World University Rankings Visualization

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Background and Motivation

Every year, many students are confused about which university they should choose. To make such decision, the first thing may be investigating the university rankings all over the world. Of all the universities in the world, which are the best? It is difficult to answer this question, it involves many different aspects to consider, besides overall ranking, someone may care about teaching level, someone may look at research achievements, the others may compare the international outlook because they need to study abroad. With time changing, the world university ranking is changing as well, investigating the trends would be an important factor to choose where to study in the future. Our project aims to provide a good reference for students to choose their universities by deeply analyzing the university ranking of different universities, countries and aspects in time period 2011-2016.

Project Objective

This project present the World University Rankings data in graphical format. It enables decision makers to see analytics presented visually. With interactive visualization, people can only look at the university information which they care about and compare universities' rankings in different aspects more easily.

From the results of projects, people can get following informations:

- How top 100 universities distributed in different countries.
- University's ranking information and scores in multiple areas.
- Trend of universities' ranking in last 6 years.
- Compare two universities based on different aspects.

Basic Info

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Project github repository:

https://github.com/YuanyuanZh/WorldUniversityRankings

Project website:

http://yuanyuanzh.github.io/WorldUniversityRankings/

Data

Data source link:

https://www.kaggle.com/mylesoneill/world-university-rankings

Attributes in dataset timesData.csv

- world_rank - world rank for the university.

- university_name - name of university.

- country - country of each university.

- teaching - university score for teaching (the learning environment).

- international - university score international outlook (staff, students, research).

- research - university score for research (volume, income and reputation).

- citations - university score for citations (research influence).

- income - university score for industry income (knowledge transfer).

- total_score - total score for university, used to determine rank.

- num_students - number of students at the university.

- student_staff_ratio - Number of students divided by number of staff.

- international_students - Percentage of students who are international.

- female_male_ratio - Female student to Male student ratio.

- year - year of the ranking (2011 to 2016 included).

Data Processing

In the dataset, there are some cells blank. We need to give default values to these cells. Some columns are not used in the visualization, we can remove them. We only care about top 100 universities, so we remove universities after top 100.

Visualization Design

Brainstorming

1. Country distribution of top universities

- The first visualization is to show the distribution of top 100 universities all over the world. We provide a dropdown list to choose in which year do you want to display the distribution. In the world map, every country will be filled with a color, the darker, the more top 100 universities in that country. When the mouse on a country, there will pop out a window to show all the top-100 universities with their rankings in that country.
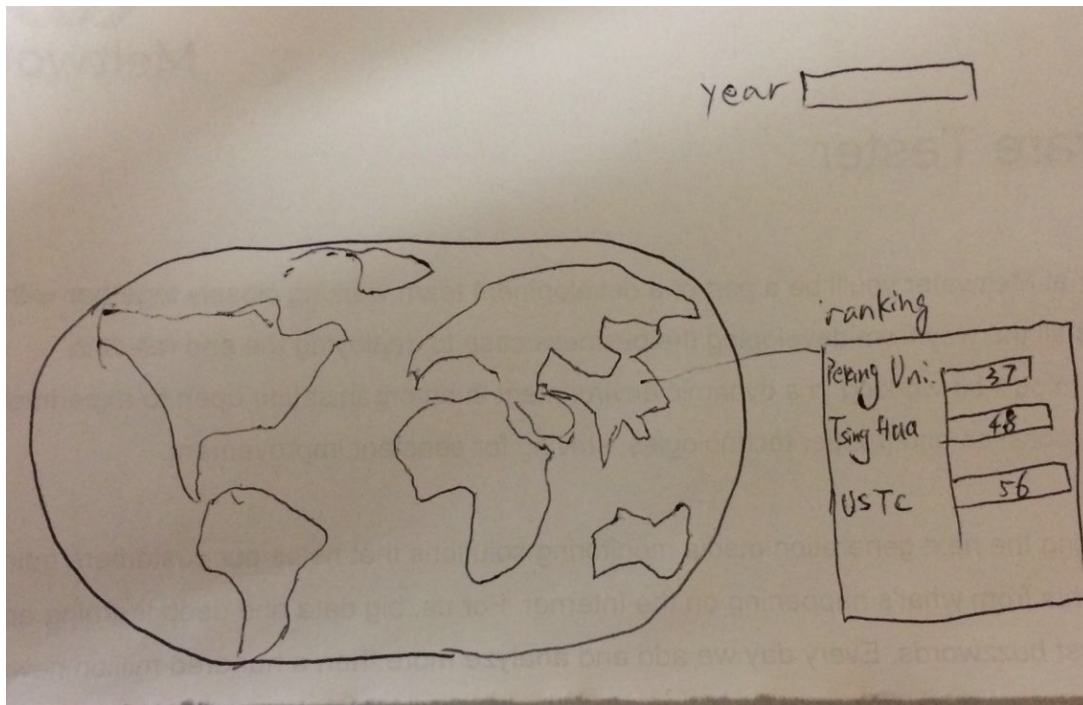
- Bar chart visualization with interaction, each bar shows number of universities in Top 100 in this country.

Country wise distribution of top universities

Number of universities in Top 100

Australia   China   US   UK   Japan
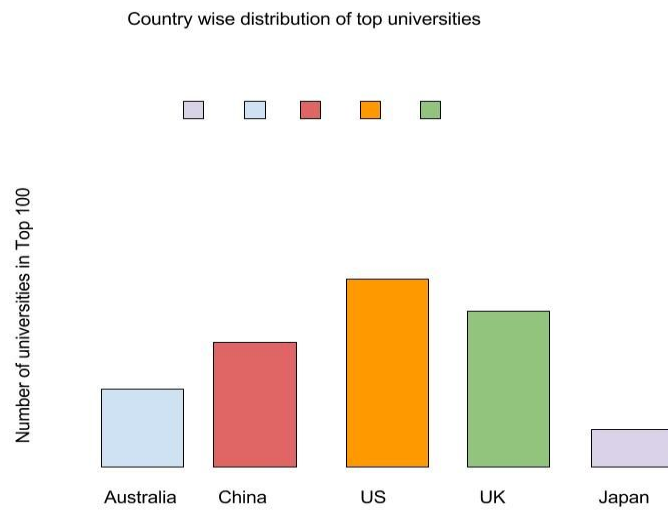
2. Ranking of Universities

● Universities ranking with many aspects.

