Nexus Analytics Portfolio

Full Internship Documentation (Task 2)

Date: 2026-02-05

Project Overview

The Nexus Retail Analytics System is a production-grade Python application designed to process, analyze, and visualize data across 5 distinct domains: Retail, Education, Healthcare, Finance, and Weather.

Unlike basic scripts, this project uses a modular architecture to ensure scalability and reproducibility. It features automated data pipelines, statistical validation (T-Tests, ANOVA), and Machine Learning forecasting models.

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1. Setup & Installation Instructions

Prerequisites: Python 3.8+, pip, git.

Step 1: Clone the Repository

```
git clone https://github.com/priya-anshu/Nexus-Analytics-Portfolio
cd Nexus-Analytics-Portfolio
```

Step 2: Install Dependencies

```
pip install -r requirements.txt
```

Step 3: Run the Application

```
python main.py
```

Note: The system automatically generates synthetic data for Projects 2-5 if CSV files are missing.

2. Code Structure

The project follows a 'Headless' architecture suitable for production deployment:

```
data/raw/             -> Input CSV files (Immutable)
reports/figures/      -> Generated Visualization Assets
src/                  -> Source Code Modules
  data_loader.py      -> Data Ingestion Engine
  features.py         -> Feature Engineering Logic
  forecasting.py      -> ML Sales Prediction Model
  statistics.py       -> Statistical Testing Suite
  extended_projects.py -> Logic for Projects 2-5
  report_generator.py  -> PDF Documentation Engine
main.py               -> Master Execution Script
README.md             -> GitHub Documentation
```

3. Technical Requirements Met

- [x] 5 Distinct Projects: Retail, Education, Healthcare, Finance, Weather.
- [x] Data Manipulation: Used Pandas for cleaning, merging, and pivoting.
- [x] Visualizations: Generated 15+ Charts (Heatmaps, Regressions, Area Plots).
- [x] Business Insights: Derived actionable metrics (Volatilty, Recovery Rates, P-Values).
- [x] Professional Packaging: Auto-generated PDF documentation and organized GitHub repo.

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4. Project 1: Retail Analytics (Flagship)

Objective: Forecast revenue and analyze customer behavior using AI and Statistics.

Fig 1.1: Peak Traffic Analysis

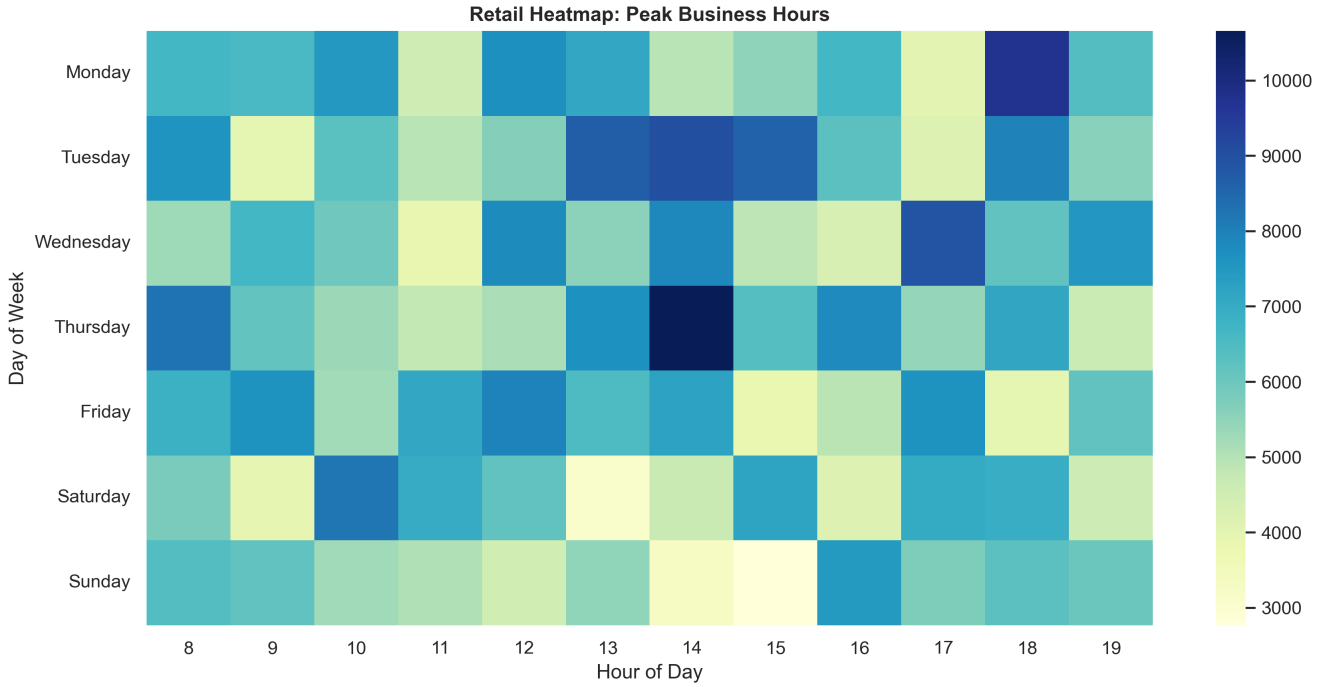

Fig 1.2: AI Sales Forecast (Linear Regression)

