Comparing University Rankings: Statistical Analysis of Four Global University Ranking Systems

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Description of Data

- US News Rankings from 2018:
  1250 universities in overall ranking and 22 subject rankings
- Shanghai Rankings (ARWU) from 2017:
  500 universities in overall ranking and 52 subject rankings
- QS Rankings from 2018:
  959 universities in overall ranking and 48 subject rankings
- Times Higher Education Rankings from 2018:
  1250 universities in overall ranking and 22 subject rankings

Measuring Distances between Rankings

- Overlap (Aguillo, 2010):
  Normalized size of overlap between two top k lists
- Kendall tau (Kendall, 1990):
  Proportion of pairs that are ranked differently
- Spearman’s rho:
  Pearson correlation coefficient between ranked lists, normalized to a distance between 0 and 1
- M measure (Aguillo, 2010):
  Weighted version of Spearman’s rho
- Ranking Discrepancy:
  Mean highest/lowest rank ratio
  This measure can be applied to more than two rankings

Example

<table>
<thead>
<tr>
<th>University</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranking I</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ranking II</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Discrepancy</td>
<td>3/1</td>
<td>2/1</td>
<td>3/2</td>
</tr>
</tbody>
</table>

- Kendall tau distance:
  3 pairs (A, B), (A, C), (B, C)
- Spearman rho distance:
  \( \rho = \text{Corr. between } (1, 2, 3) \text{ and } (3, 1, 2) = -1/2 \)

Similarities and Differences between Ranking Systems

- The lowest distance is between US News and Shanghai Ranking (ARWU) in all four distance measures, which matches the results by Aguillo et al. (Aguillo, 2010).
- The highest distance is between US News and QS in three out of four distance measures.

Homogeneity of Subject Rankings

- The above boxplots show the rankings of selected universities in 52 subjects.
  - The lowest distance between overall rankings over two out of three continents is between US News and Shanghai Ranking (ARWU). Among three regions, North America shows the lowest distance in pairwise distance comparison for two out of three pairs.
  - From the plot, North American universities seem to have the highest homogeneity in subject rankings, while Asian universities have the lowest homogeneity.

References