5 Potential Projects:

1. The EPA Compliance Dashboard (Data & Regulation)

The Concept: Go to the EPA's "ECHO" database or a local municipal site and download water quality or emissions data. Use Excel or a simple Python script to create a dashboard that flags when levels went "out of spec" based on legal limits.

- **The "Why":** Every BSE firm has to deal with the government. Showing you understand **regulatory compliance** and **data visualization** makes you an immediate asset for environmental or process roles.
- **The Resume Win:** *"Developed an automated compliance dashboard using [Excel/Python] to analyze 2,000+ data points of municipal water records, identifying 5 key seasonal trends in nutrient loading."*

2. The 30-Day Sensor Log (Instrumentation & Signals)

The Concept: Use a cheap Arduino/ESP32 or even a "Sensor Logger" app on your phone to track one variable for a month (like soil moisture in a plant or the temp/humidity in a specific room). Analyze the raw data to find the "noise" and filter it out.

- **The "Why":** In the field, sensors are messy. If you can show you know how to **collect primary data** and perform **signal processing** (even basic filtering), you're ahead of 90% of other applicants.
- **The Resume Win:** *"Engineered a low-cost environmental monitoring system to track micro-climate variability over 30 days; implemented signal processing techniques in Python to improve data accuracy by 15%."*

3. The Professional Process Flow Diagram (PFD)

The Concept: Take a complex biological process—like anaerobic digestion, beer brewing, or grain handling—and map it out professionally in a tool like LucidChart or Visio. The key is adding **Mass and Energy Balances** (calculating exactly what goes in vs. what comes out).

- **The "Why":** This is the "language" of process engineering. When a recruiter sees a clean, professional PFD on your iPad or in your portfolio, they immediately see you as a "real" engineer who understands **systems thinking**.
- **The Resume Win:** *"Designed a comprehensive Process Flow Diagram (PFD) for a [Specific Process], calculating mass and energy balances to identify a 10% potential reduction in energy waste."*

4. The AI-Assisted Material Validation (AI & Rigor)

The Concept: Use an AI tool (like ChatGPT) to research and compare three different bio-materials for a specific application (e.g., biodegradable packaging or medical implants). Then—and this is the important part—**validate** the AI's claims against 5-10 peer-reviewed papers to prove where the AI was right and where it hallucinated.

- **The "Why":** Everyone says they "use AI." Very few people show they have the **engineering rigor** to verify it. This project proves you are "AI-literate" but also technically disciplined.
- **The Resume Win:** *"Conducted a technical material-selection study using AI-assisted research; validated AI outputs against peer-reviewed journals to ensure 100% compliance with industry standards."*

5. The Inventory & Asset Optimizer (Operations)

The Concept: Take a messy list of items—like a lab's chemical inventory, a student org's equipment, or a farm's supplies—and build a structured relational database in Excel or Airtable. Add automated "low-stock" triggers and a "check-out" system.

- **The "Why":** Engineering isn't just math; it's logistics. If you show you can **optimize an operation**, it proves you have the leadership and organizational skills to manage a project or a shop floor.
- **The Resume Win:** *"Developed a centralized asset management system in Airtable for [Organization], reducing manual audit time by 40% and implementing automated re-order triggers for critical supplies."*

Our Story Vault Live Exercise Notes:

• Trained and mentored new lifeguards and swim instructors over a 3-year period, supporting consistent operations across high traffic aquatic facilities and improving staff readiness through peer leadership.

General experience:

- Over 3 years at Lifetime, trained lifeguards and swim instructors for all different swimming strokes.
    - At newest location, assessing the new swim instructors if they are capable of teaching the strokes.
- Peak summer has a high number of members at the pool. It is important to control a large number of members in the pool, and safety brakes during those times. Being able to take care of students during peak times as well to ensure their safety.
    - A lot of younger members get left alone by their parents, and dealing with this is a big challenge for new lifeguards, having to coach and make sure they are comfortable with this is a challenge.
- Notes:
    - Add comparison between peak summer times and non peak summer times.
    - Add: there are around 100+ members in the pool at peak times vs around 20, very challenging to keep track and see all of them.