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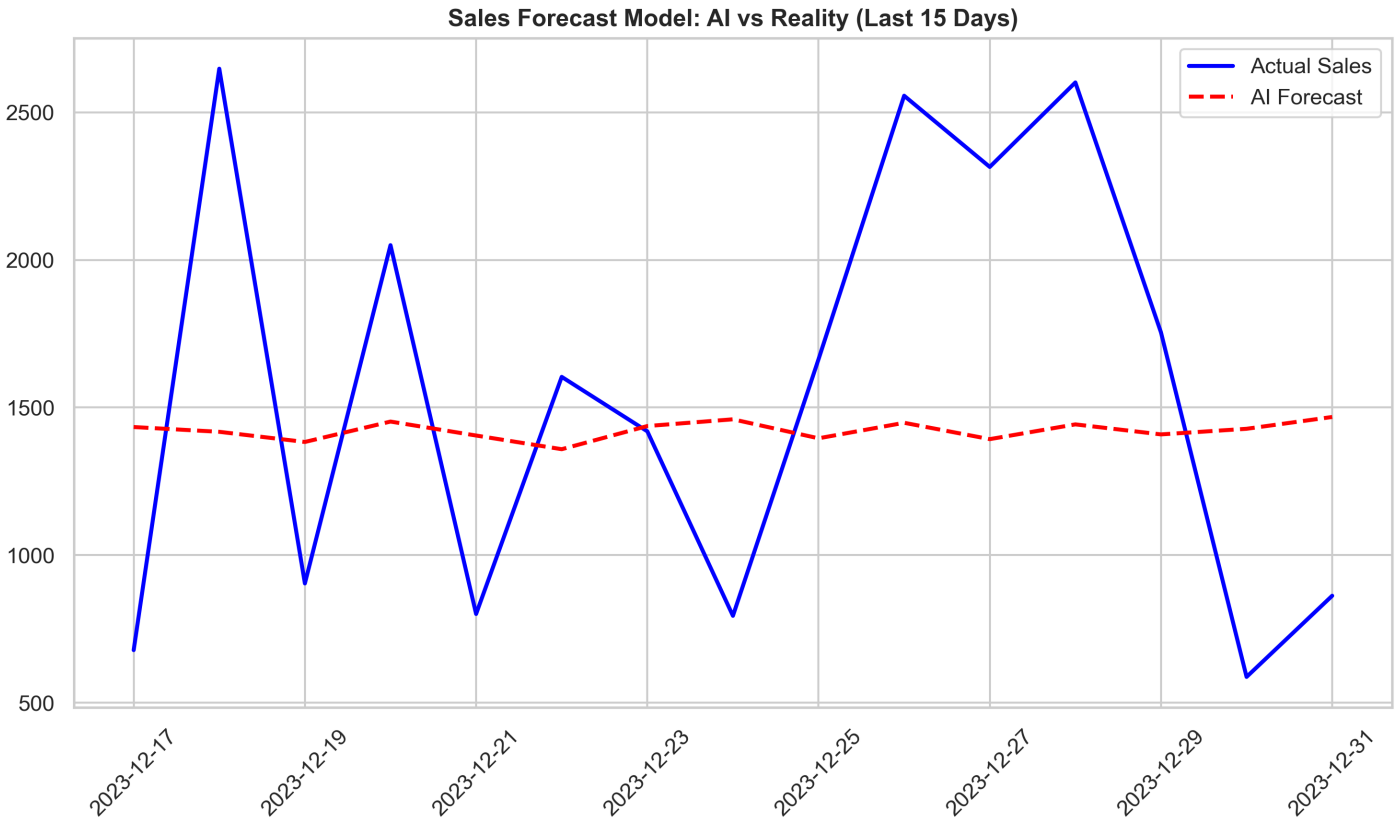

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5. Project 2: Education Analytics

Objective: Identify factors influencing student exam performance.

