

College tuition, diversity, and pay

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0.1 Introduction

- Many people are interested to know about the tuition, costs, diversity and potential salary when searching for college.
- In this project, we want to analyze:
 1. Diversity among schools across US
 2. Tuition costs across different states
 3. Historical trends of tuition
 4. Average potential salary for graduates from different universities
- We have 4 datasets with 23 variables and more than 50000 observations.

0.2 Diversity dataset

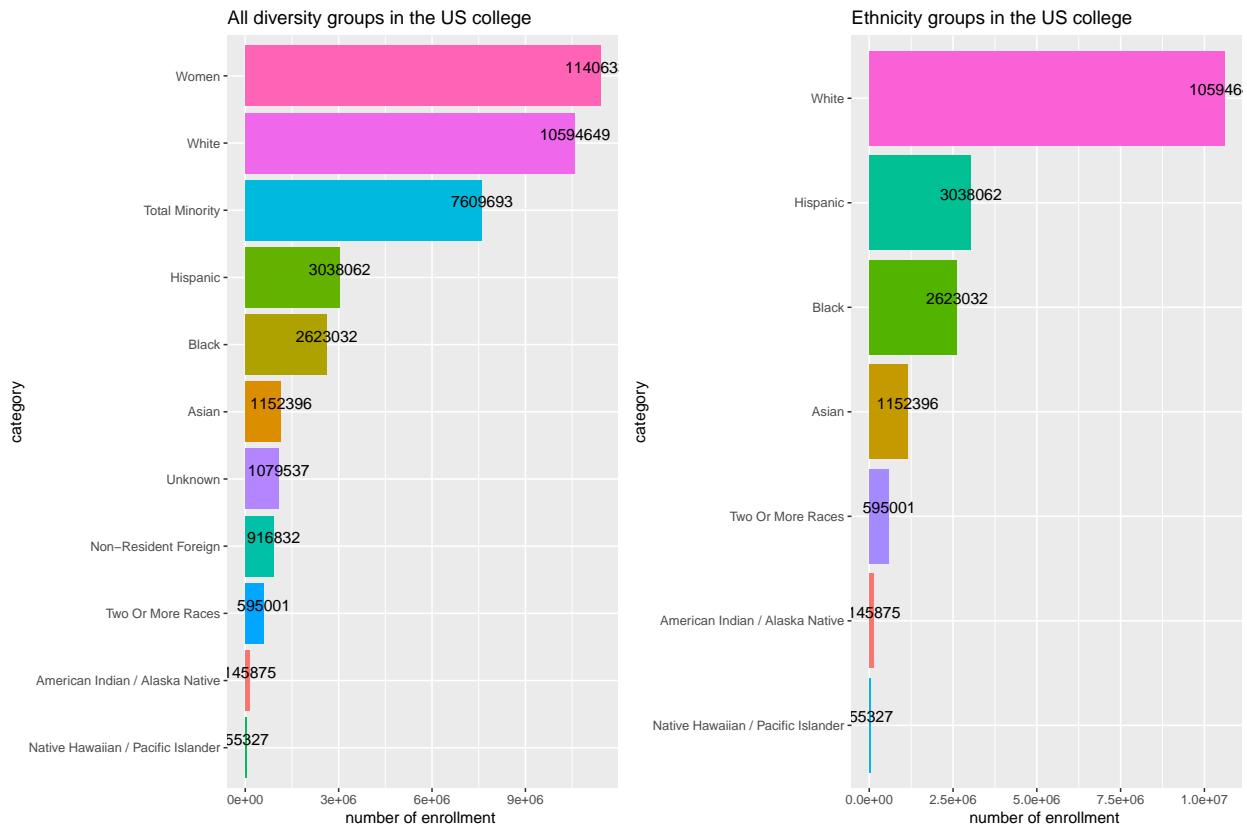
```
diversity_school %>% glimpse()

## #> #> #> #> #> #>
```

```
## #> Rows: 50,655
## #> Columns: 5
## #> #> #> #> #>
## #> $ name <chr> "University of Phoenix-Arizona", "University of Ph...
## #> $ total_enrollment <dbl> 195059, 195059, 195059, 195059, 195059, 19...
## #> $ state <chr> "Arizona", "Arizona", "Arizona", "Arizona", "Arizo...
## #> $ category <chr> "Women", "American Indian / Alaska Native", "Asian...
## #> $ enrollment <dbl> 134722, 876, 1959, 31455, 13984, 1019, 58209, 1903...
```

name	total_enrollment	state	category	enrollment
University of Phoenix-Arizona	195059	Arizona	Women	134722
University of Phoenix-Arizona	195059	Arizona	American Indian / Alaska Native	876
University of Phoenix-Arizona	195059	Arizona	Asian	1959
University of Phoenix-Arizona	195059	Arizona	Black	31455
University of Phoenix-Arizona	195059	Arizona	Hispanic	13984
University of Phoenix-Arizona	195059	Arizona	Native Hawaiian / Pacific Islander	1019

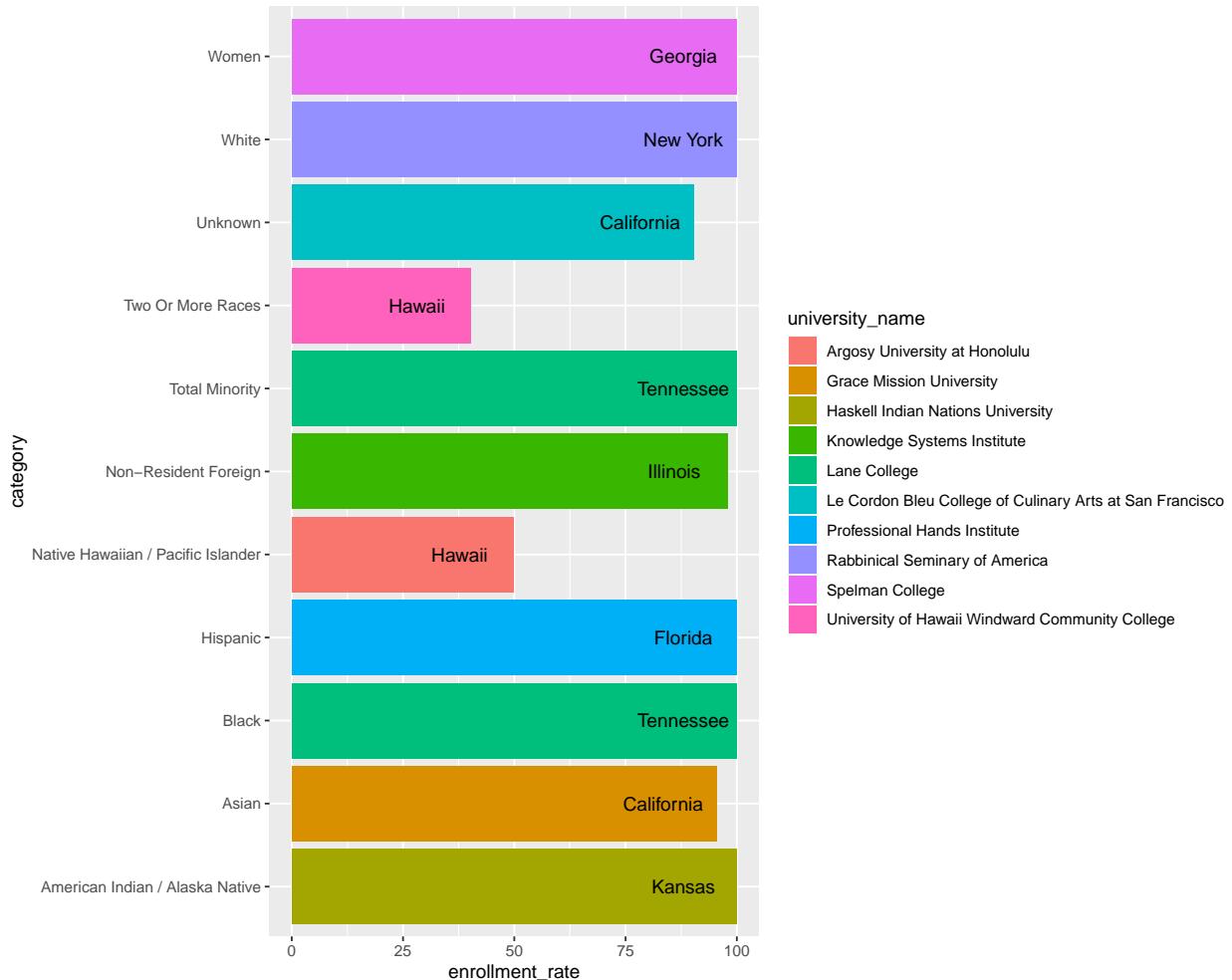
0.2.1 Bar chart of all diversity categories and ethnicity groups in the US college



