Background

Each term in the Applied Mathematics & Statistics department consists of 2-3 exams consisting of 8-10 problems per exam, per course. With the advent of Gradescope and Canvas statistics on the students' performance has been recorded per problem over the last 5-7 years. The problems are not identical from term to term though they are somewhat similar. Unfortunately, they may also differ in difficulty. There is a need to archive these problems in such way that a sample exam could be constructed based on problem type and statistical performance. For example, 'I need a problem on Integration by Parts of medium difficulty'.

Project Description

This is Phase II of the problem bank. Phase I was successfully completed during the summer field session. The result is a desktop application, running on my Mac using a local database for archiving problems (latex statement of problem, solution and statistics) from past courses. The team implemented an interface for inputting problems and querying stored problems and constructing future exams from existing problems (manually).

Phase II will involve:
- Some functionality updates/changes,
- Some minor bug fixes, and
- Implementation of an AI language model trained on the problem data that has been stored in the existing database. This interface would then be used to develop problems for future exams based on the existing archive.
    - Depending upon the system requirements, the training model could be run locally (ideally but understandable if not feasible) or cloud based (also dependent on the subscription cost).
    - Up-front investigation into the possibilities would be necessary initially.
    - Any modification to the currently stored data to better support the interface into the training model is possible if necessary

Desired Skill Sets

- Some database understanding. The existing data is resident in a relational database using SQL for access.
- An understanding of LaTeX. Not critical but can be helpful due to some functionality changes.
- Some fundamental understanding of user interface design.
- Understanding of machine learning basics since the implementation of the AI language model will require investigation into current capabilities.