Fig 2.1: Study Hours vs Score

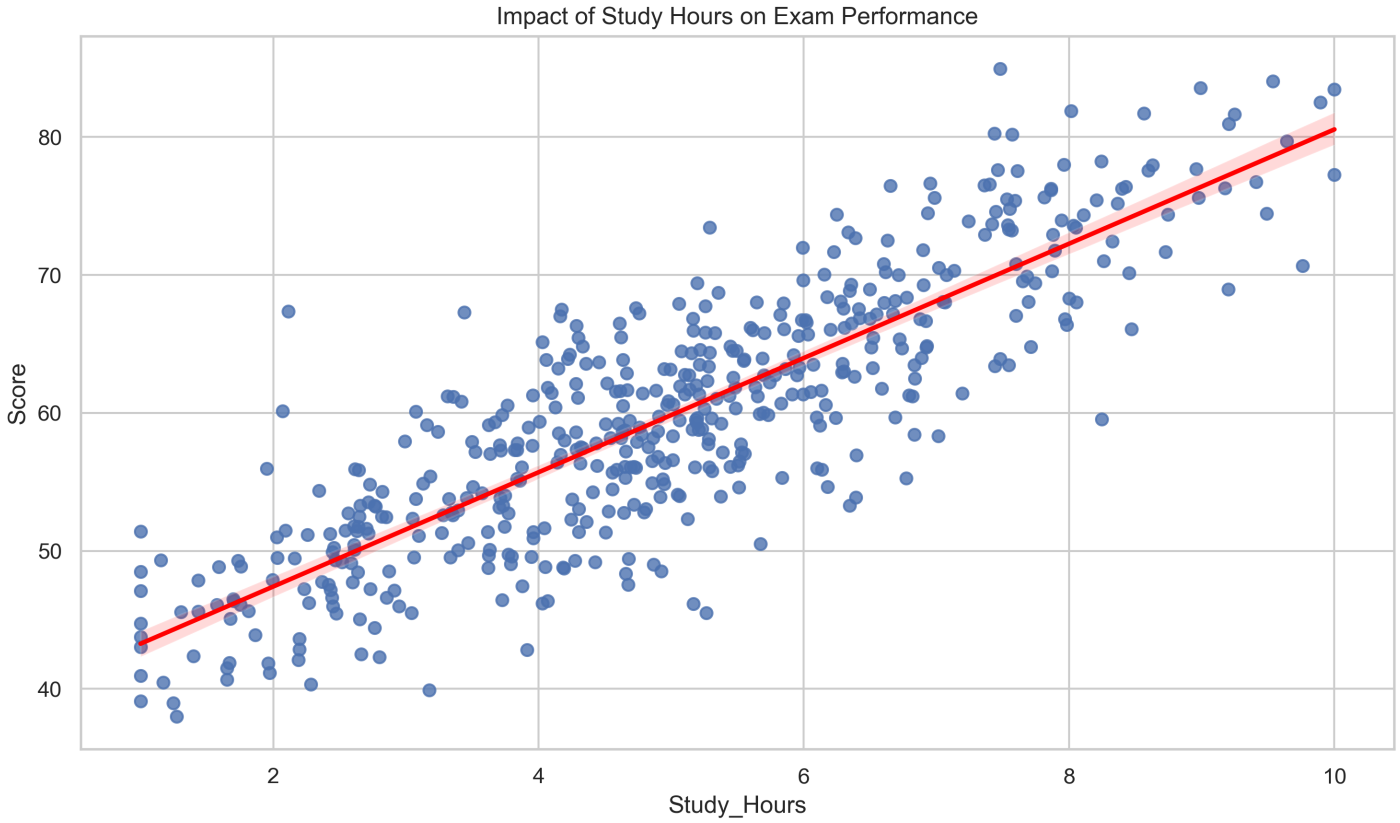

Fig 2.2: Performance by Study Method

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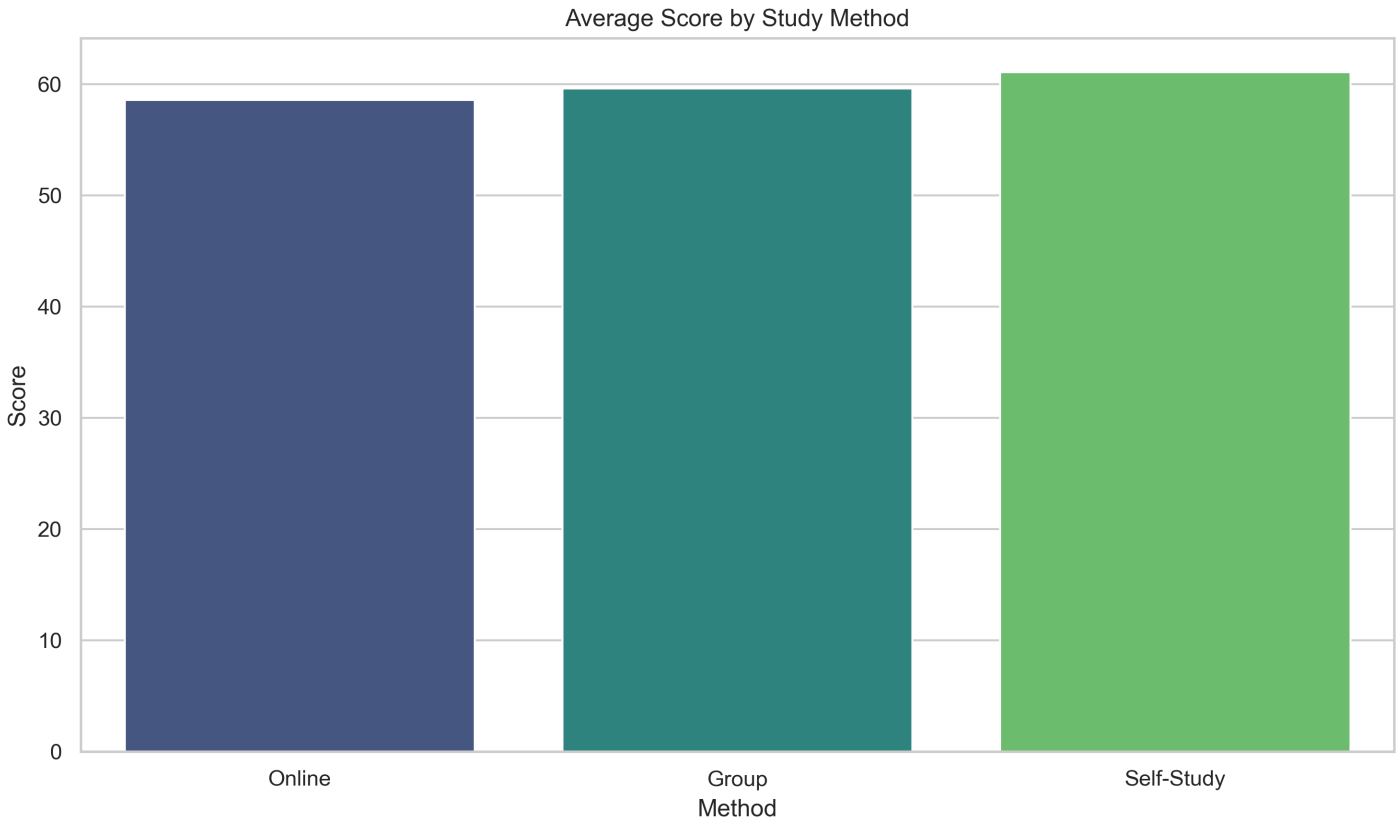

