Biweekly Report

Name: Tong Li

Period: April 7 - April 20, 2025

Project: Smart Maintenance Platform for Aero Engine Industrial Equipment

Week 3: Database Design and Architecture (April 7-13, 2025)

During this week, I focused on designing the database architecture for our predictive maintenance platform. My specific contributions included:

1. **Database Conceptual Design (April 7-10)**
    - Completed E-R diagram design, establishing four core entities
    - Identified key relationships between entities with appropriate cardinality
    - Defined primary and foreign key constraints for data integrity
    - Established foundational business rules for data validation
2. **Database Logical Design (April 10-13)**
    - Developed relational model with normalized tables:
    - Optimized schema for both transactional and analytical workloads

Time spent: 16 hours

Week 4: Database Implementation and Testing (April 14-20, 2025)

This week was dedicated to implementing the database design and creating integration points:

1. **Database Implementation (April 14-18)**
    - Completed ORM mapping using Java JPA for all entities
    - Implemented features including:
    - Created migration scripts for schema versioning
2. **Database Testing and Documentation (April 18-20)**
    - Developed test cases for database operations
    - Prepared comprehensive database documentation

Time spent: 16 hours

Completed WBS Items

- **3.1 Database Design** (WBS Item, 20 hours) - 100% Complete
- **4.3 Database Implementation** (WBS Item, 15 hours) - 80% Complete

Challenges & Solutions

The primary challenge was designing a database schema that efficiently supports both transactional operations and analytical queries on time-series data. I addressed this by:

1. Implementing a hybrid approach with normalized tables for transactional data and specialized structures for time-series monitoring data
2. Designing appropriate partitioning strategies for historical monitoring data to optimize query performance
3. Creating a flexible schema that can accommodate future sensor types without structural changes

Next Steps

1. Complete remaining transaction management implementation
2. Develop advanced query functionality for analytics
3. Implement data migration utilities for release management
4. Begin integration with backend API services

Total Hours Worked

Total hours for this reporting period: 32 hours