

College Sign Statistics Calculator

Scrumdog Millionaires

February 11, 2025

Overview

The **College Sign Statistics Calculator** is a Python-based simulation and analysis tool designed to evaluate the effectiveness of sign displays in a college environment. The application leverages a modular architecture, integrating a graphical user interface (GUI) with simulation logic, data processing, and reporting. Its primary purpose is to simulate how students—attending on varying schedules—interact with a series of signs and to compute statistics on sign viewership.

1. Key Components

1.1. Graphical User Interface (GUI)

- **Framework:** Built using Tkinter.
- **Features:**
 - **Input Fields:** Users can specify simulation parameters such as the number of students, car speed, sign display time, and the number of signs.
 - **Output Displays:** Results are shown in multiple text areas, each corresponding to different student attendance types (from one-day to five-day attendees).
 - **Background and Layout:** A customized background image and organized layout ensure an intuitive user experience.
- **Workflow:** Upon clicking the “Submit” button, the application:
 1. Gathers input data.
 2. Runs the simulation.
 3. Writes the results to a CSV file.
 4. Displays aggregated statistics (such as average view times and viewership percentages) in the GUI.

1.2. Simulation Engine

- **Student Modeling:**
 - **Base and Derived Classes:** A base `Student` class and several child classes (`OneDayStudent`, `TwoDayStudent`, `ThreeDayStudent`, `FourDayStudent`, and `FiveDayStudent`) represent students with different attendance patterns.

- **Attributes:** Each student is assigned a random travel speed (which influences the viewing time), a unique identifier, and a schedule indicating attendance on weekdays.
- **Sign Management:**
 - **Circular Linked List:** Signs are managed using a circular linked list that rotates and, optionally, randomizes the order of sign display.
 - **Sign Attributes:** Each sign is identified by an index and associated with a fixed display duration.
- **Processing System:**
 - **SignProcessingSystem Class:** This core component simulates how each student interacts with the rotating signs over a five-day week.
 - **Mechanism:** For each day, the system processes a queue of attending students. As a student’s available viewing time is consumed, the system rotates through the signs and updates each student’s cumulative viewership statistics.

1.3. Data Management and Reporting

- **CSV Database Module:**
 - **Exporting Data:** The simulation results (detailed per-student viewership records) are written to a CSV file for persistent storage.
 - **Statistical Analysis:** Functions compute the average time each sign is viewed and the percentage of signs that meet a specified visibility criterion (e.g., viewed for more than 4 seconds) for each student attendance group.
- **Reporting:** Aggregated results and statistics are both saved in the CSV file and displayed within the GUI, offering insights into sign effectiveness and student engagement.

2. How It Works

1. User Input and Configuration:

The user sets simulation parameters through the GUI (e.g., number of students, sign display duration). These parameters control the creation of student instances and the sign display cycle.

2. Simulation Execution:

- **Student Creation:** A random assortment of student objects is generated, each assigned a specific attendance schedule.
- **Sign Initialization:** A circular linked list is populated with sign objects; the order of signs may be randomized.
- **Student-Sign Interaction:** Over the week (Monday to Friday), each student’s available viewing time is allocated among the signs. The simulation tracks the duration each student views every sign.

3. Data Aggregation and Analysis:

- **Recording:** Detailed viewership statistics are collected and stored as dictionaries.
- **CSV Export:** The data is written to a CSV file for further analysis.
- **Statistical Computation:** The application computes average viewing times per sign and the percentage of signs adequately viewed by each student group (categorized by the number of days attended).

4. Result Presentation:

The computed statistics are displayed in the GUI across five dedicated text fields, each corresponding to a different student attendance profile. This allows users to compare sign effectiveness across varying levels of student engagement.

3. Conclusion

The College Sign Statistics Calculator serves as a comprehensive simulation tool for analyzing sign display performance in a college setting. By integrating a user-friendly GUI, a robust simulation engine, and detailed data analysis capabilities, the application offers valuable insights into student engagement with digital signage. This tool not only aids in understanding viewing behavior but also has potential applications in optimizing advertising strategies and enhancing communication effectiveness in academic environments.