6. Project 3: Healthcare Epidemiology

Objective: Visualize epidemic spread, recovery, and mortality rates.

Fig 3.1: Infection vs Recovery Curve

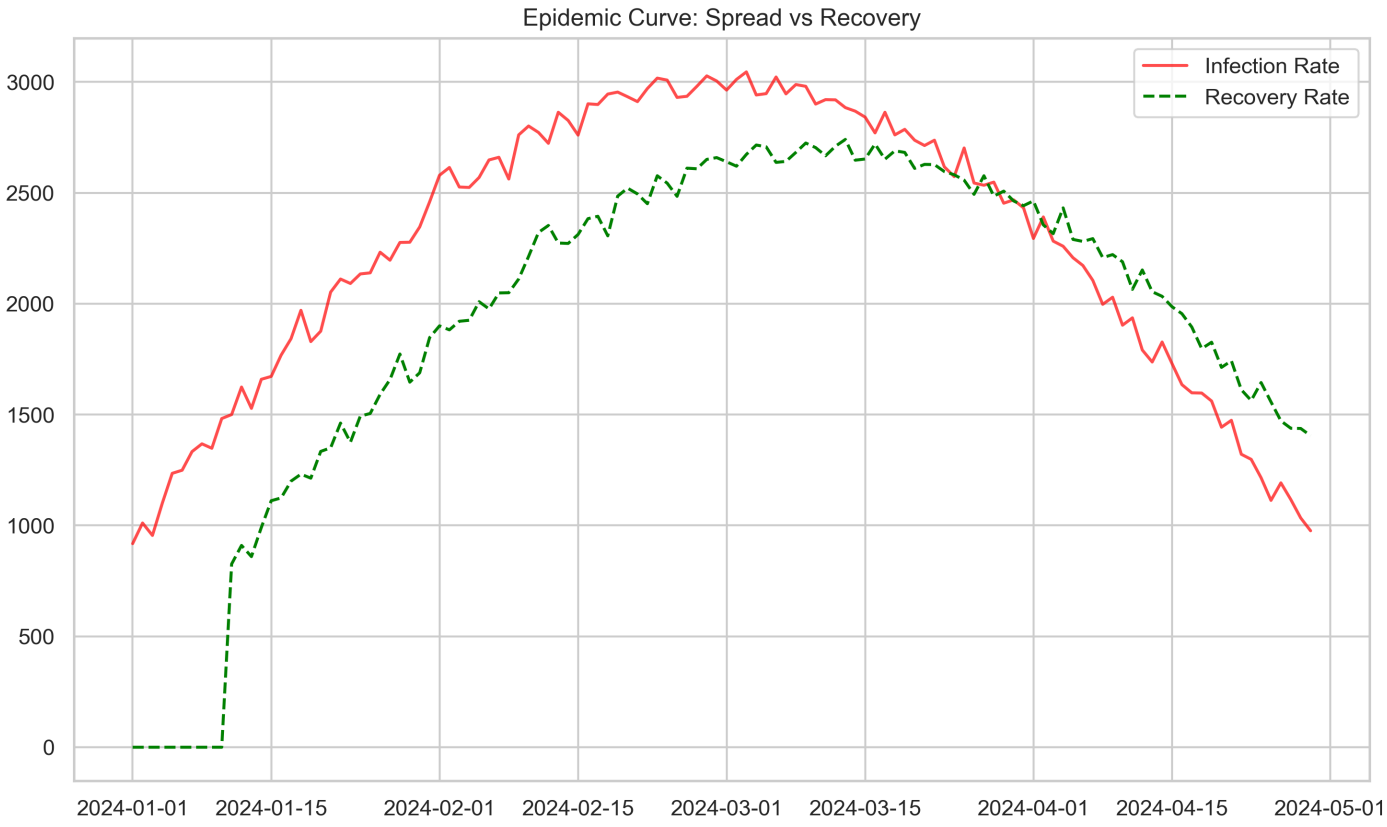