The table will display top-100 universities comparing with different aspects(teaching, research, international, etc.) using bar charts for specified year.
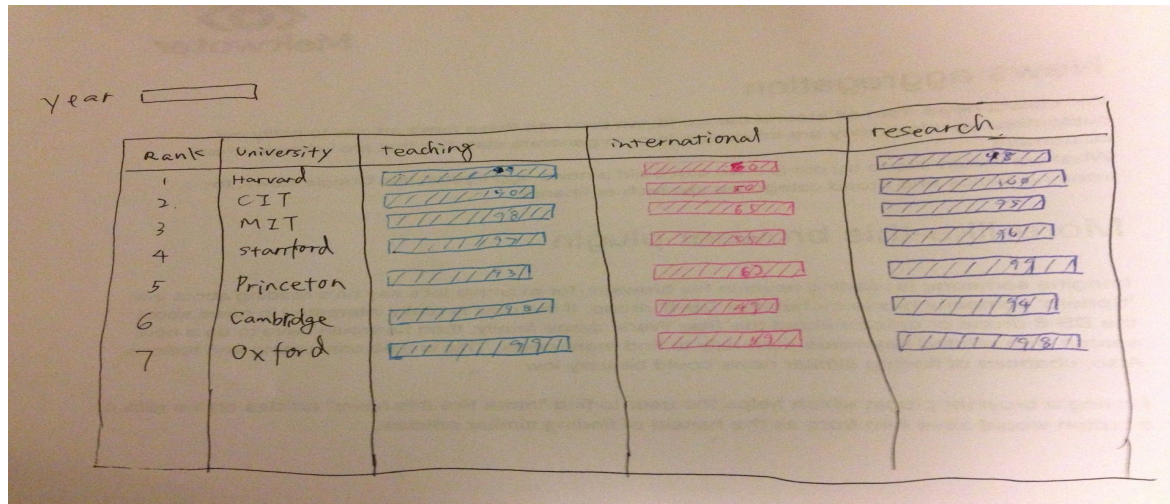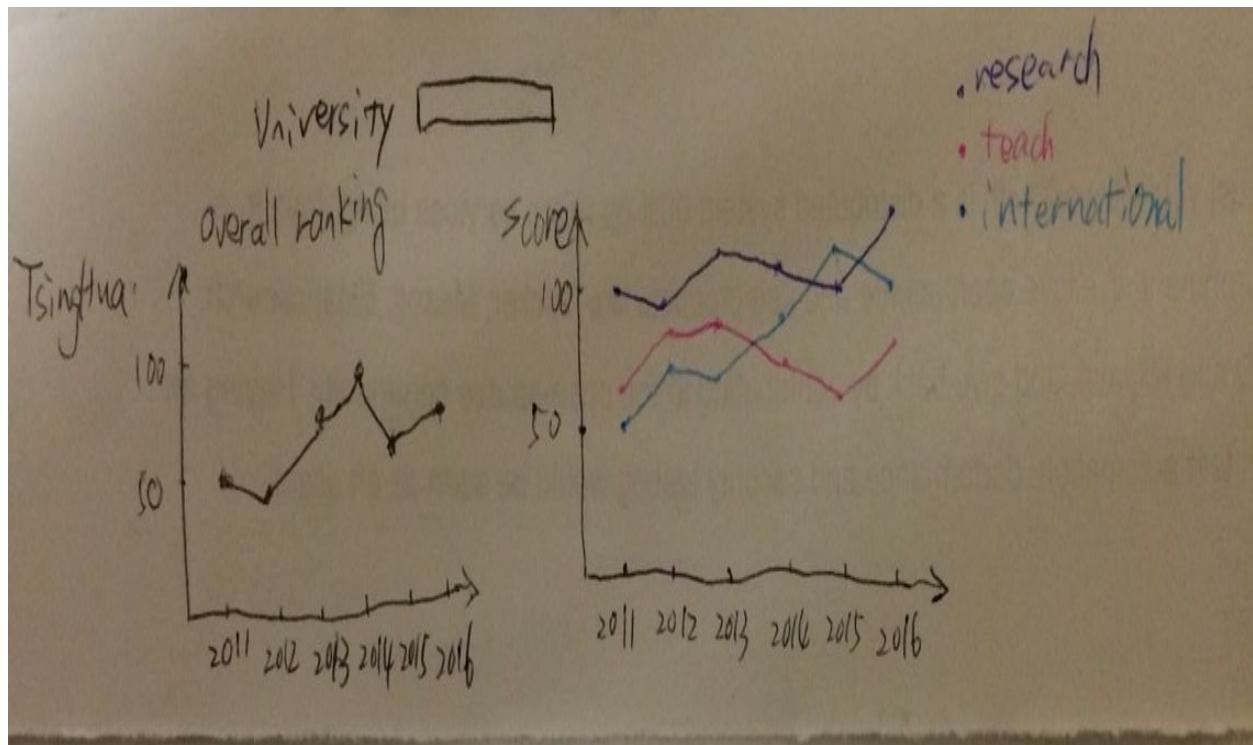

The parallel coordinates will display top-100 universities with their multiple aspects(teaching, research, international, etc.) for specified year. When mouse on one line, the name of the university will be displayed. When mouse draging on one attribute line, selected ranges of universities will be shown.
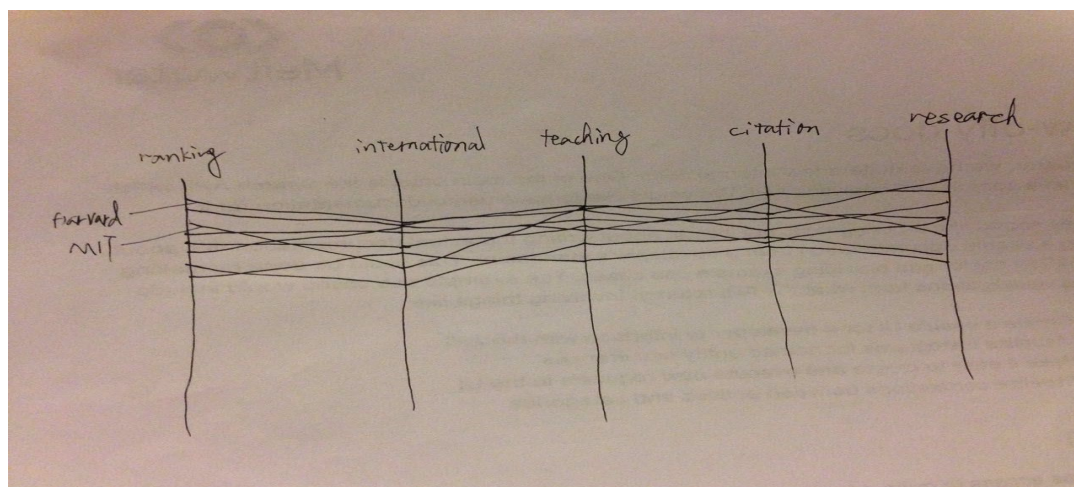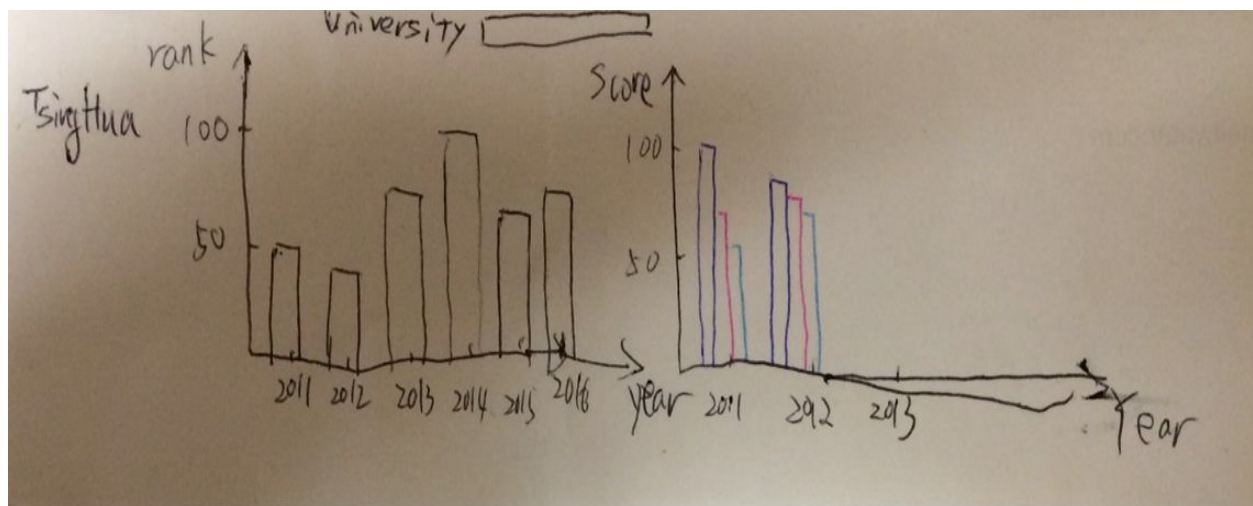
● Ranking change for one university from 2011-2016

