Software Requirments Document (SRD)



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# 1 Project Overview

* Context

Students entering into a first-semester probability and statistics course are often required to perform complex operations using the statistical command-line library of R. Students are also often required to format their homework neatly using the LaTeX framework. Both R and LaTeX are cumbersome hurdles that certain students have difficulty getting over to even be able to grasp the content of the course. This application is intended to eliminate the need for students to learn LaTeX and R as in depth, offering them a graphical interface to do the same sorts of things.

* Application

The application gives the user a simplistic graphical interface that allows them to perform complex statistical calculations. Problem sets can be created, solved, and exported to a neatly formatted Portable Document Format (PDF) file. Problem sets can be created easily using the simple graphical wizard for a new problem. Calculations can easily be made by dragging and dropping statistical commands onto the user’s data set, and the solutions to those calculations can be tied back to certain parts of the problem. To the average user, the complex calculations and exporting code will not be shown, but this code will be available at the request of a more advanced user.

* User(s)

The program is specifically targeted for students in their first-semester of a probability and statistics course. The scope could reach beyond students to anyone needing rudimentary functionality for simple probability and statistics equations, specifically if the user is seeking a simple graphical interface and not wanting to work with the command-line environment of R.

* Purpose

To eliminate the LaTeX and R learning curve from a first-semester probability and statistics course, and to provide an ease-of-use graphical interface for R that allows users to manipulate a drag-and-drop interface to perform complex statistics calculations in a simple manner.

# 2 Requirements

## Guidance Requirements

* The application shall be programmed in Java.
* The application shall use R and LaTeX as both a middle layer (for exports to PDF) and an end result (for exports to R).
* The application shall use Sweave to perform R interactions within exported LaTeX code.
* The application shall remove any code-based learning curve for first-semester statistics students.
* The application shall not implement any statistical calculations, but shall make the appropriate calls to R, which shall do them for the application.

## Interface Requirements

* The application shall have a simplistic, drag-and-drop interface.
* Components in the workspace shall interact with each other and will be movable and reconnectable.
* Components shall snap together when allowed.
* The application shall allow the user to enter data in a clean, graphical manner.
* Users shall be able to construct an entire problem via the New Problem Wizard, which will start their workspace for them.
* Users shall be able to right-click on individual components to edit the individual component or group it is connected to.
* Users shall be able to tie a group of components (and their solution) to a given problem or subproblem (specified through the New Problem Wizard).
* Users shall be able to load and save workspaces.

## Functional Requirements

* The application shall be able to produce PDF output, preferably through LaTeX.
* The application shall be able to receive data response from R.
* The user shall be able to specify assumptions for the statistical data.
* The application shall notify the user if assumptions are violated, but shall allow the user to continue.
* The user shall be able to export R commands for a specific block.
* The user shall be able to export LaTeX code for a specific block.
* The application shall allow the user to perform, at a minimum, T-Test, ANOVA, and basic statistical commands.

# 3 Theoretical Interaction

## Creating the Problem

* The user shall be able to select File->New Problem.
* A New Problem Wizard shall appear.
* The New Problem Wizard shall allow the user to enter the question of the problem and the user’s data.
* The user’s data in the New Problem Wizard may be represented in several different ways, so the Wizard will need to accommodate the different types of potential data.
* The user shall be allowed to import properly formatted data from a CSV file.
* The user shall be allowed to edit the data in the New Problem Wizard.

## Solving the Problem

* When the New Problem Wizard completes, the user shall be shown a new, empty workspace that contains a visual component that is their Data Block(s).
* The New Problem Wizard shall allow the user to specify sections of the problem (or sub-problems) that shall be answered in the workspace. For instance, Part A, Part B, etc.
* There shall be a pane on the side of the screen that will house a set of statistical operations that the user can drag-and-drop into the workspace to interact with the Data Block(s).
* The user shall be able to double-click on the Data Block(s) to open an editor window to update the data.
* The user shall be able to right-click on the Data Block(s) or specific commands to be given the R commands or LaTeX code for that block or command.
* The user shall be able to group commands together to indicate their solution is the answer to Part A of the problem.
* The user shall be able to export the entire problem as a PDF file through LaTeX commands. The user shall be given the option to review the LaTeX code.

## Saving and Restoring the Problem

* If a user needs to exit the application and come back at a later time, they may select File->Save or File->Save As to save
* Workspaces shall be saved in an XML format, specifying components used, their affiliations, and their coordinates in the workspace.
* The user shall be able to select File->Open to load a previous workspace.

# 4 Validation Criteria

* For coding efficiency and correctness, extensive JUnit testing will be implemented. 75% code coverage for testing is required.
* For user-interaction testing, our team will extensively test individual components in as many ways as possible.
* Additional testing will be done through releasing our beta software to Professor Schumacher for student use in statistical courses.
  + From these tests, information will be gathered, bugs will be fixed, and new suggested features may be implemented.
  + Most importantly, any implementation that is unclear to the average person (specifically those in Professor Schumacher’s classes) will be fixed at the highest priority.