

Slate of Schools - US Universities

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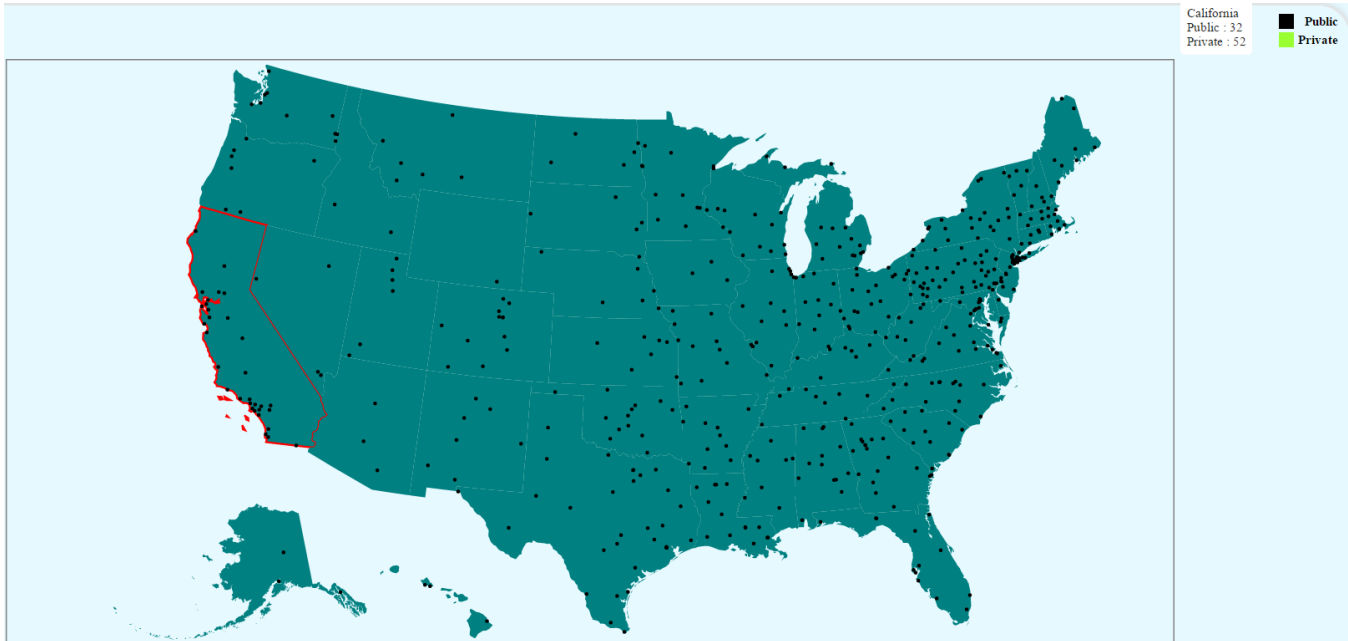


Fig. 1. Illustrative U.S.A map showing all the private universities and a state (highlighted in red color), gives the name of the state, count of Public and Private Universities in that state.

Abstract — In this project we have shown all the 4 or more year U.S Universities in one place mainly focusing on acceptance ratio and tuition fee. It is designed for those students who look for a quality education and are confused. This is done by comparing statistics of the universities in and outside a state. Upon observation, it is noticed that universities with less acceptance rate are highly ranked compared to universities with high acceptance rate and also have relatively high tuition fees.

1. INTRODUCTION

AS many students struggle to get into a university in USA, they have few things to think about before getting into it, such as state, tuition fee, acceptance ratio, etc. Our motivation for the project came from this aspect. Previously, students used to select the universities based upon the opinion of their friends who have already been in USA, studying or have done their degree. They don't know individually how to select a university and how to make a right decision for their education, here we will give a brief description of the universities in the USA to the students all over the world and let them compare the tuition fee and acceptance rate of their desired universities and select them for their future education. In this project we show the US map with different colleges located in different states and differentiate them based upon the public and private categories through which the students can know which category their desired university comes under.