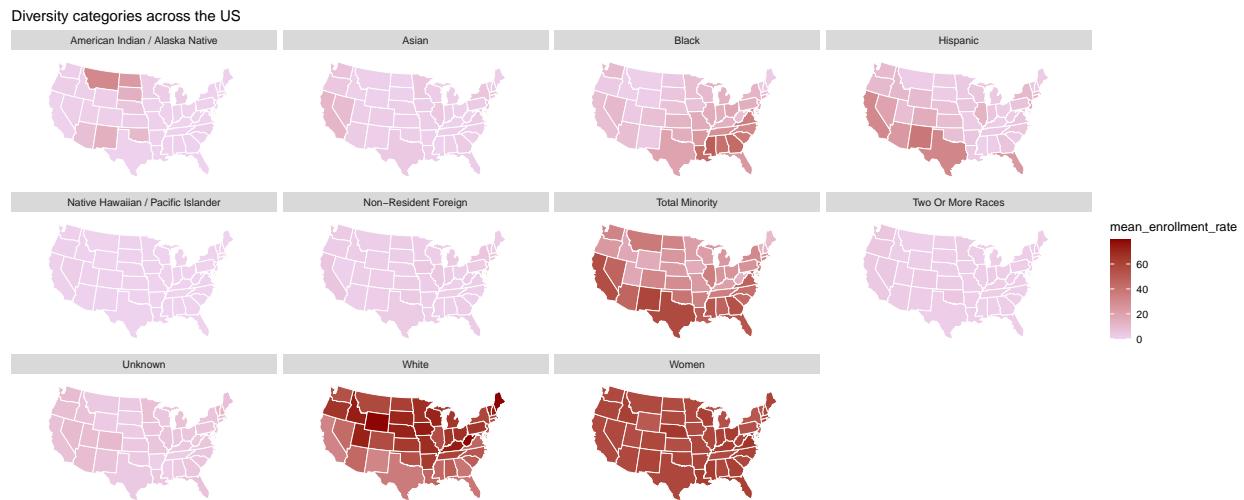
0.2.2 Finding the most diverse campus for each diversity category

category	university_name	state	etc
American Indian / Alaska Native	Haskell Indian Nations University	Kansas	
Asian	Grace Mission University	California	
Black	Lane College	Tennessee	
Hispanic	Professional Hands Institute	Florida	
Native Hawaiian / Pacific Islander	Argosy University at Honolulu	Hawaii	
Non-Resident Foreign	Knowledge Systems Institute	Illinois	
Total Minority	Lane College	Tennessee	
Two Or More Races	University of Hawaii Windward Community College	Hawaii	
Unknown	Le Cordon Bleu College of Culinary Arts at San Francisco	California	
White	Rabbinical Seminary of America	New York	
Women	Spelman College	Georgia	

0.2.3 Finding the most diverse campus for each diversity category



0.2.4 Diversity map of the US for each diversity group



0.2.5 Women enrollment rate across the US



0.3 Tuition cost dataset

```
tuition_cost %>% glimpse()

## # Rows: 2,973
## # Columns: 10
## $ name      <chr> "Aaniiih Nakoda College", "Abilene Christian U...
## $ state     <chr> "Montana", "Texas", "Georgia", "Minnesota", "C...
## $ state_code <chr> "MT", "TX", "GA", "MN", "CA", "CO", "NY", "NY"...
## $ type      <chr> "Public", "Private", "Public", "For Profit", "...
```

```

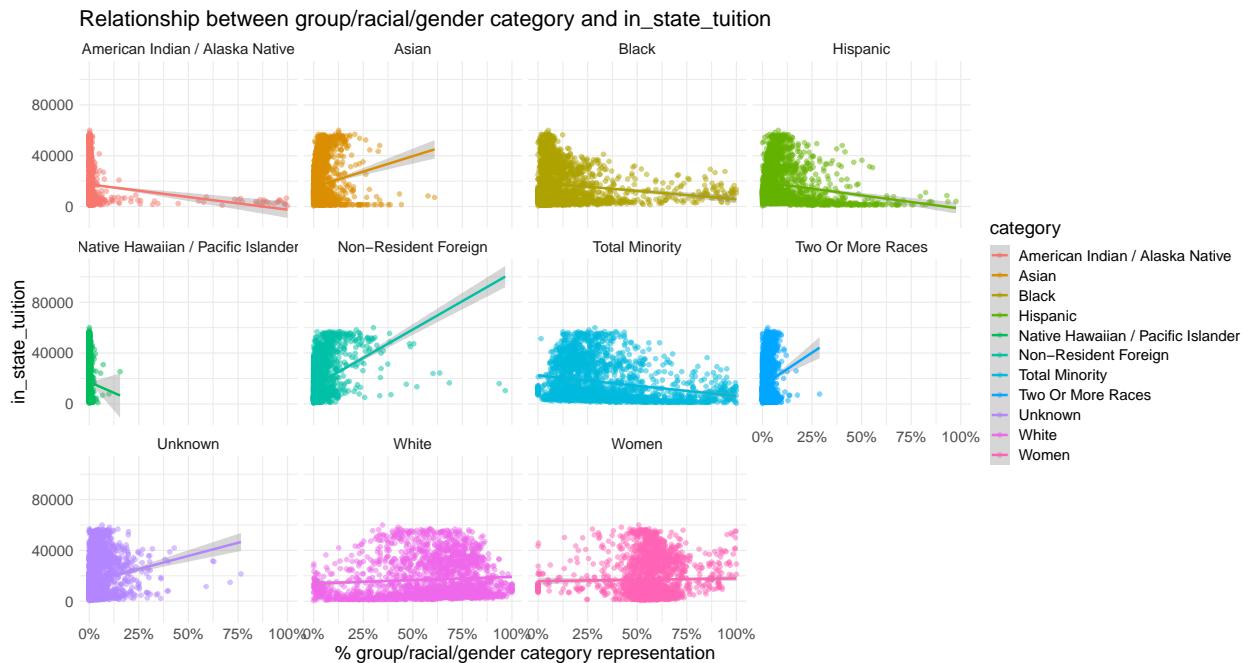
## $ degree_length      <chr> "2 Year", "4 Year", "2 Year", "2 Year", "4 Yea...
## $ room_and_board     <dbl> NA, 10350, 8474, NA, 16648, 8782, 16030, 11660...
## $ in_state_tuition   <dbl> 2380, 34850, 4128, 17661, 27810, 9440, 38660, ...
## $ in_state_total      <dbl> 2380, 45200, 12602, 17661, 44458, 18222, 54690...
## $ out_of_state_tuition <dbl> 2380, 34850, 12550, 17661, 27810, 20456, 38660...
## $ out_of_state_total   <dbl> 2380, 45200, 21024, 17661, 44458, 29238, 54690...

```

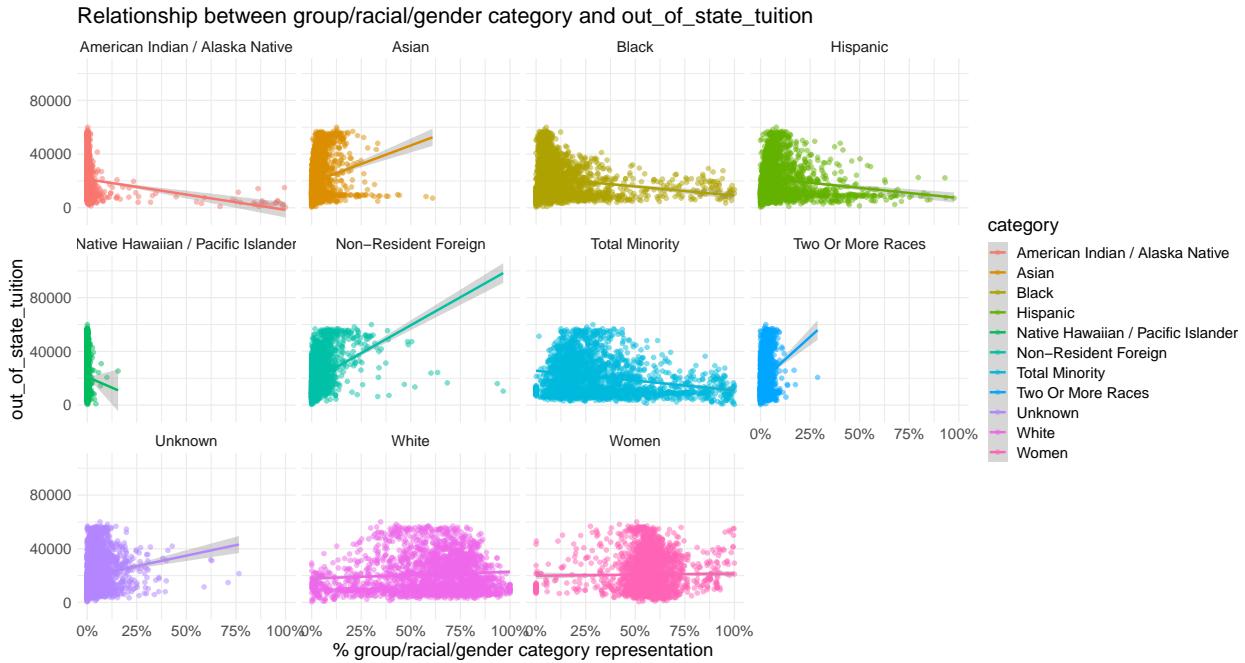
0.3.1 Merge tuition cost dataset and diversity dataset

