PROCESS BOOK

DATA SCIENCE – GRAD SCHOOL FINDER

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Project Repository: https://github.com/u1068846/VisProject.git

BACKGROUND AND MOTIVATION:

The United States of America is a home to a large number of schools that are well acclaimed for their Data Science programs. Hence, for an individual intending to pursue a graduate degree in Data Science in the US, it may be overwhelming to zero down upon a list to schools that best suit his requirements, which he can apply to. Hence, we propose to design an interactive visualization tool that assists an individual in easing up this process.

PROJECT OBJECTIVES:

With the gigantic increase in the volume of data, there seems to be a huge demand in the industry for professionals who are trained to create value out of this data. Generally, such professionals are designated as – Data Scientists, Data Analysts, Data Engineers, and so on.

To cater to the rising need in the industry for data professionals who can mine enormous datasets to extract insights, several universities have begun to introduce Data Science programs into their curricula at the graduate level. Ultimately, they intend to produce graduates who can contribute to stemming the shortage of data scientists in the industry.

For an individual wanting to pursue a Data Science degree in the United States, there are undoubtedly a broad spectrum of options. The "Data Science – Grad School Finder" is a visualization that allows one to shortlist a set of schools offering Data Science degrees based on his/her set preferences for parameters such as – type of the program (Masters' or Certificate), delivery mode of the program, world rank of the program, pre-requisites needed for the program, and the state of the United States where the school is located. Additionally, the user can explore the shortlisted schools in more detail, draw up two schools to compare them closely, and sort the shortlisted schools based on his/her preferred parameter.

To reiterate, our objective is to build a comprehensive and an interactive visualization tool that assists potential data-science grads to shortlist, explore, and compare and contrast schools offering Data Science degrees in the US of A.

PROBLEM STATEMENT:

The "Data Science – Grad School Finder" tool finds an optimized set of schools in the US offering Data Science graduate degrees based on the user's preferences set for – the type of the graduate

program (Masters'/Certificate), the delivery mode, the state of US where the school is located, and pre-requisites for the program. From the list of schools, the user can explore details like – the location of the school (state, city), the several Data Science programs offered by the school, the departments within the school offering these programs, the world rank of the program, a link to the program's website, and so on.

Additionally, from the obtained list of shortlisted schools, a user can choose any two schools to compare them more closely. Lastly, the tool also enables the user to sort the shortlisted schools based on his preferred parameter, for instance, the world rank, faculty-student ratio, research citation score, and so on.

DATASET:

An existing data set of 951 entries will be employed for this project. The source of the dataset is stated in [1].

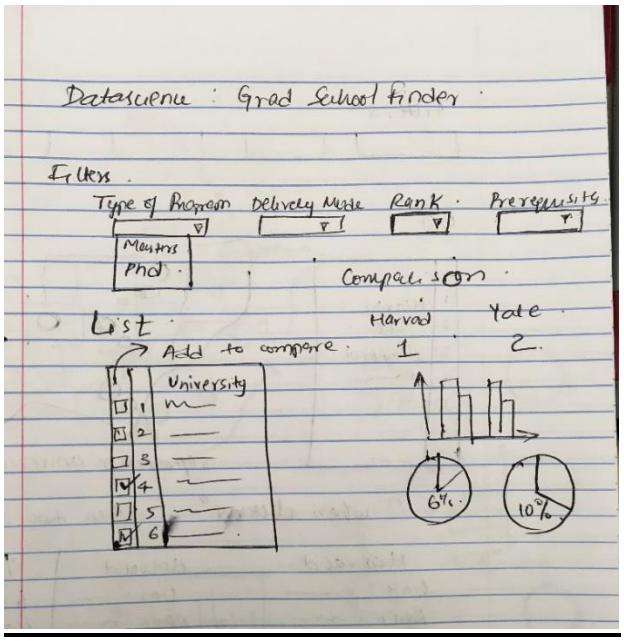
The dataset comprises of a comprehensive set of attributes that are sufficient for all components of our project. The attributes of the dataset include – School, State, City, Program, Type, Department, Delivery, Duration, Prerequisites, Link to the program website, Longitude and Latitude of the school, World Rank, Teaching Score, International Score, Research Score, Total Score for the school, Student Population Size, Student Faculty Ratio, International Student Population, and Male to Female Ratio.

DATA PROCESSING:

The dataset obtained from [1] was in CSV format. Hence, we are using our data in the raw form and did not find the need to subject it to any form of processing.

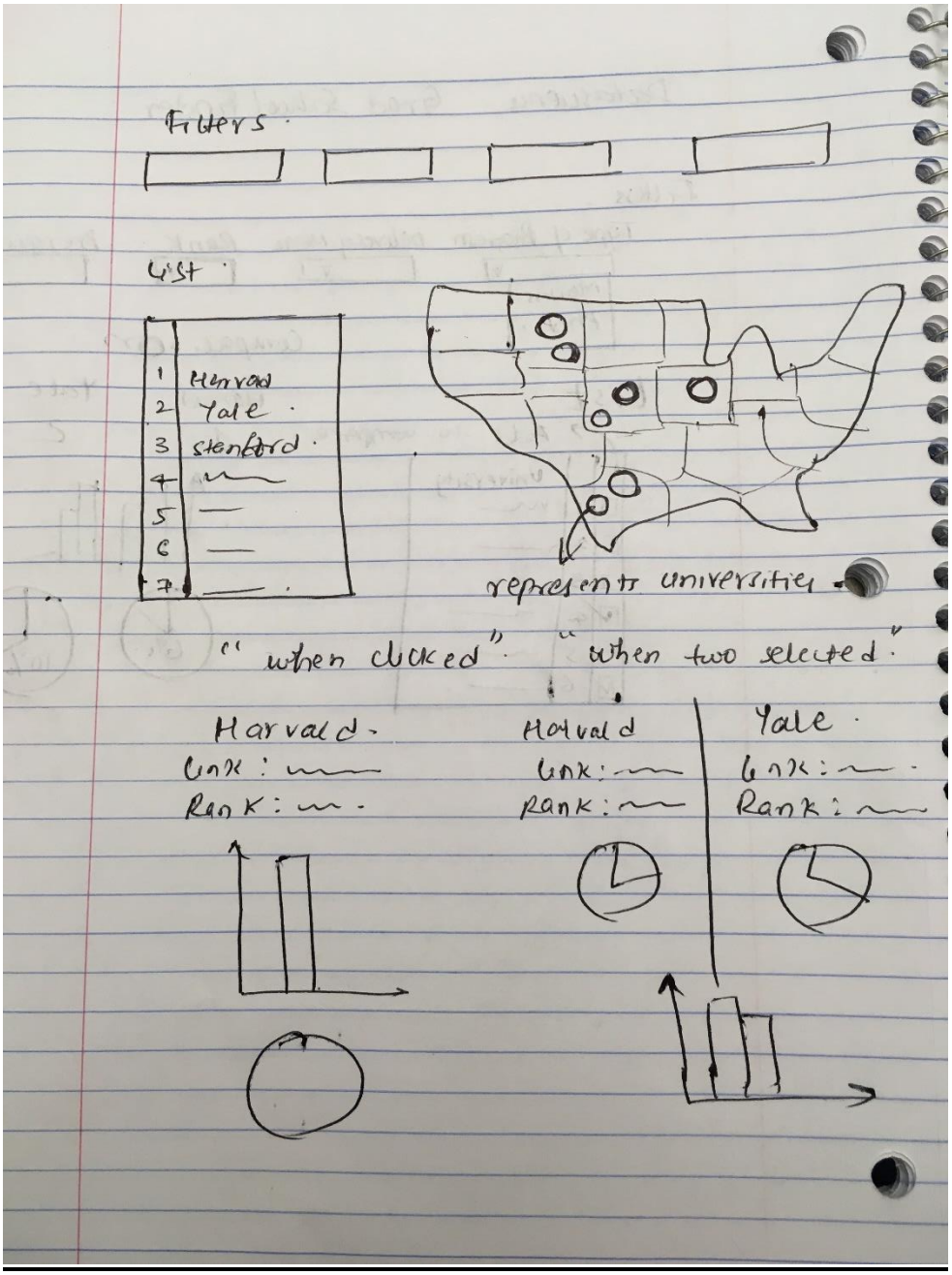
VISUALIZATION DESIGN:

DESIGN #1:



This is our first design based on our original ideas. Here, our visualization had three components – First, filters to allow the user to set his preferences for the type of Data Science program he wishes to pursue, the list of schools derived from the dataset based on the filter values, and the comparison of two schools selected by the user in the list using bar charts, donut charts, tiles, scatterplots, and so on.