Generally, the student wishes to join in the universities with

less tuition fee and valuable education which can be known by searching each and every university website but it becomes hard for a student to search every university website and know which courses they offer? Is that university offering that degree that students desire to plan? Will they be able to afford the tuition fee? Is that university has a good acceptance rate? And many other questions will haunt the student before selecting a university. Our visualization will make the student first select the state and see how many universities are there in that state i.e., public or private and then they can see what are the details of each university individually by which the student can select a university.

2. RELATED WORK

Studying in a university which best fits the students' requirements is an important factor to consider while choosing a university. Students who wish to study in a good university find it difficult to find a good school for them. There are many online websites which show the universities listed based on which we got an idea to enhance them by adding some of the extra features like visually showing them the location of the university on a map, showing and comparing

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the acceptance rate and tuition fees for the universities they choose. We came up with a visualization in order to make students work easier in finding a college which suits their requirements. Student's questions like, does low acceptance rate universities have high tuition fee? How much change is there in the tuition fee for a university over the years? Can be answered in this visualization project.

3. DESCRIPTION OF SYSTEM

We started the project by analyzing the dataset. Our dataset was too big with over 120 columns and 1492 rows. So, it was a tough task for us to use data that is necessary for our project. In this process of analyzing the dataset we found that there are some cells which are empty which a very big concern was. Basically, each row represent a university in United States and each column is a property respective to that university. Our project is mainly focusing on tuition fees and the acceptance rate for each university and plotting graphs based on these properties.

We have chosen tuition fees and acceptance rate as basic filters for a student to choose a university in USA. This is because it is obvious that every student first looks for a university that has a good acceptance rate and less tuition fee. But, we also need to observe that acceptance rate for top universities would be less. It is based on the student on how to analyze these features and choose a university that is appropriate for him. In order to fill the empty cells we used "usnews.com" to get the details for each university. The columns that we used for our project are University name, latitude and longitude positions, Type of University, Tuition fee data from 2011 to 2015, State, Total applications and Total Admissions. The view of the project is divided into 3 basic views. They are United States Map, Bar graph and Line graph. These views are explained clearly below.

3.1. United States Map View

This view is considered as head of our project. Here we plot United State Map on which each university is indicated as a dot. The Map was introduced using a pre-defined json file called "us.json". This file contains all the latitude, longitude and path positions for a map to be designed. Once we got the map here, our next goal was to point all the universities on the map. In order to do this we used us-state-names.tsv file which contains all the state names linked to the latitude and longitude positions on the map. So, this file helps us to identify each state with a specific name. Now I will explain all the functionalities that we have encoded. There are total of 50 states and 1492 universities in our data. One of them is when we click on a state the borders of that particular state are highlighted with black color. This helps the user to identify each state clearly. Additional functionalities are explained clearly here:

3.1.1. Legend Highlighting

We categorized our data into two main groups that is public and private universities. Initially, there will be no

universities plotted on the map. We have indicated public universities with black color and private universities with green color. You can see in the figure1 that there is a legend on the right top which represents public and private. So, now when we click on Black color, only public universities are pointed on the map and when green color is clicked only private universities are pointed. This helps the user to filter the universities easily and also reduces confusion as there will be less number of points pointed on the map.

3.1.2. State Hovering

Once the universities are plotted on the map, we can hover on each state which gives us information about the name of the state and the number of public and private universities in that particular state. We have introduced this because there are a lot of universities on the map and this would act as a filter for the user so that he/she can select a state where he can find his own choice of private/public University.

3.1.3. State Clicking

We now need to go to the main functionality that is the acceptance rate for each university. This is represented using the bar graph which is explained below. In order to get this bar graph we need to click any state. When clicked on a state we get a new bar graph which shows the acceptance rate for each university in that state.

3.1.4. University Hovering

Now there are public/private universities on the map and when we hover on any particular university we get a box beside that university which shows the name of that university, State of that university, Type of the university, Acceptance rate of that university, Highest degree offered in that university, Total matriculate in that university and also link to the website of the university. So if the user is interested in any particular university he can directly visit that university through the link we provided here. This can be seen in fig2.