- We are interested to know whether there is any correlation between enrollment rate and each diversity group
- We have done analysis for both in state and out of state tuition in the next slides

0.3.2 Relationship between enrollment rate and in-state-tuition per each diversity group

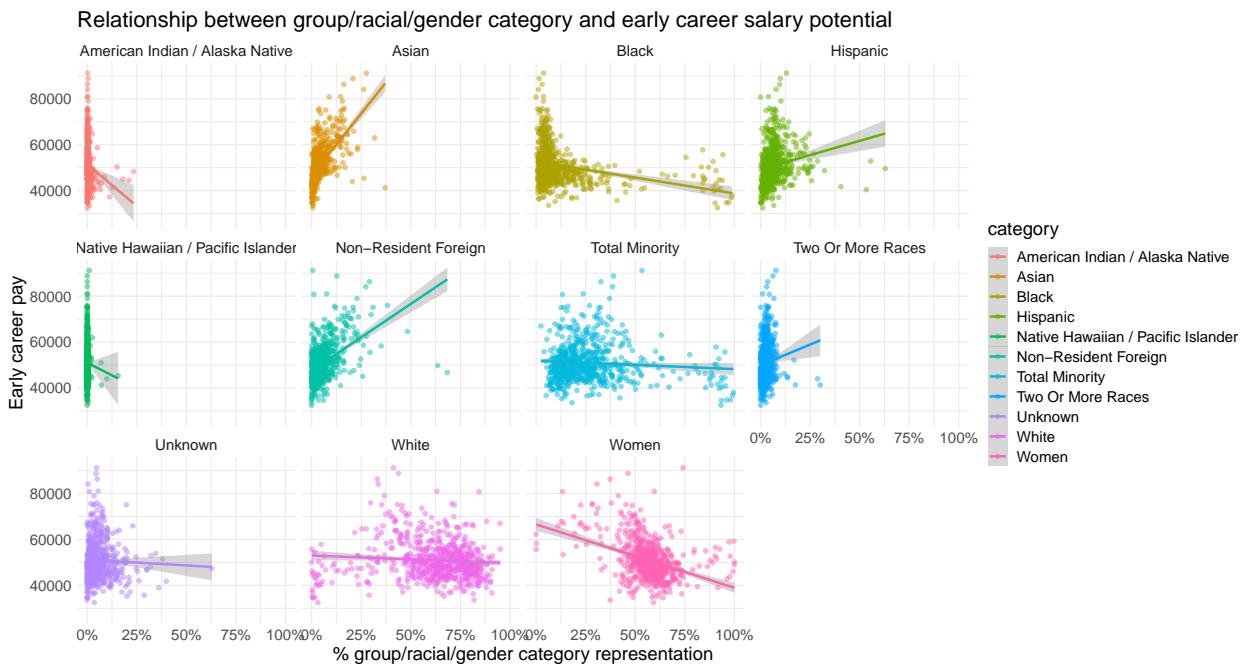


0.3.3 Relationship between enrollment rate and out-of-state tuition per each diversity group



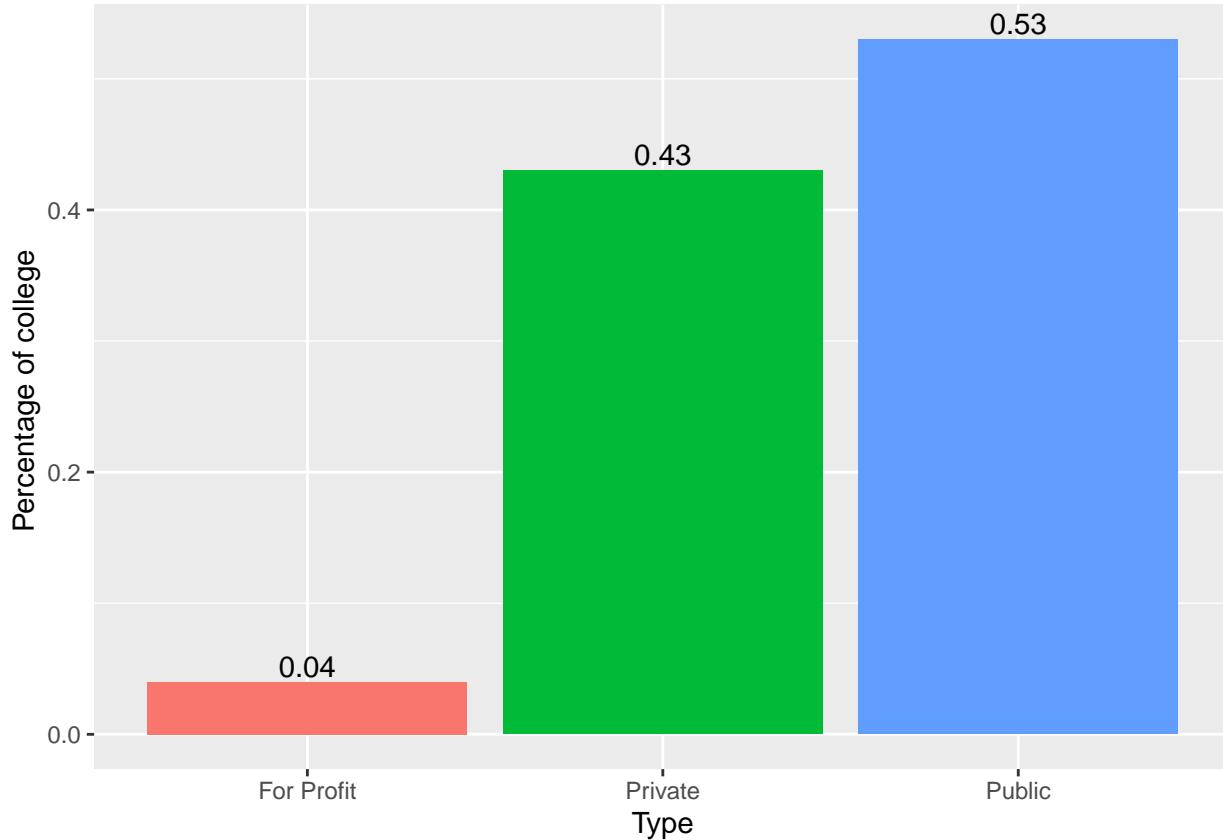
0.3.4 Relationship between diversity groups enrollment rate and early career salary

- we need to merge diversity dataset and salary dataset.



