

STEM Job Market Situation

Long Bui

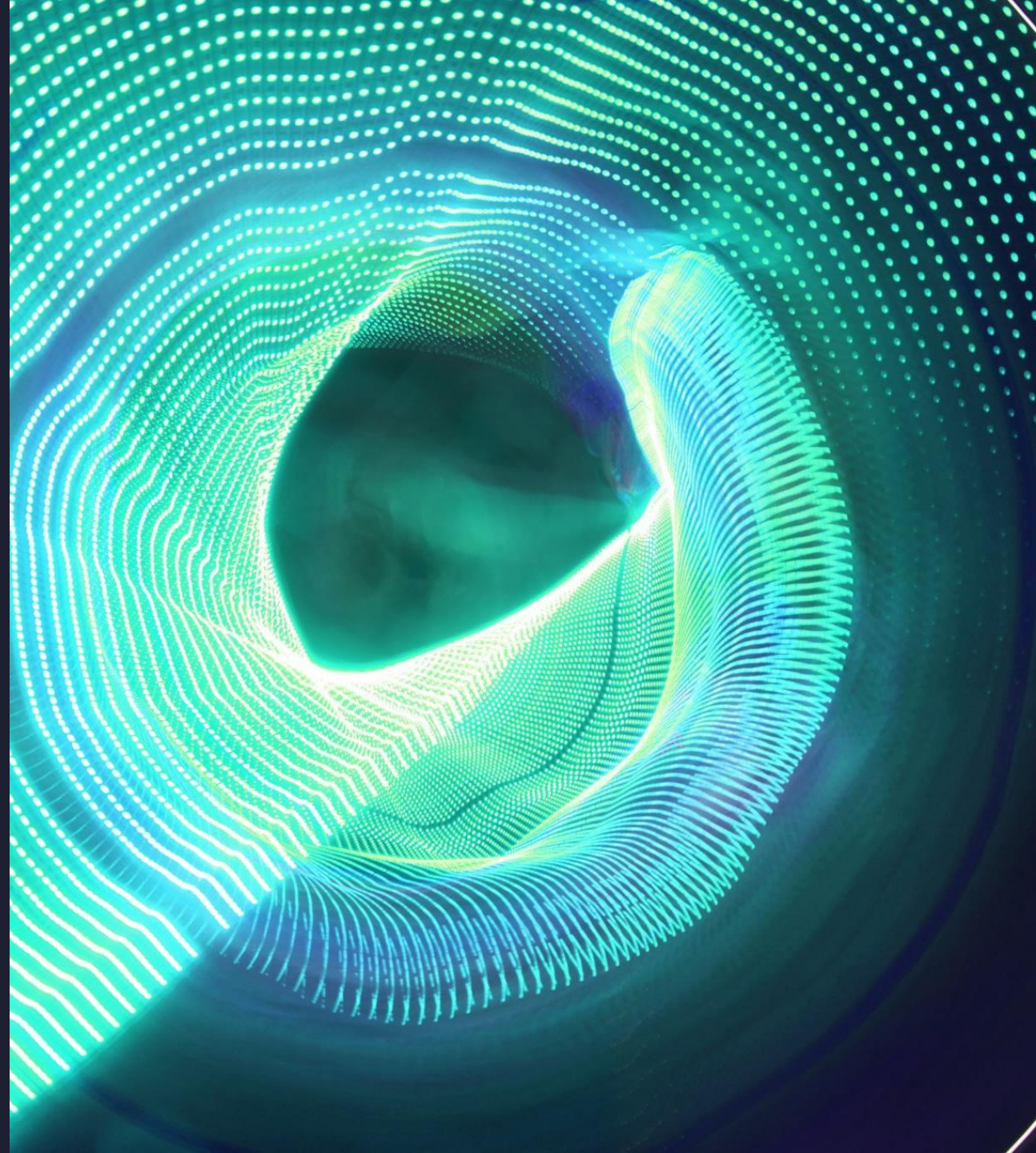


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