By choosing one university, it will show the trend of ranking, and other aspects from 2011-2016 with line graph. When mouse on one point, the value of that point will be shown.


By choosing one university, it will show the trend of ranking, and other aspects from 2011-2016 with bar charts.

Final Visualization Design

Geo-based visualization

A world map for selected year, every country will be filled with a color, the darker, the more top 100 universities in that country. And the interaction, when the mouse on a country, a sub bar chart visualization will be generated which contains all in top 100 universities ranks info in that country.
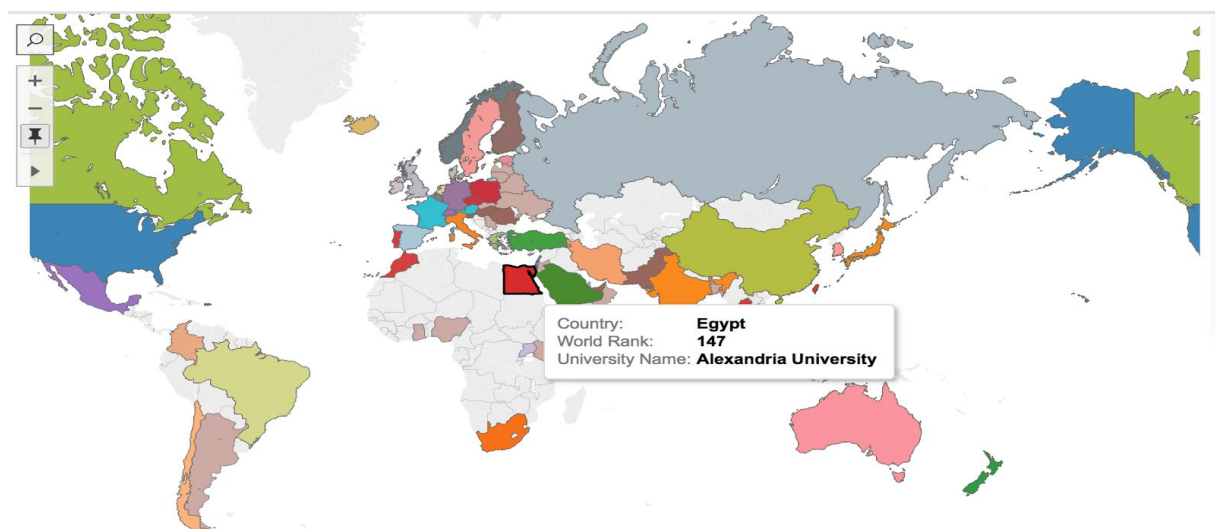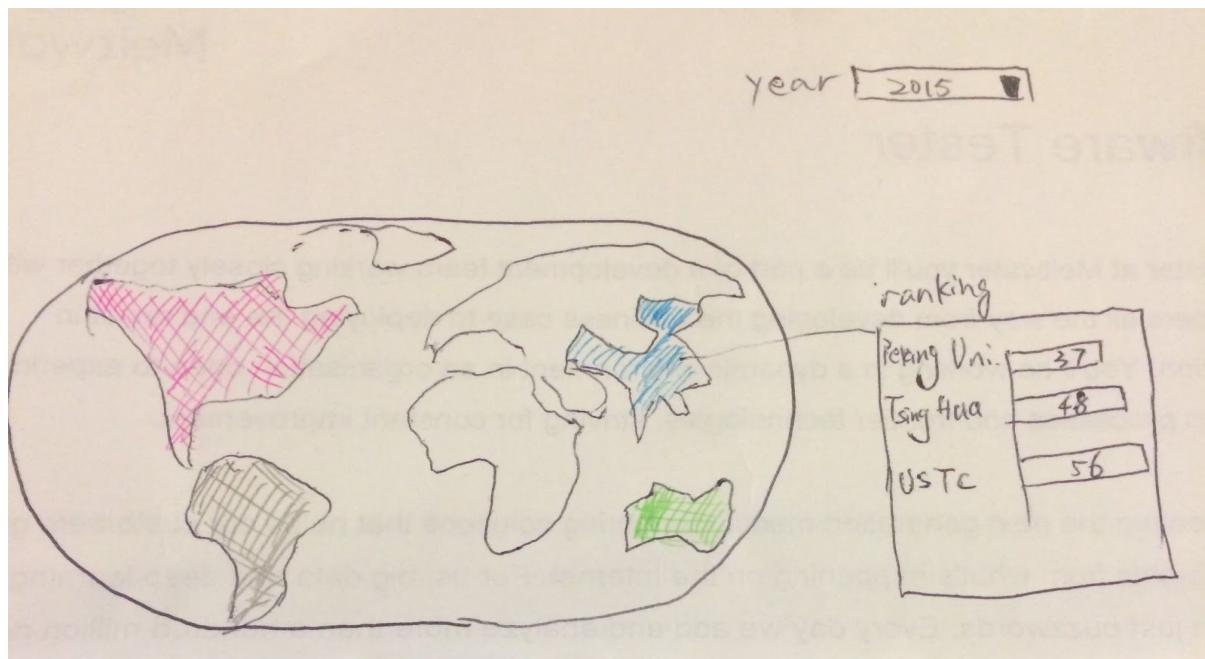
University Comparision visualization

