Bioengineering Day Poster Addendum (ABET questions)

1. List two to four **Desired Needs** of your project that led to your final design objectives.
   - HDR-based genetic engineering is currently very inefficient, with high time and labor costs for researchers
   - Millions of people suffer from genetic diseases that currently don't have treatments that help repair and alleviate their conditions

2. List the major **Constraints** on your design/project
   a) Safety/Regulatory Affairs
      a. The system must be able to produce medical-grade procedures to minimize the risk of unwanted mutations in patients greatly.
   b) Risks
      a. System outputs must be thoroughly analyzed and grounded in expert research to ensure highly accurate predictions for HDR%
      b. System outputs must not have hallucinations to ensure researchers have a trustworthy source of information for the design of genetic engineering experiments
   c) Global Impact
      a. Millions of people around the world suffer from genetic diseases, and our project aims to alleviate even a fraction of those.
   d) Manufacturability
      a. The project is aimed to be available on GitHub to be readily available for researchers to use.
   e) Quality Control/Marketability
      a. System outputs need to be continuously benchmarked and analyzed by experts to ensure that the quality of the outputs is accurate, as even minor errors in genetic engineering can lead to unwanted mutations.
3. List the major **Engineering Standards** on your design/project
   - IEEE 2894-2024 standard, Guide for Explainable Artificial Intelligence
   - ISO 13845, Medical Devices: Quality Management
   - ASTM International ASTM F3209-24a, Standard Guide for Autologous Platelet-Rich Plasma, Platelet Gels, and Whole Blood Gels for Use in Tissue Engineering and Cell Therapy
4. Explain **Ethical, Environmental, or Societal concerns** for practical applications of your project.
   - Ethical Concerns:
     - The project needs to ensure the security of experimental data and results by researchers using the design
     - The project also needs to ensure that its outputs are of the highest quality for precise genetic engineering
     - Our project could also theoretically be used for the design and development of genetic enhancements, such as the use in the development of genetically enhanced babies, which is a topic of great ethical concern
   - Environmental Concerns:
     - AI has been highly controversial due to its high carbon footprint and water usage
   - Societal Concerns:
     - There is still great skepticism about AI use and whether its outputs can be trusted. As such, our design needs to have high transparency and ensure that there are minimal inaccuracies
5. Describe **Active Teamwork** and **Leadership** in your design group
   a) **collaboration** and inclusion of diverse opinions?
      - We started off on different pages, and Steven was more well-versed in the field than me, so I had to play catch-up a little bit due to familial problems that limited my ability to contribute much at first.

- Following much guidance from the TAs and trust in each other, we quickly developed a plan and honed our communication style to be one that both of us were greatly appreciative of.
- We wanted both of us to communicate our goals clearly and developed an environment of trust.

b) **delegation** of leadership on subprojects?

- I did not have access to a strong GPU as Steven did, so I worked on the less computationally dense subprojects.
- As such, I was also given the leadership role in all of our logistical work on the project.
- Steven, with the more powerful setup, would work on the more rigorous and computationally dense sections of the project

c) establishing and reaching **goals and deadlines**?

- We communicated with each other every week to go over what assignments and goals needed to be done by the next week.
- We always communicated if there were any issues or other required tasks that needed to be done.

d) received or given **constructive feedback**?

- We cultivated a very trusting environment for both of us to give each other feedback and discuss what we need to work on and improve.

6. What were the most significant motivating factors that led you to

a) acquire **new knowledge**
b) be **self-initiating**
c) **persist** against challenges and setbacks.

- The main motivating factor that led me to acquire new knowledge is that my grandma suffered from cancer and was luckily treated and recovered from it. I truly want to learn about treatments that can help those with genetic diseases.
- I always feel like I need to be self-driven to ensure that I uphold the standards that I set for myself and I don't want to let my team down. I believe that to truly improve and learn, I need to continuously push myself and motivate myself.
- Challenges to me are just learning experiences, and there is a rewarding feeling when I overcome a challenge. I feel like they are just natural occurrences in the learning process, so I am not demotivated when I come across challenges.

7. What are your most **innovative and/or entrepreneurial ideas** for this project

- The biggest innovative idea we came up with was the idea of developing our project into a fully functional website like ChatGPT or Gemini. The field of genetic engineering currently lacks some of the same tools that are currently available for widespread use. We feel like our project can fill this gap and help the genetic engineering field.