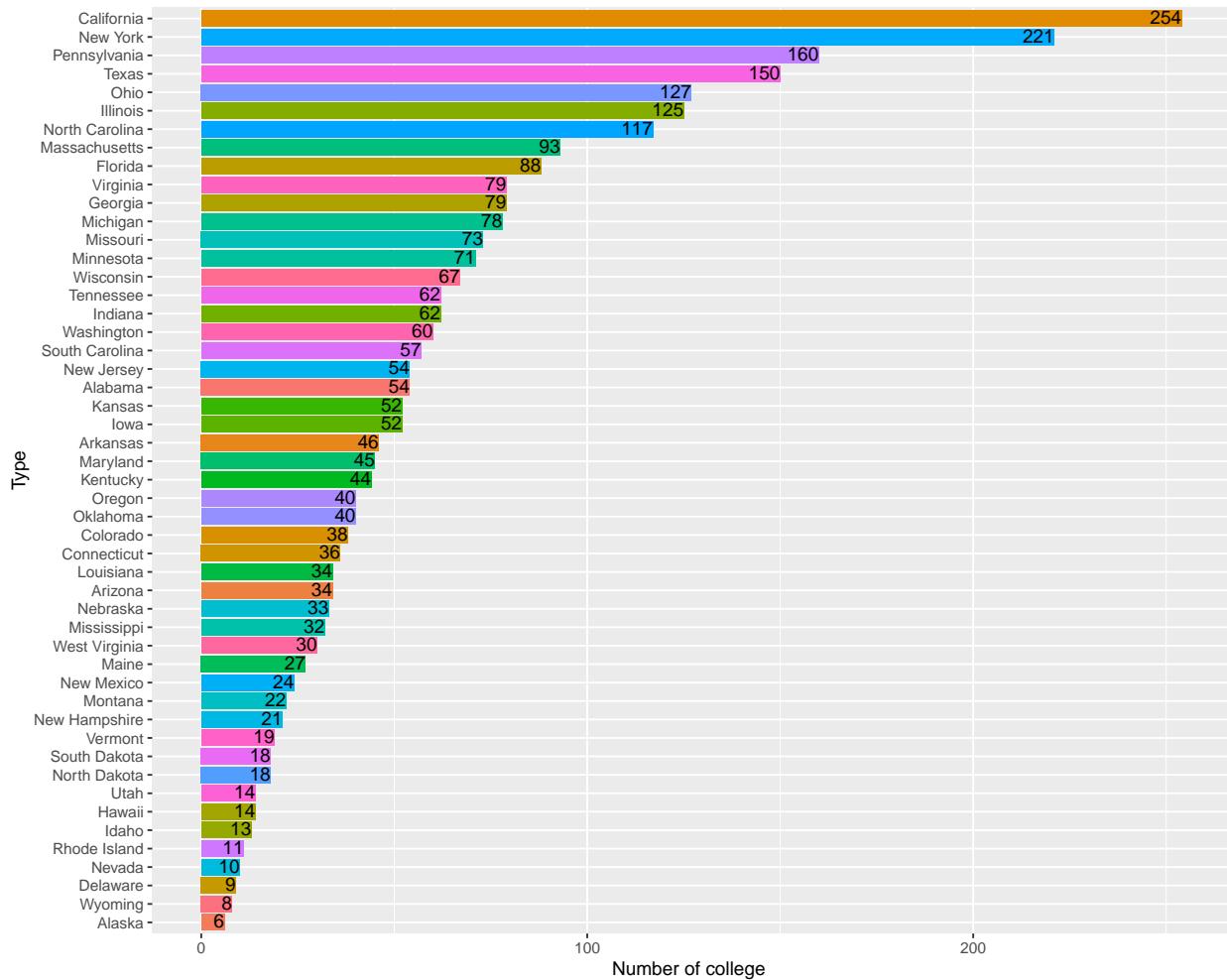
0.3.5 Different types of colleges in US

There are different types of colleges enrolling students across the country. According to this data set, three types of colleges are recognizable: public, private, and for profit. As shown in the following plot, public colleges are the majority category with 53 percent of all colleges and private and for-profit colleges are following public collages with 43 and 4 percent, respectively.



0.3.6 How many colleges are there in each state?

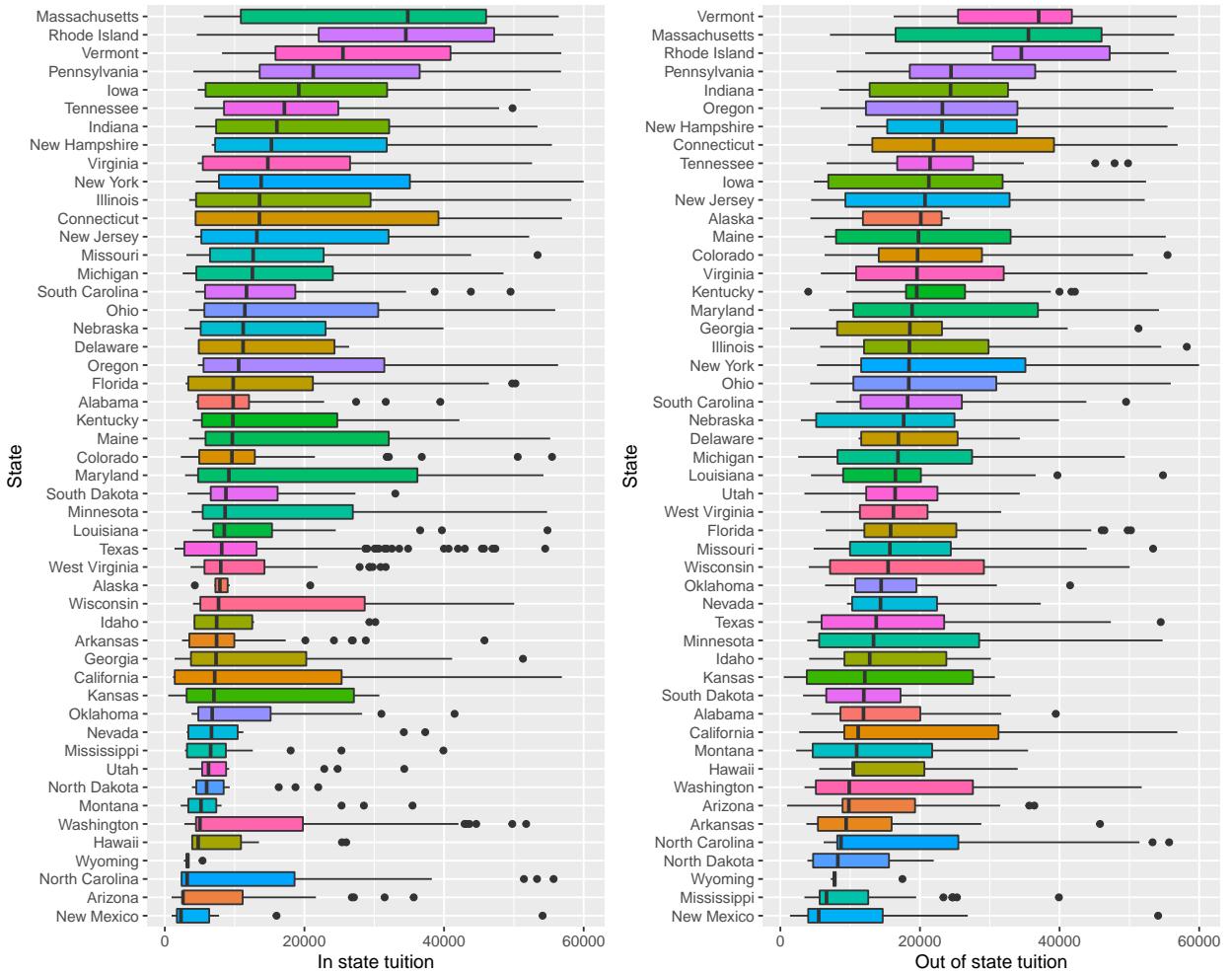
In this part, we explore the number of colleges in different states. According to the following plot, the top 5 states are California, New York, Pennsylvania, Texas, and Ohio. Rhode Island, Nevada, Delaware, Wyoming, and Alaska are the states with the least number of colleges. Iowa is ranked 19th in the country with 52 collages.



0.3.7 Comparing different states in terms of in state and out of state tuition

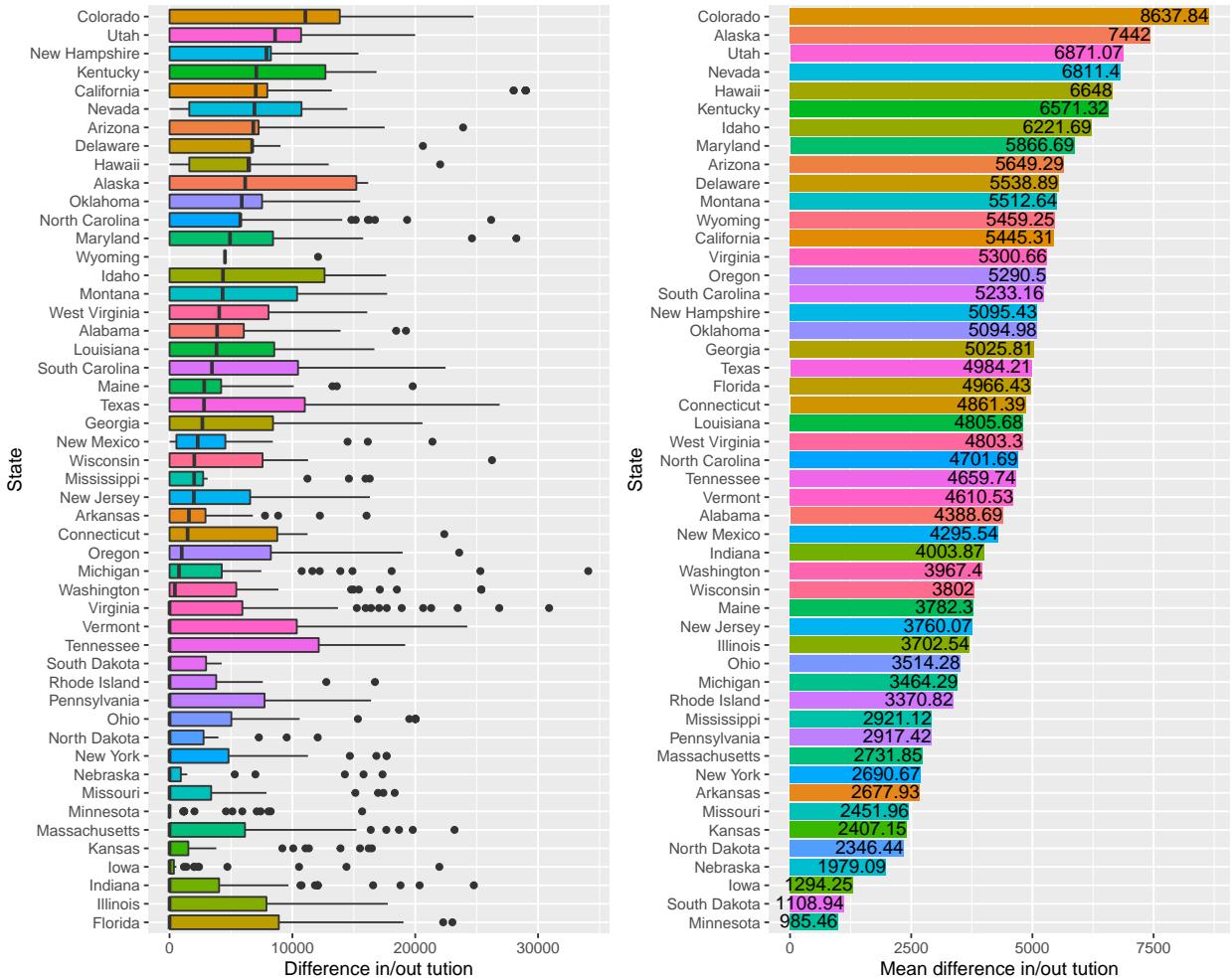
Which states have a higher rate of tuition costs? This is a question that most students are interested to find an answer to it when they are going to choose a college to continue their studies. This section provides a comparison for in/out-of-state tuition in different states. As can be seen in the left boxplot Massachusetts is the most expensive state on average in terms of in-state tuition. On the other hand, North Carolina, Arizona, and New Mexico are the cheapest states on average for those who intend to pay in-state tuition.