The parallel coordinates will display top-100 universities comparing with different aspects(teaching, research, international, etc.) using bar charts to indicate values for specified year.
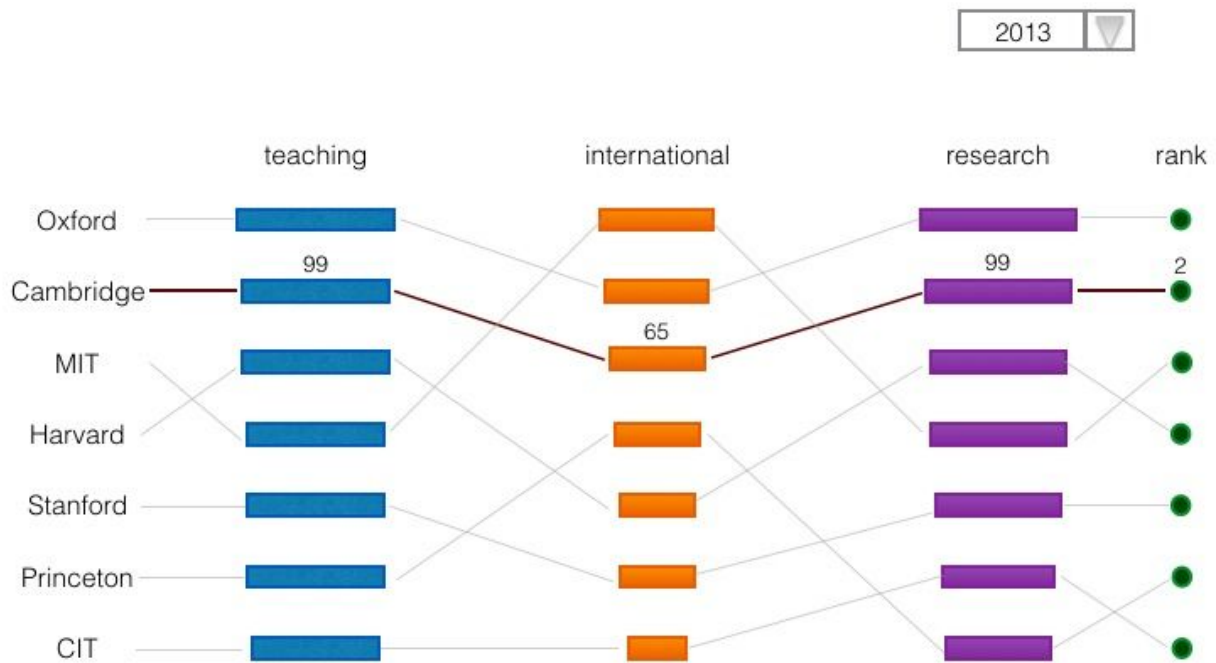
Collapsible Tree visualization:

A collapsible Tree start from country, then university, then year, after select specific year, all ranking information about that country will be displayed in leaf node.
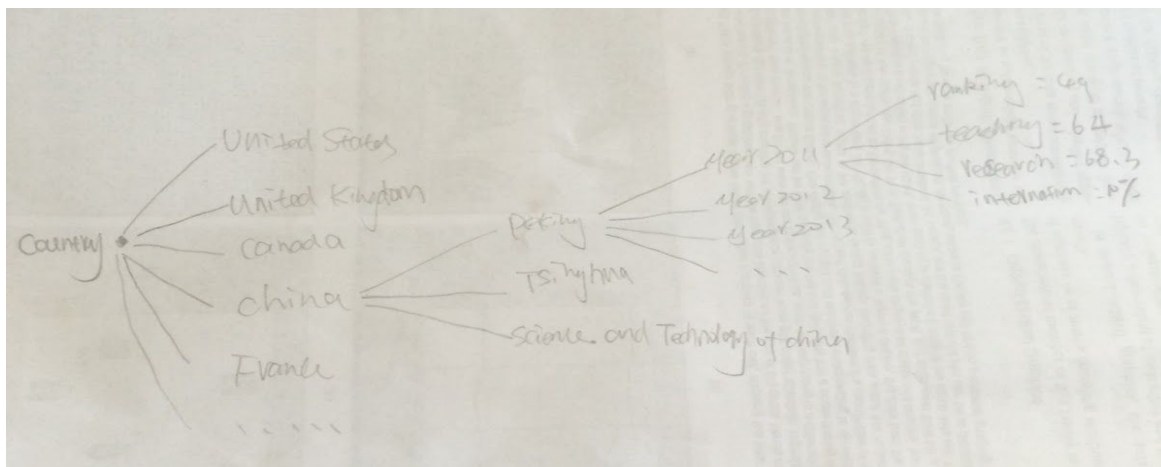
Must-Have Features

1. Country wise distribution - Geo based visualization with interactive
● World map, each country will be colored by how many universities in top 100, the more universities it has, the darker it will be colored.
● When mouse move to each country, it will show all universities' ranking information.
● By choosing different year, the map will be reload by different year's data
2. Universities' compare in different aspects (ranking ,international, teaching, citations, Student_staff_ratio, international_students …)
● Parallel visualization with bar chart. Provide tooltip.

Optional Features

Customized search bar to compare universities

user can customize their own search conditions to get the data they care about, compare two universities based on different aspects and get trend of universities' ranking in last 6 years.
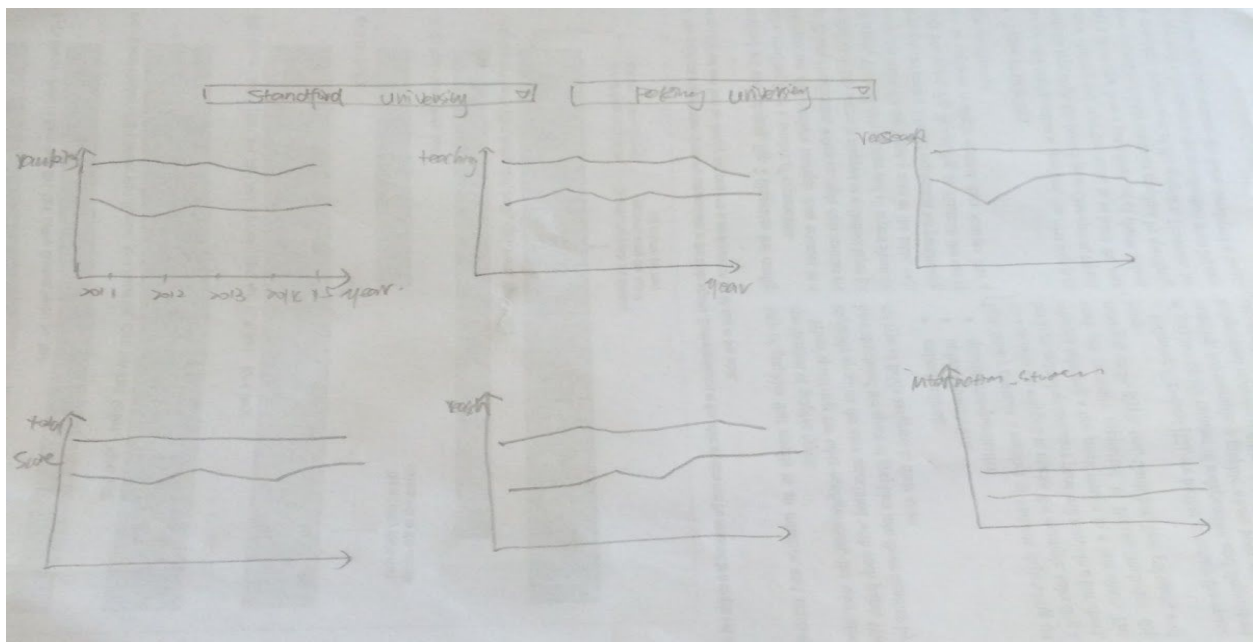
Project Schedule

Project Proposal	March 24
Revised Proposal and Annotated Bibliography	March 25 ~ March 31
Alpha Release: processing data and data visualization	April 1 ~ April 12
Beta Release: website building	April 13 ~ April 26
Final Project Presentation	May 10
Report, Source Code, Presentations slides, and User Manual	May 11 ~ May 19

Project Process & Implementation

Alpha Release(April 12):

What we have done:

Geo visualization:

A world map for selected year, every country will be filled with a color, the darker, the more top 100 universities in that country. And the interaction, when the mouse on a country, all the universities with ranking info in that county will be listed out.

