# College Audit

## Visualization Tool for Personalized University Recommendations

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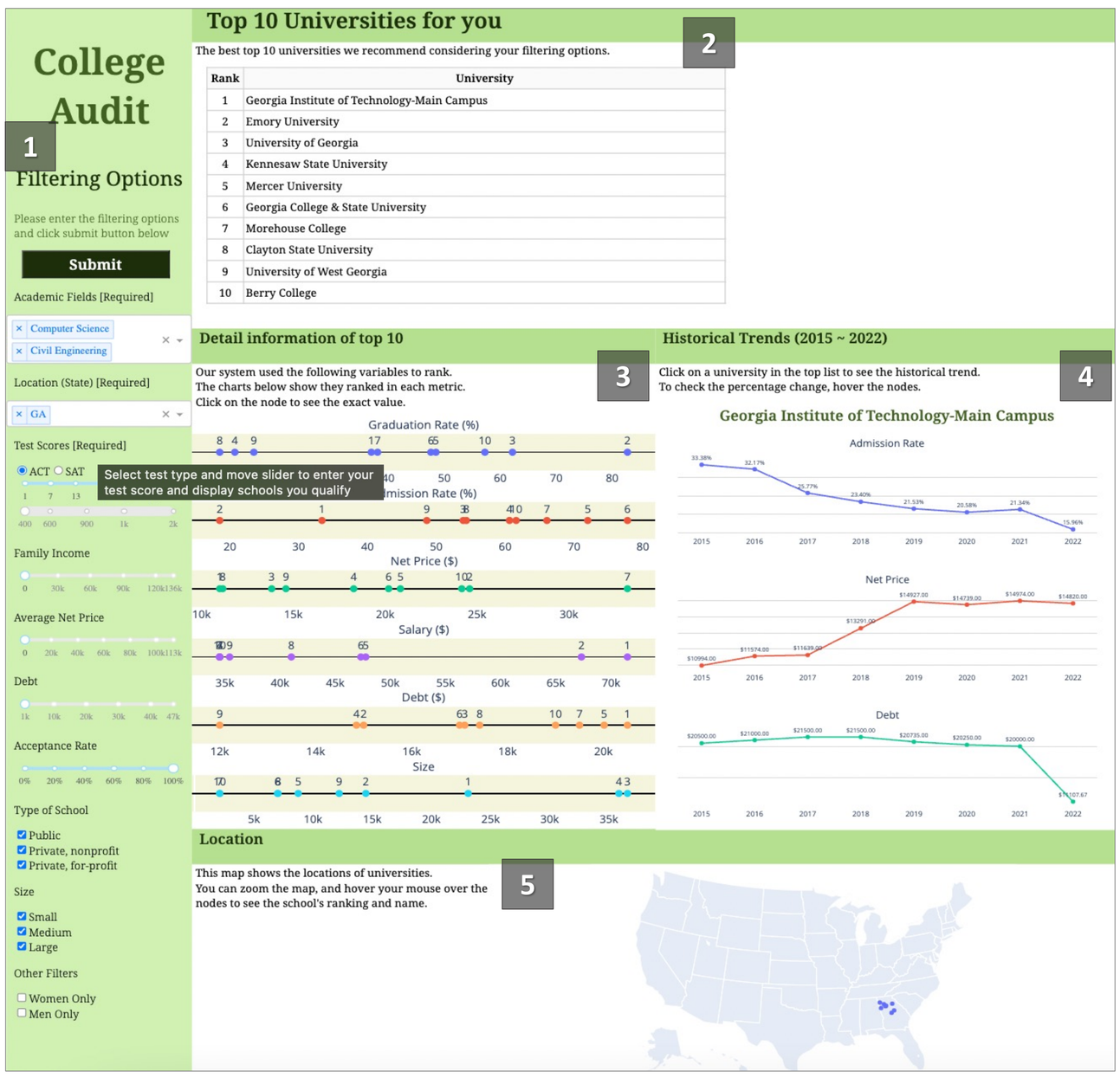
## *Introduction:*

**College Audit** addresses the issues of increasing student debt and dropout rates with a unique dashboard, offering multifaceted information beyond traditional search tools. This innovation aids in informed college decision-making, particularly benefiting first-generation and non-traditional students, and aims to mitigate the long-term effects of student debt on mental and financial health.

