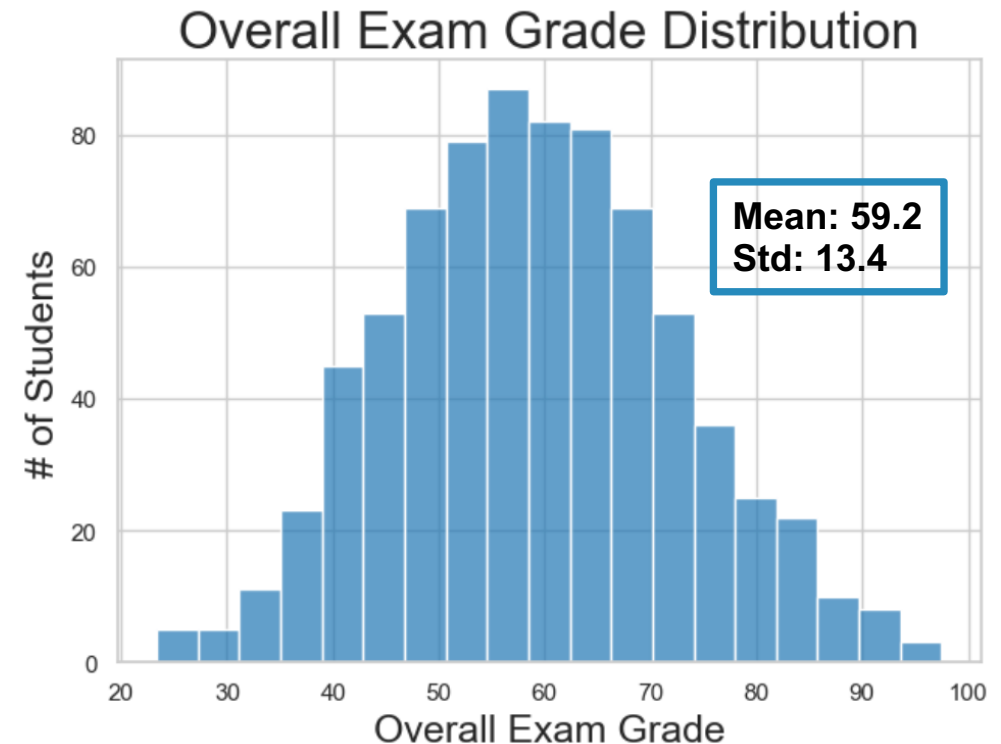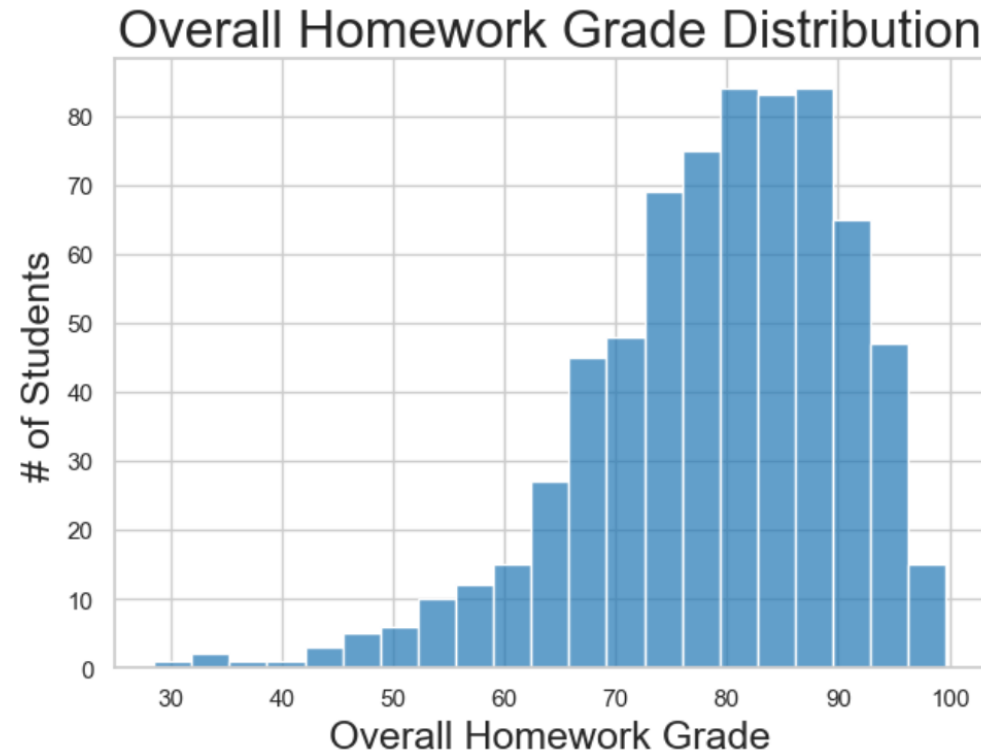# Analyzing
impact of procrastination on exam scores using student data