Top 100 universities world distribution

Collapsible Tree:

A collapsible Tree start from country, then university, then year, after select specific year, all ranking information about that country will be displayed in leaf node.
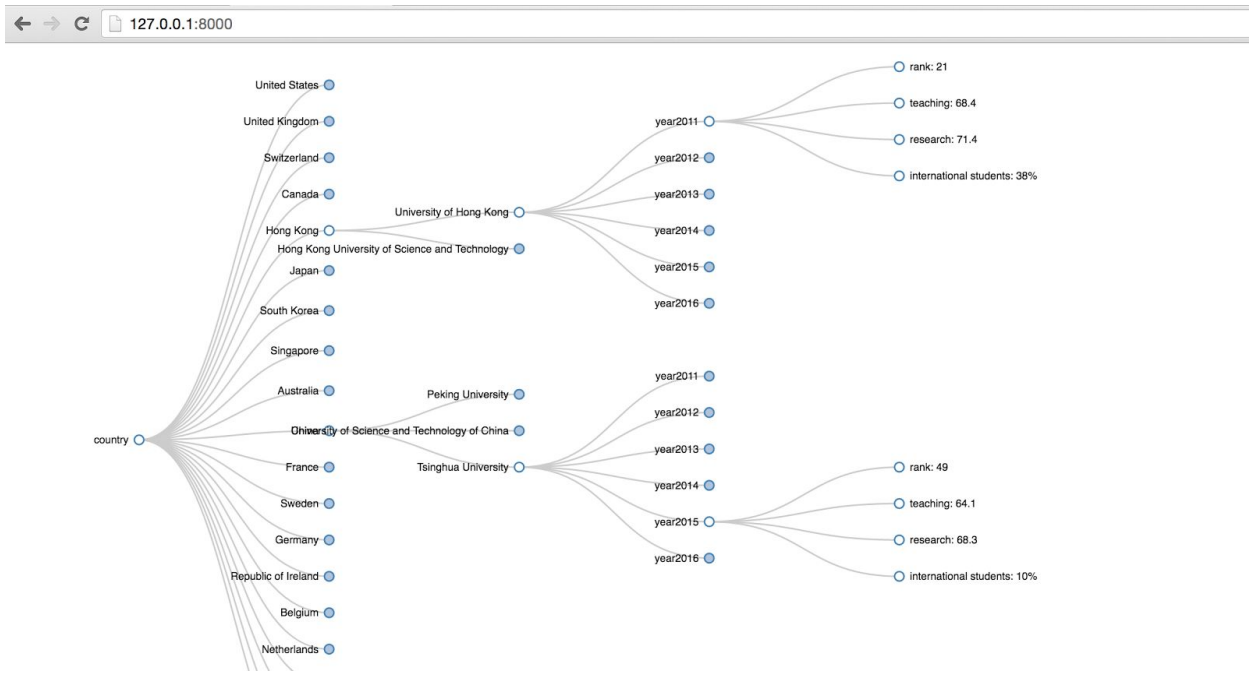
Future Work:

1. For geo vis when the mouse on a country, instead of universities list, a sub bar chart visualization will be generated which contains all in top 100 universities ranks info in that country.
2. Implement parallel coordinates,get multi-aspect data of each university,not only ranking.

Beta Release(April 26):

What we have done:

In this release we finished parallel visualization for university ranking, we integrated all visualizations together.
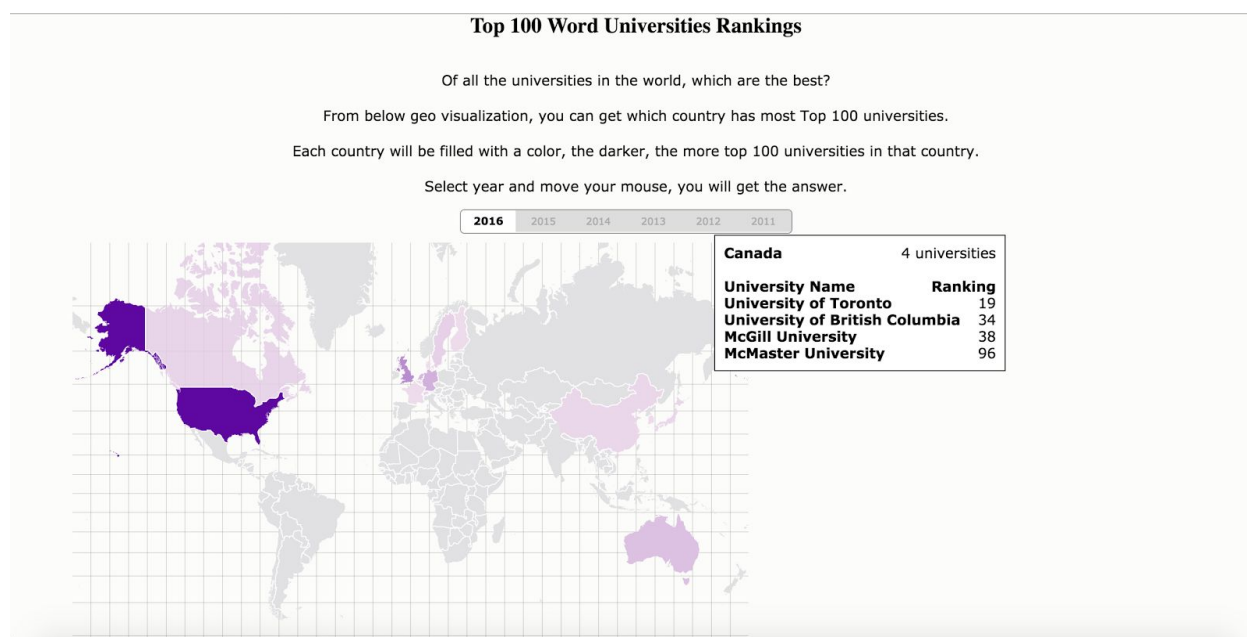
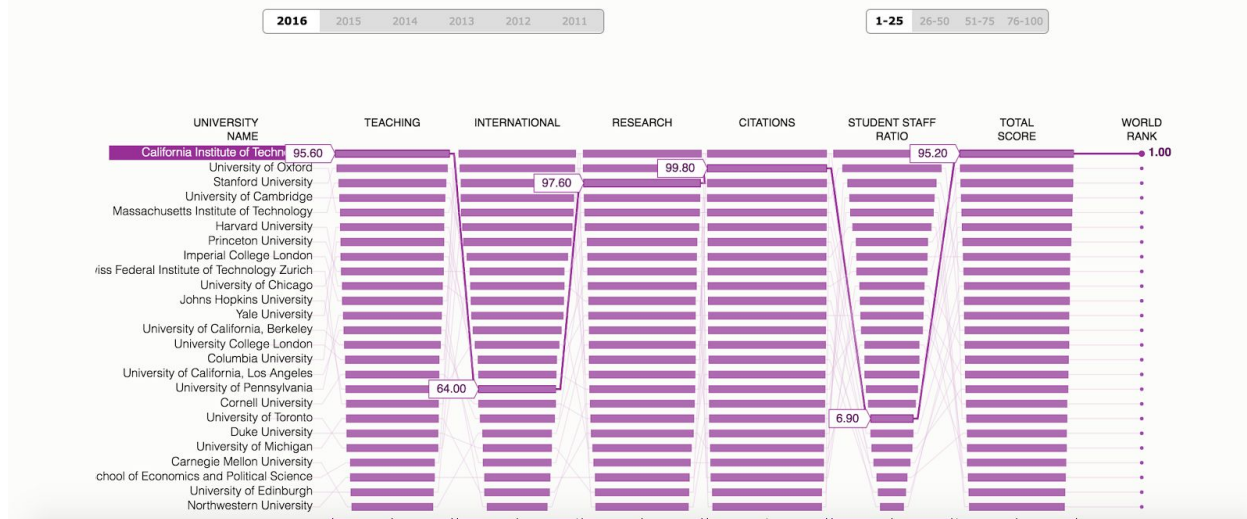Want more detailed information of each top 100 university?