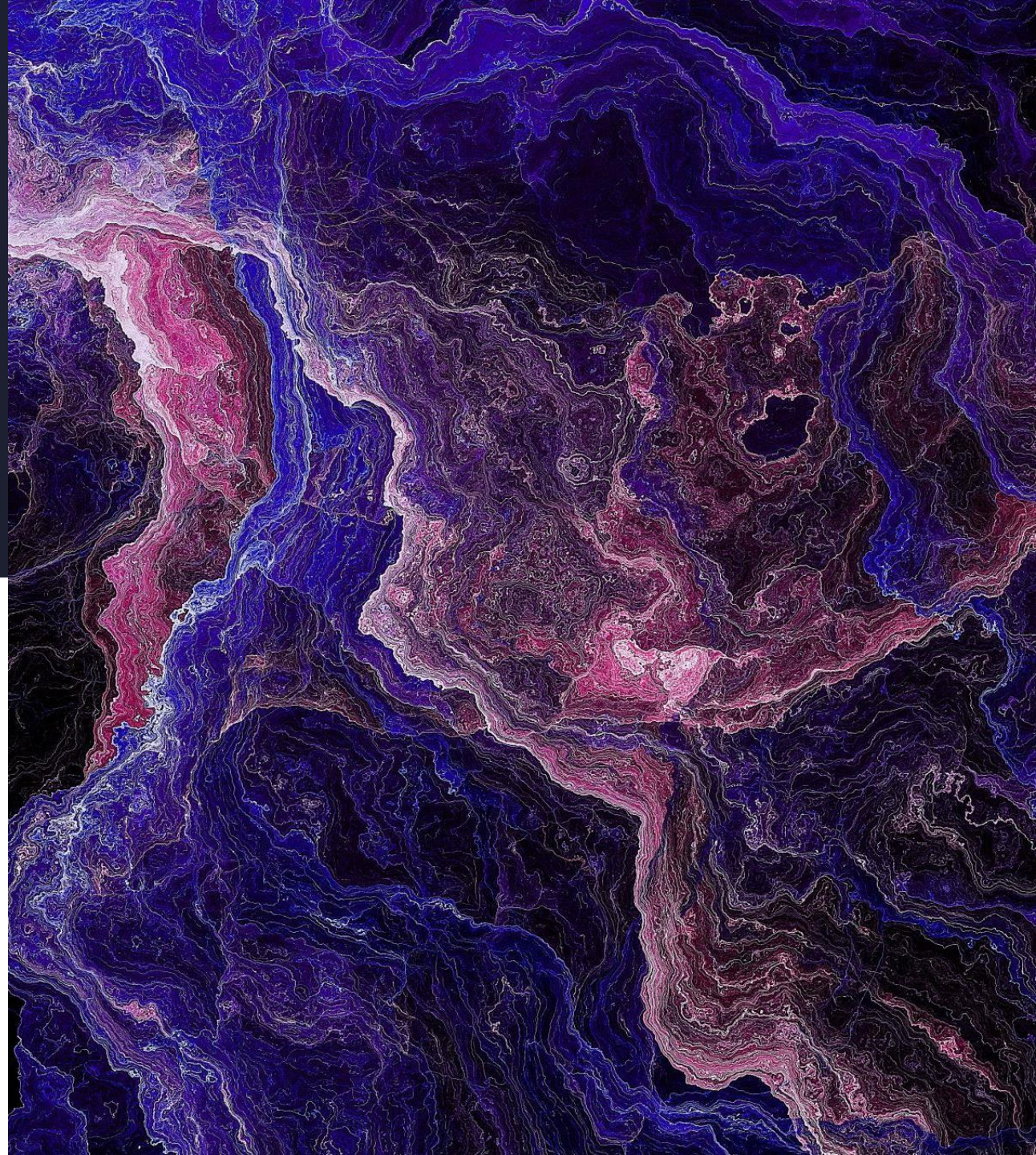
Takeaways

04

Techstacks
Implmented

BACKGROUND

- 1) Why STEM ?
- 2) What questions should we focus in ?