By: Owen Bai

Data introduction

- CS 170 [Efficient Algorithms and Intractable Problems], Spring 2019

- 12 homework assignments (psets), 2 midterm exams + 1 final exam
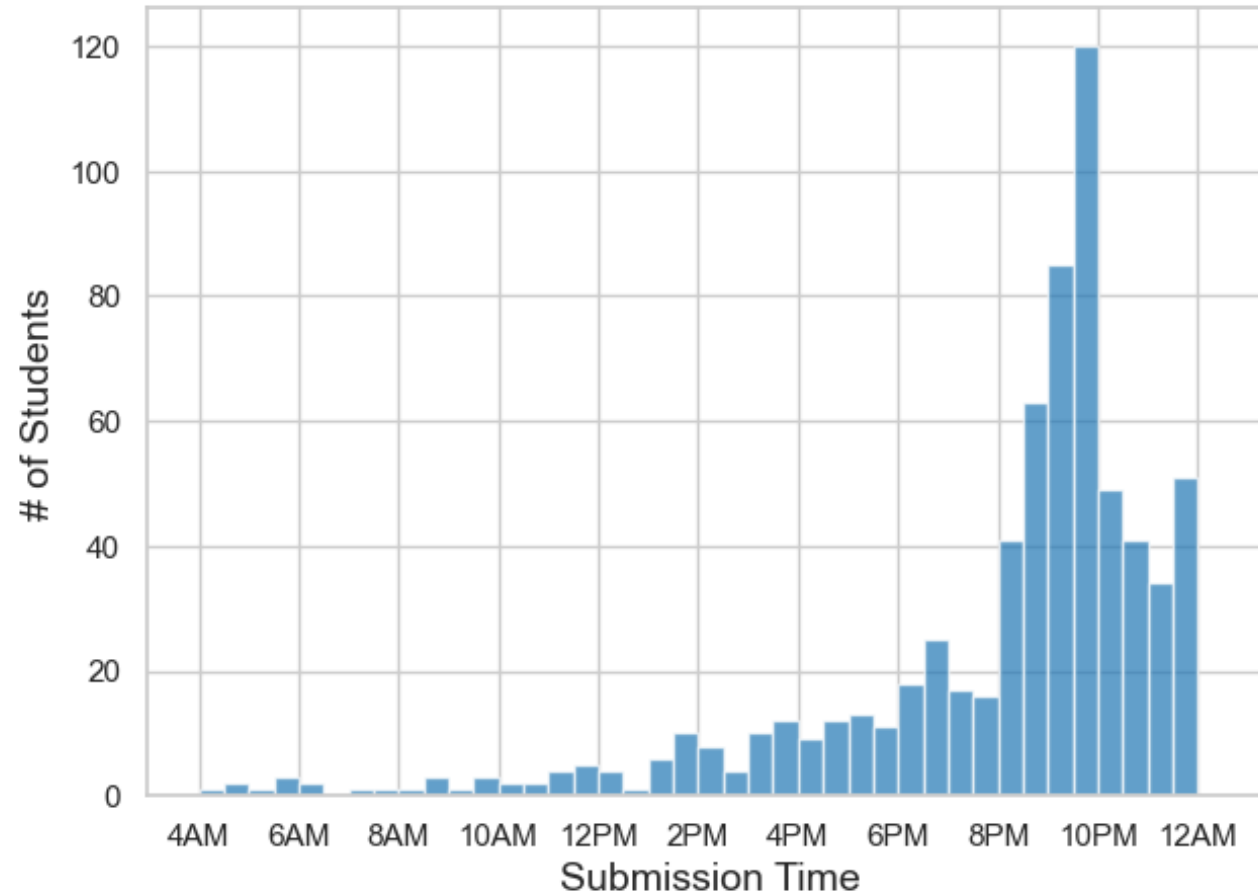
- Number of students who took all 3 exams: 766

Notes
- The distribution of exam grades is normal, while the distribution of homework grades is slightly left skewed.
- Both the overall homework grade and overall exam grade are normalized to be out of 100.