Same comparison is done for out-of-state tuition in right boxplot. This plot shows that Vermont has the largest out-of-state tuition cost on average and New Mexico is the most affordable state.



0.3.8 Comparing in/out-of state tuition

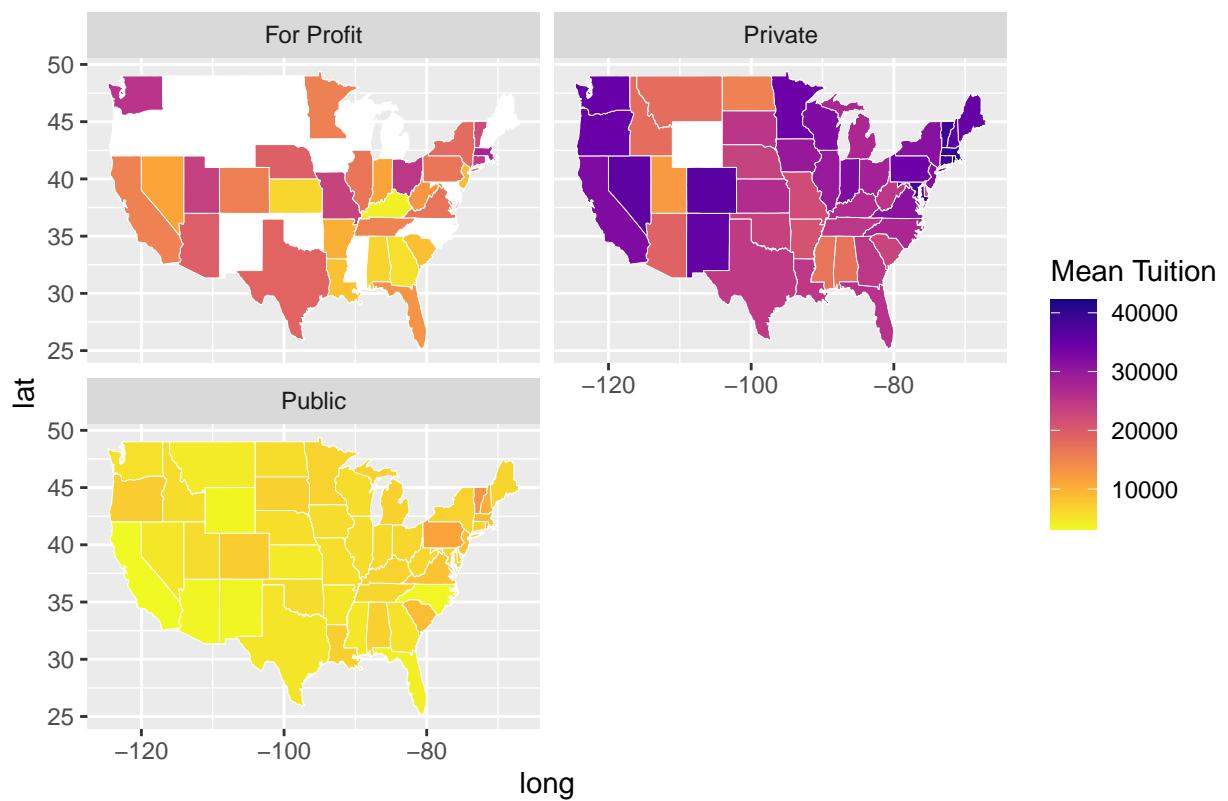
This section compares the difference between in/out-of-state tuition in different states. As can be seen in the following plots, the cost difference of in/out-of-state tuition in Colorado is larger compared to other states. One interesting point in boxplot is the median of difference with zero value for some states. This shows that in these states the average in-state tuition is equal to average out-of-state tuition.



0.3.9 In-state tuition, different type of colleges; What is the relationship?

Let's take a closer look at the geographical distribution of average in-state tuition costs for different types of colleges in the US. The following plots illustrate the distribution of average tuition costs on the US map. As can be seen, average tuition cost varies in different states for private and for-profit colleges. However, this statistic remains almost the same for public colleges across the country. It should be mentioned that white color in maps means that data is unavailable for the corresponding college type.

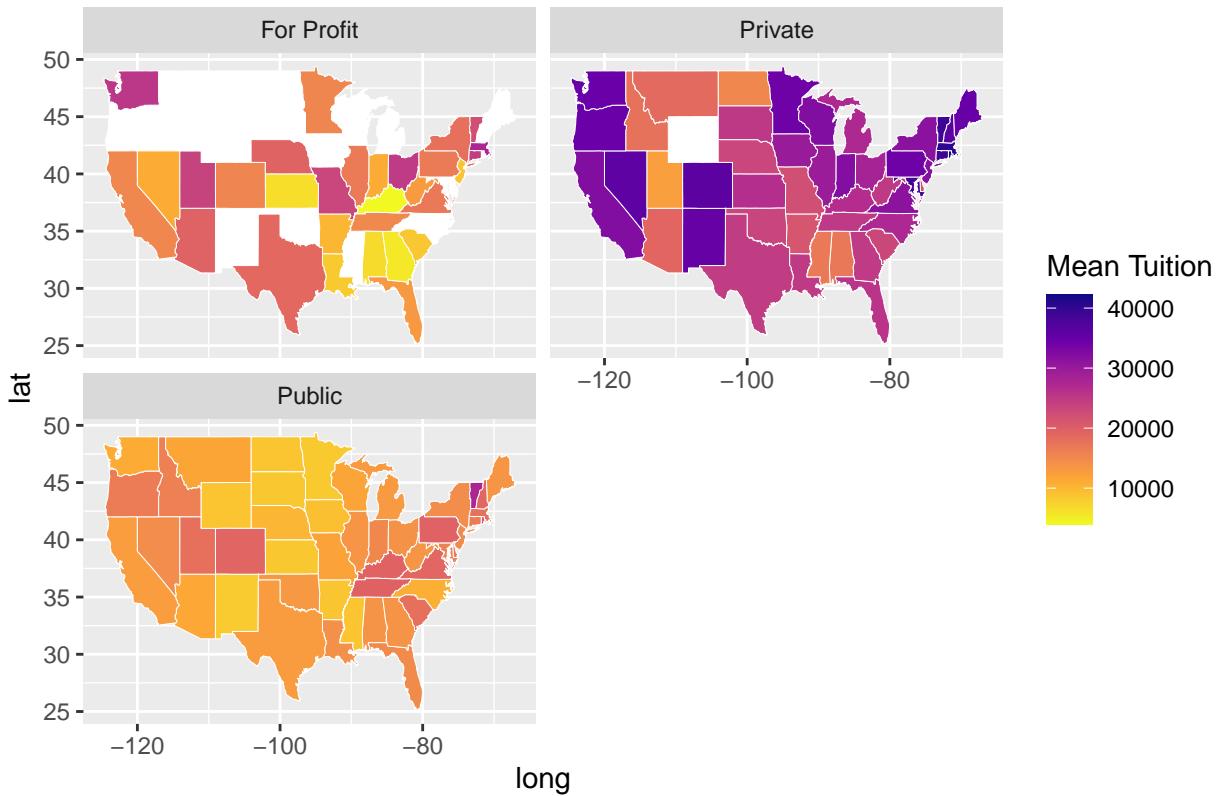
Mean in-state tuition of colleges in U.S. States