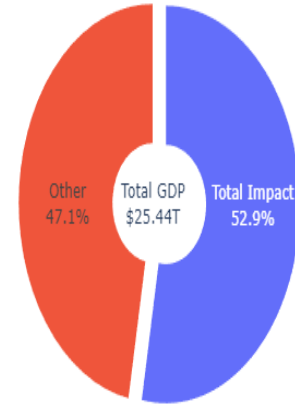
Why STEM ?

+ 11.110.400 jobs
created next
decade

+ 52% higher
earning than
average

+ Accounting for
60% of U.S. GDP

GDP Composition and Tax Revenue

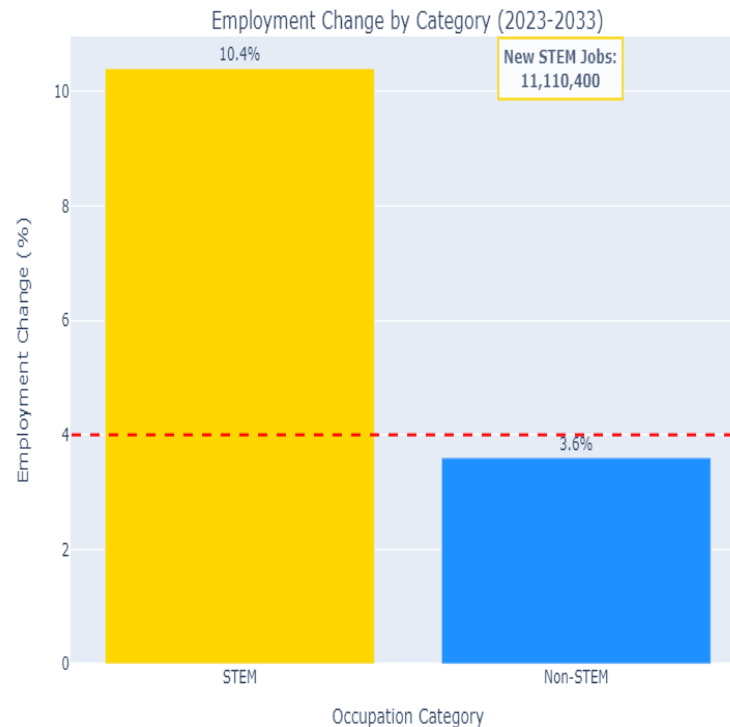


Federal Tax Revenue
\$2393.09B

State & Local Tax Revenue
\$1227.30B



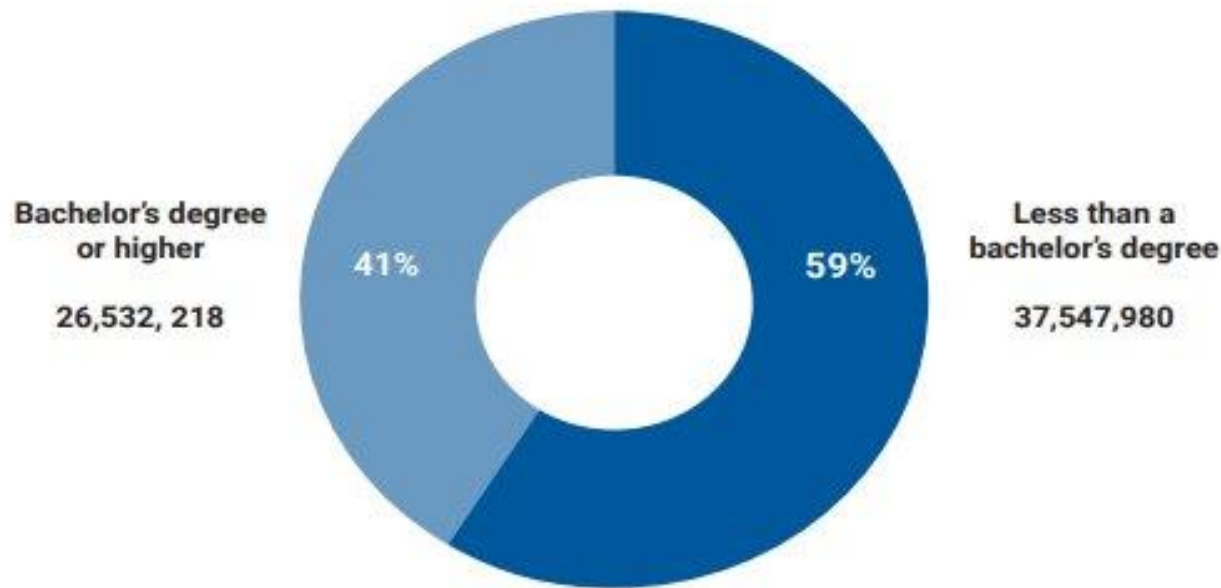
STEM Employment Growth and Wage Comparison



