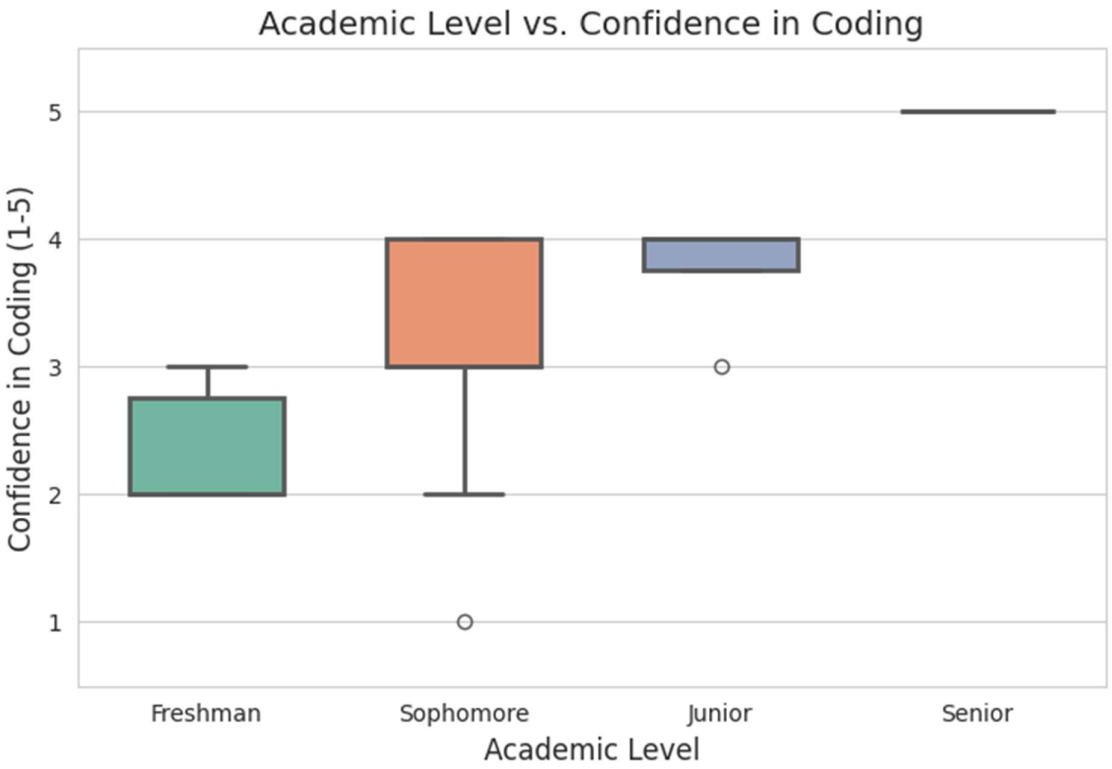
5) Mental and Social Challenges vs. Academic Level



Freshmen struggle the most with the pressure to always be improving their skills, while sophomores experience the highest levels of burnout from workload. Juniors find it most difficult to balance their studies with personal life, whereas seniors primarily struggle with feeling isolated or lacking a support system.

Quantitative Data Analyzation:

1) Academic Level vs. Coding Confidence



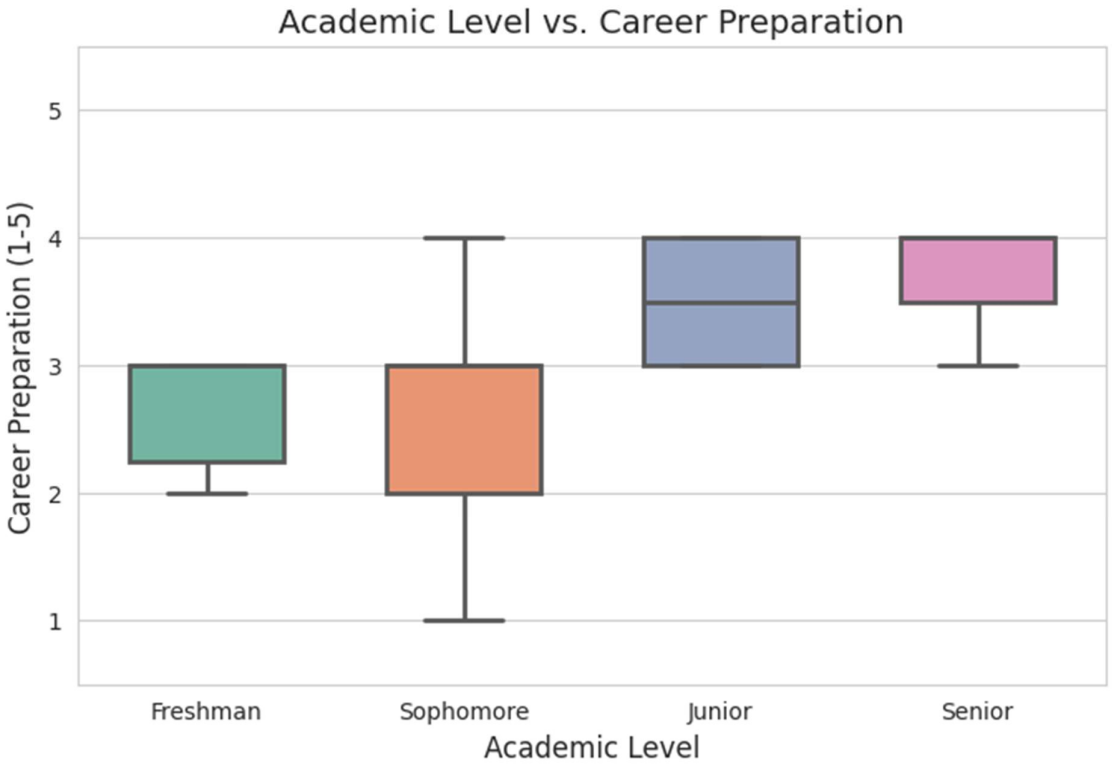
The box plot shows the distribution of confidence in coding across different academic levels.
Freshmen have the lowest confidence, mostly between 2 and 3, with little variation.
Sophomores show a wider range, from 1 to 4, indicating more variability in confidence levels.
Juniors tend to have a more stable confidence level around 4, with a few lower outliers.
Seniors have the highest confidence, with their scores reaching 5, showing strong self-assurance in coding.

Mean, Median and Mode:

Academic Level	Mean	Median	Mode
Freshman	2.33	2.0	2
Sophomore	3.13	3.0	3
Junior	3.75	4.0	4
Senior	5.00	5.0	5

Overall, confidence in coding generally increases with academic level, with some variability in the middle years

