System Requirements Specification

1. **Purpose**

The purpose of this document is to provide all requirements that the Statistical Analysis Tool (SAT) shall meet. The requirements will describe all functions of the SAT. This document will delve into the details of each function of the SAT. Reading this document allows for a better understanding of the development of the SAT for all people involved.

1. **Scope**

The SAT is a statistical analysis tool that allows users to input data and display measurements from center, data dispersion, linear regression/correlation, confidence intervals, and statistical probabilities. All data will be inputted through a java swing GUI and each statistical test can be displayed through a menu on the same interface.

1. **Definitions**

Measurements of Center: Different measurements of where the most data falls

Mean: Average value of the data

Median: Middle value of the data

Mode: Most common value of the data

Measurements of Data Dispersion: Data spread or how the data is stretched or squeezed

Range: Difference between the highest and lowest value of the data

Sample Standard Deviation: Variation in data that is taken from a sample of the data

Population Standard Deviation: Variation in data taken from the entire data

Linear Regression/Correlation: Linear relationships/dependencies between two variables

Least-squares Regression: Best fit line given two data sets

Residuals: Difference between observed and predicted value of data

r2 : Measure of how close data is to the regression line

Confidence Interval: Certainty of how close the mean is to the true population

Population Mean: Actual mean of the data

Z critical value: measures of standard deviation on the data

t critical value: Size of the difference relative to the sample of data

p critical value: probability that the test statistic is right given the null hypothesis

Statistical Probability:

Binomial Probability: Probability that a number of success is achieved given two outcomes

Probability Addition: Adding probabilities together

Conditional Probability: Probability of an event happening given other events happen

1. **Overview of document**

The remaining sections of this document shows the general description, specific requirements, and references. The general description will discuss about what will be displayed on the GUI produced by SAT. The specific requirements will be split in the functional and non-functional requirements of SAT. Functional and non-functional requirements will be split further into smaller sections that share relationships with each other. Finally, we will show the references we used to create this document.

1. **General description**

The SAT GUI takes in data for each statistical test and then displays the result after running each separate test.

Each test has its own tab on the GUI and to enter data a keyboard is used. The GUI will have tabs that follows:

**Measure center:**

Mean

Median

Mode

**Measure Data Stats:**

Range

Sample Standard Deviation

Population Standard Deviation

**Data Set Functions:**

Least squares regression

Residuals

r2

Population Mean

Z,t,p critical value

**Statistical Probability**

Binomial Probability

Probability Addition

Conditional Probability

**Statistical Glossary**

**Syntax Glossary**

The GUI will display each corresponding page and be able to do each separate test on the page.

One tabs that have each specific test the GUI will ask for data needed to be inputted and will show the result of the test. The statistical glossary tab will show the definitions of various terms that are displayed from the GUI that are hard to understand without background knowledge of statistics. Similarly the syntax glossary will show the syntax required when inputting data for each different test.