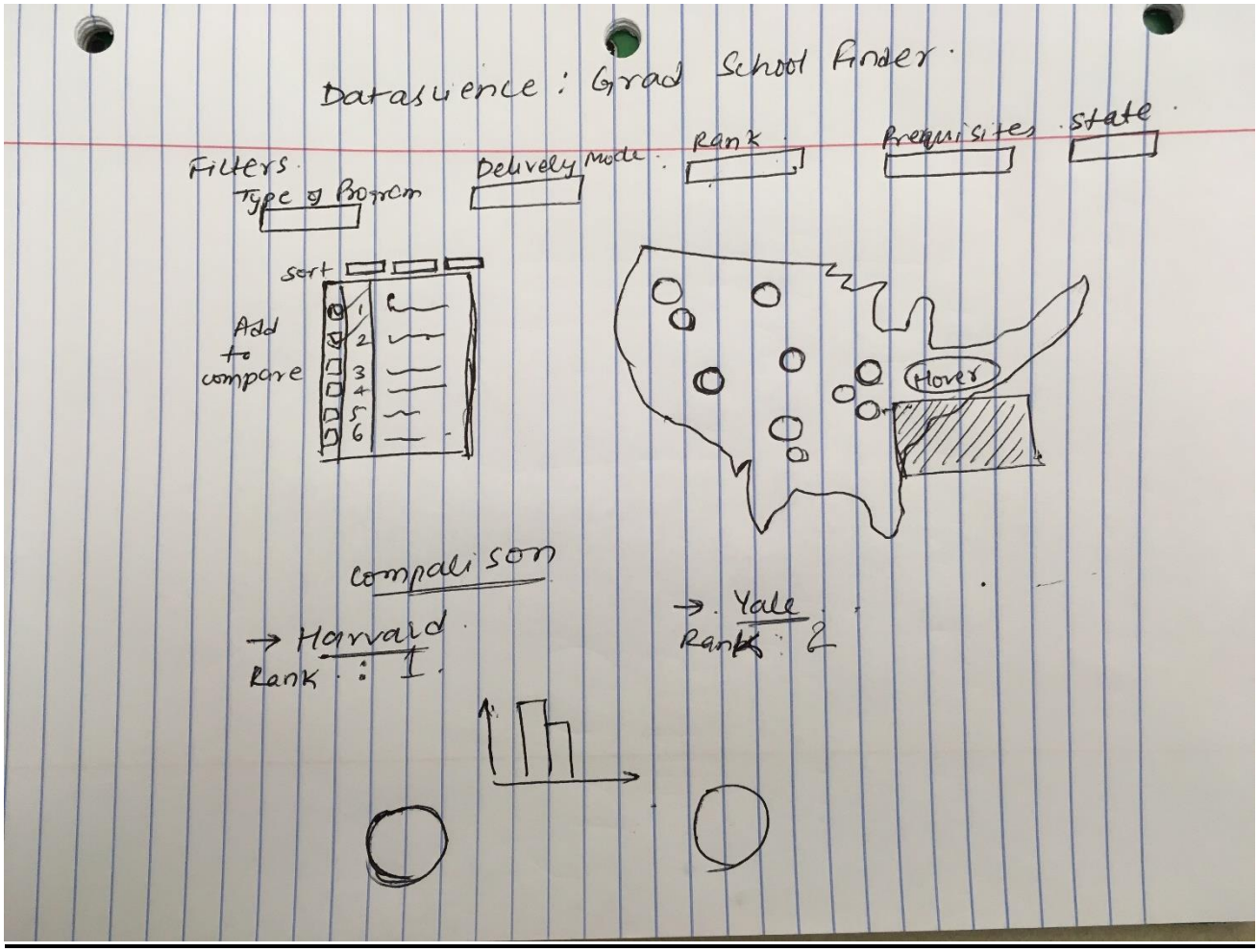
DESIGN #2:



In our second design, we made the following amendments: First, we decided to add a map of the US and highlight the location of the schools shortlisted by the tool to give the user an idea of the location of the school. This decision was primarily influenced by the presence of the latitude and longitude attributes for the schools in our dataset. Second, when the user clicks upon a highlighted school on the map, additional details of the school such as – the location, the degree names, the departments within the school offering these degrees, the world rank, a link to the program's website,

etc. are displayed below the map. Third, when the user selects two schools on the map, a comparison of the two schools is provided using bar charts, tiles, scatterplots, donut charts, and so on.

DESIGN #3:



This is our best design till date. Here, we added functionalities such as – allowing user to hover over a school on the map and get details of it in a tooltip, and sort the schools shortlisted by the tool based on his preferred parameter like for instance, the world rank, the student-faculty ratio, and so on.

MUST HAVE FEATURES:

1. Filters provided for the user to define more precise dataset he/she wants to look into.
2. Display a map of the US with interactive features like hovering over the university (represented with circles) to explore more about the school and clicking adds the university to compare with the university the user clicks next.
3. Selection of the criteria upon which the user wants to compare the two selected universities (multiple selections possible).
4. Visualizing the parameters using different designs like using grouped bar charts, pie-charts for representing percentages, donut charts, etc. to encode the data in a visibly effective manner.

5. The user is given an option to sort the list of universities displayed based on the parameter he chooses.

OPTIONAL FEATURES:

1. Enabling the comparison for more than two university selections.
2. Being able to add to compare from the list displayed instead of selecting from the map.
3. Zoom feature in the map which makes it more fun to interact with.

PROJECT SCHEDULE:

Week	Date	Deadline	
		Neha	**Pranav**
1	Nov 4	Filters	Comparison
2	Nov 11	Map	University List
3	Nov 18	Map Interaction	Sort
4	Nov 28	Zoom	Comparison designs

OVERVIEW OF PROJECT DELIVERABLES:

An interactive visualization that has the following functionalities:

1. Allows the user to set his preferences for – the graduate degree type (Master's/Certificate), mode of delivery, the location of the school, and the prerequisites for the program.
2. Obtains a set of schools based on the user's preferences and highlights the schools location on the map of the US of A.
3. Upon hovering over a school on the map, allows the user to explore the school to a greater detail by displaying - the location of the school (state, city), the world rank of each of the programs, the student population size, the student faculty ratio, the research citation score, and so on.
4. Select two schools on the map and compare them closely.
5. Sort the schools shortlisted by the tool based on the user's preferred parameter like – the world rank, research citation score, and so on.

QUESTIONS:

The primary questions our visualization intended to answer were:

1. Which schools in the US offer Data Science degrees that match the user's preferences for – the type of the graduate program (Master's or Certificate), the world rank range of the program, and if the program requires any prerequisites.
2. Where are these filtered out schools located on the map of the US?
3. What is like to sort these schools based on the University and department names?

4. For a particular school - what is the world rank of the school, location of the school, the list of data science programs offered by the school, the duration of the data science program, a link to the school's official program website, the student population, the faculty-student ratio, the teaching score, the research score, the citation score, the international score, and the average income earned by graduates of that program.
5. Compare two schools based on - the teaching score, the research score, the citation score, the international score, and the average income earned by graduates of that program.
6. Find the history of the teaching score, the research score, the citation score, the international score, and the average income earned for a school over a span of 6 years. Since, the ranking of schools for parameters like teaching, research, citation, and so on are greatly dynamic, it helps to get a brief history of these scores to observe a general trend.
7. Find how the teaching, research, citation, international, and income earned vary with two schools for the current year and for a span of 5 years in the history.

The additional questions our visualization was equipped to answer during the course of implementation were:

1. What is the average temperature across the states of the US for each month of the year?
2. Which are the schools offering data science programs that match the user's requirement for parameters - the teaching score, the research score, the citation score, the international score, and the average income earned by graduates of that program?

RELATED WORK:

Our work is inspired by the reference provided by our advisor – Yogesh Mishra [2]. This reference is a website that allows the user to explore and compare the schools of New York City. Another work that has inspired our visualization is the "College Cost Analyzer" visualization in the Hall of Fame of 2015 [5].

PEER FEEDBACK:

A peer feedback session was conducted on November 3rd. We received valuable feedback from another team during this session. This session also facilitated us in improving the design of our project and motivated us to include more effective visualizations. We were critiqued by Sunipa Dev and group. Their critique was fair and helpful.

Listed below are some of the concerns the peer feedback session instigated us to reconsider.

What are you doing that doesn't already exist on the Internet?

We are providing a tool that enables an individual to explore and compare schools in the US to pursue a Data Science degree based on his preferences. The preferences he can vary include - the type of the graduate degree he wants to pursue, the World Rank of the program, and the presence/absence of prerequisites for that program. We employ several visual encodings that further assist an individual to make an informed choice of the schools he wishes to gain admission into. For instance, (a). the parallel axes allows the individual to filter out schools based on the range of scores awarded to the school for – teaching, research, international, citation, and income, (b). the map of US of A encodes the location of the school and allows the user to easily select a school to explore and select greater than

one school to compare closely, (c). The comparator chart employs several encoding mechanisms to compare the selected schools based on several parameters.

Most of the websites focus on providing statistics of a particular school, and rarely furnish a wholesome comparison of schools, specifically for the Data Science degrees. Hence, we provide a tool for an individual intending to pursue a Data Science degree in the US to customize his choices to a greater extent, which is rarity to find on the internet.

When there are a large number of schools generated by the filters in a state, how will you handle the clutter?

We intend to use a zoom technique, wherein a user can zoom into a cluttered region of the map for better visibility.

Are you allowing the user to select the prerequisites explicitly rather than just allowing him to choose programs with or without prerequisites?

During the latter part of the project, we do intend to incorporate the selection of specific prerequisites like – Mathematics, Statistics, and a Bachelor's degree in Computer Science and so on.

When the user selects two schools to compare, in which order are you displaying them in the Comparator chart?

We will sort them by world rank, and then compare them in an effective manner.

Would you consider the use of tooltips and popovers for the map?

Yes, the map will have tooltips and popovers for all the schools on it. Additionally, we also intend to provide a link to the official website of the school for the Data Science degree.

Will you be using animations while adding schools to the comparator?

Yes, we intend to implement a drag-and-drop animation to drag schools from the map and drop them into the comparator for comparison. As we are unsure of the feasibility of implementing this functionality, we would like to add this to our list of additional features.

When the filters result in a large number of schools, how do plan to display the list of schools?

We intend to display the schools in a well-defined box and use scrolling, if that is the case.

DATA COLLECTION AND PRE-PROCESSING:

The dataset we retrieved from [1] came in the form of a CSV file with 951 entries. The entries were organized primarily by the school name in alphabetical order.

Each entry comprised of the following data – school name, the state, the city, the name of the Data Science program, the type of the program (Masters' or Certificate), the department of the school offering the program, the duration, the prerequisites, a link to the official program website, the latitude and longitude on a map of the US, the world rank, several scores for teaching, research, international, citations, income, a cumulative score for the school, the number of students, the student-faculty ratio, ratio of international students, the female to male ratio, and the year. Additionally, some schools had multiple entries corresponding to different years. Each of such entries differed only with respect to the several scores assigned to the school.

Though this dataset seems wholesome, it required a considerable amount of cleaning up as some critical fields were missing for several school entries.

There were several schools that did not have entries for critical fields like world rank. Since, the world rank is one of the filtering parameter, we were forced to exclude schools that did not have a world rank. Hence, a large number of schools were eliminated from our dataset due to this reason.

