

###Drive Mounting

```
1: from google.colab import drive
drive.mount('/content/drive')
```

```
1: Mounted at /content/drive
```

###Importing

```
1: import pandas as pd
```

```
1: university = pd.read_csv('/content/drive/MyDrive/STUDY2/DATA ANALYSIS LAB/LABCYCLE/DATASETS/NURanking_7th Question.csv', dtype=str)
university.head(10)
```

	index	Name	Location	Rank	Description	Tuition and fees	In-state	Undergrad Enrollment
0	0	Princeton University	Princeton, NJ	1	Princeton, the fourth-oldest college in the Un...	\$45,320	NaN	5,402
1	1	Harvard University	Cambridge, MA	2	Harvard is located in Cambridge, Massachusetts...	\$47,074	NaN	6,699
2	2	University of Chicago	Chicago, IL	3	The University of Chicago, situated in Chicago...	\$52,491	NaN	5,844
3	3	Yale University	New Haven, CT	3	Yale University, located in New Haven, Connect...	\$49,480	NaN	5,532
4	4	Columbia University	New York, NY	5	Columbia University, located in Manhattan's Mo...	\$55,056	NaN	6,102
5	5	Stanford University	Stanford, CA	5	Stanford University's pristine campus is locat...	\$47,940	NaN	6,999
6	6	Massachusetts Institute of Technology	Cambridge, MA	7	MIT is located in Cambridge, Massachusetts, ac...	\$48,452	NaN	4,527
7	7	Duke University	Durham, NC	8	Durham, North Carolina, which surrounds Duke's...	\$51,265	NaN	6,639
8	8	University of Pennsylvania	Philadelphia, PA	8	The University of Pennsylvania, located in Phi...	\$51,464	NaN	9,726
9	9	Johns Hopkins University	Baltimore, MD	10	Johns Hopkins University has four main campuse...	\$50,410	NaN	6,524

###Cleaning

```
1: university['Tuition and fees'] = university['Tuition and fees'].str.replace('$','')
university['Tuition and fees'] = university['Tuition and fees'].str.replace(',','')
university['Tuition and fees'] = pd.to_numeric(university['Tuition and fees'], errors='coerce')
university['In-state'] = university['In-state'].str.replace('$','')
university['In-state'] = university['In-state'].str.replace(',','')
university['In-state'] = pd.to_numeric(university['In-state'], errors='coerce')

university['Undergrad Enrollment'] = university['Undergrad Enrollment'].str.replace('$','')
university['Undergrad Enrollment'] = university['Undergrad Enrollment'].str.replace(',','')
university['Undergrad Enrollment'] = pd.to_numeric(university['Undergrad Enrollment'], errors='coerce')
```

```
1: <ipython-input-17-3423c69f7262>:1: FutureWarning: The default value of regex will change from True to False in a future version. In addition,
single character regular expressions will *not* be treated as literal strings when regex=True.
university['Tuition and fees'] = university['Tuition and fees'].str.replace('$','')
<ipython-input-17-3423c69f7262>:4: FutureWarning: The default value of regex will change from True to False in a future version. In addition,
single character regular expressions will *not* be treated as literal strings when regex=True.
university['In-state'] = university['In-state'].str.replace('$','')
<ipython-input-17-3423c69f7262>:8: FutureWarning: The default value of regex will change from True to False in a future version. In addition,
single character regular expressions will *not* be treated as literal strings when regex=True.
university['Undergrad Enrollment'] = university['Undergrad Enrollment'].str.replace('$','')
```

```
1: num_cols=['Tuition and fees','In-state']
for num in num_cols:
university[num].fillna(university[num].mean(),inplace=True)
university[num] = university[num].astype(int)
university.head()
```

	index	Name	Location	Rank	Description	Tuition and fees	In-state	Undergrad Enrollment
0	0	Princeton University	Princeton, NJ	1	Princeton, the fourth-oldest college in the Un...	45320	10895	5402
1	1	Harvard University	Cambridge, MA	2	Harvard is located in Cambridge, Massachusetts...	47074	10895	6699
2	2	University of Chicago	Chicago, IL	3	The University of Chicago, situated in Chicago...	52491	10895	5844
3	3	Yale University	New Haven, CT	3	Yale University, located in New Haven, Connect...	49480	10895	5532
4	4	Columbia University	New York, NY	5	Columbia University, located in Manhattan's Mo...	55056	10895	6102