Sources: Bureau of Labor Statistics

2. What is Happening?

National STEM Employment by Level of Education

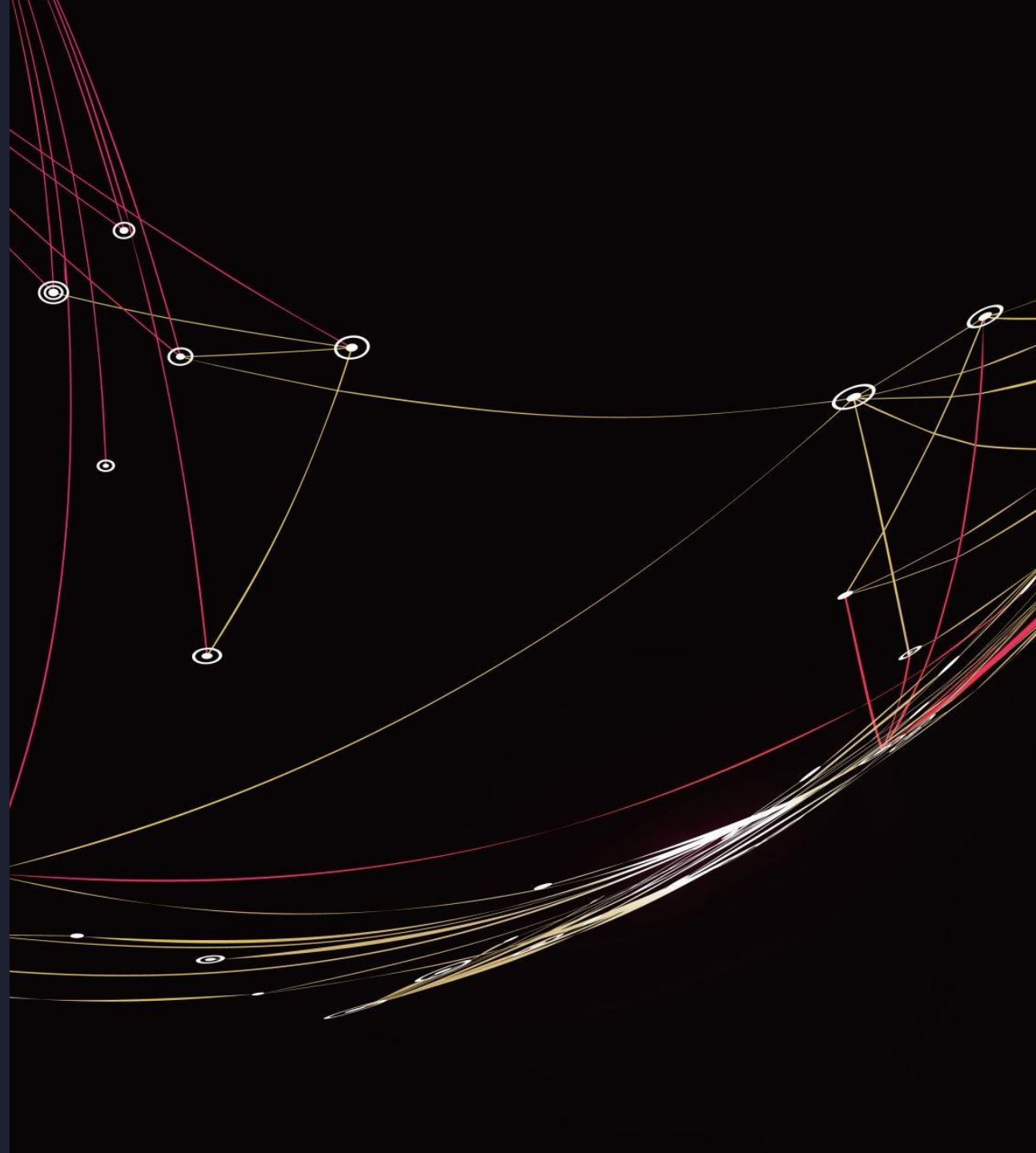


+ 6 out of 10 people in STEM workforces does not have a bachelor's degree or higher

Addressing 2 concerns:

- + As a student, where should (not) to start your career when that person graduates in STEM majors ?
- + As government officials, how can we understand the overall STEM labor market trends in the US in recent years ?