Fig. 2. Florida state is highlighted showing Public universities and hovering a university showing its name, state, type, acceptance rate, highest degree offered, Total matriculates and university website.

3.1.5. University Clicking

Each university is represented as a point on the map, so when a university is clicked on the map then a line graph is generated which shows the tuition fee variation from 2011 to 2015. The variation is showed as a point on a line in each year. This helps the user to easily find out the tuition fee variation for a particular university.

3.2. Bar Graph View

Bar graph is the second most important part of our system. Each bar in the bar graph represents a state. When a state is clicked, then a bar graph associated to the universities in that particular state is generated. The basic aim of this bar graph is to compare all the universities in a particular state with respect to the acceptance rate. So from this we can easily find out the state with high acceptance rate and the state with low acceptance rate. Y-axis shows the acceptance rates and x-axis shows the name of the university.

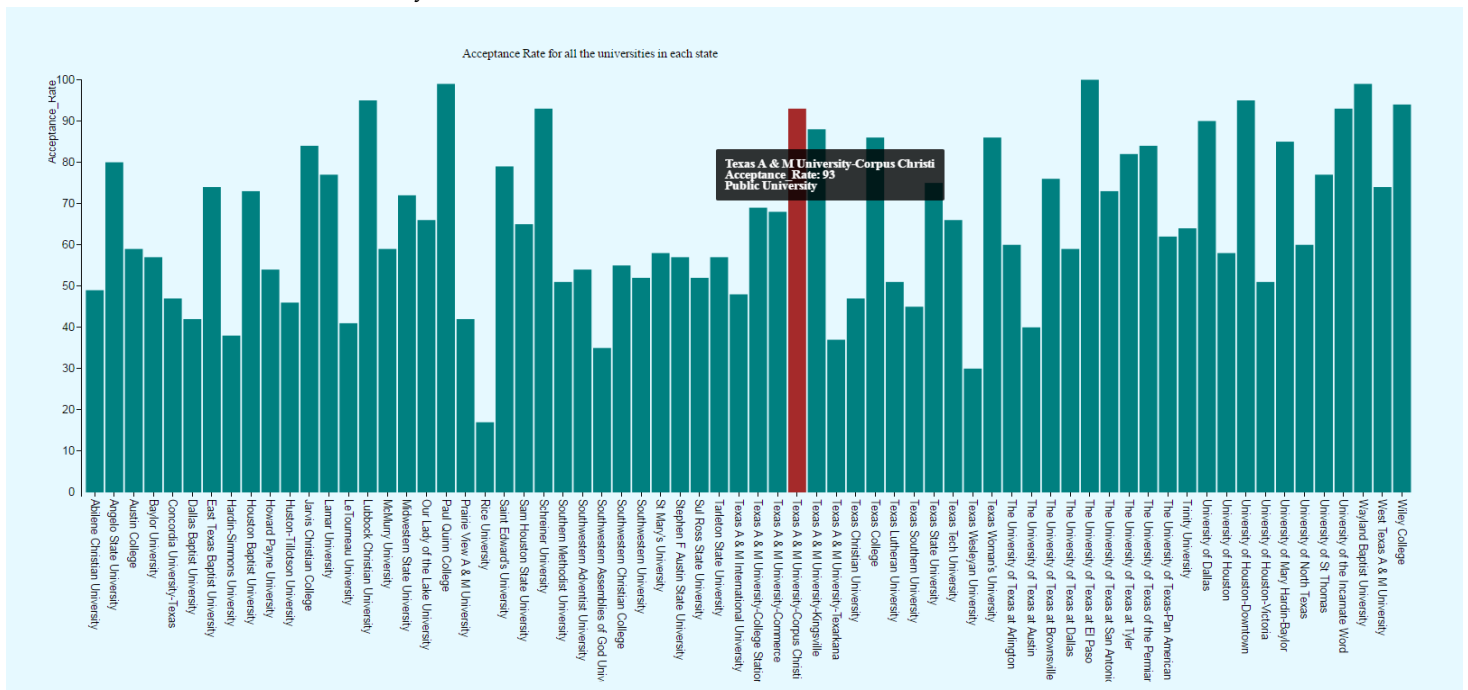


Fig. 3. Bar graph showing all the universities in Texas state which are compared based on the acceptance rate and Texas A & M University-Corpus Christi is being hovered so it got highlighted and giving information about that university like name, acceptance rate and type.