Below parallel visualization can let you get multiaspect data of each university,not only ranking.

Select year and range of ranking, move your mouse onto the university you are interested, detail figures will be highlighted.

| 2016 | 2015 | 2014 | 2013 | 2012 | 2011 |

| 1-25 | 26-50 | 51-75 | 76-100 |

| UNIVERSITY NAME | TEACHING | INTERNATIONAL | RESEARCH | CITATIONS | STUDENT STAFF RATIO | TOTAL SCORE | WORLD RANK |

California Institute of Techn... 95.60 ... 97.60 ... 99.80 ... 95.20 ... 64.00 ... 6.90 ... 1.00

University of Oxford
Stanford University
University of Cambridge
Massachusetts Institute of Technology
Harvard University
Princeton University
Imperial College London
Swiss Federal Institute of Technology Zurich
University of Chicago
Johns Hopkins University
Yale University
University of California, Berkeley
University College London
Columbia University
University of California, Los Angeles
University of Pennsylvania
Cornell University
University of Toronto
Duke University
University of Michigan
Carnegie Mellon University
School of Economics and Political Science
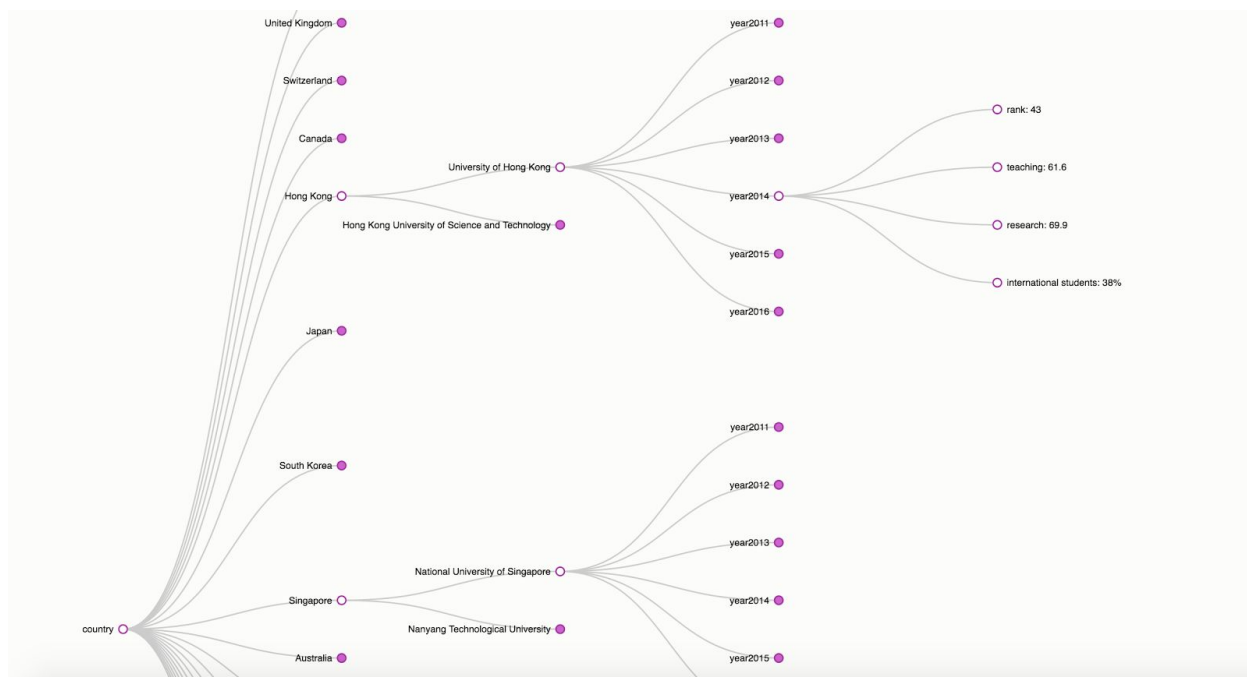University of Edinburgh
Northwestern University

Try a different way to explore top 100 universities.

Search universites by country nodes in the collapse tree.

Unfold the country node, all universities in top 100 will be listed.

Choose your target university, you will get up to 6 years ranking info.

Challenges we met:

1. For the parallel visualization it is difficult to display 100 universities in a single vis well, since we can't capture all pic of a university if the difference between its different aspects ranking is big. We resolve it by displaying only 25 universities each time, user can get all universities info by switching the rank ranges.
2. How to choose aspects of university to visualize.

   Choose most useful aspects which may be most important for students especially international students. Drop minor aspects like number of students,etc.

3. Adjust the mouse on area on the bars.

   First the mouse on area is not exactly the bar area. Adjust it to make it exactly match the bar area.

Future Work:
1. add customize search bar, user can choose different 2 universities to compare
2. continue to work on trend lines issue
3. make slight modification on visualization based on professor's suggestions
4. clean up code

Final Release(May 10):

What we did:

we add a new virtualization which is a line graph with search bar and modify the geo visualization.