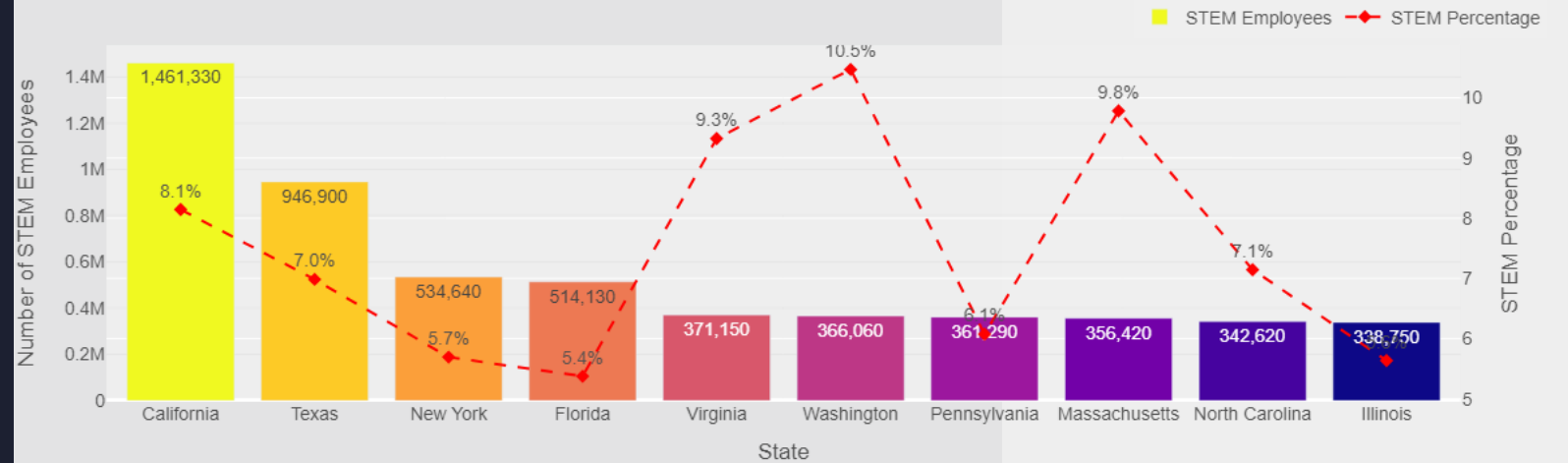
GEOGRAPHICAL DISTRIBUTIONS



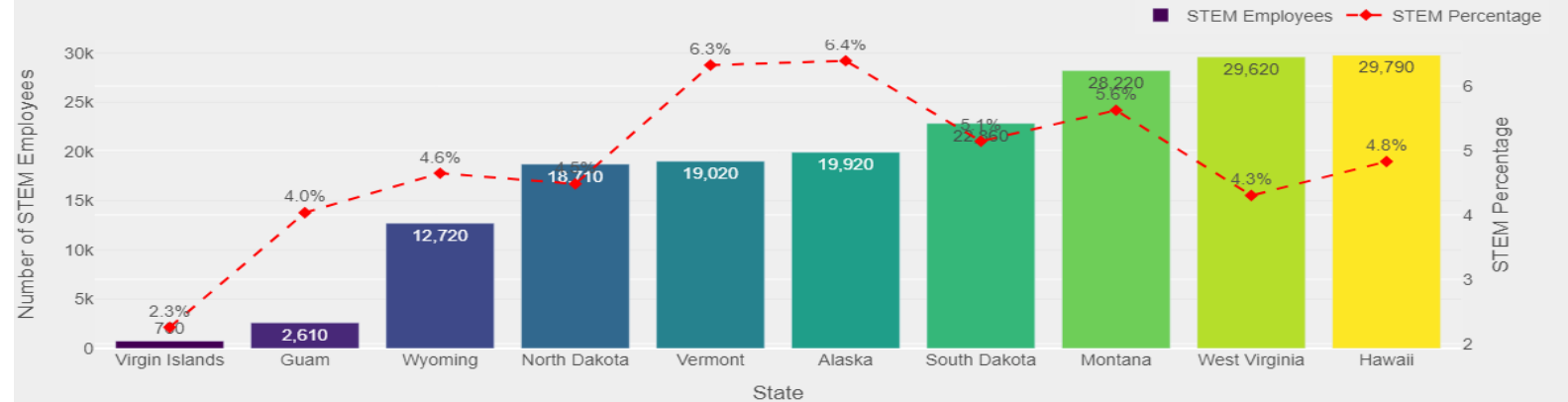
Which states should you start out ?