3.2.1. Hovering on a Bar

An additional functionality to this is when we hover on a bar we can see the name of the university, its acceptance rate and the type of that university. We already know the state that it belongs to as the state is highlighted on the map when clicked. When we hover on a bar, it turns into red color for easy understanding.

3.2.2. Clicking on a Bar

When clicked on a bar we can generate a new line chart if it is not generated yet or we can add a line to the already generated line graph. This helps in comparing two universities from the same state in terms of tuition fee.

3.3. Line Graph View

In order to create this line graph we did not have the data as required. So, in order to form the data as required, we wrote python code which turns the data into acceptable format. We can get a line graph when clicked on a university from the map. It can also be generated when clicked on a bar in the bar graph. The basic use of this line graph is to compare the universities with respect to tuition fee over the years 2011 to 2015. Years are shown on the x-axis and the tuition fee range is shown on the y-axis. Universities from different state and same state can be compared.

3.3.1. Hovering on a circle on the line

Additional functionality to this is when we hover on a particular circle on the line graph, the circle gets filled up which indicates that it has been hovered. It gives us information like name of the university, Tuition fee for that university in that particular year, State of that university and

type of that university. This way we can compare any university in United States in terms of their tuition fees.

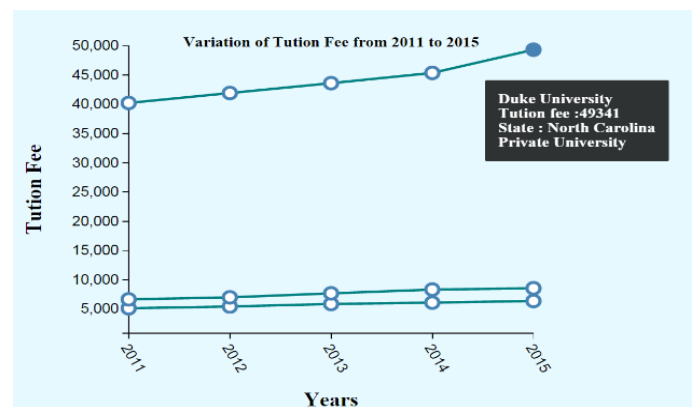


Fig. 4. Line graph showing various universities and their tuition fee variation over the years and hovering on a circle on the line showing Duke University and its information like name, Tuition fee, State and type.

4. WHAT WHY HOW FRAMEWORK AND DESIGN CHOICES MADE

What: Data	Table
Why: Tasks	<ul style="list-style-type: none">Analyze-Consume (Discover, Present, Enjoy), Produce (Annotate)Search- Lookup, Browse, Locate, ExploreQuery- Identify, Compare, Summarize.
How: Encode	US Map Bar chart Line graph
How: Manipulate	Change, Select, and Navigate
How: Facet	Superimpose, Details on Demand
Scale	Universities: 1492, 50 States + District of Columbia

Table 1 What, Why, How Framework

4.1. What- Data

The data we used is in the form of tables. The dataset availability is static as it is fixed and no changes will be made at runtime and also involves qualitative and categorical values. The dataset has 1492 universities along with several attributes like University name, Longitude and Latitude position of the university, Tuition fees for the years 2011 to 2015, and Matriculate information to name a few. The initial dataset had many null values and were required to manually update the values.

4.2. Why-Tasks

Among the three levels of data task abstraction, high level actions are to produce or consume information, middle level actions is to search and low-level actions is to query. Transforming task descriptions from domain-specific language into abstract form allows us to reason about similarities and differences between them.

4.2.1. Analyze

The most common use case for the user is to consume, where the universities are discovered from existing data and presented in the form of dots. Information about university is produced when the dots are hovered along with a link which redirects to college website.