2) Academic level vs. Career Preparation



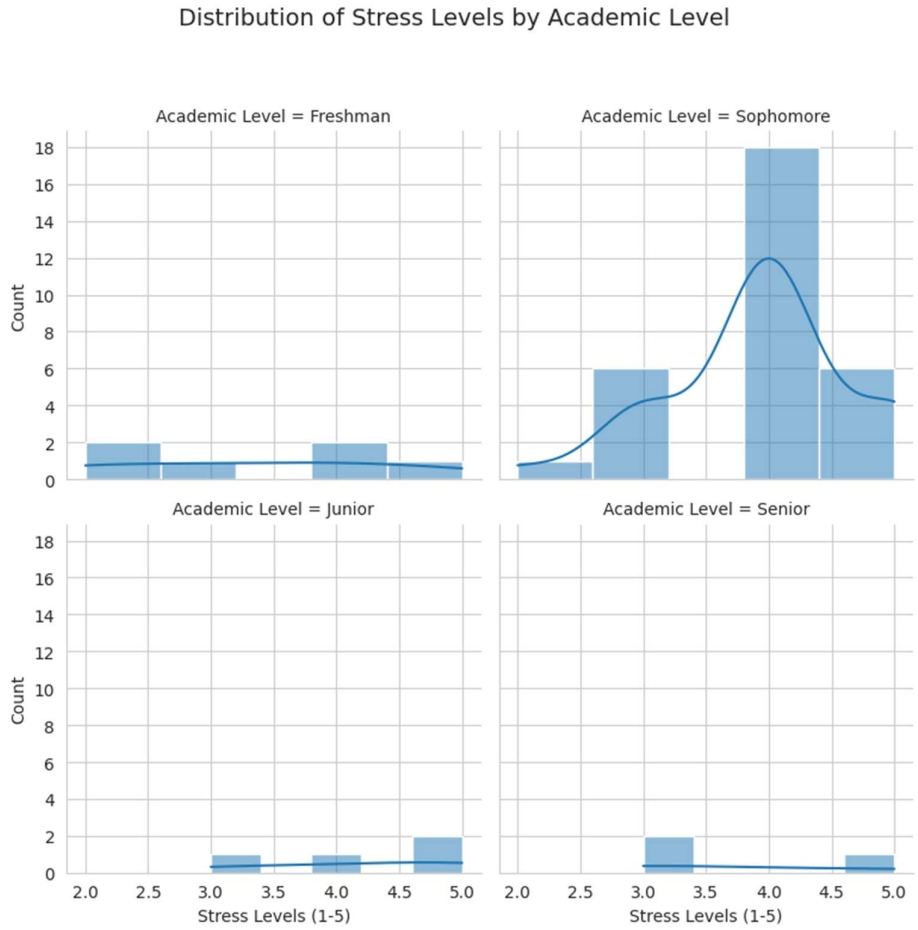
The box plot shows career preparation levels across different academic years.
Freshmen have low career preparation, mostly around 2-3, with little variation.
Sophomores show the widest range, from 1 to 4, indicating some students are just starting while others are progressing.
Juniors have a more stable preparation level, mostly between 3 and 4, showing increasing readiness.
Seniors have the highest preparation levels, clustered around 4, with little variation, indicating strong career readiness.

Mean, Mode, Median:

Academic Level	Mean	Median	Mode
Freshman	2.67	3.0	3
Sophomore	2.58	3.0	2
Junior	3.50	3.5	3
Senior	3.67	4.0	4

Overall, career preparation improves with academic progression, with the biggest variability seen in sophomores.