Data introduction

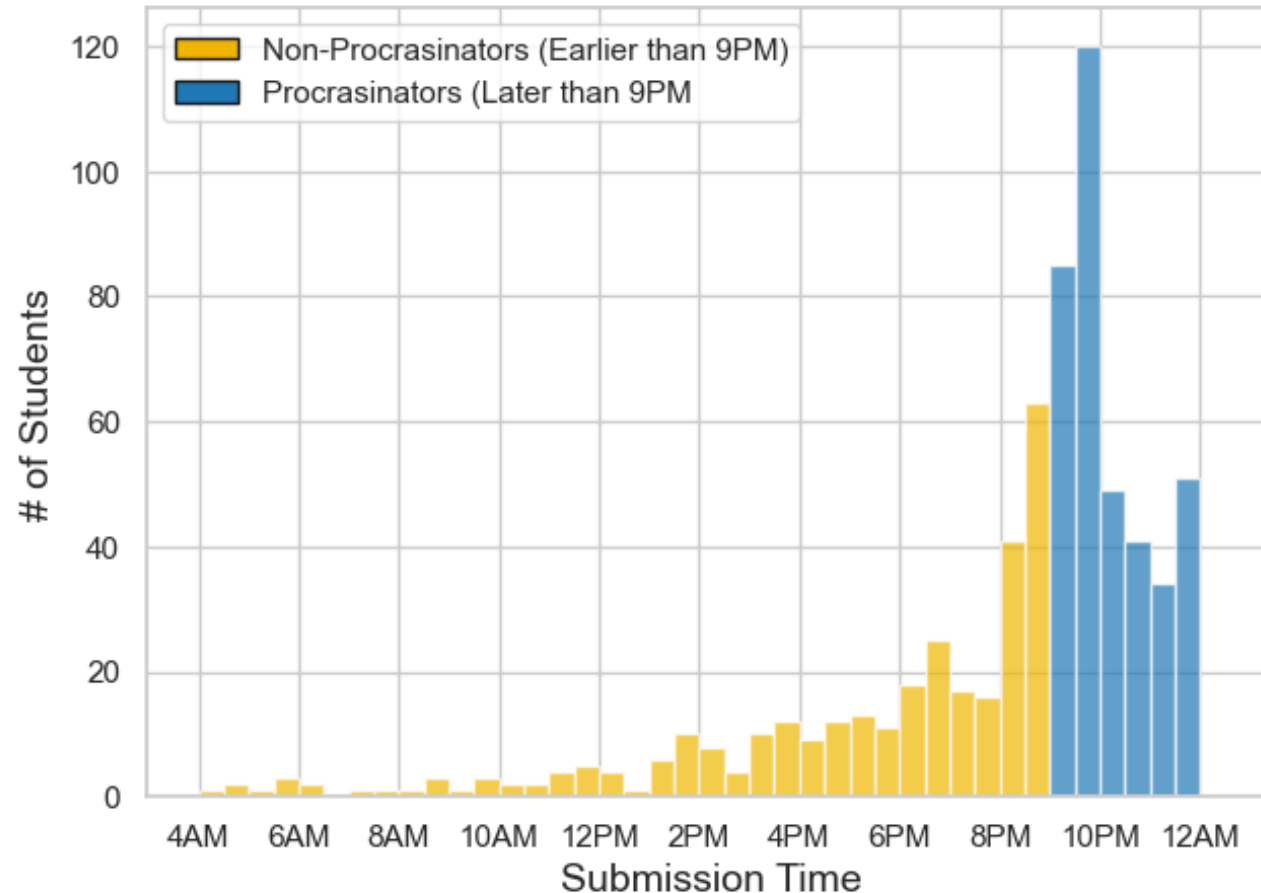## Student Median Homework Submission Time Distribution

Hard deadline: 12am
Soft deadline: 10pm

Notes
- Few students submit before noon; most submit near the deadline with a spike just before 10pm.
- Between 10pm and 12am, submissions are allowed, but software issues won't merit deadline extensions.

