**Project Design Document: Statistical Analysis Library**

**1. Overview** This document outlines the design and implementation of a Tyrone Russ Python-based statistical analysis library. The library provides a structured way to perform common statistical operations on datasets loaded from CSV, JSON, or Excel files.

**2. Objectives**

* Provide a reusable and extensible project class.
* Enable seamless dataset loading and processing.
* Implement commonly used statistical methods for hypothesis testing and outlier detection.
* Allow users to execute statistical functions dynamically.

**3. Class Design**

**Class: Project**

**Attributes:**

* name: (str) Name of the project.
* author: (str) Name of the creator.
* course: (str) Associated course or subject.
* dataset: (pd.DataFrame) Loaded dataset.
* methods: (dict) Dictionary to store statistical methods.

**Methods:**

1. **\_\_init\_\_(name, author, course, dataset\_path=None)**
   * Initializes the project with metadata.
   * Loads dataset if a file path is provided.
   * Registers statistical methods.
2. **get\_summary()**
   * Returns a summary of the project details.
3. **load\_dataset(file\_path)**
   * Supports CSV, JSON, and Excel formats.
   * Loads data into a Pandas DataFrame.
4. **add\_method(name, function)**
   * Registers a new statistical function.
5. **execute\_method(name, \*args, \*\*kwargs)**
   * Dynamically calls a registered method.
6. **\_initialize\_statistical\_methods()**
   * Registers built-in statistical functions.

**4. Statistical Methods**

* **T-Tests**: One-sample, Independent, and Paired
* **Chi-Square Test**: For categorical data analysis
* **ANOVA**: For comparing multiple groups
* **Outlier Detection**:
  + Z-Score method
  + IQR (Interquartile Range) method

**5. Usage Example**

my\_project = Project("Stat Analysis", "Tyrone", "Data Science", "data.csv")

print(my\_project.get\_summary())

print("T-Test Result:", my\_project.execute\_method("t\_test\_one\_sample", "age", 30))

**6. Future Enhancements**

* Add support for additional statistical methods.
* Implement visualization tools using Matplotlib and Seaborn.
* Enable database connectivity for large datasets.