DESIGN CHANGES:

1. Earlier, we had decided to use the state of the US within which the school is located as a filter. But, since several entries in the CSV dataset had to be excluded due to absence of world rank, further filtering the schools by state would drastically reduce the number of schools.
2. Also, we decided to eliminate the delivery mode of the program as a filter parameter, as there no schools of particular world rank ranges that were offering online Data Science programs.
3. We decided to allows multiple selections for filter values, as it is possible that the user would like to explore both types of data science programs (Master's and Certificate), and programs for more than a single range of world ranks.
4. We decided that the user must be allowed to select schools to explore and compare only from the list of schools.
5. When a user selects a school to explore, or selects two schools to compare from the list, the corresponding schools are highlighted on the map.
6. We decided to implement parallel axes to enable the user to zero down schools having his specified range of teaching score, research score, international score, citation score, and the average income after graduation.
7. We decide to encode the average temperatures for all states of the US on the map for each month of the year. So upon clicking a month of the year, the user can view the average temperatures across all states for that month.
8. When the user selects a school to explore, along with the textual information being displayed, we decided to depict the scores in a bar chart. Upon clicking a bar, a line chart showing the history of the score for that school for a span of 6 years in shown.
9. We decided to compare two schools only based on their teaching scores, research scores, international scores, citation scores, and the average income earned by the graduates of those two schools. Since all the additional information of a school like the location, list of programs, etc. will be obtained by selecting to explore a school individually, we decided that displaying this information while comparing schools too would be redundant.
10. When two schools are selected to compare, two visualizations are shown: first, a bar chart of teaching score, research score, international score, citation score, and the average income after graduation for the two schools are shown; second, upon clicking the bars representing any of

the represented scores in either of the schools, a line chart comparing that selected parameter for a span of 6 years is depicted.

DESIGN EVOLUTION:

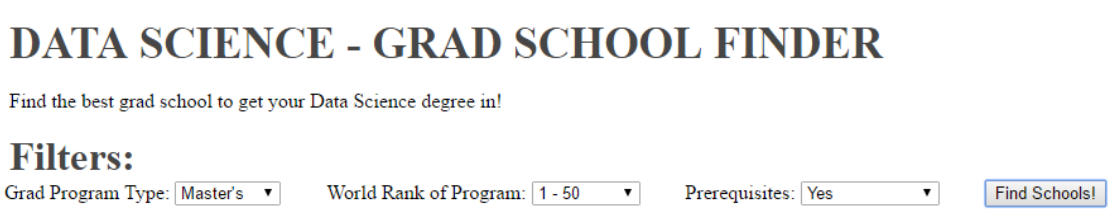
FILTERS

The filters enable the user to narrow down what school they want to look at by having them choose their preferences. The filters we have chosen are parameters that someone would most commonly look at when trying to explore schools. These include:

1. The type of the graduate program (Master's or Certificate).
2. The range of world ranks of schools the user wants to explore.
3. Whether the program has any prerequisites.

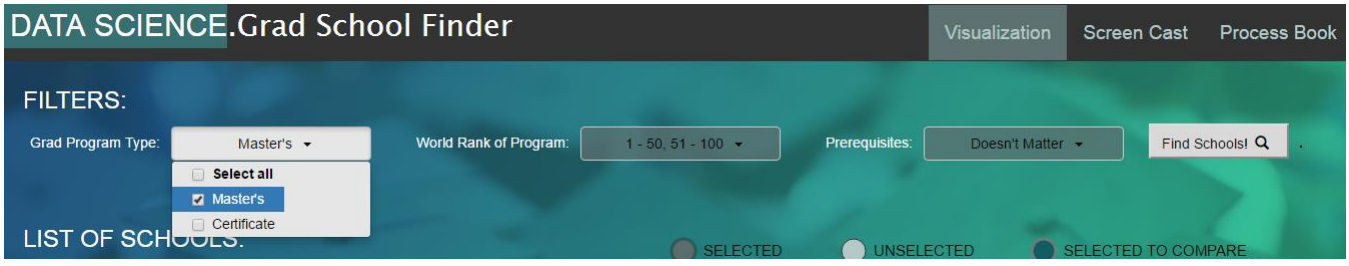
A drop-down is used for all these selection parameters. Once the user has set his preferred values for these parameters, then he can hit the "Find Schools!" button to get the list of schools.

A screen shot of our initial filter implementation is shown below.



However, later on we decided to set up multiple selections in filters. The reason was because it is possible that the user may like to explore both types of data science programs (Master's and Certificate), and programs for more than a single range of world ranks.

A screen shots of our implementation of filters with multiple selections is shown.



The filter triggers the launch of the other parts of the visualization. The launch of the list and the map is dependent on the values set for the filters. The comparator is populated based on the schools selected in the list. Hence, the filters can be regarded as the initial point of our visualization.

While trying to set up multiple selection filters with checkboxes, we ran into an issue as this feature could not be implemented efficiently in pure Java Script. Hence, we resorted to the use of JQuery and Bootstrap by incorporating the appropriate libraries.

LIST

We implemented a simple list that displays the schools shortlisted by the tool based on the parameters set by the user for the filters.

The list displays the school name, the department within the school offering the Data Science degree, the duration of the program, the type of the program, and a checkbox. The checkbox allows the user to add schools to the comparator. Additionally, the shortlisted schools can also be sorted based on the school name, the department, and the duration of the program.

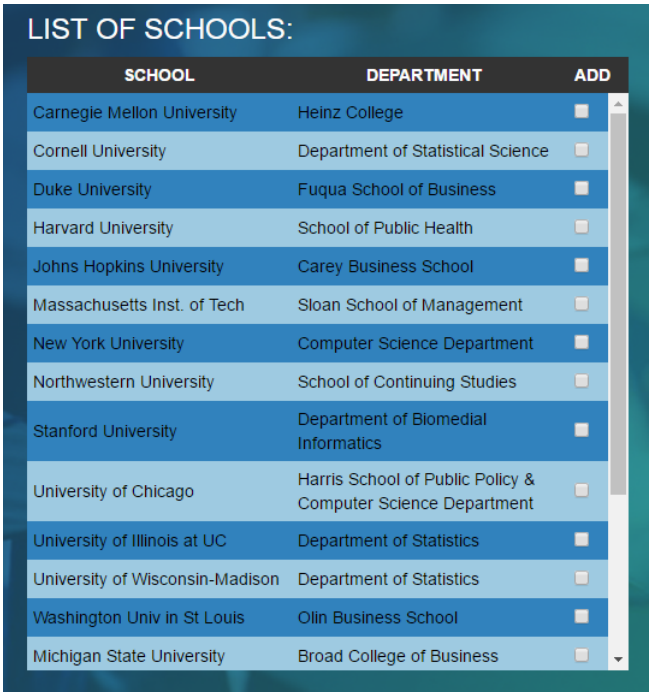
A screen shot of our first list implementation is shown below.

University List

University Name	Department	Duration	Type	Check Box
Carnegie Mellon University	Heinz College	144 units	M	☐
Cornell University	Department of Statistical Science	2 semesters	M	☐
Duke University	Fuqua School of Business	10 Months	M	☐
Harvard University	School of Public Health	80 credits/18 months	M	☐
Massachusetts Institute of Technology	Sloan School of Management	1 Year	M	☐
New York University	Computer Science Department	39 units	M	☐
Stanford University	School of Medicine: Department of Biomedial Informatics	45 hours required	M	☐
University of Illinois at Urbana-Champaign	Department of Statistics	30 credit hours	M	☐
Washington University in St Louis	Olin Business School	39 Credits	M	☐

We then altered the appearance of our list. Firstly, we decided to not display the duration of the Data Science program in the list. So, now our list displays the school and the department offering the Data Science program, and a check box that allows to select a single school for exploration or two schools for comparison. Secondly, since we allowed multiple selections in the filters, the chances of generating a larger list of schools by the filters was a common case. Hence, we placed the list in a well-defined box with a vertical scrollbar.

Our final list implementation looks this this.



Additionally, some interactivity features were added to the list. They are:

1. A user can select a school using the checkbox to explore it in detail. The details of the selected school will be displayed by the comparator.
2. A user can select two schools from the list to compare them closely.
3. A user can sort schools in a descending and ascending order alternatively by clicking on the column headers.

Finally, the list was linked to the map, wherein, the school selected to explore or the two schools selected to compare are highlighted on the map.

MAP

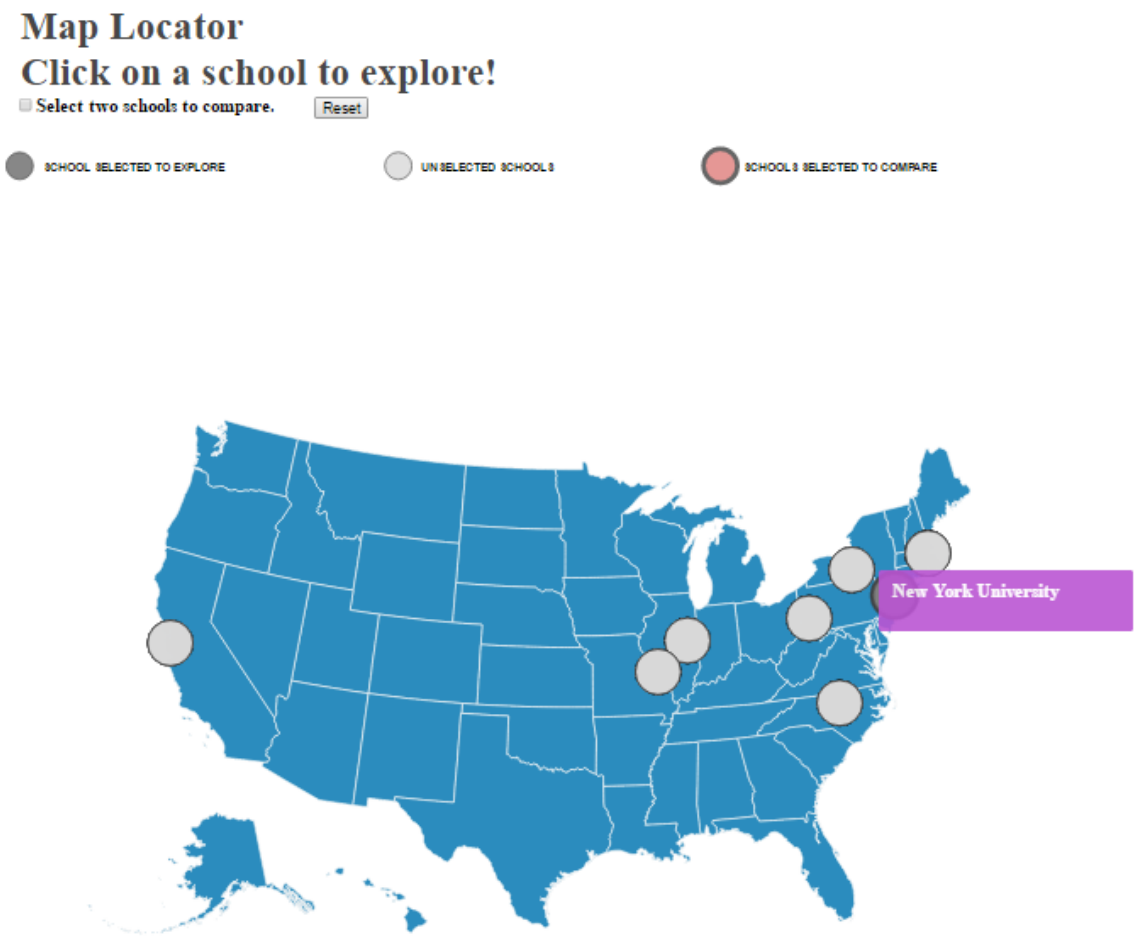
The map provides a locational reference for the schools. This way the user can explore schools by their location, targeting schools that are closer to their location, or at locations that they wish to reside in. This was done by placing the schools as circles on the map as shown below. The schools in the list are located on the map.