0.3.10 Out-of-state tuition, different type of colleges; What is the relationship?

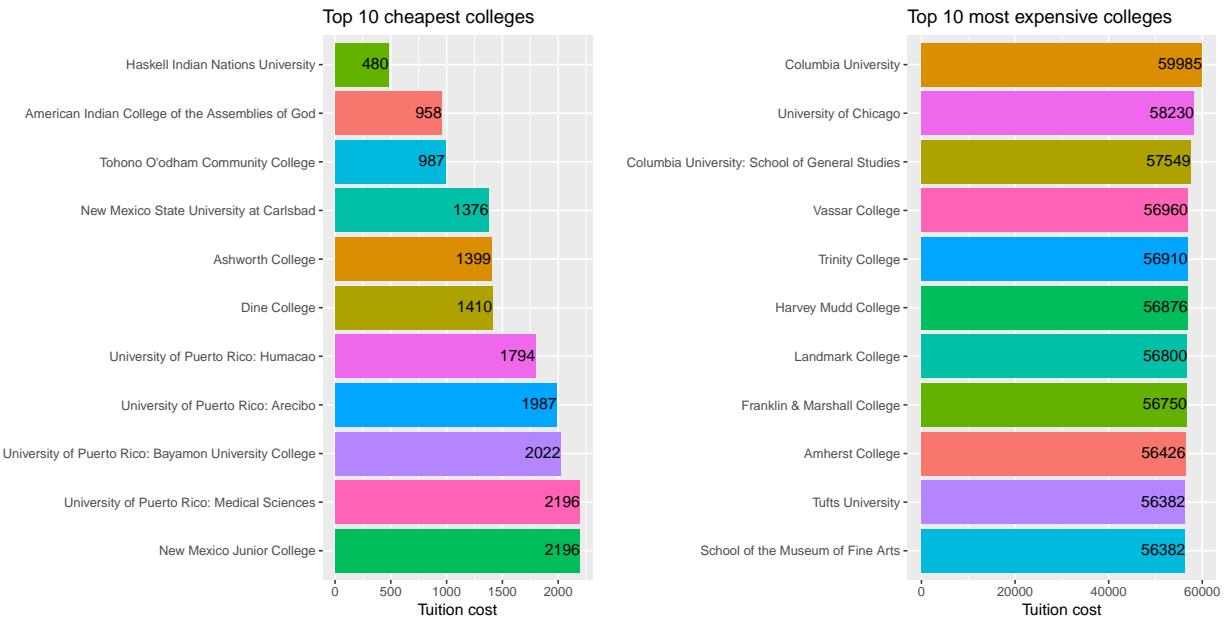
The following plots provide the same analysis for the out-of-state tuition cost. The interesting point is the larger variation of average out-of-state tuition costs in different states.

Mean out-of-state tuition of colleges in U.S. States



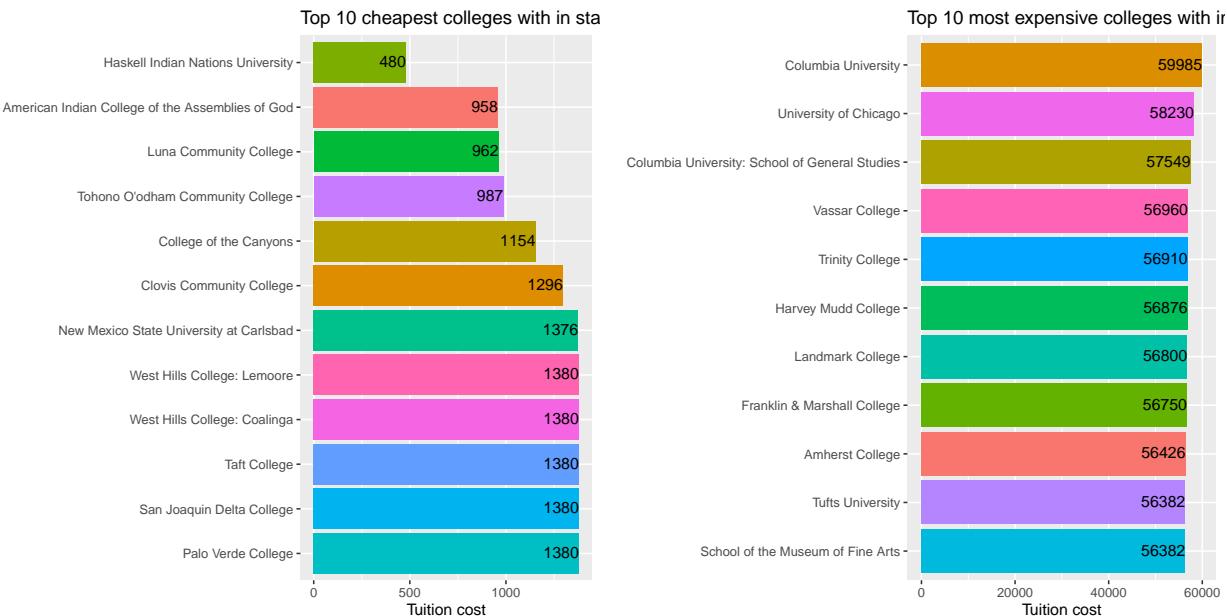
0.3.11 The chepeast/most expensive colleges with out-of-state tuition

“Which one is the cheapest one?” or “which one is the most expensive one?” always are interesting questions. This section provides some insights and helps us to answer these two questions. According to the following plots, Haskell Indian Nations University is the cheapest college in the US, and Columbia University is the most expensive college in terms of out-of-state tuition costs.



0.3.11.1 The cheapest/most expensive colleges with in-state tuition

This section addresses the two questions of the previous section, this time for in-state tuition. According to the following bar charts, the cheapest and the most expensive colleges are the same as out-of-state tuition. The reason is that in-state tuition costs and out-of-state tuition costs are equal at Haskell Indian Nations University and Columbia University.



0.4 The historical tuition dataset

0.4.1 270 observations and 4 variables

type	year	tuition_type	tuition_cost
All Institutions	1985-86	All Constant	10893
All Institutions	1985-86	4 Year Constant	12274
All Institutions	1985-86	2 Year Constant	7508
All Institutions	1985-86	All Current	4885
All Institutions	1985-86	4 Year Current	5504
All Institutions	1985-86	2 Year Current	3367

0.4.2 Data Manipulation

0.4.2.1 We observe that the data is available consistantly from 2000 till 2017.

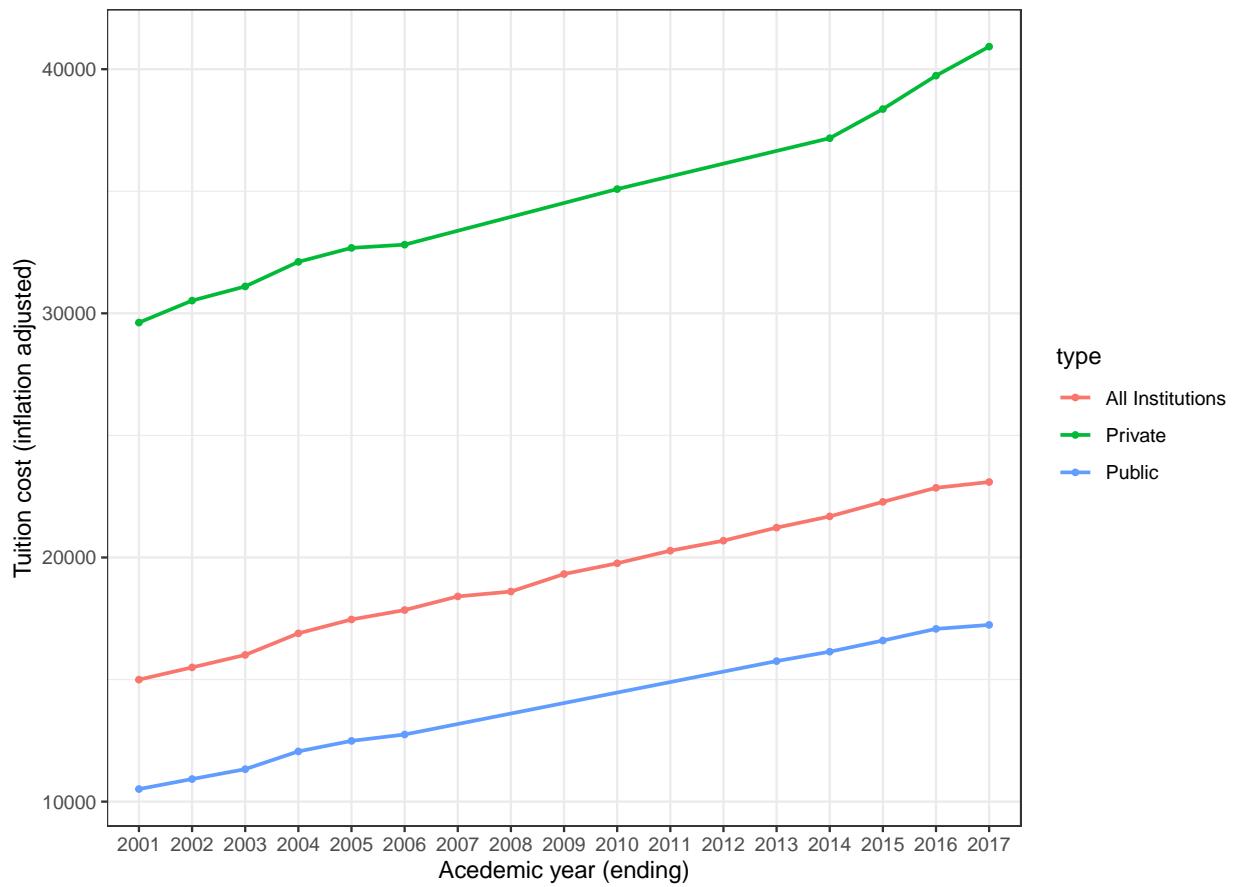
```
## [1] "1985-86" "1995-96" "2000-01" "2001-02" "2002-03" "2003-04" "2004-05"  
## [8] "2005-06" "2006-07" "2007-08" "2008-09" "2009-10" "2010-11" "2011-12"  
## [15] "2012-13" "2013-14" "2014-15" "2015-16" "2016-17"
```

