Inventory Management Platform for a Battery Testing Lab

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Company Background

Prof. Mistry's research is about building next-generation batteries and other futuristic electrochemical energy systems. The development of such devices is limited by an incomplete understanding of how material behavior translates to device-scale performance. To address this key scientific knowledge gap, his research group synergistically combines controlled experiments, physics-based theory, and machine learning techniques.

Description of the Work to be Done

As schematically shown in Figure 1, research in Prof. Mistry's research group requires tracking of multiple workflows and inventory management. While such a task is straightforward to manage with one or two active projects, as the group grows and simultaneously operates multiple projects, a *comprehensive, real-time inventory management platform* is required. Unfortunately, the commercial solutions, e.g., QuickBooks or Zoho, do not offer the necessary customization to cater to a university research lab.
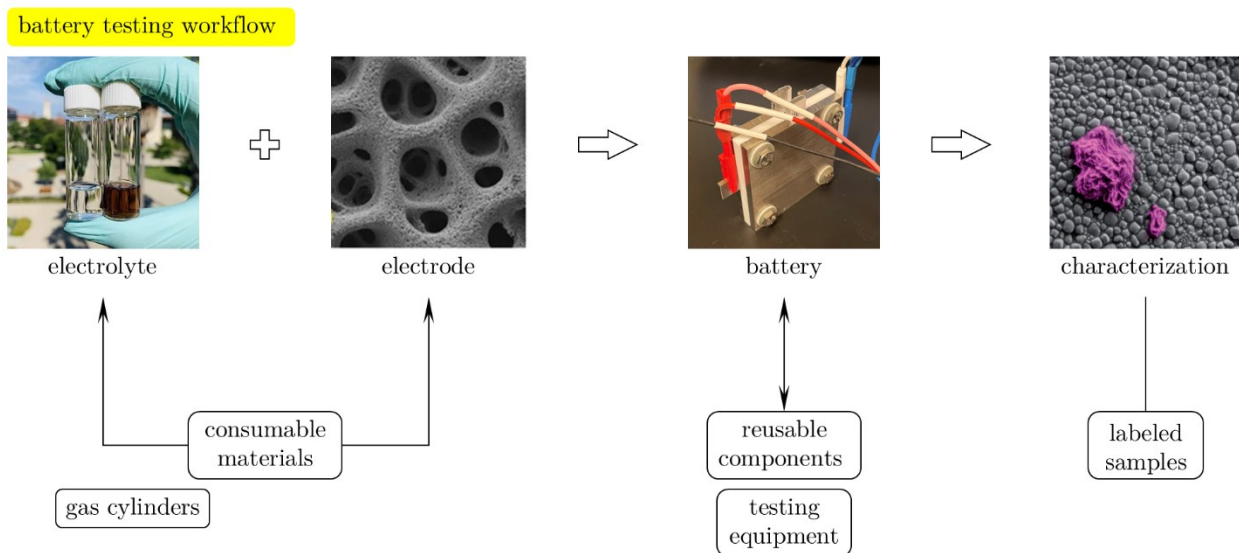

Figure 1. A typical battery testing workflow in Prof. Mistry's research group. The battery testing workflow intersects with bookkeeping of gas cylinders, consumable materials, reusable components, testing equipment scheduling, and processing of samples for subsequent characterization. Some of the figures are borrowed from the internet.

The goal of this field session project is *to build a custom inventory management platform that is hosted on the Mines network and accessible to the authorized users from different*

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devices. Additionally, some basic data analytics functions should be automated on the underlying dataset to offer critical insights and decision-making support for the admin, e.g., check for a leak since the gas cylinder only lasted half the normal time, order more 50 [mL] vials since the last box of 50 [mL] vials was opened today, etc.

App Design for User Experience
The regular lab user should be able to add information to different data streams, e.g., glovebox log, equipment scheduler, etc. (no right to modify or delete the records) only from authorized computers. The user interface should have a dashboard reporting real-time information such as "BCS-910 channel #1 is in use by Bree".

As identified in the preceding discussion, the admin dashboard should allow granular information as well as basic automated analytics for more efficient decision making.

The app and the underlying datasets should be cloud based for operational flexibility.

Any Desired Skills for the Students

- Java programming,
- python programming,
- database management,
- cloud platform, and
- app development.

Preferred Team Size

4 – 6 students

Potential Internship at the End of the Course

Please reach out to Prof. Mistry if you are interested in using your computer science skills to solve problems relevant to battery and electrochemistry research.

Some of the potential opportunities are independent study, SURF (Summer Undergraduate Research Fellowship), and a CS project-based Masters (https://cs.mines.edu/msdegree/).

Location

Anywhere except for the regular in-person check-ins @Mines

Non-disclosure Agreement (NDA)

Depending on the end result, there may be a scope of marketable software. While any information revealed to other Mines students or professors is not considered public disclosure, please refrain from discussing the specific details of the project with anyone outside Mines.

Intellectual Property Rights

We will jointly hold the Intellectual Property Rights.