Initially, our map was equipped with several interactive features to facilitate better exploration and comparison. They include:

1. On hovering over the schools on the map, the name of the school will appear on the tooltip.
2. On clicking upon a school, detailed information will be displayed for the school in the Comparator chart below the map.
3. To select two schools to compare, the checkbox “Select two schools to compare” has to be checked, and then the two schools to be compared have to be selected on the map.
4. A reset button that clears all selections on the map.

We are aware of the fact that maps are to be implemented only when absolutely necessary. In this case, the graduate Data Science programs in the US attract a large number of international students. Keeping this in mind, we decided to include this feature of providing an insight of the location.

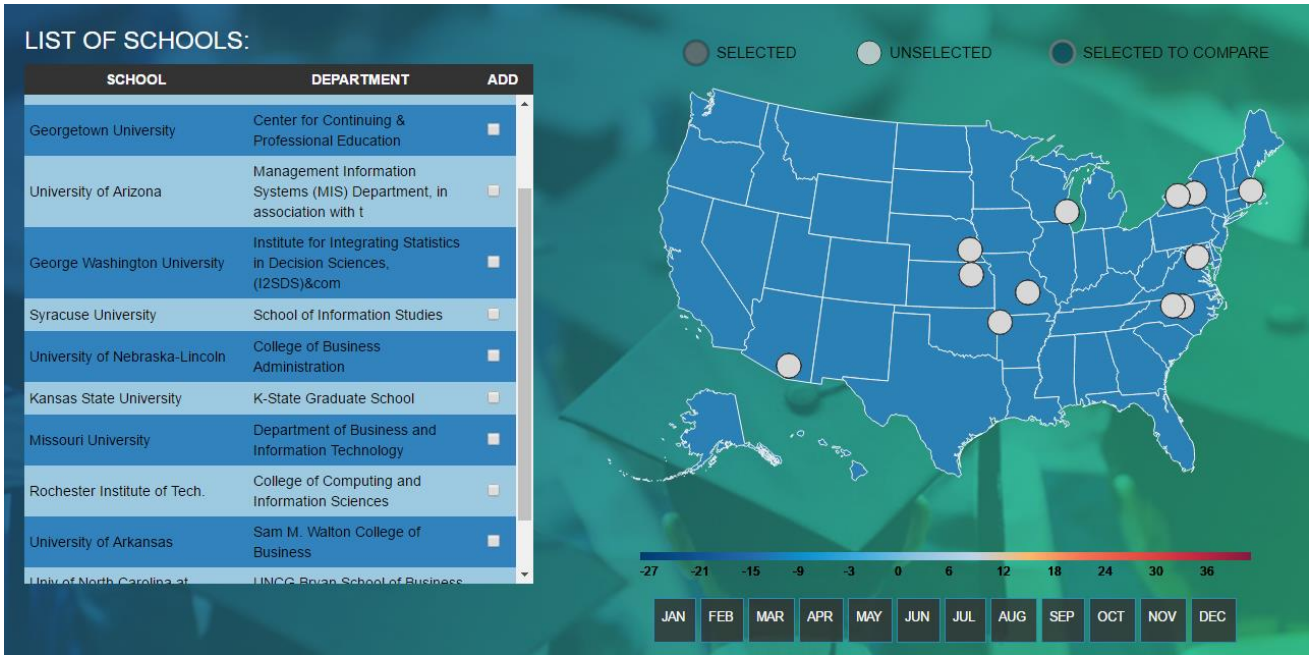
A screen shot of our initial map implementation is shown below.

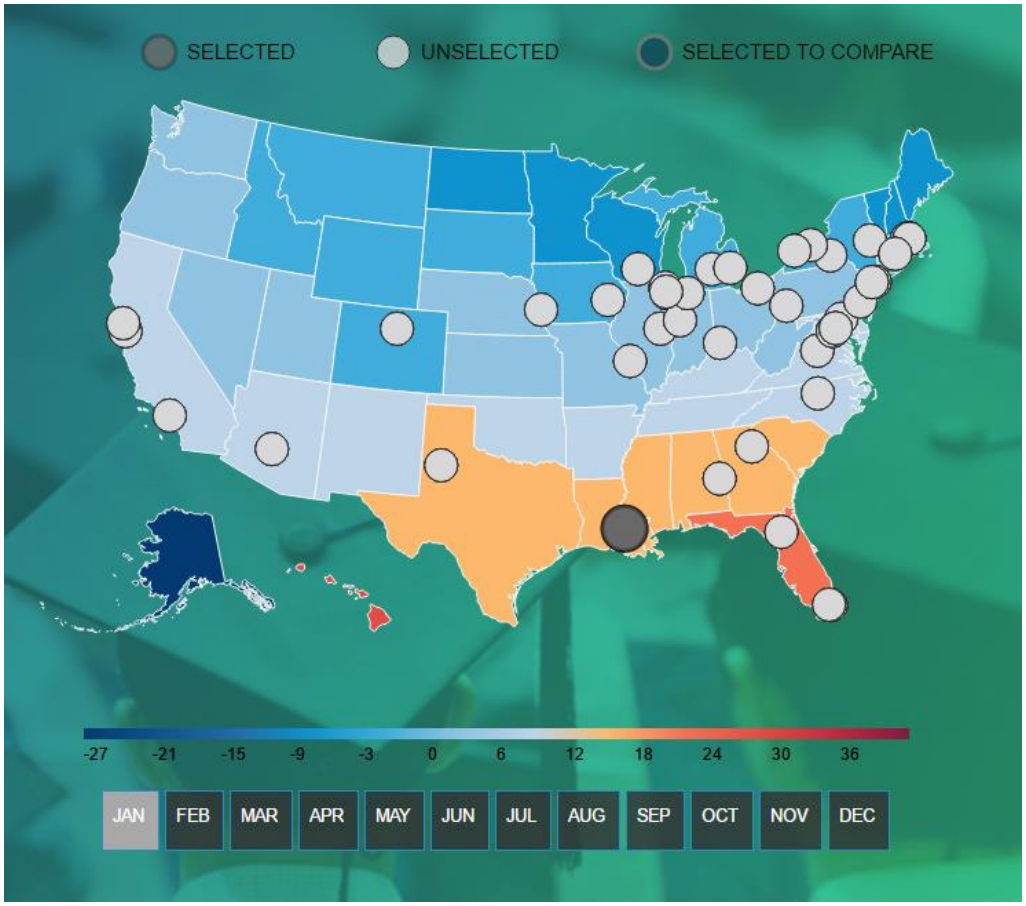


We have now changes our map design substantially. The following modifications were made in the map design:

1. The circles upon hovering still show the name of the school in a tooltip.
2. The selection of schools for exploration and comparison is no longer allowed form the map. These features are now functional from the list. This was a design choice to prevent redundancy of functionality between the map and the list. Also, it is much more convenient for the user to select a school he wishes to explore or compare from the list. As on the map, he has to hover over all the circles depicting schools or the tooltip to appear with the school name and then select schools.
3. A new feature is now added to the map. Now, the average temperatures across all the states of the US is colour encoded on the map for every month of the year. The temperature data is retrieved from source mentioned in [3].

A screen shot of our latest map implementations are shown below:





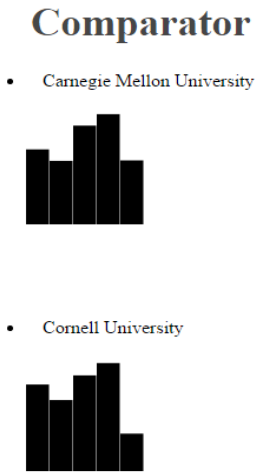
COMPARATOR

After providing the user a wide range of filters to narrow down his choices by a significant level, we feel providing a one-one comparison between any two universities would be a great feature for the

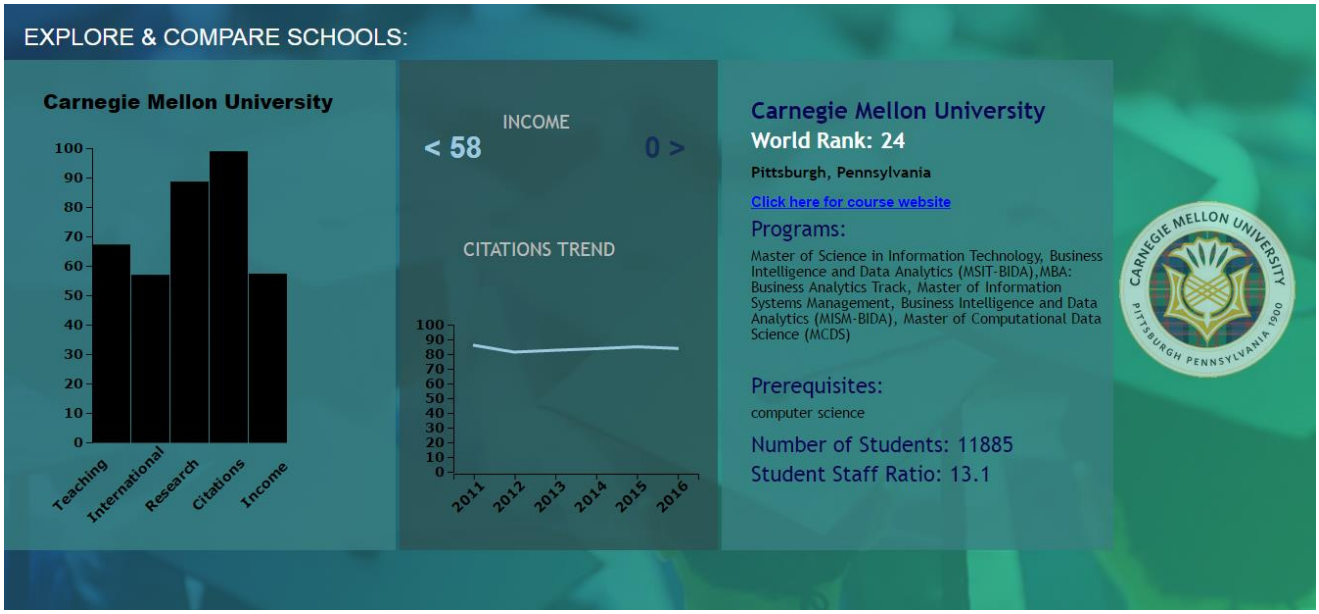
user to weigh them based on some key aspects. On the bigger picture, we intend to do a side by side comparison of the universities that the user selects.