####a. Find the universities along with state whose fee is in between 25,000to30,000

```
1: unistate = university[(university['Tuition and fees'].between(25000,30000))]
unistate[['Name','Location','Tuition and fees']]
```

		Name	Location	Tuition and fees
50		University of Florida	Gainesville, FL	28666
53		Ohio State University--Columbus	Columbus, OH	29229
57		University of Georgia	Athens, GA	29844
60		Purdue University--West Lafayette	West Lafayette, IN	28804
68		University of Pittsburgh	Pittsburgh, PA	29758
75		Texas A&M University--College Station	College Station, TX	28768
77		Virginia Tech	Blacksburg, VA	29371
84		University of Iowa	Iowa City, IA	28413
92		North Carolina State University--Raleigh	Raleigh, NC	26399
97		Stony Brook University--SUNY	Stony Brook, NY	26266

	Name	Location	Tuition and fees
98	Auburn University	Auburn, AL	28840
101	University at Buffalo--SUNY	Buffalo, NY	26270
103	University of Alabama	Tuscaloosa, AL	26950
112	University of Missouri	Columbia, MO	25892
116	University of Utah	Salt Lake City, UT	27039
119	Temple University	Philadelphia, PA	25994
121	University of Kansas	Lawrence, KS	25932
128	Arizona State University--Tempe	Tempe, AZ	25458
130	Colorado State University	Fort Collins, CO	28374
133	University of Kentucky	Lexington, KY	26334
135	Louisiana State University--Baton Rouge	Baton Rouge, LA	27005
138	Rutgers University--Newark	Newark, NJ	29480
140	University of Cincinnati	Cincinnati, OH	26334
143	Oregon State University	Corvallis, OR	28846
144	Washington State University	Pullman, WA	25673
155	University of Illinois--Chicago	Chicago, IL	26526
157	University of Massachusetts--Lowell	Lowell, MA	29125
161	University of Rhode Island	Kingston, RI	28852
164	Maryville University of St. Louis	St Louis, MO	27958
165	Missouri University of Science & Technology	Rolla, MO	26152
170	Edgewood College	Madison, WI	27530
175	Ball State University	Muncie, IN	25428
176	Lipscomb University	Nashville, TN	29756
182	Andrews University	Berrien Springs, MI	27684
184	University of Maine	Orono, ME	29498
190	Robert Morris University	Moon Township, PA	28250
194	University of Houston	Houston, TX	25410
195	Western Michigan University	Kalamazoo, MI	25713
196	Indiana University-Purdue University--Indianap...	Indianapolis, IN	29791
197	Lesley University	Cambridge, MA	25750
199	University of Colorado--Denver	Denver, CO	29334
203	Louisiana Tech University	Ruston, LA	25851
211	Old Dominion University	Norfolk, VA	27028
214	Dallas Baptist University	Dallas, TX	26180
216	Nova Southeastern University	Ft. Lauderdale, FL	27660
217	Southern Illinois University--Carbondale	Carbondale, IL	27130
221	Gardner-Webb University	Boiling Springs, NC	29850
227	University of Missouri--St. Louis	St. Louis, MO	26277

####b. Find university where undergraduate enrollement is morethan 25000 containing in-state students.

```

1: universities = university[(university['Undergrad Enrollment']>25000)]
   universities