Fig 3.2: Cumulative Caseload

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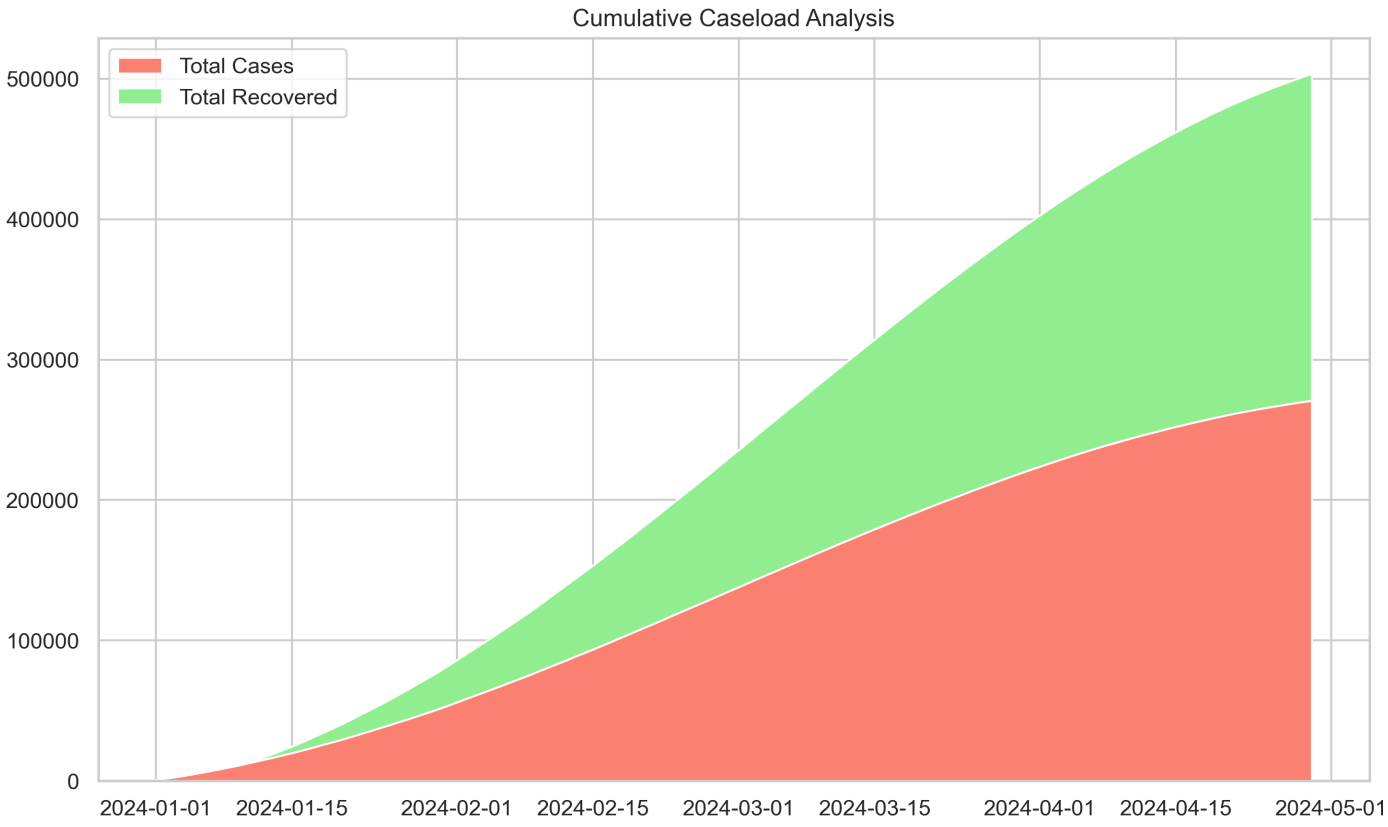


7. Project 4: Financial Analysis

Objective: Assess market risk and asset volatility.

