

CSC422 Fall 2025 - Project Final Report

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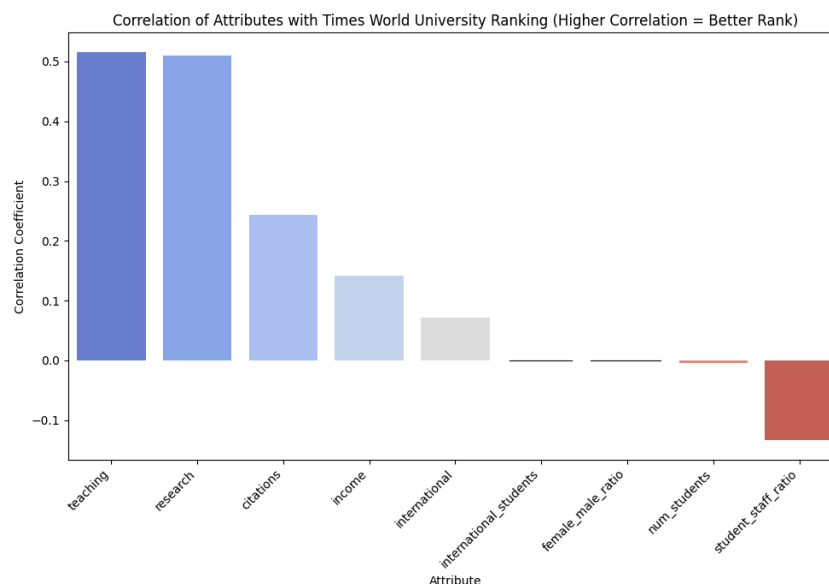
Our Goal:

- Our goal for this project was to show universities which factors correlate the most to overall ranking
- Our original plan was to combine three datasets into one by averaging them
- We ultimately decided this was not an effective way to visualize the data as the three datasets use very different metrics for ranking and could not be averaged effectively
- So for each dataset, we will discuss which factors correlate the most to a university's overall ranking

Link to Google Colab Project:

<https://colab.research.google.com/drive/1jnbIIZLqBXSkYvhqh19XEzYVDxerWY1I?usp=sharing>

- **Times Higher Education World University Ranking:**



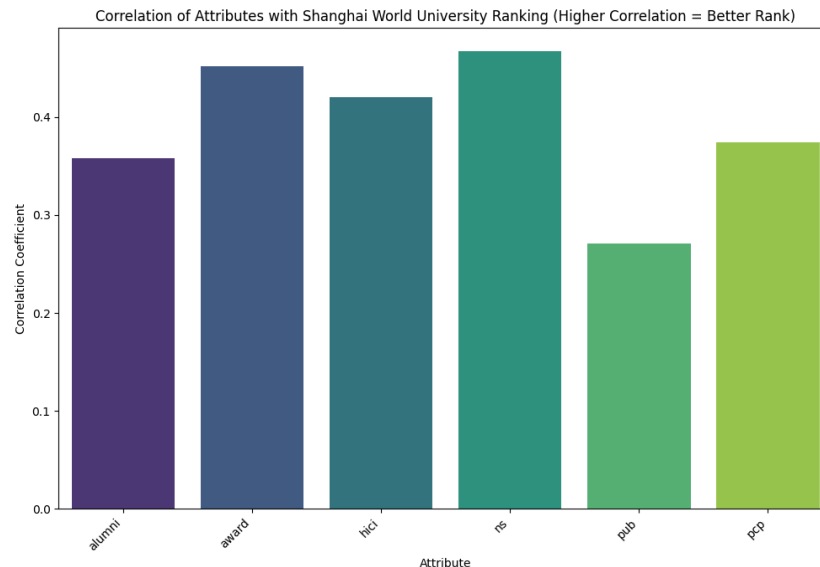
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- **Scoring System:**

- **Teaching:** Quality of teaching environment
- **Research:** Productivity & reputation
- **Citations:** Research impact
- **Income:** Industry collaboration strength
- **International:** Global engagement
- **International Students:** Number of international students
- **Female-Male Ratio:** Ratio of females to males
- **Num Students:** Total number of students

