

EECE490 – Backend (Week 1 Summary)

Why Backend The backend is the engine of the system — it runs on the server and handles all invisible operations such as data processing, validation, storage, and report generation. In this project, the backend is responsible for receiving datasets, storing them in a database, generating statistics, managing machine-learning models, and providing an API for the frontend dashboard.

What Was Built (Student 3 – Platform & Ops Lead) - **Database Schema (SQLite)**: Created five tables (users, buildings, cases, tickets, model_versions) to organize user roles, building information, reported cases, issue tickets, and model metadata. - **Dataset Upload & Validation (/upload_dataset)**: Handles CSV upload, verifies required columns, and stores valid rows into the database. Ensures data integrity before analytics. - **Public Stats Endpoint (/public/stats)**: Returns aggregate statistics such as total buildings and estimated anomalies. - **PDF Reporting (/report/pdf/{id})**: Generates inspection reports using ReportLab, listing building details and placeholders for anomaly scores. - **Model Management (/models/upload, /model/activate)**: Uploads and activates trained ML models, allowing the system to track which model is currently active. - **Drift Detection (/drift_report)**: Compares new datasets against the previous one using z-scores to detect distributional shifts. - **Testing & Documentation**: FastAPI auto-generated docs (/docs) and pytest-based endpoint tests verify correct operation and maintainability.

How It All Works 1. **Data Upload**: A CSV file is uploaded, validated, and stored in the database. 2. **Reporting**: Statistics and inspection PDFs are generated from stored data. 3. **Model Lifecycle**: ML models can be uploaded and activated for predictions. 4. **Drift Monitoring**: New data can be compared against historical datasets to check for changes.

Results All Week 1 deliverables were successfully completed. The backend now provides fully functional APIs for data ingestion, reporting, and model management. It has been tested through Swagger UI, confirming that the system correctly ingests 1761 records and returns accurate statistics. This backend forms the foundation for the Equity Analyzer's future integration with ML and frontend components.

Meaning The completed backend represents the brain of the project — managing data, automating reporting, and serving as the central interface for analytics, transparency, and decision-making across the entire system.