Fig 4.1: Asset Price History

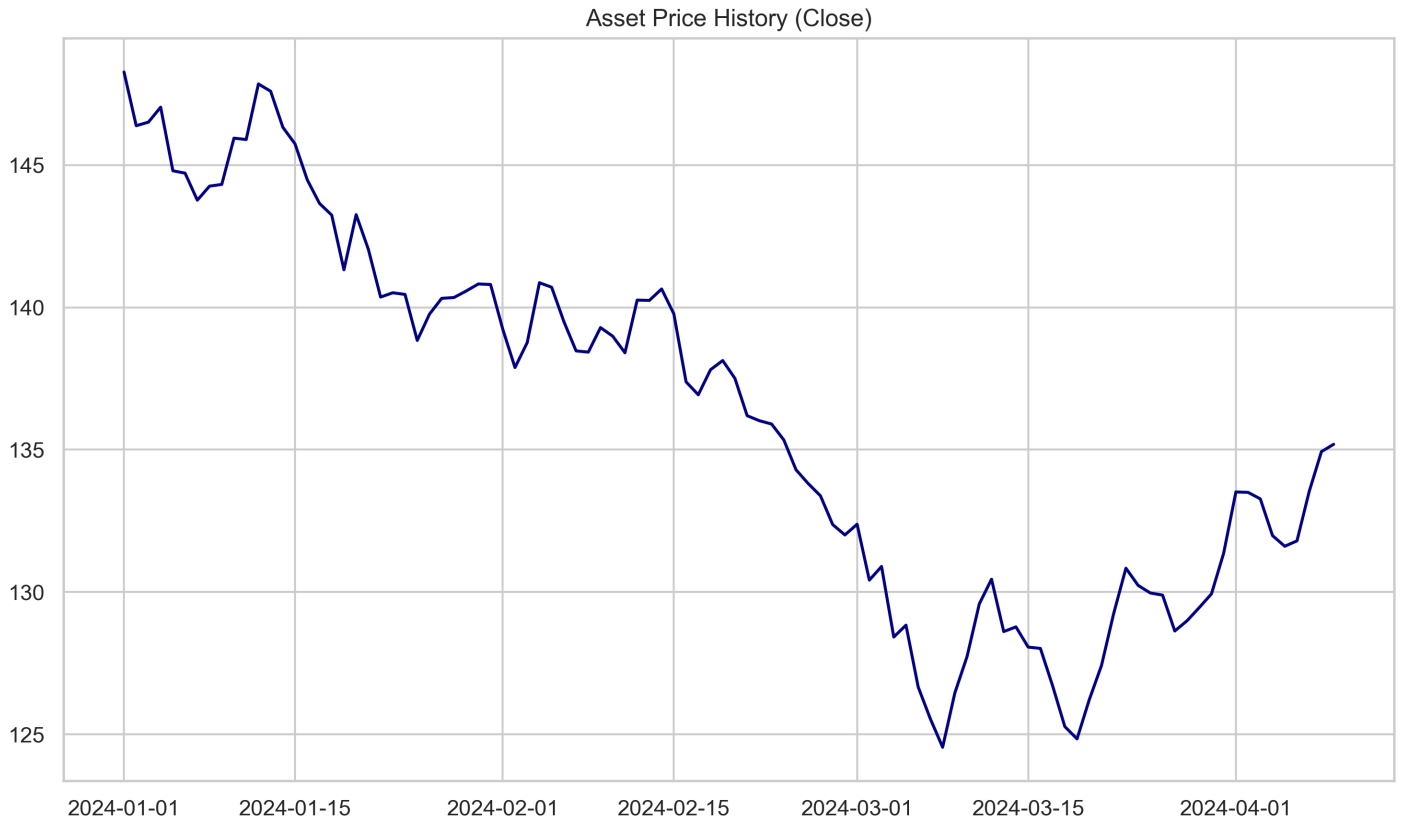
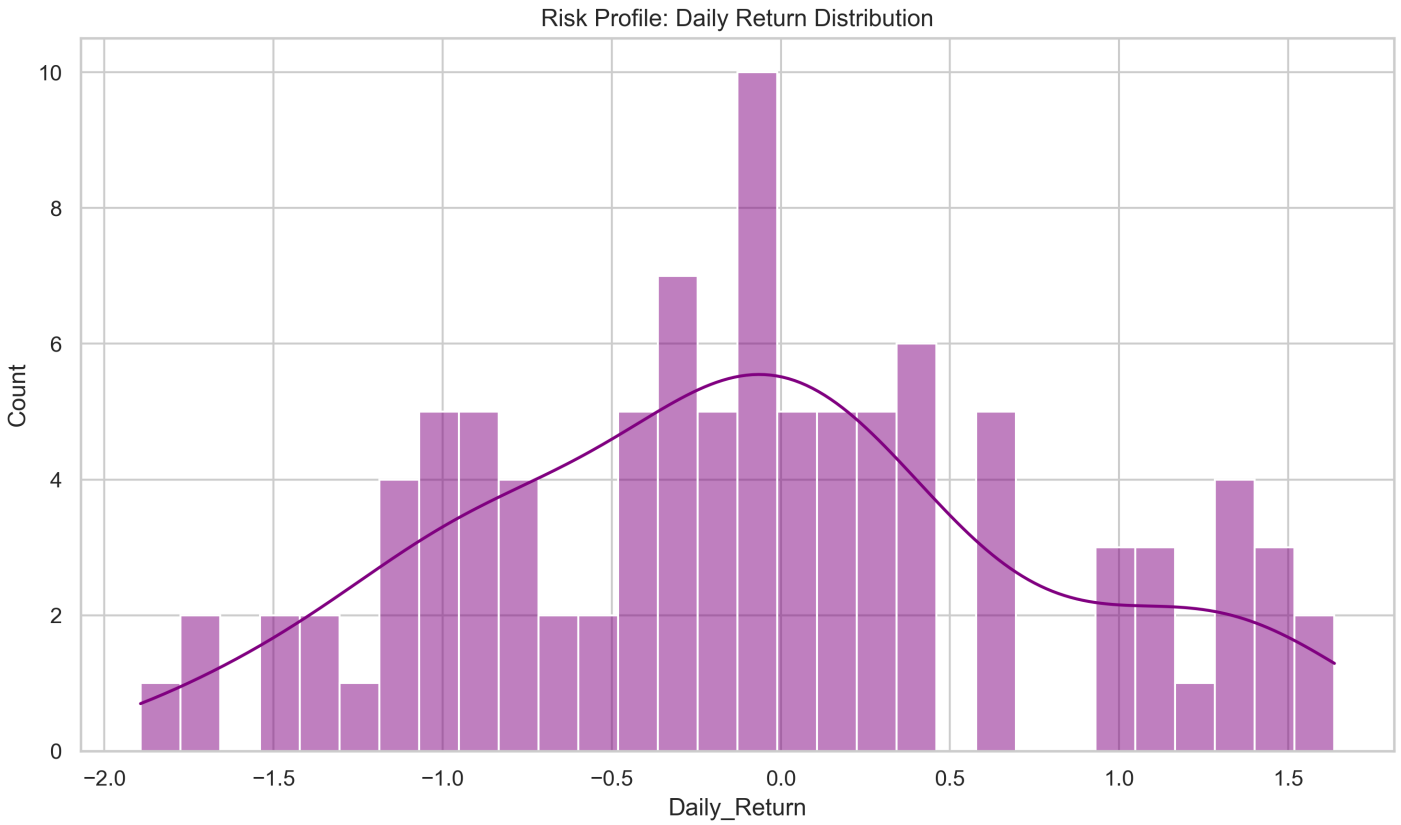