We intend to implement many interactive features and also make use of linked interactivity to throw light on the differences in an effective way and help users in finalizing their schools.

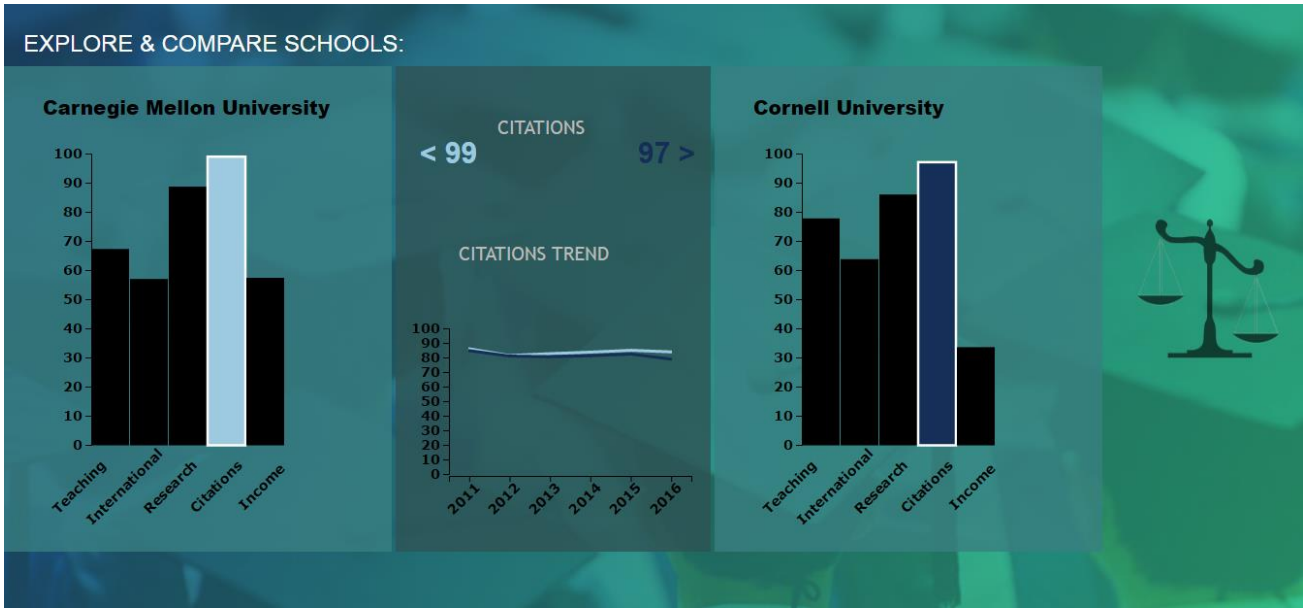
Below is the basic implementation of the comparator.



Our latest implementation of the comparator for a single school being selected is as below.



Our latest implementation of the comparator for a single school being selected is as below.



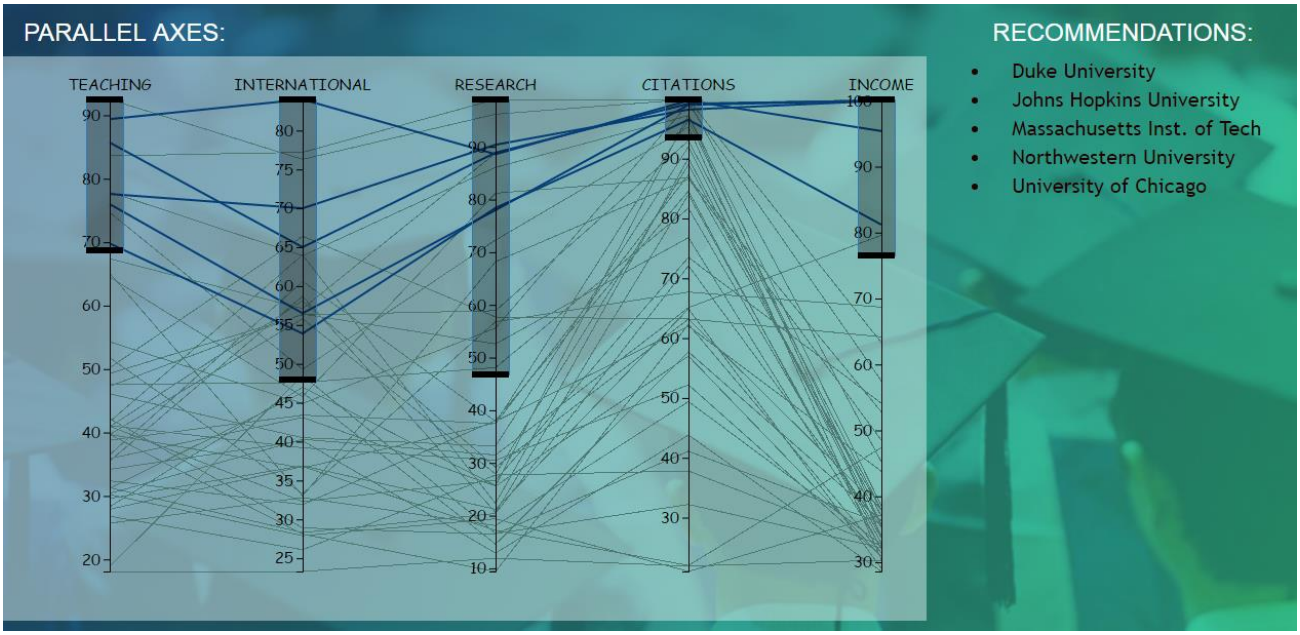
PARRALEL AXES

As suggested by our project advisor to provide the user more filters, we have implemented a parallel axes design which enables the user to filter on the universities further on some of the critical attributes by just brushing over the desirable values. We have implemented this design to give the user power to customize the filters effectively.

Here, the user can drag and set his preferable range for parameters – teaching score, research score, citation score, international score, and average income earned by the graduates of the Data Science programs offered by the school. Based on his values set, a set of schools are recommended which are displayed as list next to the parallel axes.

The parallel axes is independent of all other components of the visualization.

A screen shot of our parallel axes implementation is shown below.



IMPLEMENTATION AND INTERACTIVITY:

FILTERS

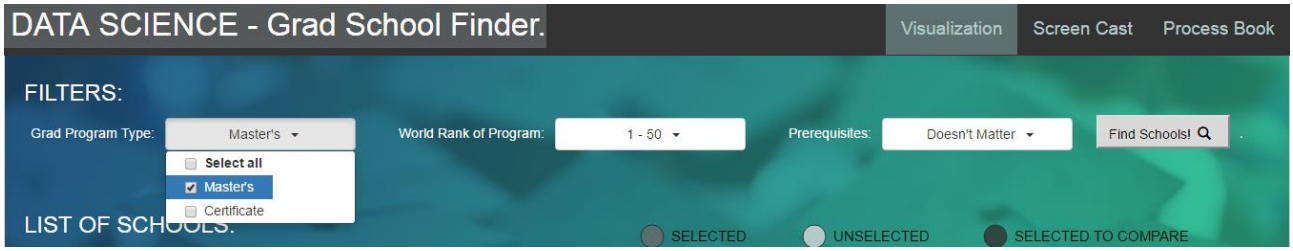
Our entire visualization is triggered by the filters.

The filters are basically used to allow the user to set his preferences for the kind of Data Science degree he would like to pursue in the US. The three filters are for – the type of degree (Master's or Certificate), the world rank range of the school, and if the grad program has any prerequisites.

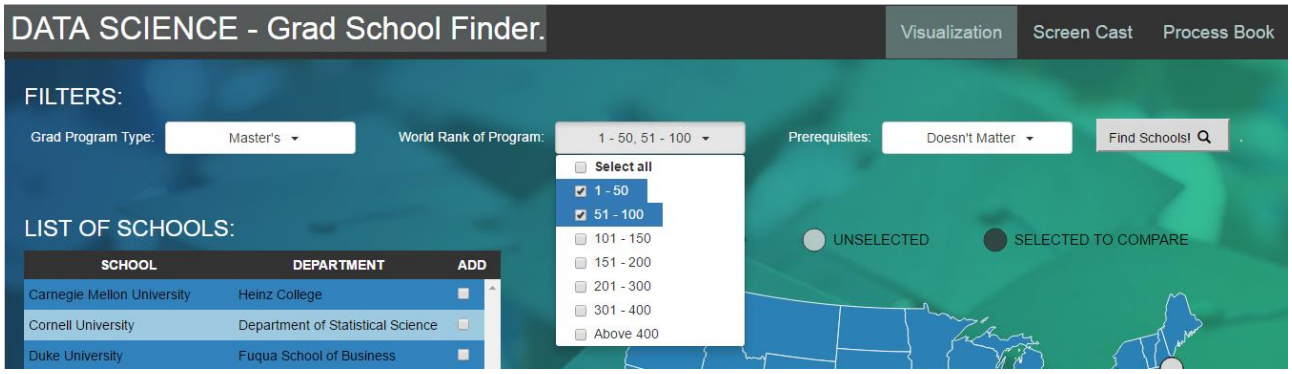
Multiple selections are enabled for two out of three filters as it is plausible for the user to want to to explore more than a single choice for a parameter.