```

	index	Name	Location	Rank	Description	Tuition and fees	In-state	Undergrad Enrollment
21	21	University of California--Berkeley	Berkeley, CA	20	The University of California--Berkeley, often ...	40191	13509	27496
24	24	University of California--Los Angeles	Los Angeles, CA	24	The University of California--Los Angeles, com...	39518	12836	29585
27	27	University of Michigan--Ann Arbor	Ann Arbor, MI	27	The University of Michigan boasts one of the b...	43476	13856	28312
35	35	New York University	New York, NY	36	New York University's primary campus is locate...	49062	10895	25722
42	42	University of California--Irvine	Irvine, CA	39	On the sunny campus of the University of Calif...	39458	14750	25256
44	44	University of California--Davis	Davis, CA	44	The University of California--Davis, one of 10...	40728	14046	28384
45	45	University of California--San Diego	La Jolla, CA	44	The University of California--San Diego lies a...	41387	14705	26590
46	46	University of Illinois--Urbana-Champaign	Champaign, IL	44	The University of Illinois is located in the t...	31320	15698	33368
48	48	University of Wisconsin--Madison	Madison, WI	44	The University of Wisconsin--Madison lies alon...	32738	10488	31662
50	50	University of Florida	Gainesville, FL	50	The University of Florida is about two miles a...	28666	6389	35043
52	52	Pennsylvania State University--University Park	University Park, PA	50	There is rarely a dull moment on the Pennsylv...	32382	17900	40742
53	53	Ohio State University--Columbus	Columbus, OH	54	Located in the state capital of Columbus, The ...	29229	10037	45289
54	54	University of Washington	Seattle, WA	54	Located in the University District neighborhoo...	34791	10753	31063
57	57	University of Georgia	Athens, GA	56	At its founding, The University of Georgia mad...	29844	11634	27547
58	58	University of Texas--Austin	Austin, TX	56	Everything is bigger in Texas, as the saying g...	34676	9806	39619
60	60	Purdue University--West Lafayette	West Lafayette, IN	60	Purdue University's West Lafayette, Indiana, c...	28804	10002	29497
63	63	University of Maryland--College Park	College Park, MD	60	Located between Washington, D.C., and Baltimor...	32045	10181	27443
67	67	Brigham Young University--Provo	Provo, UT	68	Student life centers on religion and responsib...	5300	10895	30221
69	69	Rutgers University--New Brunswick	Piscataway, NJ	70	For high school students who can't decide what...	30023	14372	35484
72	72	University of Minnesota--Twin Cities	Minneapolis, MN	71	The University of Minnesota stretches across a...	22210	13790	34071

	index	Name	Location	Rank	Description	Tuition and fees	In-state	Undergrad Enrollment
75	75	Texas A&M University--College Station	College Station, TX	74	Ready to be an Aggie? All students assume the ...	28768	10176	48960
77	77	Virginia Tech	Blacksburg, VA	74	At Virginia Tech, a former military institute ...	29371	12852	25384
82	82	Michigan State University	East Lansing, MI	82	Michigan State University is a powerhouse inst...	39090	14070	39143
86	86	Indiana University- Bloomington	Bloomington, IN	86	No one quite knows what a "Hoosier" is, but a ...	34246	10388	38364
91	91	Florida State University	Tallahassee, FL	92	Florida State University is a sprawling public...	24673	9507	32706
93	93	University of Colorado--Boulder	Boulder, CO	92	The University of Colorado Boulder, called CUCE...	35079	11531	27010
103	103	University of Alabama	Tuscaloosa, AL	103	As the flagship campus of the University of Al...	26950	10470	31958
109	109	University of South Carolina	Columbia, SC	107	The University of South Carolina eases its stu...	31282	11854	25237
110	110	Iowa State University	Ames, IA	111	Iowa State University dwarfs Ames, the small t...	21483	7969	30034
112	112	University of Missouri	Columbia, MO	111	Students at the University of Missouri live in...	25892	9518	27812
119	119	Temple University	Philadelphia, PA	118	Temple University is a large, urban college in...	25994	15688	28609
127	127	University of Arizona	Tucson, AZ	124	As one of the largest public institutions in i...	30025	10872	33732
128	128	Arizona State University--Tempe	Tempe, AZ	129	Arizona State University--Tempe, which has one...	25458	10158	41828
135	135	Louisiana State University--Baton Rouge	Baton Rouge, LA	135	Louisiana State University--Baton Rouge, bette...	27005	9842	26156
140	140	University of Cincinnati	Cincinnati, OH	135	The University of Cincinnati is a public schoo...	26334	11000	25054
147	147	San Diego State University	San Diego, CA	146	Founded in 1897, San Diego State University is...	18244	7084	29234
162	162	University of South Florida	Tampa, FL	159	The University of South Florida, or USF, as it...	17325	6410	31111
179	179	Texas Tech University	Lubbock, TX	176	Texas Tech University is a large research inst...	22861	10622	29237
180	180	University of Central Florida	Orlando, FL	176	The University of Central Florida is, fittingl...	22467	6368	54513
194	194	University of Houston	Houston, TX	194	The University of Houston is situated in one o...	25410	10710	34716
201	201	California State University--Fullerton	Fullerton, CA	202	California State University--Fullerton (CSUF) ...	17596	6436	33144
230	230	Utah State University	Logan, UT	220	Founded in 1888, Utah State University is a pu...	19772	6866	25259