We can compare two universities by using following line graph visualization in six aspects with interactive. We also get one university ranking trend in last 6 years.
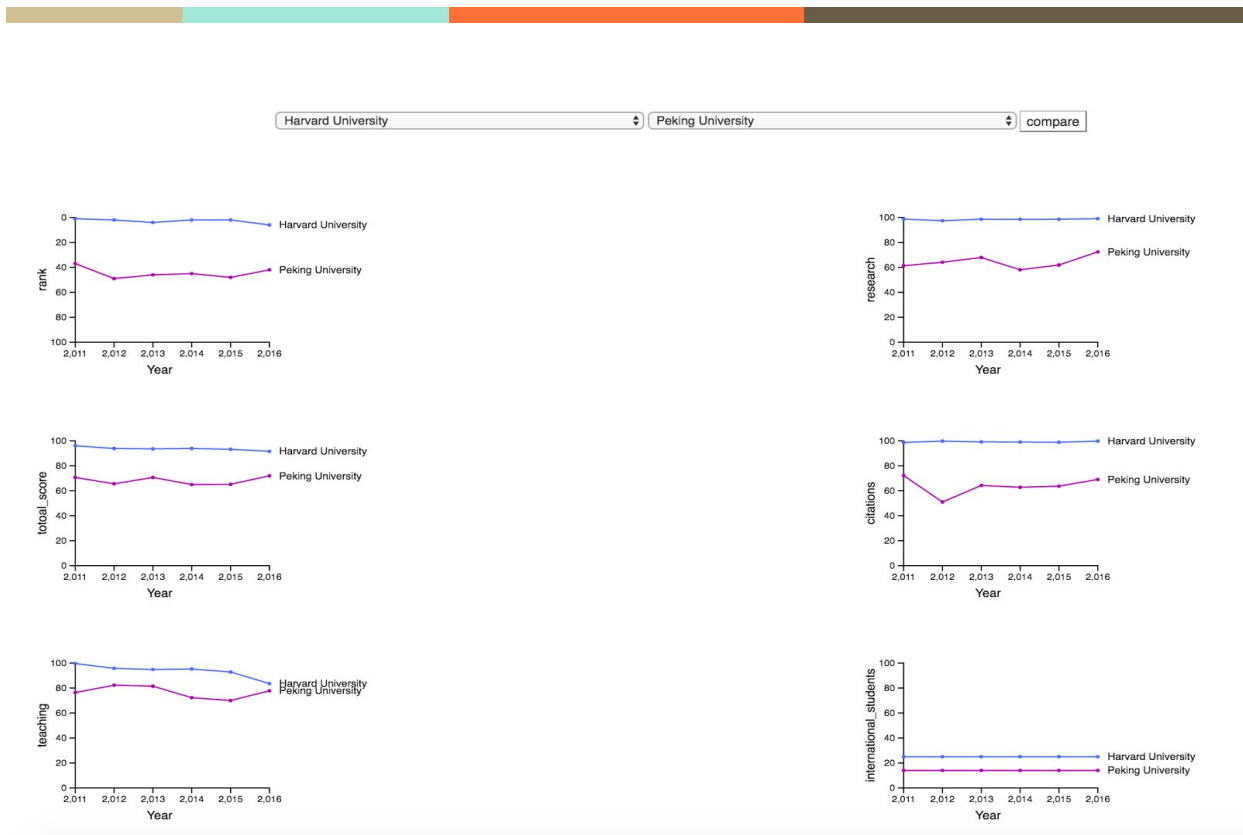
We change the view of interactive part in the geo visualization. Instead of list out all universities in that country, the tooltip just show the number of universities in each rank level. Two reasons for this modification, first, the role of this geo visualization in our project is providing the overview of the distribution in the word, so no detail universities name list is needed here; second, for some country, the university list is very long, in that case the view tooltip will affect the whole page design.
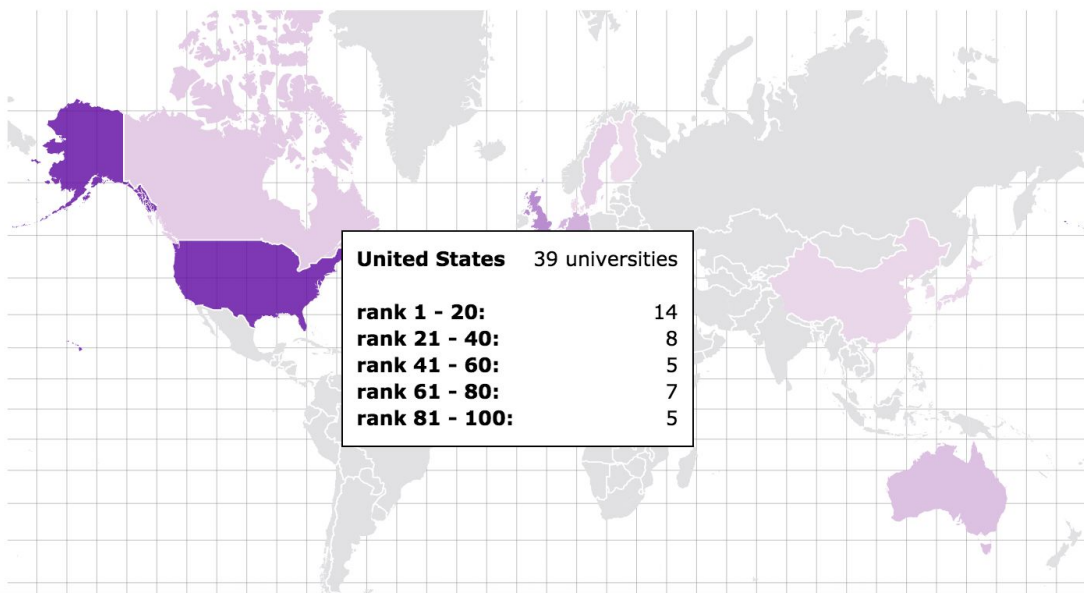
Changes After Final Release:

1. Adjust the gap between each line graph in the search bar visualization.
2. Add navigation bar to reformat the visualizations
3. Add user manual

Evaluation & Final achievement:

We finish both must-have features (geo virtualization, tree virtualization, parallel virtualization) and optional features (customized search bar).

Through all these virtualizations, user can

1. Know how top 100 universities distributed in different countries
2. Get university's ranking information and scores in multiple areas
3. Analysis trend of universities' ranking in last 6 years
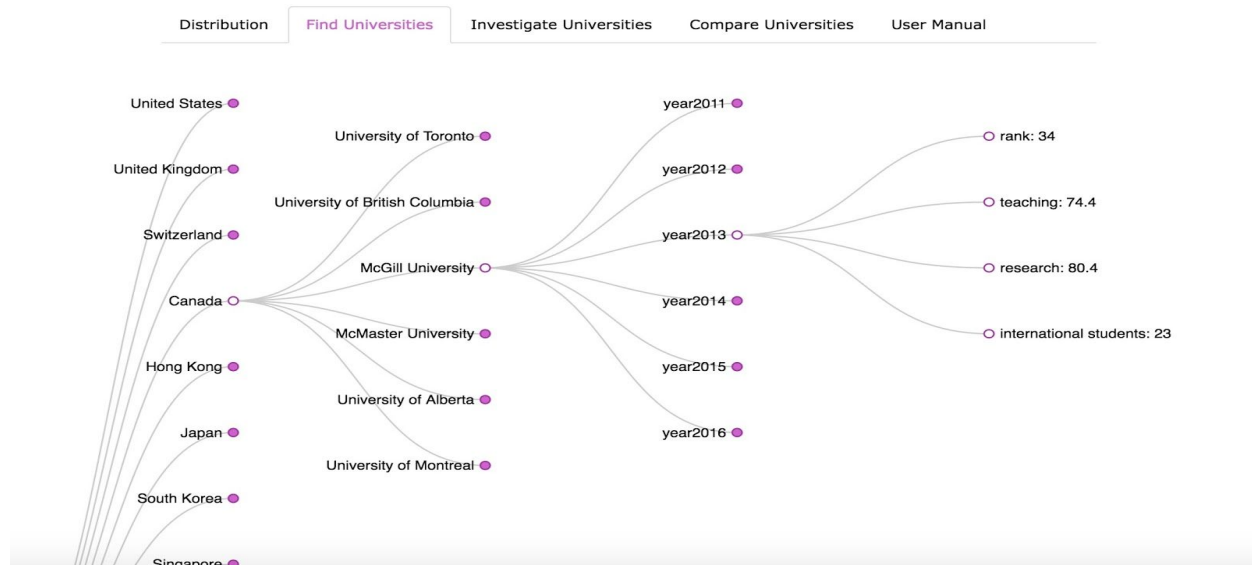4. Compare two universities based on different aspects.