JQuery and Bootstrap libraries were used to implement multiple selections with checkboxes.

The screen shot shows that the user can select to explore both Master's and Certificate type of data science programs offered by the schools in US.



The next screenshot shows that the user can choose to explore schools belonging to multiple world rank ranges.



LIST

Our visualization shortlists a set of schools based upon the values set by the user for the filters. The list comprises of the names of the schools, the departments within the schools offering the Data Science programs, and a checkbox against each school. The list is placed in a defined box with a vertical scrollbar. The schools in the list can be sorted by clicking upon the list headers. The selections of the list form the inputs to the map and the comparator charts.

Upon checking a single school in the list, there are two events that are triggered:

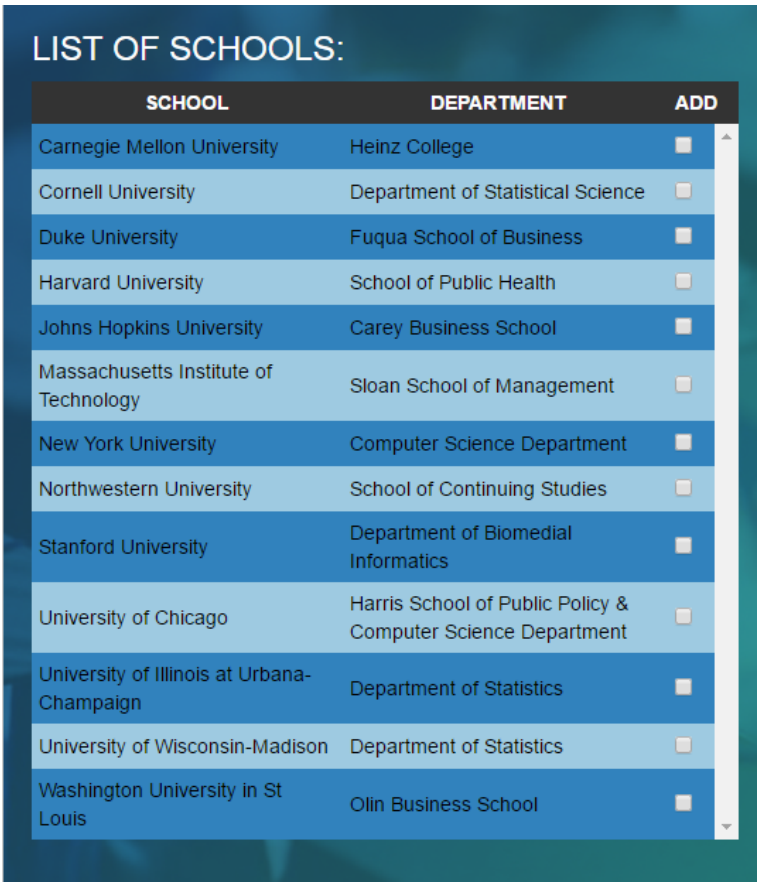
1. The checked school is highlighted on the map.
2. The school's details are displayed in the comparator chart placed below the list and the map. There are three components to the comparator chart – first, a bar chart of the teaching score,

the research score, the international score, the citation score, and the average income earned by graduates of the school are shown; second, upon clicking a bar corresponding to a parameter, a line chart of the history of values for a span of 6 years is shown; and lastly, a text box containing the world rank of the school, the location, a link to the official program website of the selected school, the list of data science programs offered by the school, the student population, the student faculty ratio, and a logo of the school are displayed.

When two schools are checked on the list, the following two events are triggered:

1. The schools are highlighted on the map (Note that the schools selected for comparison are highlighted in different manner to that of when a school is selected to explore).
2. A bar chart for the teaching score, the international score, the research score, the citation score, and the income of graduates of the program are shown in two individual bar charts. Upon clicking a particular parameter, a line chart comparing that parameter values for the two schools over a span of 6 years is shown.

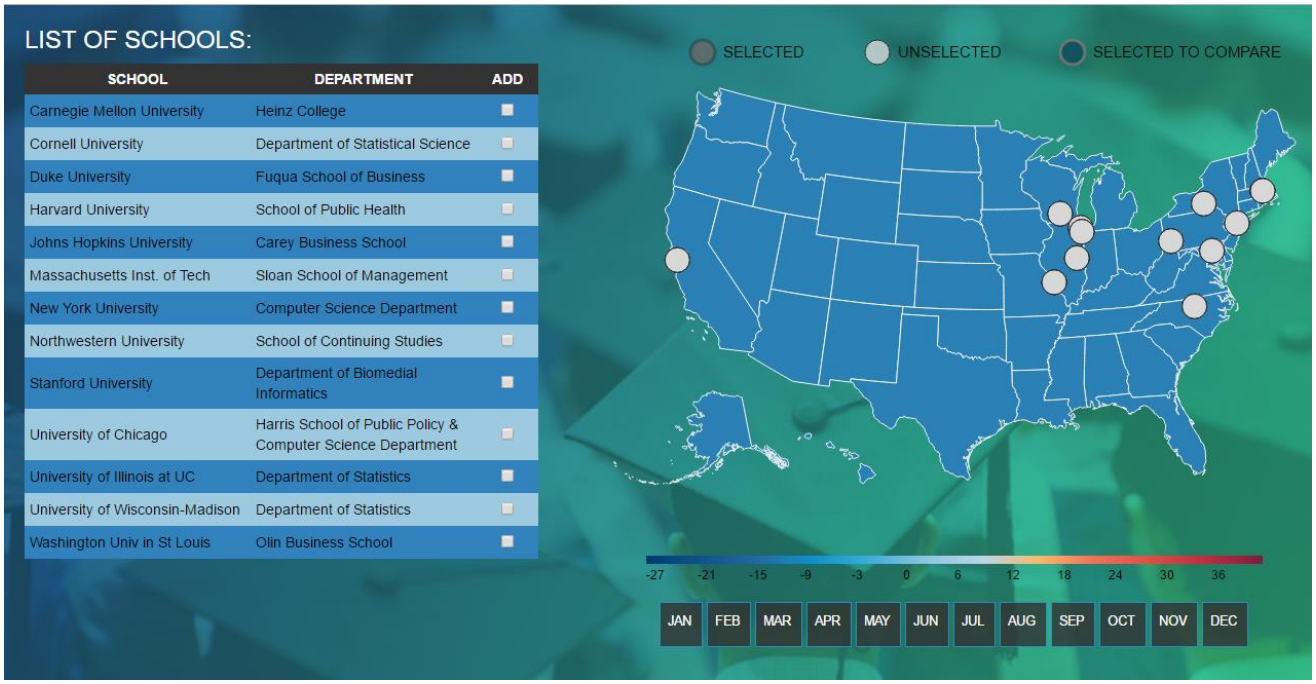
A screen shot of our list is shown below:



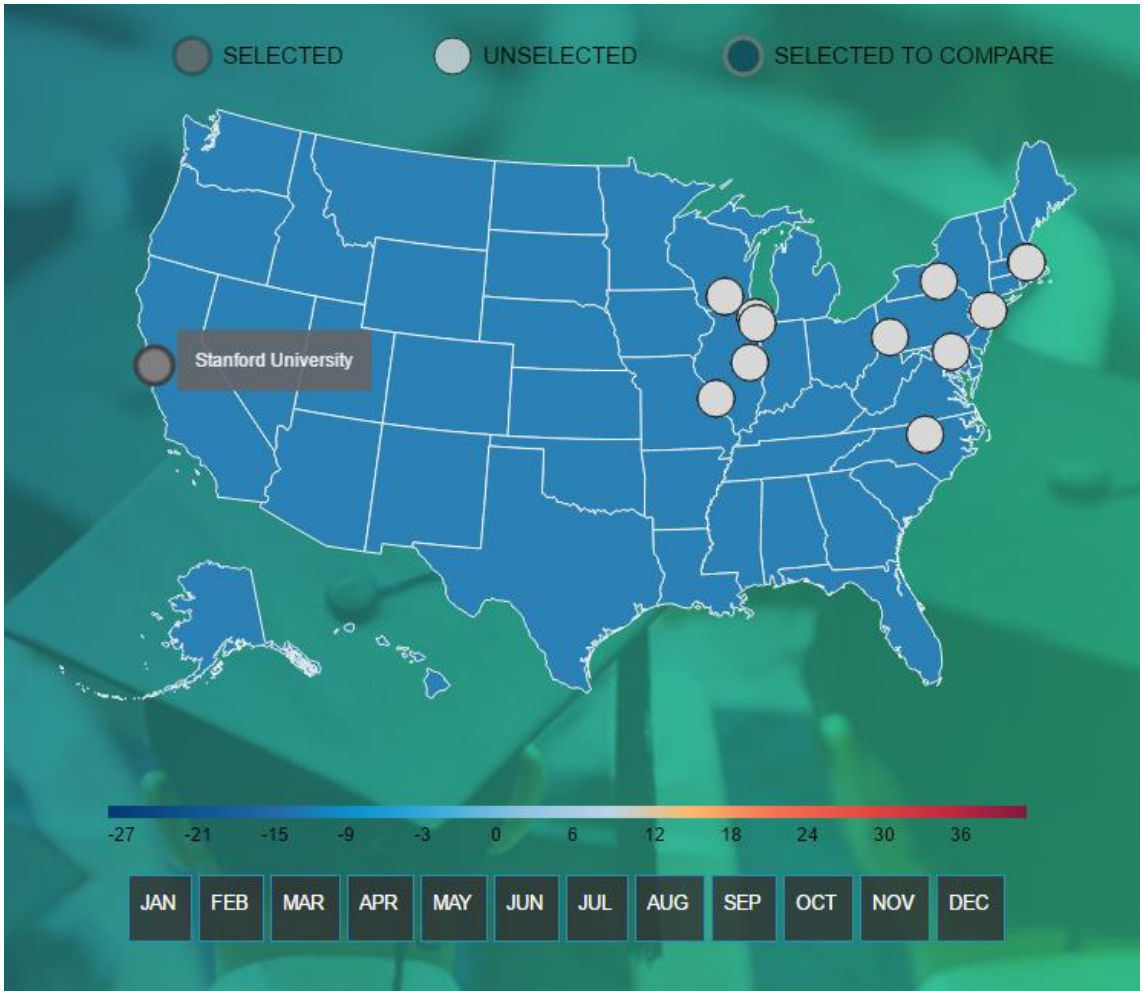
MAP

A map of the United States of America is drawn. The schools shortlisted by the filters are plotted on the map using their latitude and longitude data. In other words, the schools in the list are shown on the map.