Data introduction

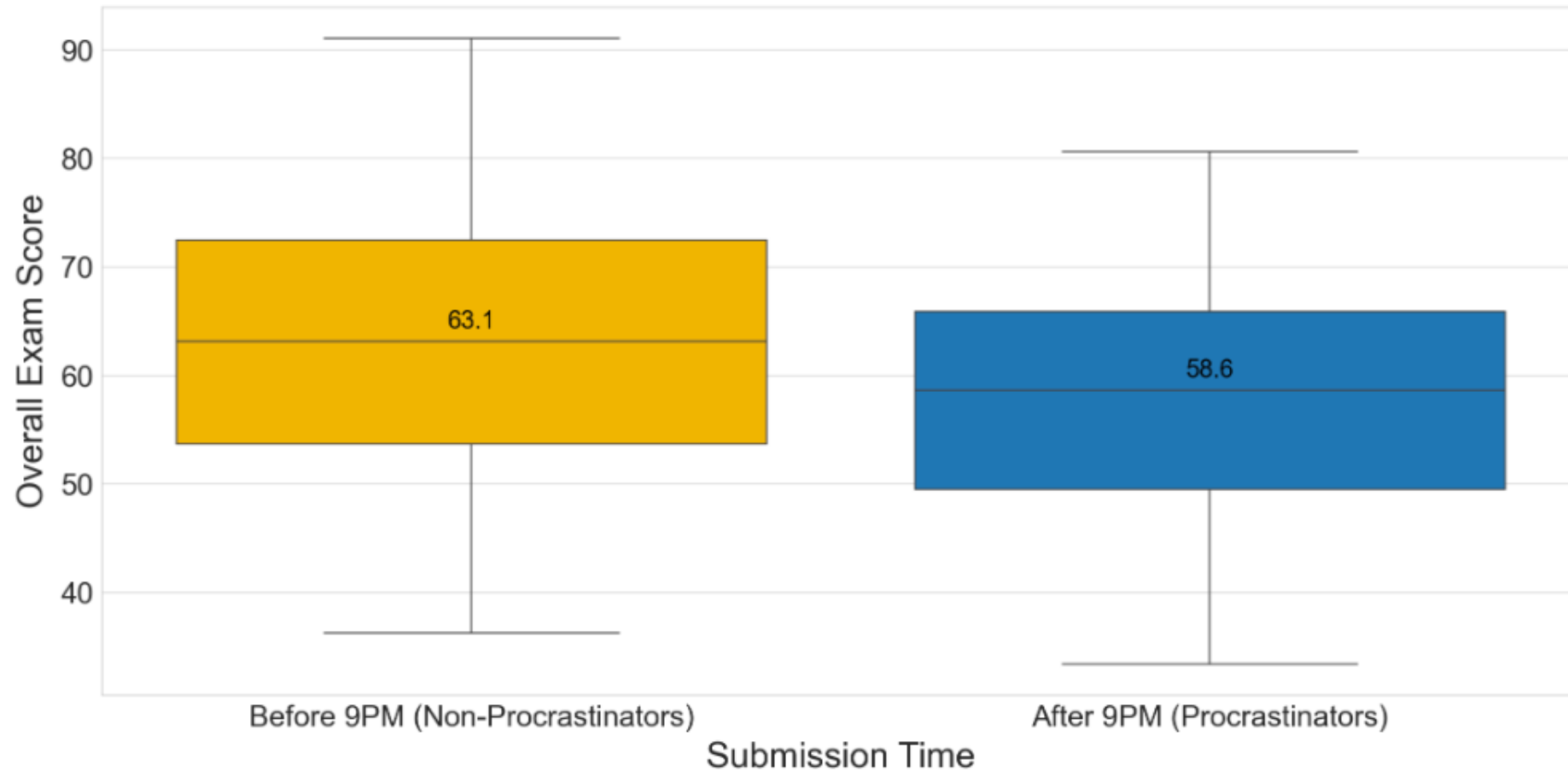## Student Median Homework Submission Time Distribution

