Problem Statement and Goals
ProgName

Team #, Team Name
Student 1 name
Student 2 name
Student 3 name
Student 4 name

Table 1: Revision History

Date	Developer(s)	Change
09/23/2025	Angela Zeng	Add first draft of problem statement and goals
Date2	Name(s)	Description of changes
...	...	...

1 Problem Statement

1.1 Problem

Instructors lack access to real-time insights about where students direct their attention during learning activities, particularly in large-group settings. Without this data, it is difficult to assess engagement, monitor collaboration, and adapt teaching strategies to improve the effectiveness of learning.

There is a need for a system that can capture and analyze group gaze data during classroom activities, so that instructors can better understand and respond to student attention and engagement in both synchronous and asynchronous learning contexts.

1.2 Inputs and Outputs

[Characterize the problem in terms of "high level" inputs and outputs. Use abstraction so that you can avoid details. —SS]

1.3 Stakeholders

Direct Stakeholders

1. Students
    - Their gaze data is collected during learning activities.
    - They benefit from potentially improved engagement and teaching methods.
2. Instructors / Professors
    - Use gaze-based analytics and dashboards to adapt teaching.
    - Participate in the research study and provide feedback.
3. Capstone Development Team
    - Designs, builds, and tests the integrated learning platform.
    - Works on solving technical challenges (e.g., real-time visualization, group data capture).
4. Researchers / Educational Technologists
    - Analyze gaze data to study engagement and collaboration.
    - Derive insights that inform system improvements and pedagogy.

Indirect Stakeholders

1. Future Students and Instructors
    - Benefit from refined teaching methods and improved learning environments informed by this research.
2. Industry Partners / EdTech Companies
    - Could leverage findings for commercial tools (e.g., learning analytics platforms).
3. University Administration (McMaster)
    - Gains insights into teaching effectiveness and innovations in classroom technology.
    - May decide on scaling or adopting such systems institution-wide.

1.4 Environment

Software Environment

- **Version Control and Collaboration:** GitHub will be used for source code management, issue tracking, project boards, and continuous integration/continuous delivery (CI/CD).
- **Integrated Development Environment (IDE):** Visual Studio Code (VS Code) will serve as the primary IDE.

2 Goals

1. Develop a Learning Platform
    - Integrate large-group eye tracking into both synchronous (live classes) and asynchronous (recorded or online activities) learning contexts.
2. Enable Contextual Data Capture
    - Log gaze data alongside classroom learning activities such as passive content viewing (e.g., watching videos) and active group work (e.g., exercises, discussions).
3. Conduct In-Person Research
    - Run a study with instructors and students at McMaster University to evaluate how gaze-based insights affect teaching and learning.
4. Inform Future System Designs
    - Use study findings to guide the development of features like instructor dashboards and real-time gaze analytics.
5. Tackle Key Technical Challenges
    - Address issues in system design, reliable capture of group gaze data, and effective real-time visualization of attention patterns.

3 Stretch Goals

1. Support more complex classroom activities
    - Extend the system beyond single-board, lecture-style classes to settings with multiple focal points (for example, group discussions or multiple boards), so it can handle a wider variety of learning environments.
2. Enhance real-time analytics

- Improve the live feedback available to instructors by going beyond simple engagement markers, while keeping the analytics lightweight enough to scale across many devices.

3. Strengthen privacy protections

   - Ensure the system does not expose sensitive or personally identifiable information. This includes hiding personal details captured by eye cameras and preventing raw video feeds from being directly viewed by researchers or instructors.

4 Extras

[For CAS 741: State whether the project is a research project. This designation, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

[For SE Capstone: List your extras. Potential extras include usability testing, code walkthroughs, user documentation, formal proof, GenderMag personas, Design Thinking, etc. (The full list is on the course outline and in Lecture 02.) Normally the number of extras will be two. Approval of the extras will be part of the discussion with the instructor for approving the project. The extras, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

Appendix — Reflection

[Not required for CAS 741 —SS]

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?
2. What pain points did you experience during this deliverable, and how did you resolve them?
3. How did you and your team adjust the scope of your goals to ensure they are suitable for a Capstone project (not overly ambitious but also of appropriate complexity for a senior design project)?