1. **Specific Requirements**
   1. **Functional Requirements**
      1. **Measurement of Centrality**
         1. SAT shall correctly calculate the mean of a data set and display it to the user.
         2. SAT shall correctly calculate the median of a data set and display it to the user.
         3. SAT shall correctly calculate the mode of a data set and display it to the user.
      2. **Measurement of Dispersion**
         1. SAT shall correctly calculate the minimum of a data set and display it to the user.
         2. SAT shall correctly calculate the maximum of a data set and display it to the user.
         3. SAT shall correctly calculate the range of a data set and display it to the user.
         4. SAT shall correctly calculate the sample standard deviation of a data set and display it to the user.
         5. SAT shall correctly calculate the population standard deviation of a data set and display it to the user.
      3. **Linear Regression and Correlation** 
         1. SAT shall correctly calculate the outliers of a data set and display it to the user.
         2. SAT shall correctly calculate least-squares regression of a data set and display it to the user.
         3. SAT shall correctly calculate the residuals of a data set and display it to the user.
         4. SAT shall correctly calculate the r2 value of a data set and display it to the user.
      4. **Confidence Intervals**
         1. SAT shall correctly calculate the population mean of a data set and display it to the user.
         2. SAT shall correctly calculate *z* critical values from a data set and display it to the user.
         3. SAT shall correctly calculate *t* critical values from a data set and display it to the user.
         4. SAT shall correctly calculate *p* critical values from a data set and display it to the user.
         5. SAT shall correctly calculate the margin of error from a data set and display it to the user.
      5. **Statistical probabilities**
         1. SAT shall correctly calculate the binomial probability of a data set and display it to the user.
         2. SAT shall correctly calculate probability addition, the rule of addition, of a data set and display it to the user.
         3. SAT shall correctly calculate probability multiplication, the rule of multiplication, of a data set and display it to the user.
         4. SAT saal correctly calculate the probability subtraction, the rule of subtraction, of a data set and display it to the user.
         5. SAT shall correctly calculate the conditional probability of a data set and display it to the user.
      6. **Statistical Glossary**
         1. SAT shall have an index of all statistical formulas it supports.
         2. SAT shall provide a search bar to search for specific formulas.
         3. SAT shall have an index that contains a list of statistical terminology and its definition.
         4. SAT shall provide a description of what each formula does and is for.
         5. SAT shall provide a description of what each variable in the formula stands for and what it means.
      7. **Calculator Input Correction**
         1. SAT shall prompt the user to change their input when the user provides SAT with an input resulting in the division of zero.
         2. SAT shall prompt the user to change their input when the user provides SAT with an input resulting in imaginary numbers.
         3. SAT shall prompt the user to change their input when the user provides SAT with an input that doesn't make logical sense for the calculation.
   2. **Non-Functional Requirements**
      1. **User Interface**
         1. SAT shall be developed in java.
         2. The interface shall be provided by the intelliJ terminal.
         3. The interface shall be a collection of different menus navigated by user input of commands.
         4. The GUI shall be developed with the java swing framework.
         5. The GUI shall have a similar look and feel between pages.
         6. The GUI shall have a toolbar along the top of the window.
         7. The toolbar shall consist of tabs which direct to different pages of SAT.
         8. The user shall be able to select a formula from the index and use that formula to calculate their data.
      2. **Data Collection**
         1. The user shall be able to create tables or list to store data separate of the normal statistics calculator.
         2. SAT shall be able to accept the input of data points/collections into the lists and tables.
         3. The user shall be able to select data sets and perform statistical calculations on it.
         4. The user shall be able to add notes about the data in the data sets
         5. SAT shall be able to perform small calculations, mean, media, mode, and range on data sets outside of the calculator section.
      3. **Data Comparison and Analysis**
         1. The user shall be able to compare the mean between different data sets.
         2. The user shall be able to compare the median between different data sets.
         3. The user shall be able to compare the mode between different data sets.
         4. The user shall be able to compare the range between different data sets.
         5. The user shall be able to compare the outlier between different data sets.
         6. The user shall be able to select which aspects of what to compare between data sets by selecting aspects from a GUI dropdown menu.
      4. **Google Drive API - reading/writing to google drive**
         1. SAT shall be able to interface with google drive api.
         2. SAT shall be able to write to a google sheet in google drive.
         3. SAT shall be able to read from a google sheet in google drive.
      5. **Jexcel api - reading/writing to microsoft excel sheets**
         1. The shall be able to interface with microsoft excel sheets.
         2. SAT shall be able to read data from a microsoft excel file.
         3. SAT shall be able to write data to a microsoft excel file.
      6. **Data Storage and access**
         1. SAT shall only except microsoft excel or google sheets files.
         2. The user shall be able to create a new directory, or file, to read from and write to on the harddrive.
         3. The user shall be able to create a new folder, or document, to read from and write to in google drive.
         4. The user shall be able to decide where files are stored.
         5. The user shall be able to select which files are read into the data table.
         6. The GUI shall alert the user if the file was unable to be read from or written to.
      7. **Data Output**
         1. SAT shall output the result of a calculation with the result, the results variable, and interpretation of the result if applicable.
         2. SAT shall output an error page if an error/exception occurs.
2. **References**

4.1 SRS Example - Atef.doc

4.2 SRS Example - e-Store.doc

4.3 SRS Example - WebApp.doc

4.4 SRS Example.docx