A screenshot of the schools on list appearing on map is below. The circles on the map stand for the schools in the list.

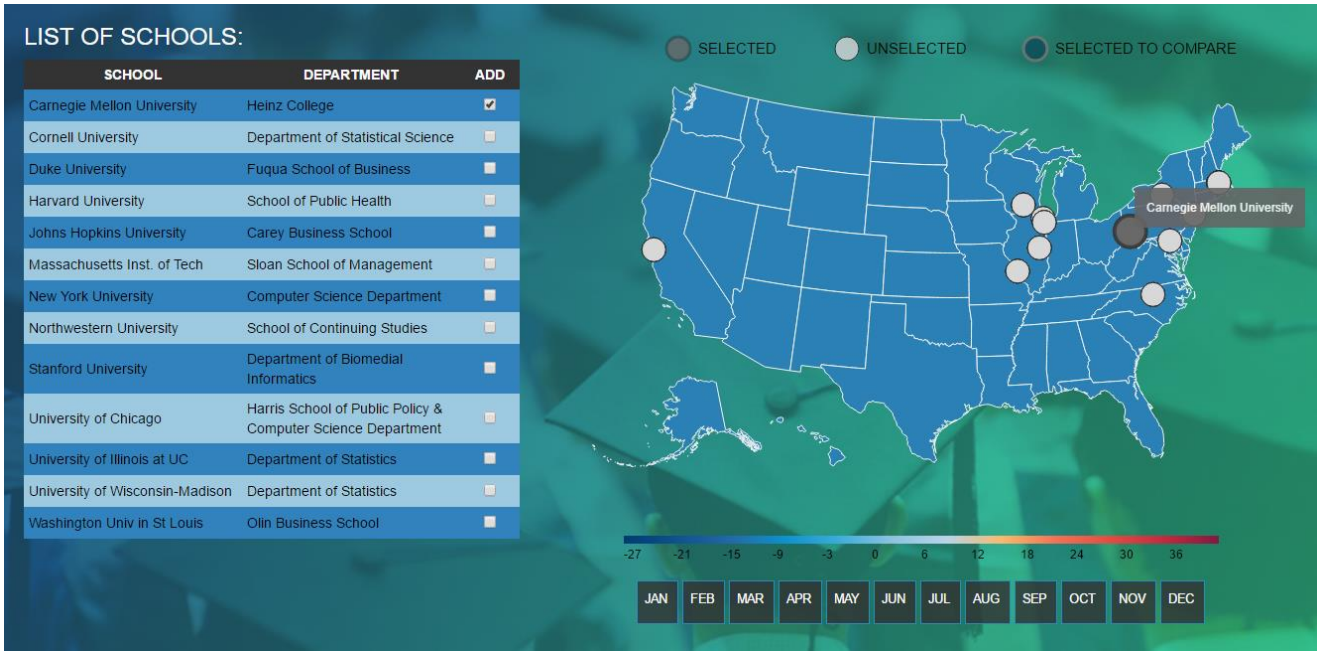


Upon hovering over the schools on the map, their names appear in a tooltip. A screenshot showing this functionality is as below.

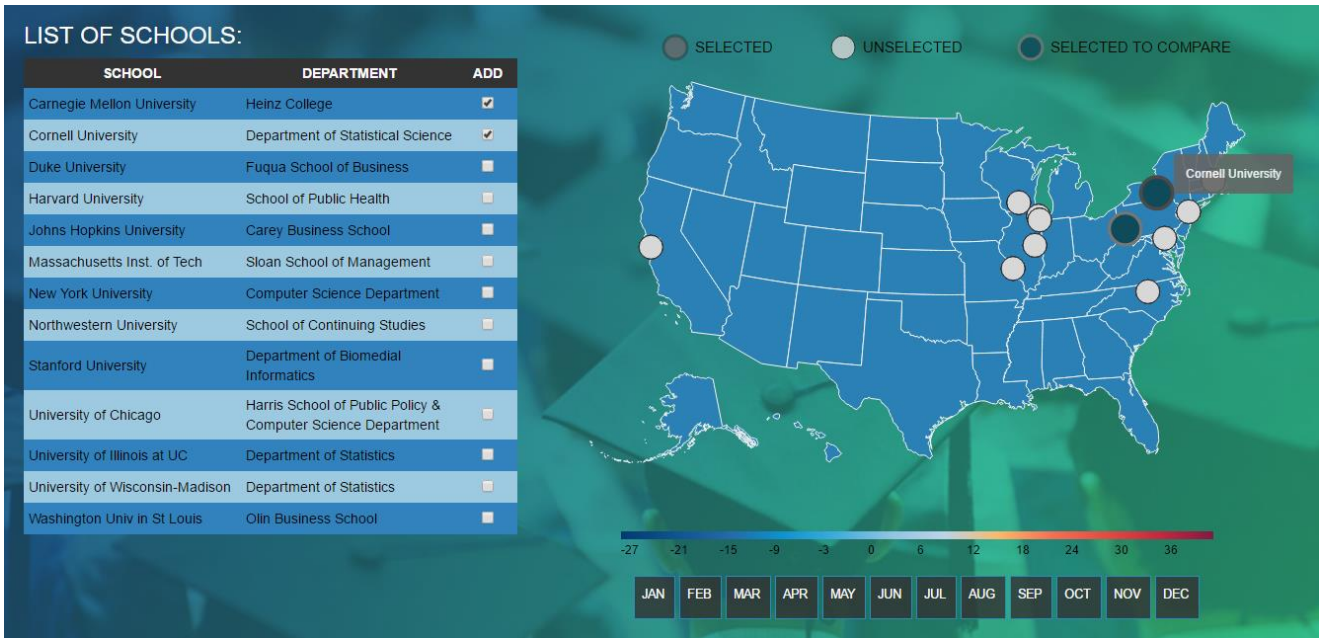


The schools checked in the list for exploration and comparison are highlighted on the map too. To distinguish between the schools selected for comparison and exploration, a legend is drawn above the map.

A screenshot of the school checked in the list and getting highlighted in grey in the map is shown. Here, Carnegie Mellon University is checked in the list and the circle showing the location of Carnegie Mellon is greyed in the map.

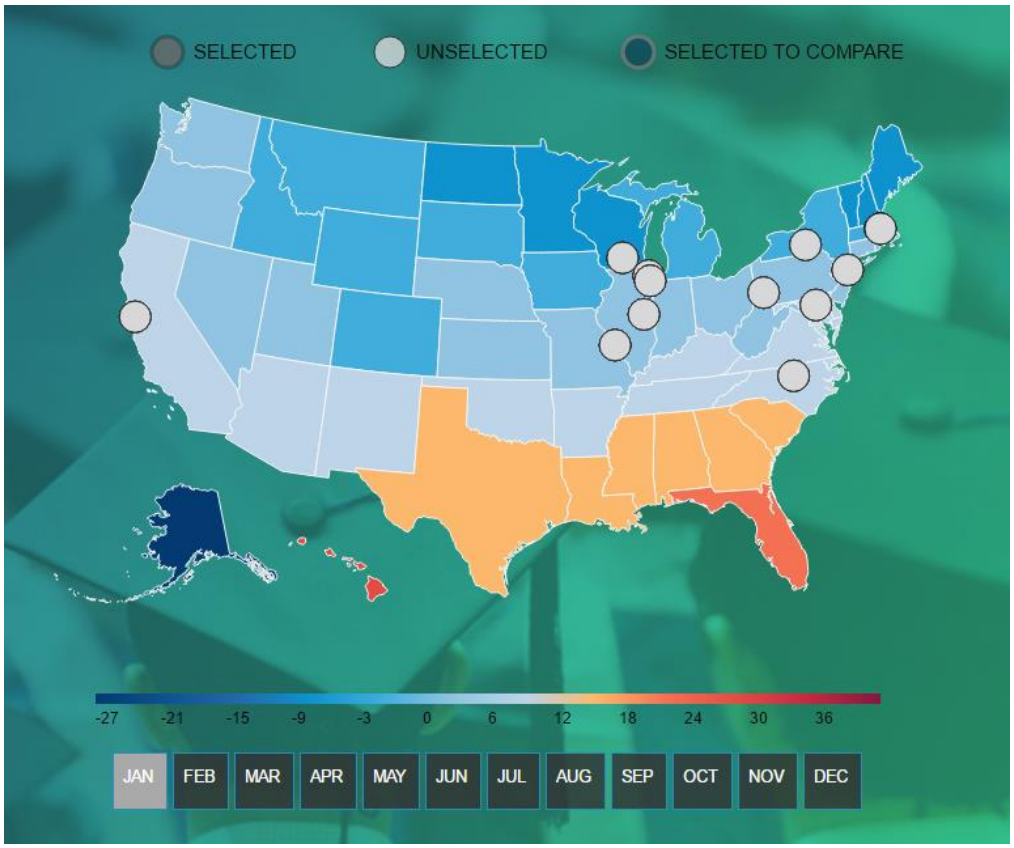


A screenshot of the schools checked in the list and getting highlighted in green in the map is shown. Here, Carnegie Mellon University and Cornell University is checked in the list and the circles showing the location of Carnegie Mellon and Cornell are coloured green in the map.



Additionally, a horizontal list of the months of the year are shown below the map. Upon clicking a month, the average temperatures across all states of the US are encoded by colours on the map. The design on the temperature legend was referenced from [4]. A temperature legend that maps the colour to the temperature range is drawn above the month's axis.

A screen shot of the temperatures for the month of January across the states of US is shown below.