Hard deadline: 12am
Soft deadline: 10pm

Notes
- Students submitting on average after 9pm are "procrastinators," and those before are "non-procrastinators."
- The 9pm cutoff both equally divides students and indicates last-minute submissions for a week-long task.
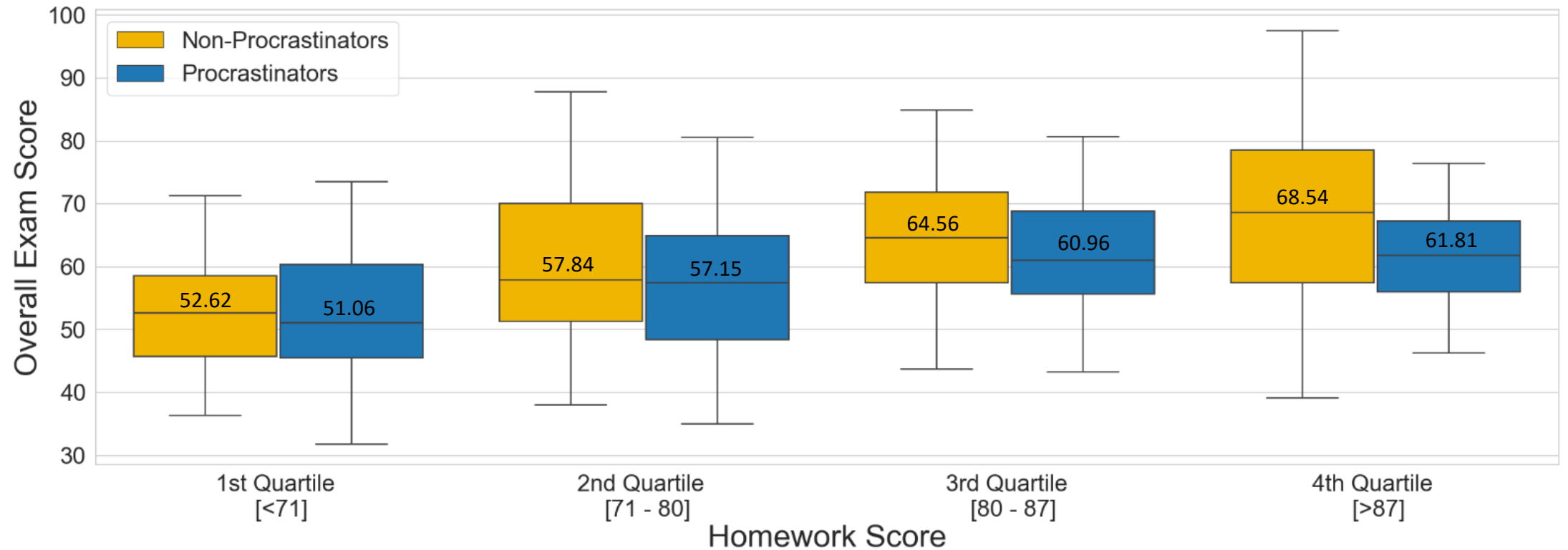
Exam Score vs. Homework Submission Time

Notes
- Box plot shows non-procrastinators had a median exam score of 63.1/100, while procrastinators scored 58.6.
- Non-procrastinators generally scored higher, but a potential confounding factor is homework grades; higher homework scores likely correlates with better exam performance.