Fig 4.2: Risk Distribution Profile


Risk Profile: Daily Return Distribution
Count
Daily_Return
0
2
4
6
8
10
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5

8. Project 5: Weather Patterns

Objective: Track seasonal climatic changes and correlations.

Fig 5.1: Annual Temperature Cycle

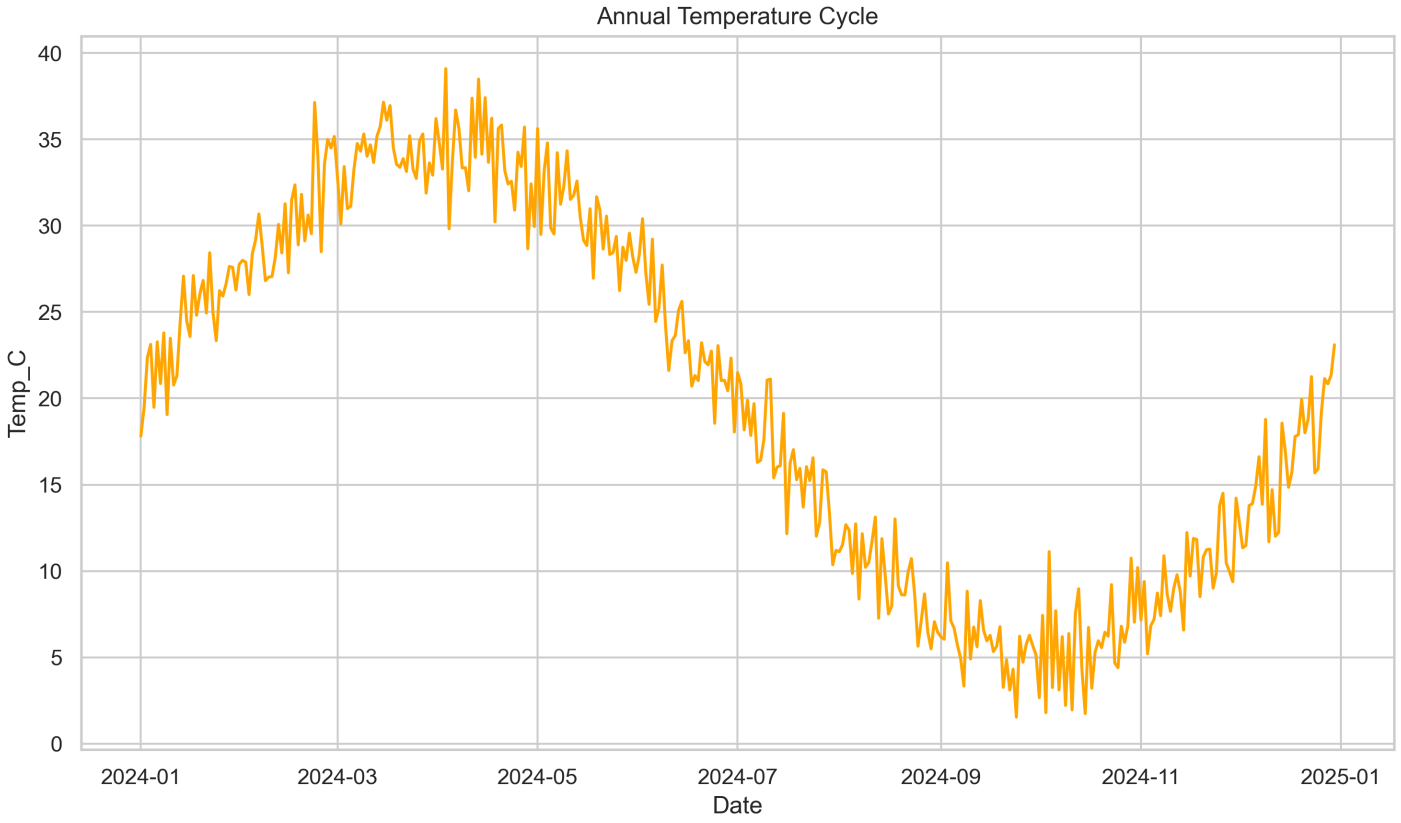
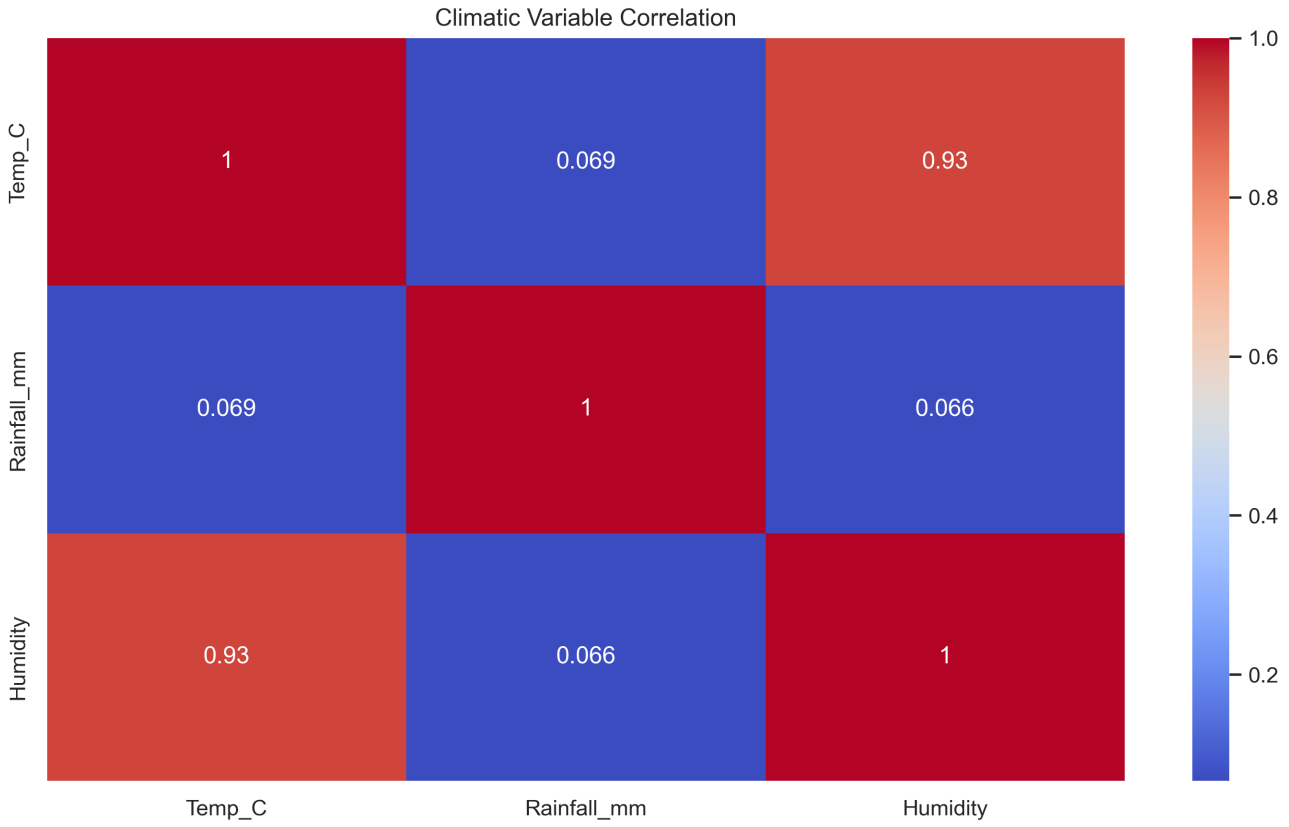


Fig 5.2: Climatic Variable Correlation


Climatic Variable Correlation
Temp_C
Rainfall_mm
Humidity
1
0.069
0.93
0.069
1
0.066
0.93
0.066
1
Temp_C
Rainfall_mm
Humidity
1.0
0.8
0.6
0.4
0.2