0.4.2.2 For convinience, we will consider the end of year.

```
## [1] 1986 1996 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013  
## [16] 2014 2015 2016 2017
```

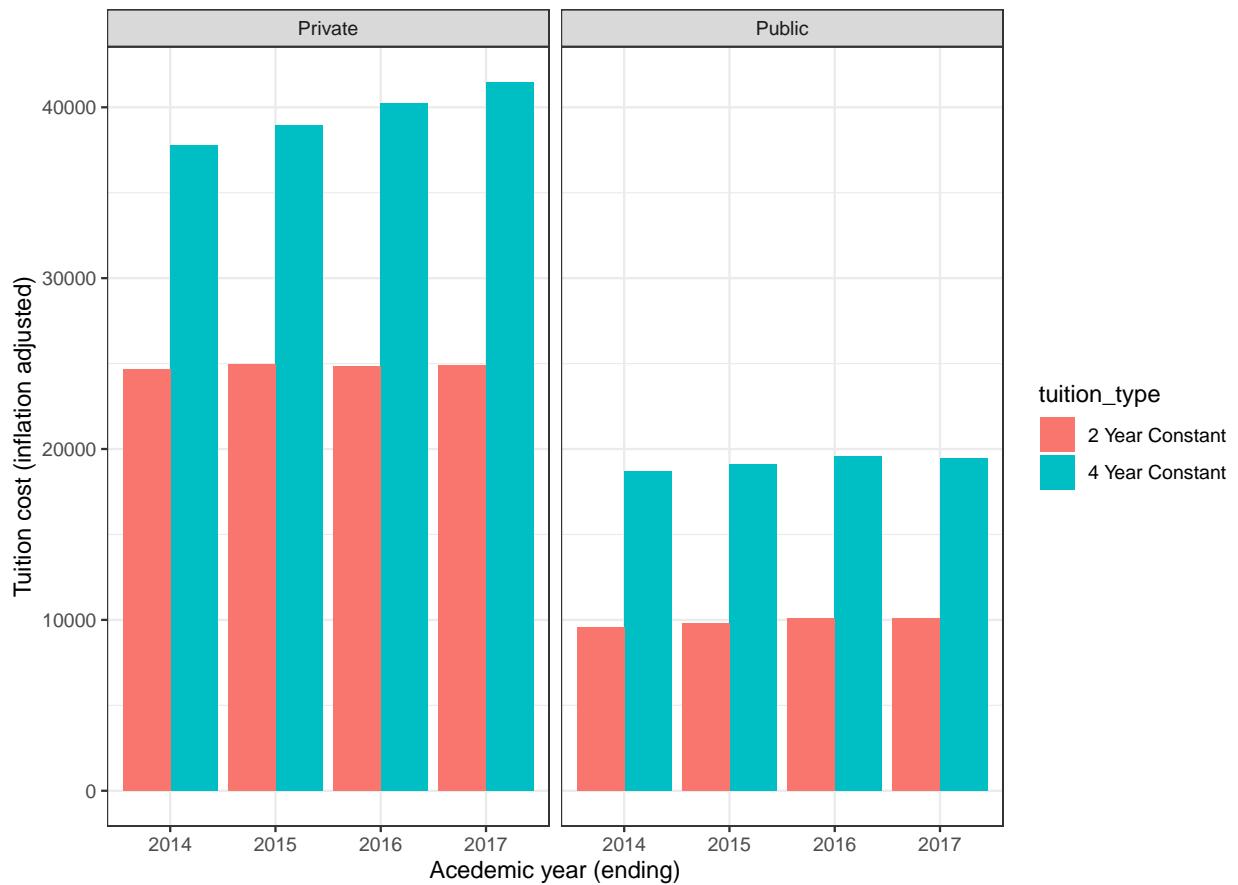
0.4.3 Average tuition cost over time

Average annual tuition cost at U.S. colleges and universities



0.4.4 Tuition comparison between 2 year and 4 year programs

Public and Private tuitions among 4 year and 2 year progerams

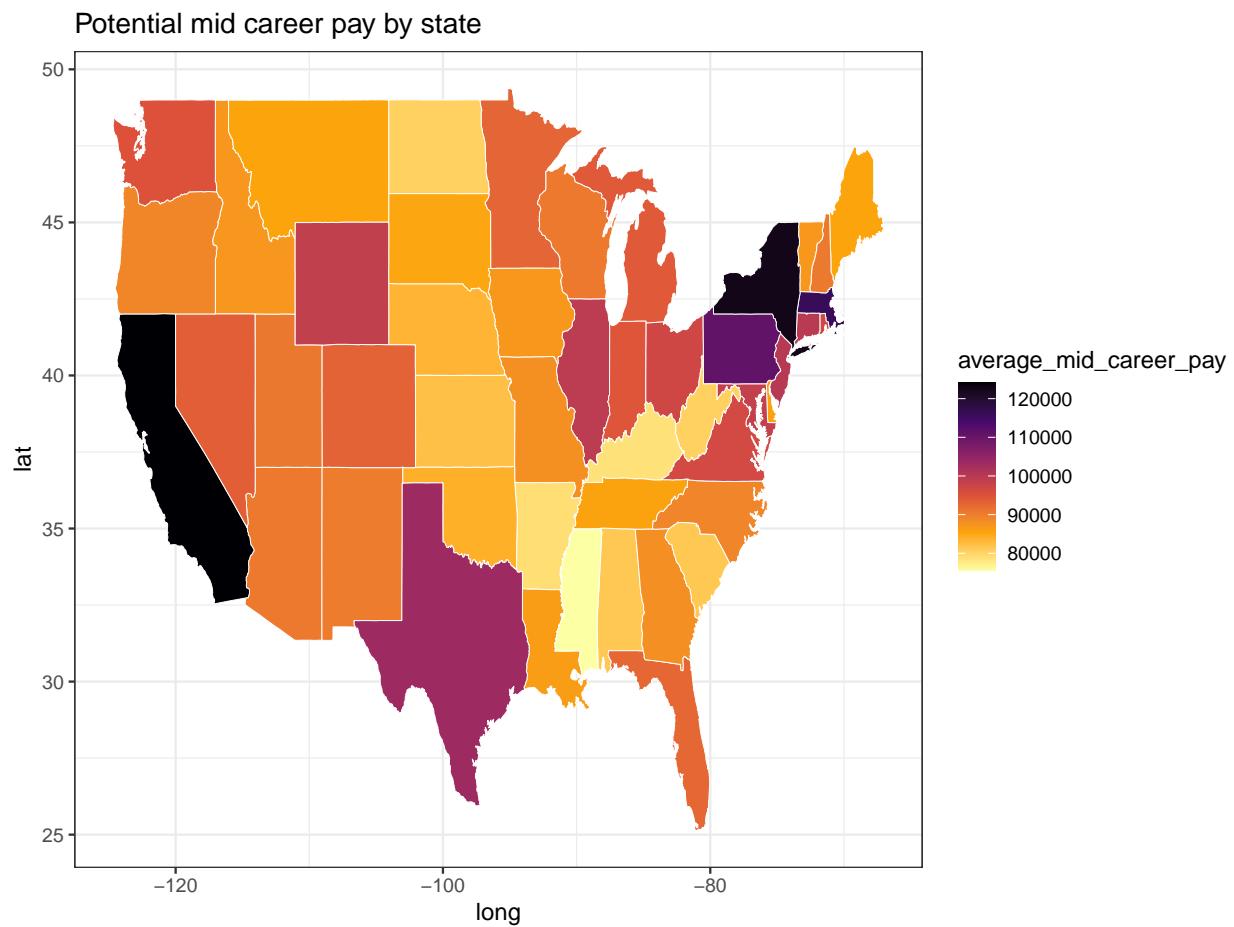


0.5 Salary potential dataset

0.5.1 935 observations and 6 variables including:

rank	name	state_name	early_career_pay	mid_career_pay	stem_percent
1	Auburn University	Alabama	54400	104500	30
2	University of Alabama in Huntsville	Alabama	57500	103900	40
3	The University of Alabama	Alabama	52300	97400	10
4	Tuskegee University	Alabama	54500	93500	30
5	Samford University	Alabama	48400	90500	10
6	Spring Hill College	Alabama	46600	89100	10