###c. Find the states where universities are located in three or more cities.

```
1: # Extract the state from the 'Location' column
university['State'] = university['Location'].apply(lambda x: x.split(',')[1].strip())

# Count the number of cities per state
cities_per_state = university.groupby('State')['Location'].nunique()

# Filter states where universities are located in three or more cities
states_with_three_or_more_cities = cities_per_state[cities_per_state >= 3].index

states_with_three_or_more_cities

1: Index(['AL', 'CA', 'CO', 'CT', 'FL', 'GA', 'IL', 'IN', 'LA', 'MA', 'MI', 'MO',
        'MS', 'NC', 'NJ', 'NY', 'OH', 'OK', 'PA', 'TN', 'TX', 'UT', 'VA'],
        dtype='object', name='State')
```

###d. Find max & min tuition fee in each state.

```
1: maxfee = university['Tuition and fees'].max()
print('The max fee is ',maxfee)
minfee = university['Tuition and fees'].min()
print('The min fee is ',minfee)

1: The max fee is 55056
The min fee is 5300
```

###e. Find the city & state where maximum tuition fee difference in the universities in that city is greater than 5,000.

```
1: diff = (university.groupby(['Location'])['Tuition and fees'].max() - university.groupby(['Location'])['Tuition and fees'].min()).reset_index()
diff1 = diff[(diff['Tuition and fees'] > 5000)]
diff1
```

	Location	Tuition and fees
8	Atlanta, GA	15550
12	Baltimore, MD	25918
22	Boston, MA	18217
29	Cambridge, MA	22702
37	Chicago, IL	25965
49	Dallas, TX	24178
53	Denver, CO	17028
80	Houston, TX	18508
103	Los Angeles, CA	12699
108	Madison, WI	5208
124	Nashville, TN	15854
127	New York, NY	14386
139	Philadelphia, PA	25470
141	Pittsburgh, PA	22282

	Location	Tuition and fees
153	Rochester, NY	18262
157	San Diego, CA	27896
164	St. Louis, MO	23493
171	Syracuse, NY	27402
185	Washington, DC	27042

####f. Print the names of universities having no. of branches along with the names of the branches.

```
1: #no need to write this in record.
new_rows = {'Name': 'American University',
            'Location': 'New York, NY',
            'Rank': 3,
            'Description': 'Description3',
            'Tuition and fees': 30000,
            'In-state': 15000,
            'Undergrad Enrollment': 8000,
            'State': 'NY'}

university = university.append(new_rows, ignore_index=True)

2: <ipython-input-66-e2614302bce0>:9: FutureWarning: The frame.append method is deprecated and will be removed from pandas in a future version. Use
pandas.concat instead.
university = university.append(new_rows, ignore_index=True)
```

```
1: # Extract the university name and branch (location) from the 'Location' column
university['University'] = university['Name']
university['Branch'] = university['Location'].apply(lambda x: x.split(',')[0].strip())

# Group by university and concatenate the branches
university_branches = university.groupby('University')['Branch'].unique().agg(', '.join).reset_index()
print("Universities along with their branches:")
university_branches
```