Top 10 States: STEM Employment and % of workforces (2023)

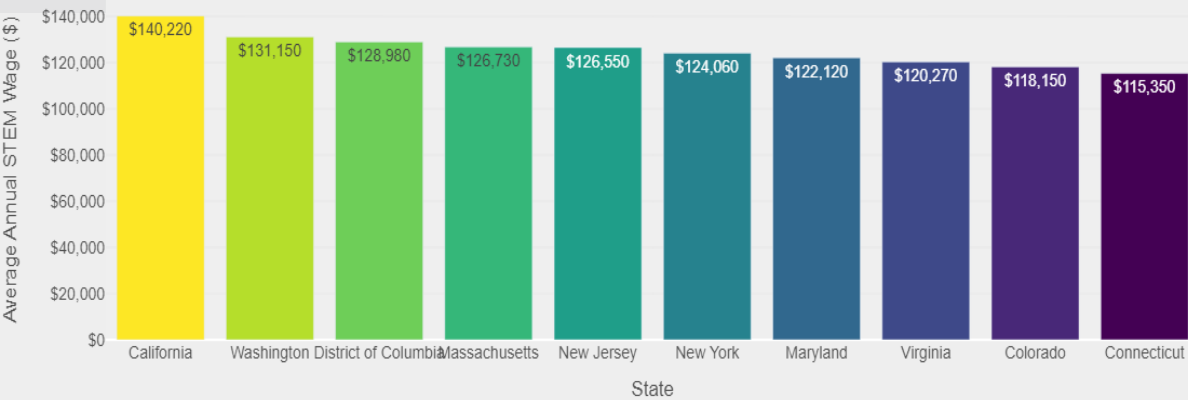


Bottom 10 States: STEM Employment and Percentage (2023)