0.5.2 Which states have the highest/least potential salary?



0.5.3 Top 5 states

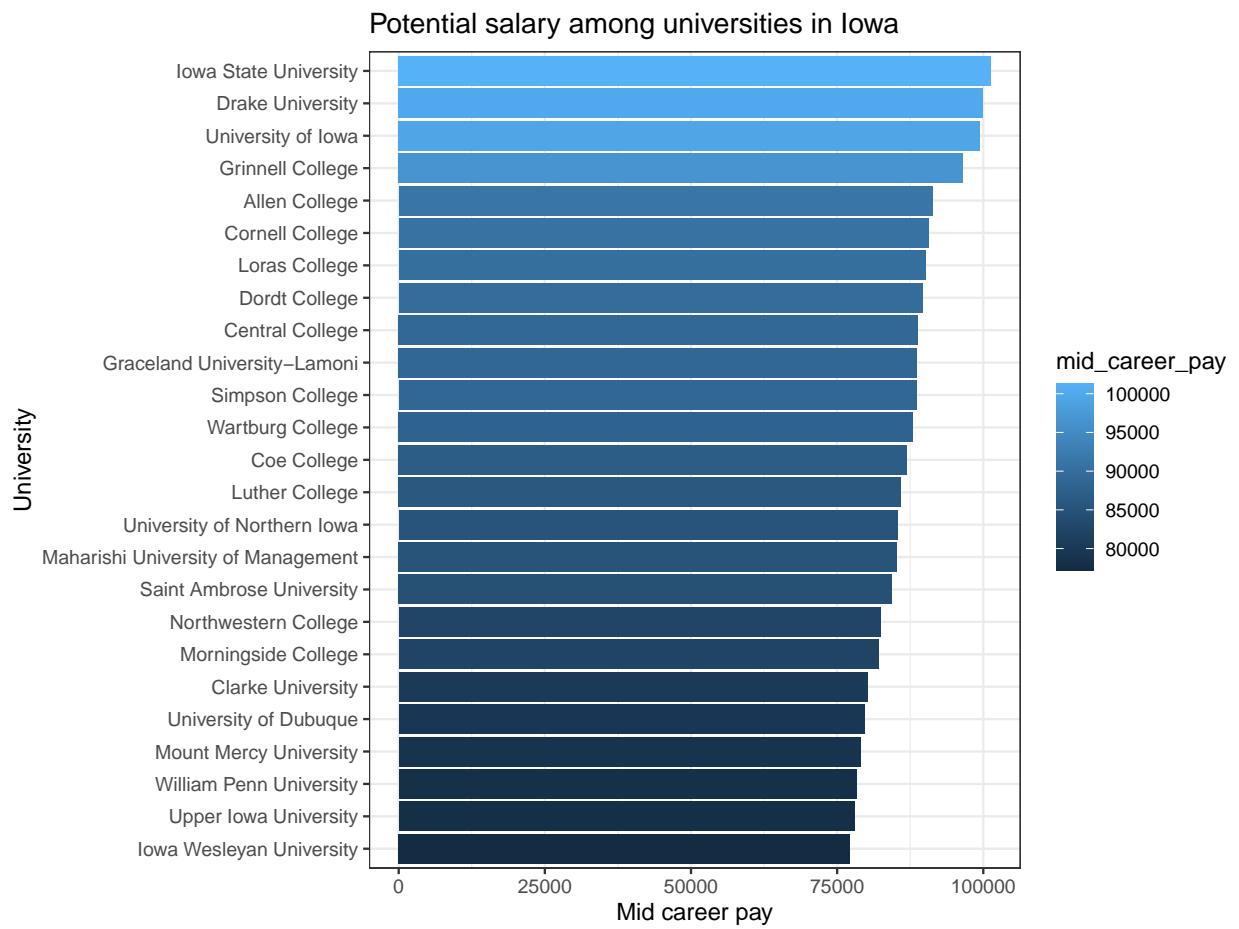
state_name	average_mid_career_pay
California	123976
New-York	122328
Massachusetts	115712
Pennsylvania	110884
Texas	103476

state_name	average_early_career_pay
California	67232
New-York	66688
Massachusetts	63100
Pennsylvania	60644
Texas	57468

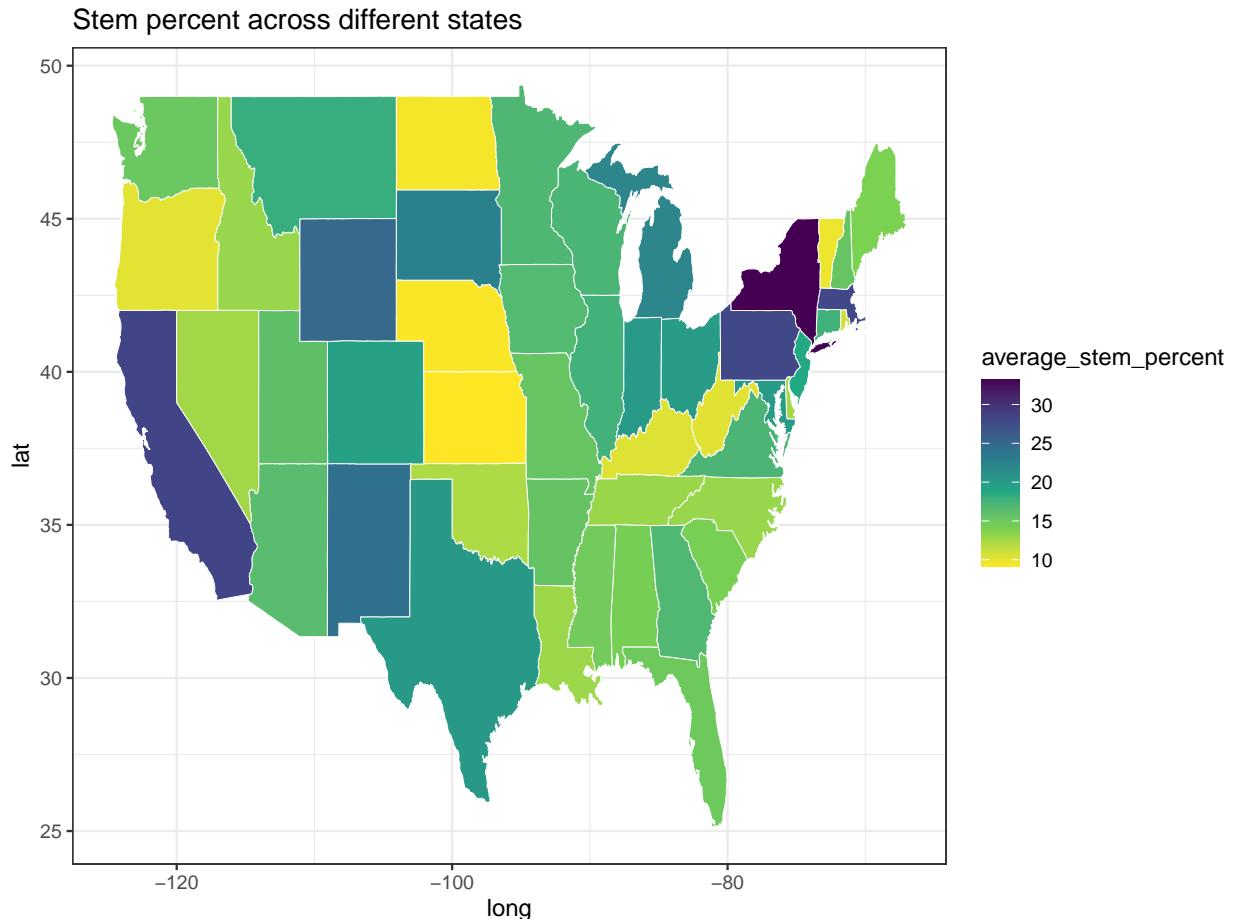
0.5.4 Let's take a closer look at Iowa

rank	name	state_name	early_career_pay	mid_career_pay	stem_perc
1	Iowa State University	Iowa	56100	101300	
2	Drake University	Iowa	52800	99900	
3	University of Iowa	Iowa	54100	99400	
4	Grinnell College	Iowa	53400	96500	
5	Allen College	Iowa	51600	91300	
6	Cornell College	Iowa	49600	90600	
7	Loras College	Iowa	48000	90100	
8	Dordt College	Iowa	51000	89600	
9	Central College	Iowa	49000	88800	
10	Graceland University-Lamoni	Iowa	48300	88700	
11	Simpson College	Iowa	49900	88600	
12	Wartburg College	Iowa	49300	88000	
13	Coe College	Iowa	47200	86900	
14	Luther College	Iowa	48200	85900	
15	University of Northern Iowa	Iowa	47100	85300	
16	Maharishi University of Management	Iowa	46800	85200	
17	Saint Ambrose University	Iowa	46900	84400	
18	Northwestern College	Iowa	44800	82400	
19	Morningside College	Iowa	44900	82100	
20	Clarke University	Iowa	44900	80200	
21	University of Dubuque	Iowa	44200	79700	
22	Mount Mercy University	Iowa	47200	79000	
23	William Penn University	Iowa	43900	78300	
24	Upper Iowa University	Iowa	44200	78000	
25	Iowa Wesleyan University	Iowa	42600	77200	

0.5.5 In Iowa, ISU has the highest potential salary



0.5.6 What is average stem percent across different states?



0.6 Conclusions

- The map of diversity across the US indicates that the US colleges are not equally diverse geographically.
 - There is relationship between different diversity groups, tuition and early career salary.
 - Average out-of-state tuition differs across the country while average in-state tuition remains almost the same.
 - East coast colleges are more expensive in terms of in-state and out-of-state tuition.
 - Massachusetts has the highest in-state tuition.
 - Private schools cost more than public schools.
 - Historical trend of tuition showed that tuition is increasing over time.

- Universities located in west/east coast have higher stem percent and also higher potential salary.