1: Universities along with their branches:

	University	Branch
0	Adelphi University	Garden City
1	American University	Washington, New York
2	Andrews University	Berrien Springs
3	Arizona State University--Tempe	Tempe
4	Ashland University	Ashland
...
226	Western Michigan University	Kalamazoo
227	Widener University	Chester
228	Worcester Polytechnic Institute	Worcester
229	Yale University	New Haven
230	Yeshiva University	New York

231 rows × 2 columns

```
1: #test:
#no need to write in record
university_branches[university_branches['University']=='American University']
```

	University	Branch
1	American University	Washington, New York

####g. Print university name and where it is located.

```
1: university[['Name', 'Location']]
```

	Name	Location
0	Princeton University	Princeton, NJ
1	Harvard University	Cambridge, MA
2	University of Chicago	Chicago, IL
3	Yale University	New Haven, CT
4	Columbia University	New York, NY
...
227	University of Missouri--St. Louis	St. Louis, MO
228	University of North Carolina--Greensboro	Greensboro, NC
229	University of Southern Mississippi	Hattiesburg, MS
230	Utah State University	Logan, UT
231	American University	New York, NY

232 rows × 2 columns

####h. Find cities having more than 2 universities along with state.

```
1: uni_states = university.groupby(['Branch', 'State'])['Name'].nunique()
uni_states[uni_states>2].reset_index()
```

```
1:
```

	Branch	State	Name
0	Boston	MA	4
1	Cambridge	MA	3
2	Chicago	IL	5
3	New York	NY	7
4	Philadelphia	PA	3
5	Pittsburgh	PA	3
6	Rochester	NY	3
7	St. Louis	MO	3
8	Washington	DC	5

```
1: #test:
university[university['Branch']=='Boston']
```

```
1:
```

	index	Name	Location	Rank	Description	Tuition and fees	In-state	Undergrad Enrollment	State	University	Branch
38	38	Boston University	Boston, MA	39	Boston University is one of the largest indepe...	50240	10895	17932	MA	Boston University	Boston
39	39	Northeastern University	Boston, MA	39	At Northeastern University, students gain subs...	47655	10895	13697	MA	Northeastern University	Boston
191	191	Suffolk University	Boston, MA	188	Visitors to the Massachusetts State House in t...	35578	10895	5565	MA	Suffolk University	Boston
225	225	University of Massachusetts--Boston	Boston, MA	220	Founded in 1964, University of Massachusetts--...	32023	13435	12949	MA	University of Massachusetts--Boston	Boston

####i. Find the no. of states and cities locating top 100 universities.

```
1: university['Rank'] = pd.to_numeric(university['Rank'],errors='coerce')
uni_rank = university[university['Rank']<=100].sort_values(by='Rank')
print('The no. os states locating top 100 univerities are: ',uni_rank['State'].nunique())
print('The no. os Cities locating top 100 univerities are: ',uni_rank['Branch'].nunique())
```

```
1: The no. os states locating top 100 univerities are: 33
The no. os Cities locating top 100 univerities are: 87
```