4.2.2. Search

The search operations performed in our project are lookup, browse, locate and explore. Lookup is the scenario where the university and state is known, which saves time for the users to directly lookup for the university. Browse is the scenario where users are searching for one/more universities that fits their requirements. In this case, the users browse the universities by clicking on that state. In case of Locate, the focus is to find out where a particular university is. Explore is contradictory to lookup; it entails searching for the university without regards to their location.

4.2.3. Query

Once a set of universities are searched, one of the three scopes of query is performed. Users can identify the public and private universities on the US map by color coding. Compare is for multiple targets; here acceptance rates and tuition fees are compared for the universities. Summarize gives users the overview of the universities they searched for in previous phases.

4.3. How- Facet

Superimpose- It is clearly shown in the line chart that there are some universities which has same or nearly same tuition fees and those lines are superimposed on one another.

Details on Demand- Upon hovering on the state (in USA map), we get the count of public and private universities in that state. Upon hovering on the bars and nodes of a line chart, information of the university displays.

4.4. Design Choices Made

The design choices that we have made at data/task abstraction level are that we have chosen United States map to indicate all the universities so that a user can have visual experience of the place while selecting a university and it is more meaningful to indicate them on the map. We have also chosen bar graph for indicating the acceptance rate for each university because the data which we intend to represent is categorical and quantitative. So, in order to plot the data that has both categorical and quantitative data, bar chart is more appropriate. We have chosen line graph for plotting the variation in tuition fee over the years, this is because here both the data are quantitative but one attribute is a time series data which is why we have opted a line chart. Time series data always pairs up with line charts.

5. FUTURE WORK

This visualization can be extended in some aspects such as, a drop down can be introduced along with the map where the student can select a particular university and search about that in more detail rather than just getting a brief description of the university details on hovering. Also we can add filters where the student can describe their requirements such as a range of tuition fee, public/private University, high acceptance rate, specific area (such as east/west/north/south) and can also add many other features. Some of the other

changes that can be done are, the list of top 20 universities can be shown on the map by checking a checkbox, compare all the aspects (tuition fee, acceptance rate, degree offered, etc.) of the universities selected by the student.

6. CONCLUSION

Finally we can conclude that by knowing the acceptance rate and the tuition fee comparison the students get the major idea which university has to be chosen. The acceptance rate of the universities gives the student an idea in which university they can easily get into and the comparison of the tuition fee gives the an idea of their desired university with less tuition fee, by now using these both filters the students can make a decision which university he/she can apply for.

7. FINAL THOUGHTS

Basically, it becomes very hard to deal with huge data and not having sufficient data make it more difficult to proceed in making a visualization. We did not have sufficient data initially, we had to search for that data and gather all the information at one place which took a lot of time and then the data refinement was really a big task to do. As the data was not sufficient for us, we had to search for all the 1500 university websites and adding them in the database by creating a new column and also we initially had 4 years of tuition fee for a particular university, we had thought it would be better to add one more year data which was another big task. Finally after getting all the data at one place, merging all the visualizations in one page and making them work was a big task. Sometimes it was hard to show all the visualization on the correct place, some overlap, go out of the screen and compressed images, but at the end we were able to do the visualization as we have expected.

8. REFERENCES

- [1] <https://public.tableau.com/s/resources>
- [2] <http://bl.ocks.org/mbostock/3680957>
- [3] <http://www.usnews.com/education>
- [4] <http://www.tnoda.com/blog/2013-12-07>
- [5] <http://www.d3noob.org/2013/01/adding-tooltips-to-d3js-graph.html>
- [6] <http://bl.ocks.org/michellechandra/0b2ce4923dc9b5809922>
- [7] <http://datamaps.github.io/>
- [8] <http://bl.ocks.org/NPashaP/a74faf20b492ad377312>
- [9] <http://alignedleft.com/tutorials/d3>
- [10] <https://d3js.org/>
- [11] <https://bl.ocks.org/mbostock/3885304>
- [12] <http://bl.ocks.org/Matthew-Weber/5645518>