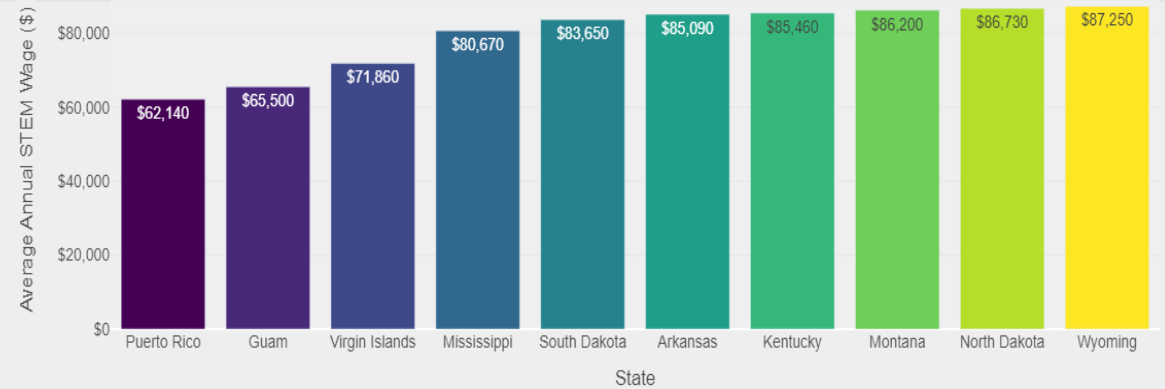


Wage & Living Standard

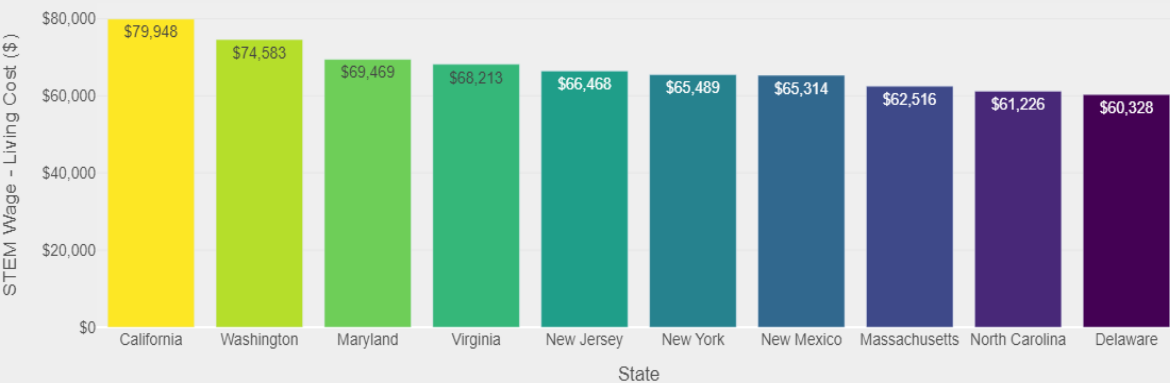
Top 10 States: Average Annual STEM Wage and STEM Percentage (2023)



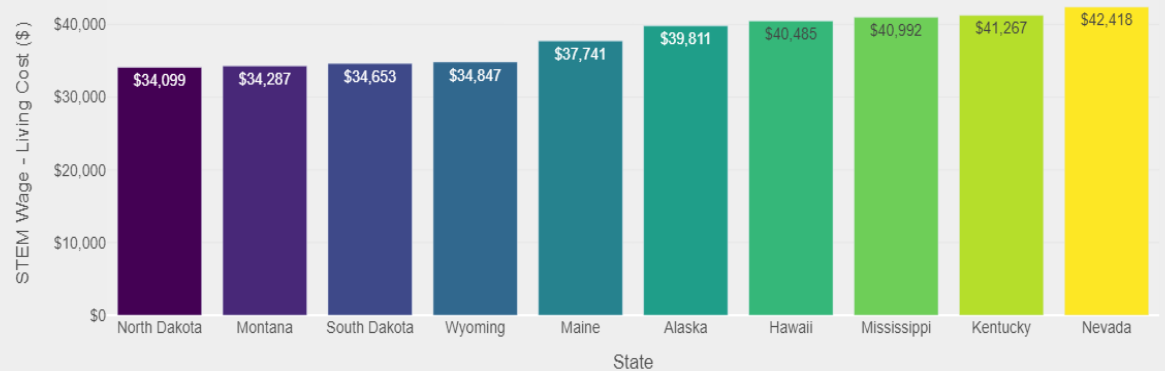
Bottom 10 States: Average Annual STEM Wage and STEM Percentage (2023)



