**Software Design Documentation**

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| **Product Name** | MediTrack |
| **Date Updated** | 09/25/2025 |
| **Written By** | Samuel Maxey |

**Introduction**

The purpose of this document is to provide a comprehensive overview of the software design for the MediTrack application. This includes the system overview, design considerations, specifications, detailed design, implementation plan, testing plan, and maintenance plan.

**System Overview**

The Medical Insurance Data Analyzer is a Java-based software system designed to process and analyze a medical insurance dataset. The system focuses on extracting meaningful insights from age, BMI, smoking status, region, and medical charges.

MediTrack provides core functionalities including statistical analysis (mean, standard deviation, percentiles), visualization through textual histograms, and hypothesis testing on factors influencing fairness and costs. MediTrack also implements predictive modeling using simple linear regression and correlation analysis.

To ensure software quality, the system incorporates unit testing using the Arrange–Act–Assert (AAA) pattern and integrates with GitHub Actions for. C.I. (continuous integration). The application is modular, extensible, and restricted to Java’s standard libraries and collections making it mobile.

**Design Considerations**

 **Language Restriction**: The system must be implemented in Java only, without external libraries (e.g., NumPy, Pandas, Matplotlib).

 **Data Handling**: Must efficiently store and process records using Java Collections.

 **Scalability**: Design should allow extension for larger datasets and additional analysis features.

 **Testability**: Code must support unit testing with the Arrange–Act–Assert (AAA) pattern.

 **Maintainability**: Clear modular structure to simplify updates and debugging.

 **Integration**: Continuous Integration with GitHub Actions for automated testing and build validation.

**Design Specifications**

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| **Requirement** | **Description** |
| System Components: |  **InsuranceRecord Class**: Represents individual data entries with attributes such as age, sex, BMI, children, smoker status, region, and charges. Provides access methods for retrieving and updating values.   **InsuranceApp (Driver)**: Manages program flow. Responsible for loading input data, presenting menu options, coordinating analysis, and displaying results. |
| Core Functionality: |  **Data Input**: Read the first N records of the dataset into InsuranceRecord objects stored in a Java Collection (e.g., ArrayList).   **Statistical Analysis**: Compute mean, standard deviation, percentiles, and other summary statistics for numerical attributes.   **Visualization**: Generate horizontal and vertical text-based histograms.   **Hypothesis Testing**: Evaluate fairness and relationships (e.g., region vs. charges, smoker vs. non-smoker, age vs. charges).   **Regression & Correlation**: Implement simple linear regression and Pearson correlation on charges with respect to BMI, children, and region. |
| Design Constraints: |  Implementation must use **Java only**, relying on the standard library and Collections framework.   No external dependencies for data processing or visualization. |
| Quality Assurance: |  **Testing**: Unit tests designed with the Arrange–Act–Assert (AAA) method.   **Integration**: GitHub Actions workflow for continuous integration and automated test execution.   **Maintainability**: Modular structure separates data model (InsuranceRecord) from control flow (InsuranceApp). |

**Detailed Design**

The detailed design of the MediTackapplication includes the architecture, database schema, and user interface design. These details can be found in the separate documents provided.

**Implementation Plan**

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| **Task** | **Assigned To** | **Start Date** | **End Date** | **Status** |
| Frontend Development | John Doe | 01/01/2022 | 01/15/2022 | In Progress |
| Backend Development | Jane Smith | 01/10/2022 | 01/31/2022 | Not Started |

**Testing Plan**

**Maintenance Plan**

**Conclusion**

This software design documentation provides a comprehensive overview of the MediTrack application design. It includes the system overview, design considerations, specifications, detailed design, implementation plan, testing plan, and maintenance plan. Any revisions to this document will be recorded below.

**Signatures:**

Project Manager: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lead Developer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Revisions:**

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| --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Description** |
| 1.0 | 09//2025 |  | Initial version |
| 1.1 | 09//2025 |  | Updated implementation plan |
| 1.2 | 09//2025 |  | Updated maintenance plan |