1. List two to four **Desired Needs** of your project that led to your final design objectives.

Answer in two to four bullet points or concepts within a sentence or two.

- Visually impaired people need cheaper, more robust navigation tools for new environments
- Healthcare professionals benefit from additional therapy options to treat visually impaired patients that do not feel comfortable with current choices
- Many spaces to navigate are crowded and noisy, so an aid that does not rely on audio is imperative

2. List the major **Constraints** on your design/project

Safety: The device must operate at safe temperatures in contact with the user's skin with no exposed electrical parts and provide reliable navigation without risk of collision.
Risks: Type I and II errors in object detection minimized to mitigate unsafe navigation.
Global Impact: Device must be usable in areas with minimal internet signal and purchased for cheap.
Manufacturability: Should not require substantial factory assembly to allow easy repairs.
Marketability: Device should be accepted by visually impaired people (they must prefer it or want to use it alongside other aids – comfortable, intuitive, reliable).

3. List the major **Engineering Standards** on your design/project

IEC 60601: Safety and essential performance of medical electrical equipment
IEC 62304: Life cycle process for developing and maintaining medical device software
ISO 9241-920:2024: Ergonomics of human-system interaction (Haptic interactions)
ISO 14971:2019: Comprehensive process for risk management of medical devices

4. Explain **Ethical, Environmental, and Societal concerns** for practical applications of your project. Please address each of these areas.

Ethical: Testing the device requires visually impaired users in the desired market. An unfinished design may pose risk of collision, overheating, or other bodily harm.
Environmental: Plastic waste from the 3D printed clips used for part mounting and use of lithium ion batteries which are hard to dispose of. We minimize power consumption to reduce battery depletion.
Societal: The bulkiness of camera reliant devices like this is that they attract unwanted attention. This can increase feelings of social isolation and psychological pressure.

5. Describe **Active Teamwork** and **Leadership** in your design group

Teamwork and leadership were large parts of our project. Each member was assigned to be a leader of a specific subproject that their experience would work best in and managed the smooth operation of said subproject. All large design decisions were communally agreed upon before execution. Design opinions and inspiration was brought in through experts (ophthalmologist and computer vision specialist). Clear deadlines were set for project goals and all group members checked in with one another to ensure goals were being met on time. When hardware or software needed changes, members would work with each other to help iterate and come to better solutions quicker.

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

The most motivating factor that led me to thrive in this project and self-study to work toward our goals was knowing that the skills I learn will be applicable in future projects. Beyond the hard-skills, learning how to code SLAM algorithms or computer vision, the soft-skills in coming up with a design from inception to completion are invaluable. With our end goal in mind, it was quite easy to contribute toward the project software without needing a push as I knew the group relied on my coding experience. Any challenges were a learning moment that only pushed our device closer to success. With that in mind, and seeing steady progress each day, I was hopeful that the last setback would eventually be overcome.