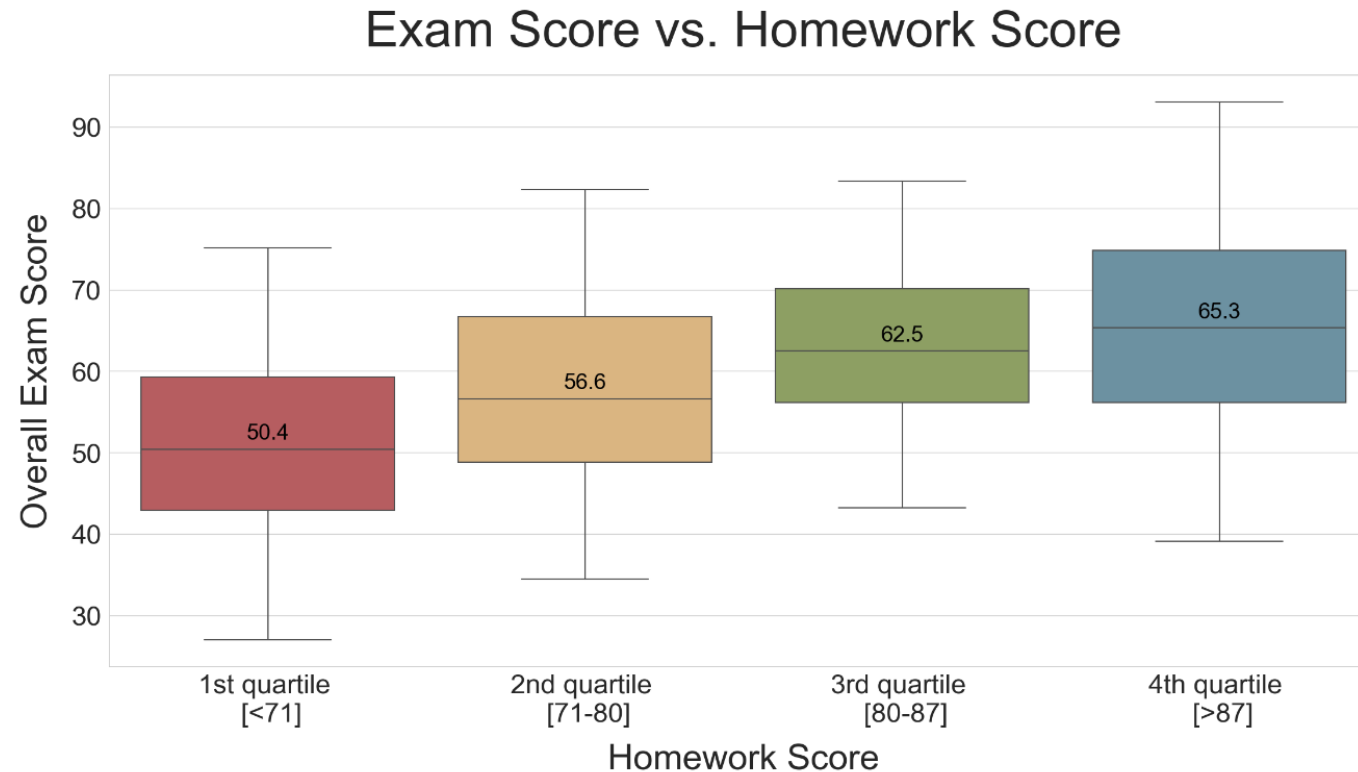Exam Score vs. Homework Submission Time
(by HW score quartile)

Notes
- Box plot divides data into quartiles by homework scores, with the first quartile scoring less than 71/100.
- Each quartile's exam scores are displayed side by side: non-procrastinators left, procrastinators right.
- Non-procrastinators outscore procrastinators in every quartile, especially noticeable in the higher quartiles.

Which has greater impact on exam scores: Procrastination or Homework Grades?

Exam Score vs. Homework Score

Notes
- Box plot segments students by homework quartile, revealing a clear correlation: higher homework scores result in higher exam scores.
- But how does the homework effect stack up against the impact of procrastination?

Which has greater impact on exam scores: Procrastination or Homework Grades?

Group 1	Group 2	Median Exam Score Difference between Group 2 and Group 1	Letter grade difference (approx.)
1st quartile HW grade	4th quartile HW grade	14.91	2/3
Procrastinator (given 4th quartile HW grade)	Non-procrastinator (given 4th quartile HW grade)	6.73	1/3
2nd quartile HW grade	4th quartile HW grade	5.92	1/3
Procrastinator (given 3rd quartile HW grade)	Non-procrastinator (given 3rd quartile HW grade)	3.62	1/6
3rd quartile HW grade	4th quartile HW grade	2.82	1/6

Key Insights
- **Homework's Impact**: Moving from the 1st to the 4th homework quartile boosts exam scores by 2/3 of a letter grade.
- **Procrastination's Effect**: Within the top HW quartile, not procrastinating boosts exam scores by 1/3 of a letter grade.
- **Overall**: To boost exam performance, students with lower homework grades should prioritize improving homework scores, while students with already high homework grades should prioritize curbing procrastination.