

1. Desired Needs

The project aims to improve personalized glucose-management insights for diabetic patients through richer feature-level analysis of CGM data. An additional goal is ensuring that menstrual-cycle-related glucose fluctuations in women are interpreted correctly rather than treated as noise or pathology.

2. Major Constraints

- a) **Safety / Regulatory Affairs:** Preventing data leakage and avoiding misleading outputs are critical requirements.
- b) **Risks:** Potential biases and exposure of Dexcom-derived patient data present significant concerns.
- c) **Global Impact:** CGM technology remains inaccessible to many lower-income populations.
- d) **Manufacturability:** The analytical pipeline must remain simple, transparent, and practical for use.
- e) **Quality Control / Marketability:** Limited labeled ground-truth data requires extensive validation before deployment.

3. Major Engineering Standards

- a) Standards related to information security and data handling include ISO/IEC 27001:2022, NIST SP 800-53 Rev. 5, and HIPAA de-identification standards.
- b) Standards related to software performance and medical-device quality include ISO 14971:2019, IEC 62304, ISO 20417:2021, and ISO 14155.
- c) While no new standards currently exist from this project, the work could contribute to future standards for CGM data quality control and standardized feature-extraction pipelines.

4. Ethical, Environmental, or Societal Concerns

Key concerns include inequitable access to CGM technology, bias in predictive models, privacy protection for sensitive patient data, and the risk of patient harm from model misuse. Large-scale CGM deployment may also raise environmental sustainability concerns related to device production and disposal.

5. Active Teamwork and Leadership

- a) **Collaboration and Inclusion:** Team members were encouraged to share perspectives, debate ideas, and support one another through debugging and feedback.
- b) **Delegation of Leadership:** Leadership shifted naturally based on expertise or ownership of a subproject.
- c) **Goals and Deadlines:** Weekly goals and mid-week check-ins helped maintain steady progress and accountability.
- d) **Constructive Feedback:** Feedback was provided through comments, presentations, and open team discussions to improve the quality of the work.

6. Motivating Factors

Weekly meetings were my main source of motivation because they created accountability and manageable goals. This structure encouraged me to stay engaged, learn new analytical methods, and persist through challenges until I achieved results I felt confident in.

7. Most Innovative / Entrepreneurial Ideas

My most innovative contribution was developing a two-layer spectral-analysis approach to detect long-term circadian fluctuations in CGM data. Combining multiple spectral methods allowed us to identify subtle rhythmic patterns that may otherwise have been lost in noise, providing a creative and effective solution for analyzing long-term glucose cyclicality.