**Biopharma Project Progress Report**

**Date: [5-23-2024]**

**1. Overview**

This report provides an update on the progress made in the development of the biopharma project. The project aims to create a comprehensive software tool to streamline downstream processing for monoclonal antibodies. The tool will include functionalities for facility fit calculations, buffer amount estimation, bill of material generation, and various process calculations for different steps such as centrifuge, depth filtration, and affinity chromatography.

**2. Completed Work**

**Backend Development:**

* **Centrifuge Calculations:**
  + Developed functions to calculate BRX mass, volume removed by PCV, centrifuge volume out, and centrifuge mass out.
  + Implemented as a dedicated Python module.
* **Depth Filtration Calculations:**
  + Implemented functions to calculate total number of filters required, total filter area installed, depth filtration mass out, depth filtration volume out, filter rack requirements, WFI flowrate, and process flowrate.
  + Developed as a dedicated Python module.
* **Affinity Chromatography Calculations:**
  + Created functions to calculate column diameter, column volume, maximum volume flowrate, eluate cycle volume, and pool volume.
  + Developed skid selection logic based on maximum AC volume flowrate.
  + Implemented as separate Python modules for calculations and skid selection.

**Frontend Development:**

* **User Interface Design:**
  + Designed and implemented an HTML interface for user inputs for centrifuge, depth filtration, and affinity chromatography steps.
  + Created a results display page to show calculated outputs for each process step.
* **Flask Integration:**
  + Integrated backend calculation modules with Flask to create a web-based application.
  + Implemented routes for handling user inputs and displaying results.

**3. Planned Work**

* **Viral Inactivation (VIN):**
  + Develop and implement calculation logic for the VIN step.
  + Integrate VIN step into the current frontend and backend structure.
* **Anion Exchange (AEX) and Cation Exchange (CEX):**
  + Develop calculation modules for AEX and CEX steps.
  + Integrate these modules with the existing application.
* **Buffer Amount Estimation:**
  + Implement a module for estimating buffer amounts required for each process step.
* **Bill of Material Generation:**
  + Develop functionality to generate a bill of materials based on inputs and outputs of each process step.
* **Database Integration:**
  + Integrate a database for storing filter and skid information, enabling easy updates and maintenance by engineers.
* **Auto-Selection for Collection Containers:**
  + Implement functionality to auto-select the correct size for cycle eluate collection and affinity pool collection based on calculated volumes.

**4. Quantitative Summary**

* **Lines of Code:**
  + Backend: Approximately 500 lines of Python code.
  + Frontend: Approximately 200 lines of HTML/CSS code.
* **Time Spent:**
  + Total hours spent on project development: Approximately 40 hours.
* **Functions Developed:**
  + Number of calculation functions: 10.
* **Modules Created:**
  + Centrifuge calculations module.
  + Depth filtration calculations module.
  + Affinity chromatography calculations module.
  + Skid selection module.
* **Platforms Used:**
  + Backend: Python
  + Web Framework: Flask
  + Frontend: HTML, CSS

**5. Challenges and Solutions**

**Challenges:**

* Maintaining consistency in parameter naming conventions.
* Integrating complex calculation logic with the user interface.
* Handling the conversion of units accurately.

**Solutions:**

* Established a rule to use lowercase for all parameter definitions to ensure consistency.
* Modularized the code to separate calculation logic from the frontend, simplifying debugging and maintenance.
* Reviewed and corrected unit conversion logic to ensure accurate calculations.

**6. Conclusion**

The biopharma project has made substantial progress, with key calculations and user interface elements successfully implemented. The focus now shifts to expanding the tool's functionality to include additional process steps and enhancing its user-friendliness. Continued collaboration and adherence to established coding conventions will ensure the project's successful completion.

A close-up of a document

Description automatically generated

A calculator with a list of results

Description automatically generated with medium confidence