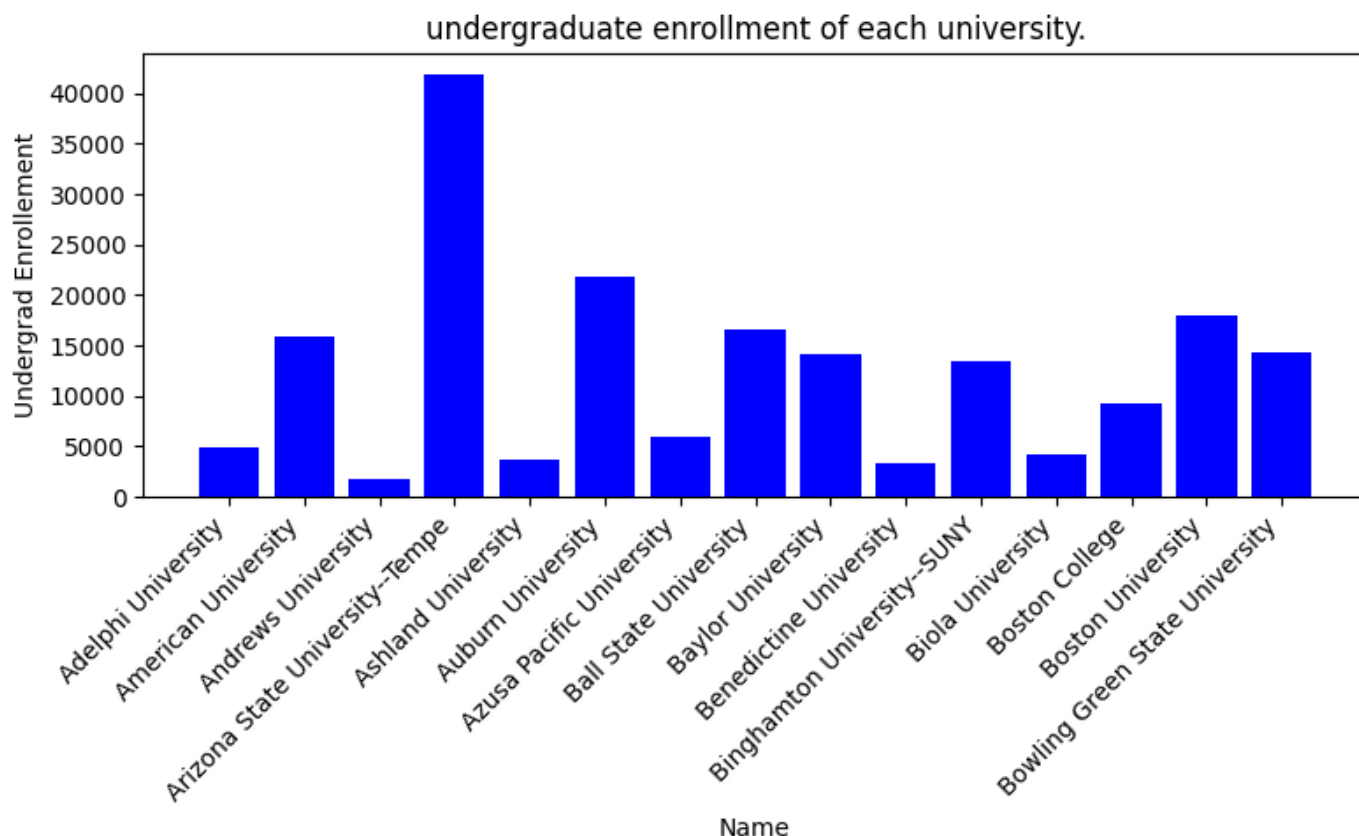
####j. Draw the plot to show undergraduate enrollment of each university.

```
1: import matplotlib.pyplot as plt

underage_enroll = university.groupby(['Name'])['Undergrad Enrollment'].sum().reset_index()
underage_enroll = underage_enroll.head(15)

plt.figure(figsize=(8, 5))
plt.bar(underage_enroll['Name'], underage_enroll['Undergrad Enrollment'], color='blue')
plt.xlabel('Name')
plt.ylabel('Undergrad Enrollement')
plt.title('undergraduate enrollment of each university.')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```

1:



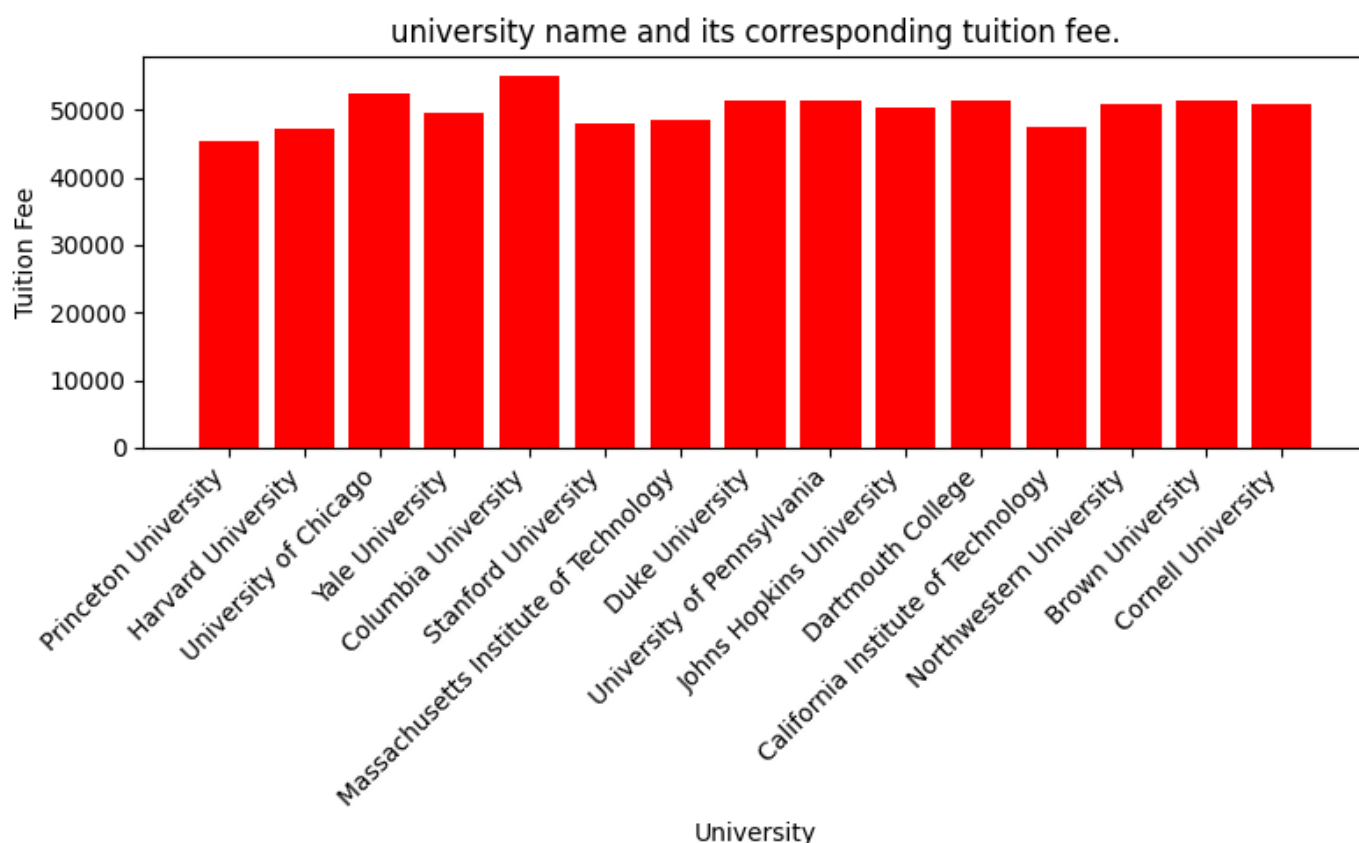
####. Draw the plot to show university name and its corresponding tuition fee.

1:

```
uni_fee = university.head(15)

plt.figure(figsize=(8, 5))
plt.bar(uni_fee['Name'], uni_fee['Tuition and fees'], color='red')
plt.xlabel('University')
plt.ylabel('Tuition Fee')
plt.title('university name and its corresponding tuition fee.')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```

1:



```
####. Plot the no. of universities in each state having ranks>100.
```

```
] : uni_rank_100 = university[university['Rank']>100]
uni_rank = uni_rank_100.groupby(['State'])['Name'].nunique().reset_index()
uni_rank = uni_rank.head(15)

plt.figure(figsize=(8, 5))
plt.bar(uni_rank['State'], uni_rank['Name'], color='orange')
plt.xlabel('No of Universities')
plt.ylabel('State')
plt.title('no. of universities in each state having ranks>100.')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```