Geographic virtualization: Interactive geo virtualization helps you to know how top 100 universities distributed in different countries.

Top 100 Word Universities Rankings
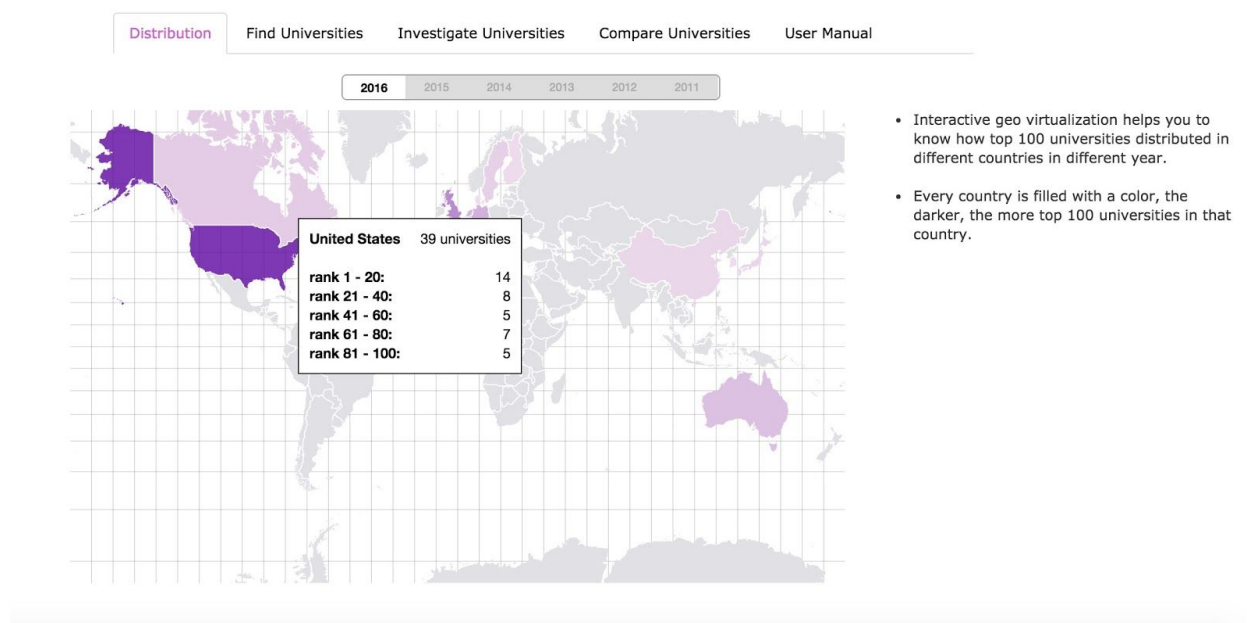
Collapse tree virtualization: You can find universities in your target country by collapse tree virtualization
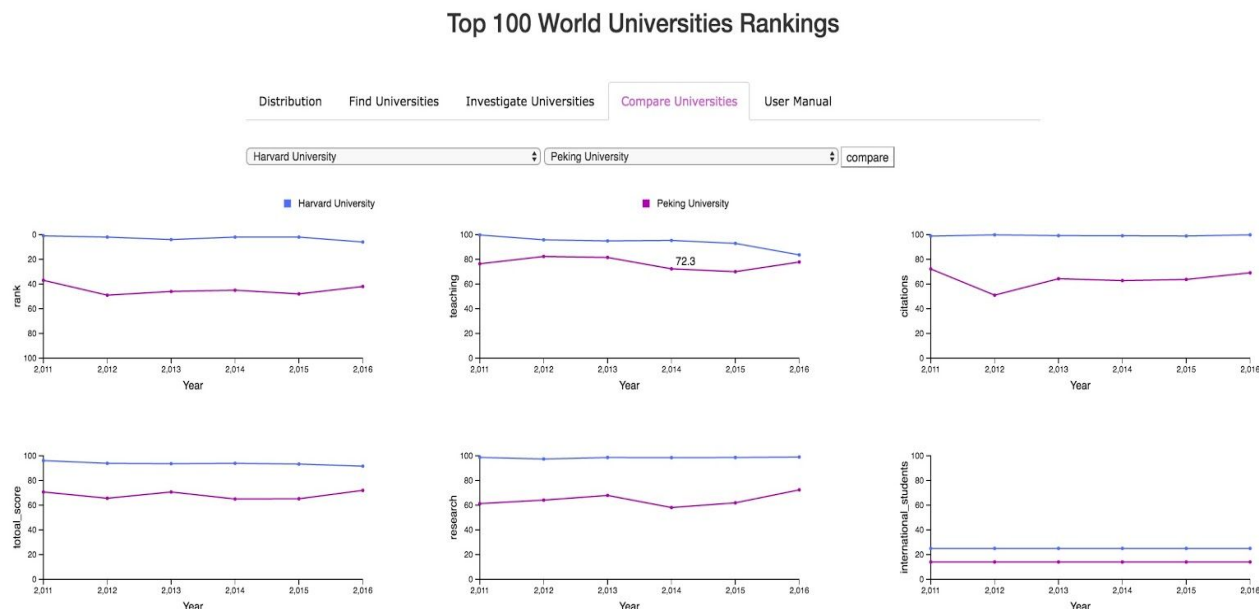

Parallel virtualization: shows university's ranking information and scores in multiple areas.

Customized search bar: You can compare two universities in different aspects and analysis trend of universities' ranking in last 6 years.

Top 100 World Universities Rankings

User Manual: explain what kind information user can get through these virtualizations.

Top 100 World Universities Rankings

Distribution   Find Universities   Investigate Universities   Compare Universities   User Manual

- Distribution:

  Interactive geo virtualization helps you to know how top 100 universities distributed in different countries.

- Find Universities:

  You can find universities in your target country by collapse tree virtualization

- Investigate Universities:

  Parallel virtualization shows university's ranking information and scores in multiple areas.

- Compare Universities:

  You can compare two universities in different aspects and analysis trend of universities' ranking in last 6 years.

Related Work & References

http://vallandingham.me/small_mults_talk/

http://www.caleydo.org/tools/lineup/

http://www.caleydo.org/lineup.js/demo/#uni

https://www.kaggle.com/mylesoneill/world-university-rankings

https://github.com/mbostock/d3/wiki/Gallery

Geo virtualization:

https://gist.github.com/mbostock/4180634

Collapse tree:

http://codepen.io/fernoftheandes/pen/pcoFz

Parallel virtualization:

http://githut.info

Customized search bar:

https://bl.ocks.org/mbostock/3884955