Specific Incident:

-Member passed out while watching children

Situation/Task:

- Was training some kids at the pool
- A member approached me and said that a member was feeling confused and may have passed out
- Had younger kids with me and had to worry about their safety while still trying to help the other member

Actions:

- I went to my supervisor and made sure that the kids were taken care of, while I took responsibility of the member issue
    - Brought a warm pad to the member
    - Cleared the pool deck
    - Brought kids back to their parents and had them clear the pool deck
    - Guided emergency services to the member
    - Once they left and took him to the hospital, everyone was brought back into the pool deck
- I called 911 and had to control the area and make sure that other members were not overcrowding the member.

Results:

- The supervisor was happy with how things were handled.
- The member who went to the ER came back and was thankful, and left a positive review on the aquatics website
- Parents were very satisfied with the way the situation was handled as well with their children.
- If I could do this over…….I would……

-The Oven Project

• Designed the main oven body and completed final integration of 11 other physical components from other team members over 10 iterations for thermal oven project in condensed 1.5-day timeline using SolidWorks and 5 new design tools for consolidation.

• Applied Geometric Dimensioning and Tolerancing principles to define critical dimensions and tolerances for oven panels, door interfaces, and mounting features, producing manufacturable drawings that ensured proper assembly across all subsystems.

Situation/Task:

- My task in our group project was to design the main oven body and completed final integration of 11 other physical components from other team members. I had introductory experience with SolidWorks (not very experienced), so I had to learn more about SolidWorks as I worked. Normally, I was expecting to have 1-2 weeks to integrate the other team members components, but I only had 1.5 days based on the time that everyone submitted their portions of the project to me.
- A big challenge here was that the other team members components were not all consistent with the starting dimensions we agreed on, which led to a lot of scaling and learning to use new tools in SolidWorks on my part to complete the integration.

Actions:

- Had my oven body done and ready to go before I got any other team members parts. We would have 12 parts total, including mine. I had designed the oven body with initially agreed upon dimensions at the outset of the project.
- Everyone sent me their components and I had all I needed to do the integration
- I learned how to use a few new functions in SolidWorks that I would need to fully integrate before getting started: combine and joint functions.
    - How did you do this?
- I assessed dimensions and (whatever else you assessed) across all components
- Came up with a game plan of which order to integrate
    - If you can include the why you chose the order
- Started integration
- Had to use scale up and scale down functions because of components X, Y, Z.
- Fully integrated for initial testing.
- Performed iterative testing (10 cycles) to complete design.
    - Some details about iterations, what happened, what did you adjust, what did you learn, change, etc.
- Had to scale oven body up as a whole, in order to fill all 12 parts. I had to go online and learn a new function (scaling) to do this in SolidWorks.
- I also had to learn how to scale down (not the same as scaling up) to adjust oven body to fit other parts.
- I had to the learn the combine function in SolidWorks to combine parts.
- I had to learn the joint function in SolidWorks I had to lose.
- One other team member built arms for the oven body, but they weren't fully assembled. There were hands, etc, that I had to assemble myself into one arm assembly.
- Had to open up other team members' parts and work on unknown territory to adjust their work (scale down or up) to consolidate it into one full assembly.

Results:

- High scoring project
- A lot of relief from me and my team as it was a final project
- Was very proud of myself to do something new and learn so many new things in such a short amount of time
- Have used engineering principles and solidworks knowledge in other areas since then.
    - If you can provide 1 or 2 very short mentions of where you did this, that would be great (3 tier level)
- Think about these ?s:
    - What would you do differently if you could go back in time
        - Why was there only 1.5 days instead of 2 weeks?
            - Communication on the team not good?
            - Need more sync meetings to check on progress?
            - Need to communicate out to team earlier?
        - Why did the dimensions not line up?
            - Team not aligned on dimensions?
            - Team didn't know that scaling is not trivial?
            - Team didn't do their job to make dimensions right?

Next session: 13 Jan Tue 6PM CST.