## *Data*

Data was downloaded from the College Scorecard site (1.44 GB), which is a government-sponsored aggregation of most publicly-available university data. The contents are primarily time-series data with yearly information about universities and fields of study in the United States.

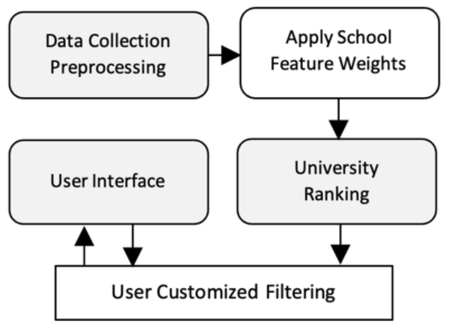
## *User Interface*




## *Model Approaches*

1 *LightGBM, a Python gradient boosting algorithm*
2 Graduation Rate, Net Price, Acceptance Rate, Salary, Debt, Size

Our university ranking model is operated by **gradient boosting**[1] that is powerful in improving prediction accuracy and robustness of regression models while handling large datasets with memory efficiency. To build the model we first assign weights to specific features[2] which will allow us to compute university scores and rank them according to their predicted scores. The model generates predictions based on the actual scores, and we rank them in descending order to use in the UI. Our novel model creates a **universal ranked list** of all universities, eliminating the repeated rankings for each user. It efficiently applies personalized filters based on user information to address student debt and dropout concerns.




Dashboard is developed using '*Dash*', '*Plotly*' Python packages.

### How it works

**1 Filtering Options:**
Users specify their selection criteria. Academic fields, state location, and test scores are mandatory parameters, while additional criteria are optional. (Specific information is displayed by a tooltip for each criteria)

**2 Top 10 Best Colleges List:**
Based on the entered criteria, this section displays a curated list of the top ten universities.

**3 Detailed Information:**
Users explore in-depth information about university, including how they fare against the ranking variables.

**5 Location Information:**
The map section provides detailed geographical information about each listed university.

**4 Historical Trends:**
By selecting a university from the list, users can view historical data on admission rates, net prices, and debt levels.

### Intuition and Novelty of College Audit

1. Unified View: Multi-faceted information in a single display
2. Offering Time Series Data : Enables users to form realistic expectations about admission rates, cost, and debt
3. Presenting Information on the Primary Reasons for Dropout : Enables users to make informed decision about application

## *Experiments and Results*

3 MAE = 82.05, RMSE = 412.08, R-squared = 0.9822

**Scalability Evaluation**:
The model is evaluated by various performance metrics[3] to measure the differences between the predicted and actual scores. Despite a couple of outliers present on the scatterplot in the right figure, the performance show that our model executed decently with an R-squared value of 0.9822.




The scatterplot displaying the actual and predicted scores of each university

**Runtime & Accuracy:**
Overall, our runtime was comparable to the College Scorecard, on average about half a second faster. Accuracy of a model like this is somewhat difficult to measure, but we determined that differences in the results were due to our model being weighted toward accurate responses for non-traditional and low-income students.

**User Study:**
We conducted a trial with 21 participants to evaluate the usability, effectiveness, and marketability of College Audit, collecting feedback through a questionnaire. Among the participants:

- 76.2% indicated that College Audit is intuitively easy to use.
- Two-thirds expressed a likelihood to recommend College Audit to others.
- Most appreciated the simplicity and ease of use of the UI

Summary of ratings received is tabulated below.

| Questions | 1 (Extremely Dissatisfied) | 2 (Dissatisfied) | 3 (Neutral) | 4 (Satisfied) | 5 (Extremely Satisfied) |
|---|---|---|---|---|---|
| 1. Usability and functionality of College Audit | 0 | 0 | 7 | 9 | 5 |
| 2. Accuracy of the results from College Audit | 0 | 1 | 5 | 11 | 4 |
| 3. Intuitive ease of using College Audit | 1 | 2 | 2 | 8 | 8 |
| 4. User Interface design of College Audit | 0 | 4 | 9 | 5 | 3 |
| 5. Runtime of College Audit | 0 | 0 | 4 | 6 | 11 |

The table displaying the analysis of user study (survey) on College Audit