**Goal**
Our goal is to explore how students use their classroom resources and figure out what we can gather from that information to help students perform better in the class.

**Abstract**
Most classes use one or more tools (Gradescope, My Digital Hand, Piazza, Sakai, etc.) to keep the course running smoothly. When students use these tools, they create data at many levels (breadcrumbs) that could be collected and mined for insights on how to make the class better. Using network analysis and machine learning techniques, this project aims to generate deeper insights about student progress.

**Research Questions**
- Are connected components and other graph topological features of test results reflective of student progress?
- Where do students commonly get stuck? Which tests do they get stuck on? What help events are most impactful?

**Data sources**
- Piazza
  - Full text of posts and answers for all students
- MDH
  - Help room attendance and topic info
- Gradescope
  - Submission data and raw code for each student

**Resources**

**Results**

**Methodology**
- Graph approach: Using NetworkX and Gephi, graphs were generated representing submission states and nodes connected by edges representing student progress.
- N-gram approach: test states represented as "words" connected into "sentences" representing student paths.
- Heatmap approach: partitioned N-grams based on score patterns and created histograms of frequently changed tests for each pattern.

**Discovering where students get stuck:**
- N-gram analysis allowed us to explore specific cases where students got stuck or fell behind. We were able to look at "sentences" where students went from improving to losing points on the assignment.
- We then looked at the common tests where students with positive progress slipped and went negative (below).

**Results (cont.)**
**Automated Student Flagger:**
- This Jupyter notebook was created to help the teaching staff detect students who are struggling in the class.
- It allows the user to input a cutoff (to see the bottom n% of the class) and also gives access to an in depth view of how an individual student performing in the class.
- This tool produces statistics such as class average, individual student assignment scores, piazza posts, and time spent in office hours.

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