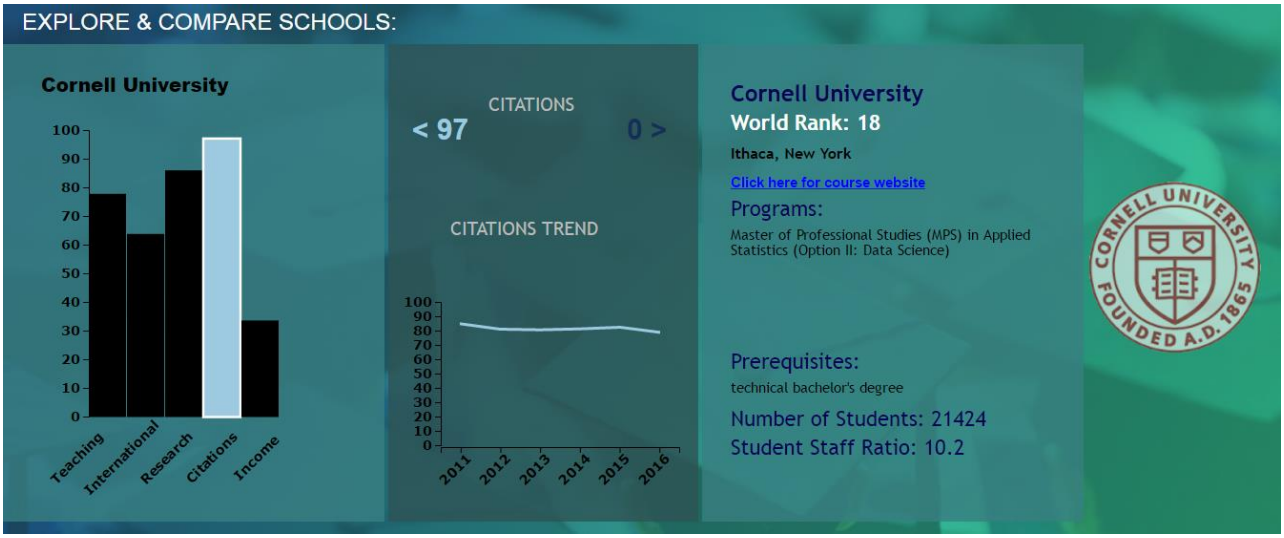


COMPARATOR

The schools checked in the list form the input to the comparator chart.

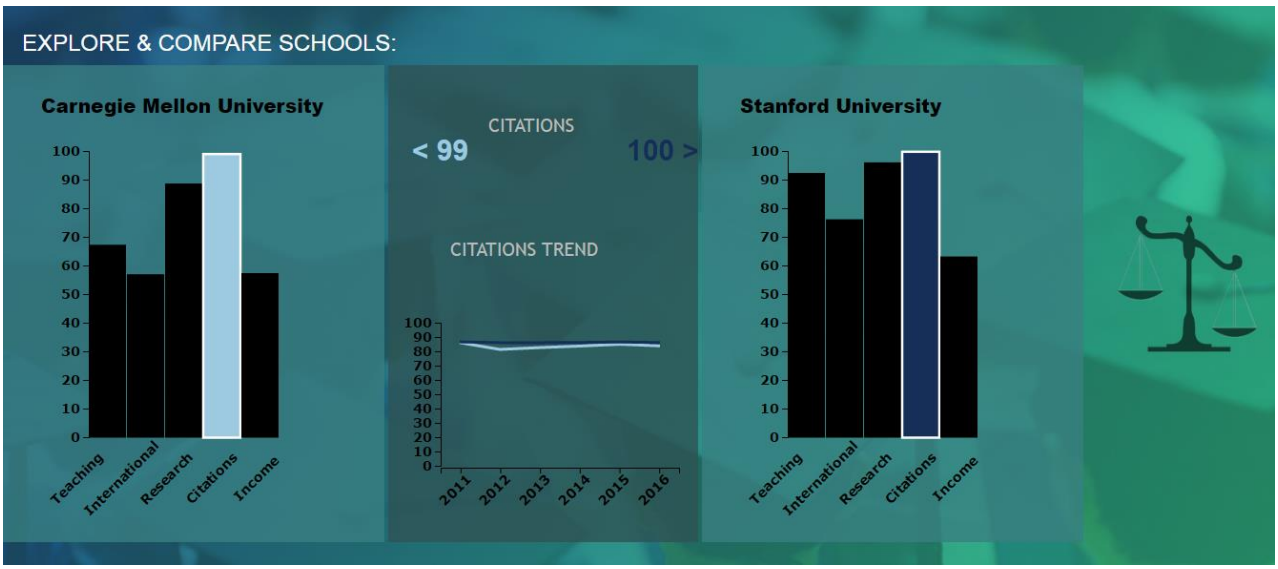
For a school checked in the list, the school's details are displayed in the comparator chart. There are three components to the comparator chart – first, a bar chart of the teaching score, the research score, the international score, the citation score, and the average income earned by graduates of the school are shown; second, upon clicking a bar corresponding to a parameter, a line chart of the history of values for a span of 6 years is shown; and lastly, a text box containing the world rank of the school, the location, a link to the official program website of the selected school, the list of data science programs offered by the school, the student population, the student faculty ratio, and a logo of the school are displayed.

The screenshot of the comparator chart for a single school selected in the list is as follows. Here, Cornell University has been checked in the list.



For two schools check from the list, a bar chart for the teaching score, the international score, the research score, the citation score, and the income of graduates of the program are shown in two individual bar charts. Upon clicking a particular parameter, a line chart comparing that parameter values for the two schools over a span of 6 years is shown.

The screenshot of the comparator chart for two school selected in the list is as follows. Here, Cornell University and Stanford have been checked in the list.



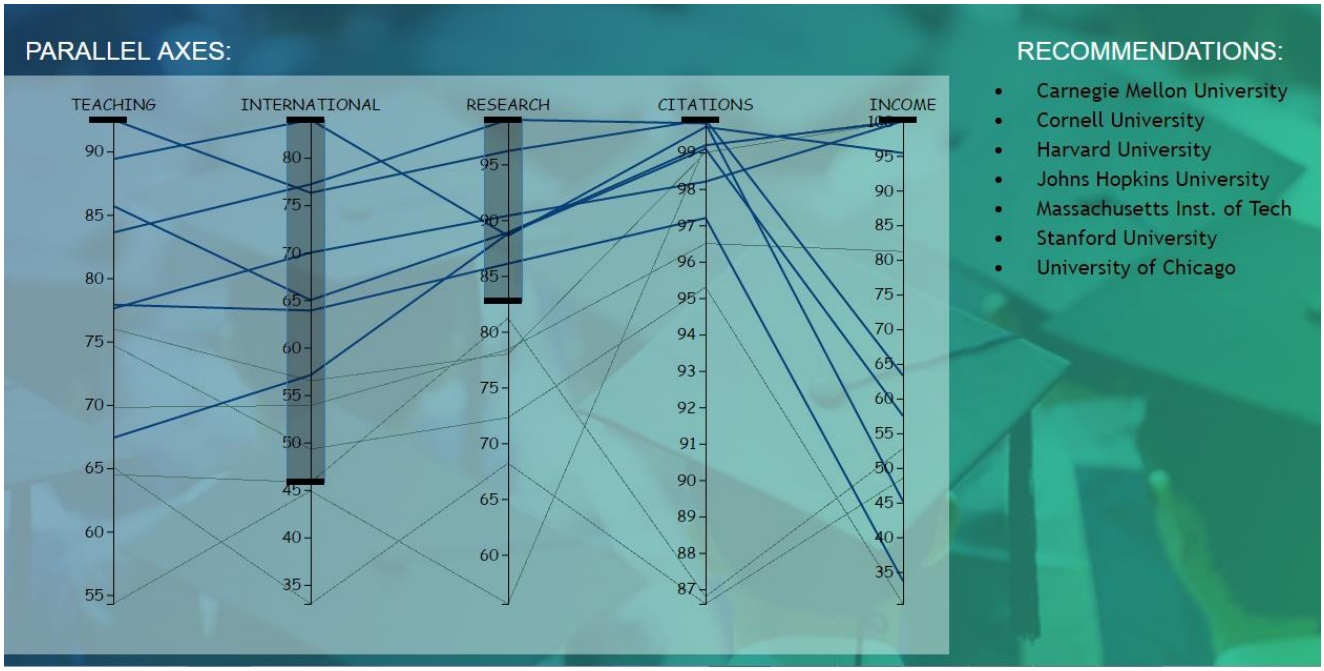
PARALLEL AXES

This component of our visualization is independent of all the above described components.

Here, there are 5 vertical axes for parameters – teaching score, research score, international score, citation score, and the average income for graduates of the program.

The filters can be shifted, dragged, expanded, and minimized over the axes to set the preferred ranges for the five types of scores. Based on the ranges set for these scores, schools are dynamically recommended and are displayed in the form of an unordered list adjacent to the parallel axes visualization.

A screenshot of our parallel axes and the recommendation list is shown below.



EVALUATION AND FUTURE SCOPE:

During the course of building this visualization, we learned that our visualization could have greatly improved if our dataset had a larger number of attributes and also had valid values for all the existing attributes. However, we have tried to utilize all the existing attributes in an efficient way for our visualization. As a result, the user is able to learn a massive amount about the schools matching his preferences.

Because of the limited breadth of the dataset, we were forced to limit ourselves to the conventional visualization designs. However, we have added the parallel axes to enable the filtering in a novel way. As we progressed, we found the necessity of visualizing temperatures which may also be a deciding factor in selecting schools. Hence, we incorporated another dataset with average temperatures in Celsius for all states of US across the year, which in turn made the space occupied by the map more efficient.

We had to compromise on the interactivity for selecting and comparing schools between the map and the list. Since the map was designed to encode temperature variations, adding interactivity to it would have made it cluttered. Also, it is easier for a user to selecting the school he wants to explore or compare from the list than the map as he has to hover over each circle on the map to find the school he wishes to explore or compare.

In future, we would like to add the following features for our visualization. First, we would like to add the zoom functionality to the map as there are certain regions of the map, where large number of schools are located and hence they get overlapped. Hence, a zoom into such features would be reduce the clutter. Second, now our visualization functions to find schools offering Data Science programs only. However, we would like to enhance it to be able to shortlist schools of several majors. Third, we would like to implement a search box for the list. As when a user finds a school on the map, and wants to explore it further, he has to manually screen through the list to find that school. With a search box, he could just key in the school name and check it to compare.

We regret not being able to implement the zoom functionality, which was our optional feature. On the whole, we are quite happy with the way our visualization turned out. It certainly looks a bit different from the original sketches, but our final visualization seems much better that what we had envisioned.

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