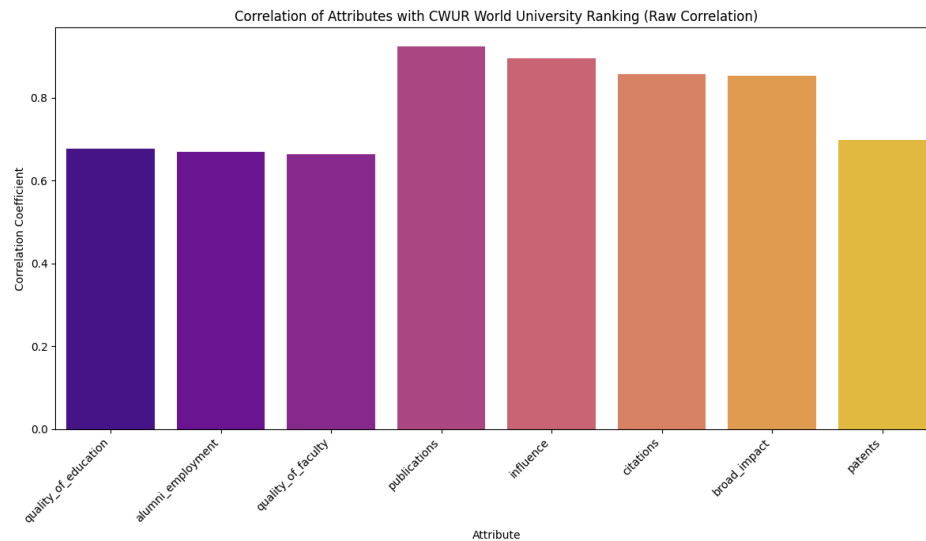
- **Student-Staff Ratio:** Ratio of students to staff
- **Findings (Correlation of attributes to overall ranking):**
 - **Teaching & Research:** Strong positive correlation
 - **Citations:** Moderate positive correlation
 - **Industry income, International:** Weak positive correlation
 - **International students, Female-Male, Num students:** No correlation
 - **Student-Staff ratio:** Negative correlation

- **Academic Ranking of World Universities (Shanghai Ranking)**



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- **Scoring System:** The top university is given a score of 100. Every other university is then scored as a percentage of the top score.
 - **Alumni Score:** Number of alumni who have won nobel prizes or fields medals
 - **Award Score:** Number of staff who have won nobel prizes or fields medals
 - **HiCi Score:** Number of Highly Cited Researchers selected by Thomson Reuters
 - **N&S Score:** Number of papers published in Nature and Science
 - **PUB Score:** Number of articles indexed in Science Citation Index - Expanded and Social Sciences Citation Index
 - **PCP Score:** A university's academic performance per capita. It is calculated by dividing the weighted sum of the other indicators by the number of full-time equivalent academic staff
- **Findings (Correlation of attributes to overall ranking):**
 - **Award, HiCi, N&S:** Strong positive correlation
 - **Alumni, PCP:** Moderate positive correlation
 - **PUB:** Weak positive correlation

- **Center for World University Rankings:**



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- **Scoring System:**

- **Quality of Education**
- **Alumni Employment**
- **Quality of Faculty**
- **Publications**
- **Influence**
- **Citations**
- **Broad Impact**
- **Patents**

- **Findings (Correlation of attributes to overall ranking):**

- **Publications:** Strongest positive correlation
- **Influence / Citations / Broad Impact =** Strong positive correlations
- **Quality of Education, Alumni Employment, Patents:** Moderate positive correlations

- **Overall Findings:**

- All of these ranking systems use an objective scoring system, but the weight/correlation to the overall ranking of universities is very subjective.
- The Times Ranking System places the most emphasis on teaching quality, research performance, and citation impact, making faculty resources and academic output the strongest drivers of a higher overall ranking.
- The Shanghai Ranking System puts a lot of weight on the total number of awards and published papers.
- The Center Ranking System focuses heavily on research productivity, citation influence, and overall academic output, with publications showing the strongest correlation to higher rankings.
- Universities need to decide which ranking system is the most important to them as being the best under them all is not very feasible, and yet somehow Harvard does it

- **Conclusion:**

This project shows that while all three global ranking systems appear similar, the weighting of factors that drive a university's ranking differs dramatically.

- THE rewards teaching environment + research quality
- Shanghai rewards world-class researchers and elite publications
- CWUR rewards volume and influence of academic output

For universities seeking to improve rankings, it is crucial to understand which system matters most to their strategic goals.

Improving all systems simultaneously is unrealistic—yet top institutions like Harvard excel in every metric due to massive, sustained investment in faculty and research excellence.

Universities with more limited resources should prioritize high-leverage factors identified through our correlations rather than pursuing broad, expensive initiatives.