3) Academic Level vs. Stress Level



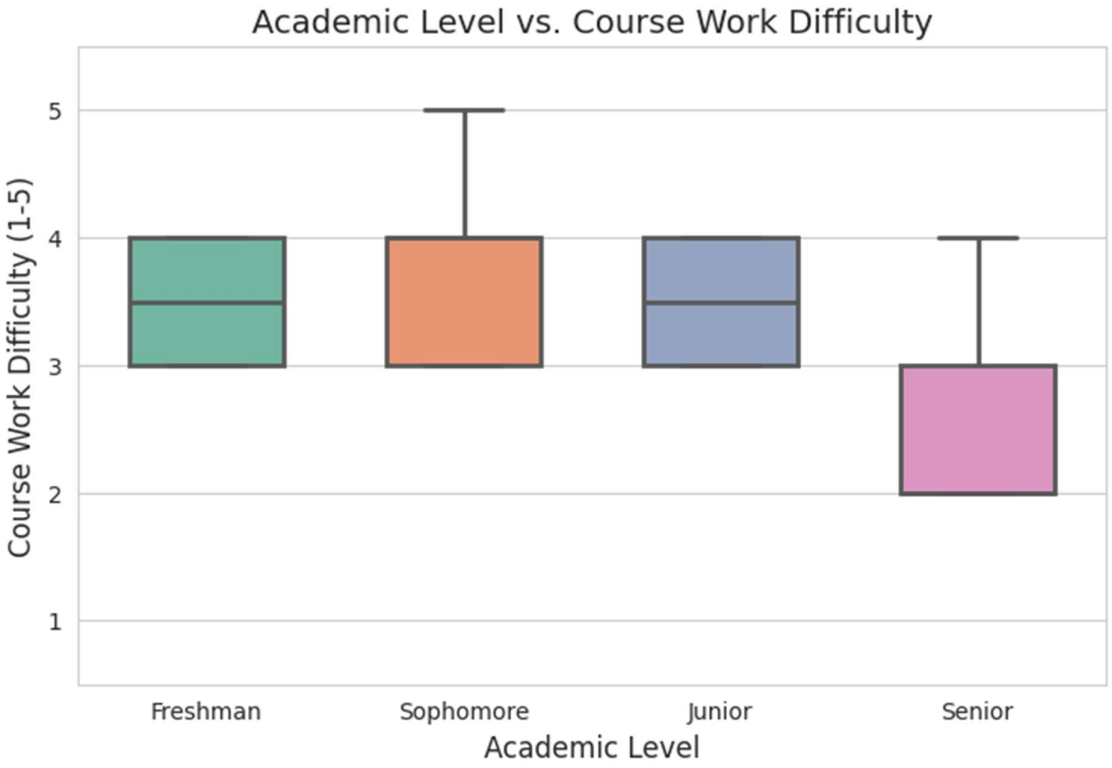
This visualization shows the distribution of stress levels (rated 1-5) across different academic levels.
Freshmen and Juniors have relatively low stress levels, with only a few students reporting high stress.
Sophomores experience the highest stress levels, with a peak around 4-5, indicating that they struggle the most.
Seniors show some stress but not as extreme as sophomores, suggesting that they might have adapted or managed their workload better.

Mean, Mode, Median:

Academic Level	Mean	Median	Mode
Freshman	3.33	3.5	2
Sophomore	3.94	4.0	4
Junior	4.25	4.5	5
Senior	3.67	3.0	3

Overall, stress appears to peak in the sophomore year and decrease slightly by senior year.

4) Academic Level vs. Career Preparation



This visualization shows Course work diffuculty levels (rated 1-5) across different academic levels.
Freshmen, Sophomores, and Juniors have similar levels of career preparation, with a median around 3-4, suggesting moderate confidence in their readiness.
Seniors, however, show the lowest median and the widest variability, with some feeling well-prepared while others report low confidence (around 2).
Mean, Mode, Median:

Academic Level	Mean	Median	Mode
Freshman	3.50	3.5	3
Sophomore	3.58	4.0	3
Junior	3.50	3.5	3
Senior	2.67	2.0	2

This suggests that while students generally cope with course difficulties over time, as they grow older and gain experience in their fields.

Correlations

Coding Confidence vs. Career Preparation → 0.4983 → Moderate positive correlation: Higher coding confidence tends to be associated with better career preparation.

Academic Level vs. Coding Confidence → 0.6412 → Strong positive correlation: Higher academic level is strongly linked to higher coding confidence.

Stress Levels vs. Career Preparation → -0.1104 → Weak negative correlation: Higher stress levels slightly correlate with lower career preparation, but the effect is small.

Conclusion

The data analysis on the challenges faced by Computer Science students at EUI shows that stress, academic struggles, and coding difficulties are common issues. However, over time, students seem to cope with these challenges as they gain more experience. While stress levels do impact academic performance and coding tasks, students gradually find ways to manage and adapt as they progress. There also seems to be a gap between the skills students feel they have and what they think is necessary for career preparedness, suggesting that more support might be needed earlier in their studies.

Any potential issues

A few issues were noted during the data collection:

1. **Limited Data**: The survey only received 52 responses to the survey, which may not fully represent the experiences of all Computer Science students across different academic stages.
2. **External Variables**: Factors like personal circumstances, extracurricular activities, and varying levels of support were not explored, which could have affected the results but were not considered in the analysis.
3. **Sampling Type issue**: Using convenience sampling by sending the survey to university groups could have led to skewed responses, with over-representation from certain student types.