Top 10 States: STEM Wage - Avg Living Cost (2023)

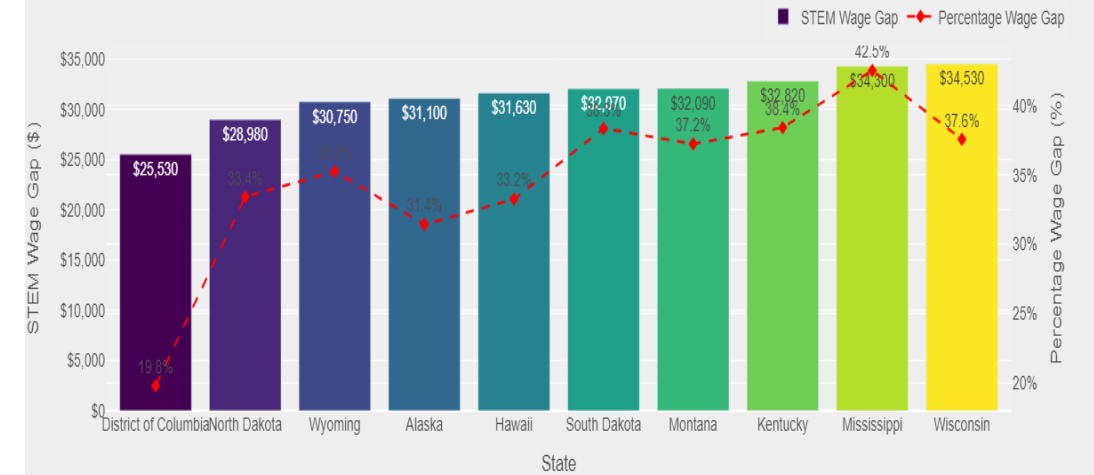


Bottom 10 States: STEM Wage Profit (2023)

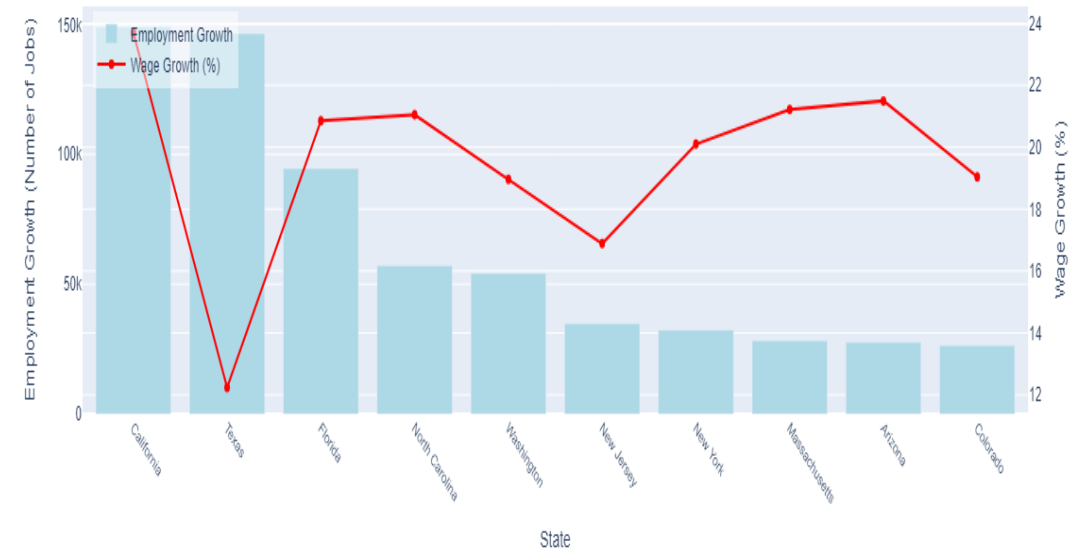


Is that the real value of STEM education? (stem avg wage – non avg)

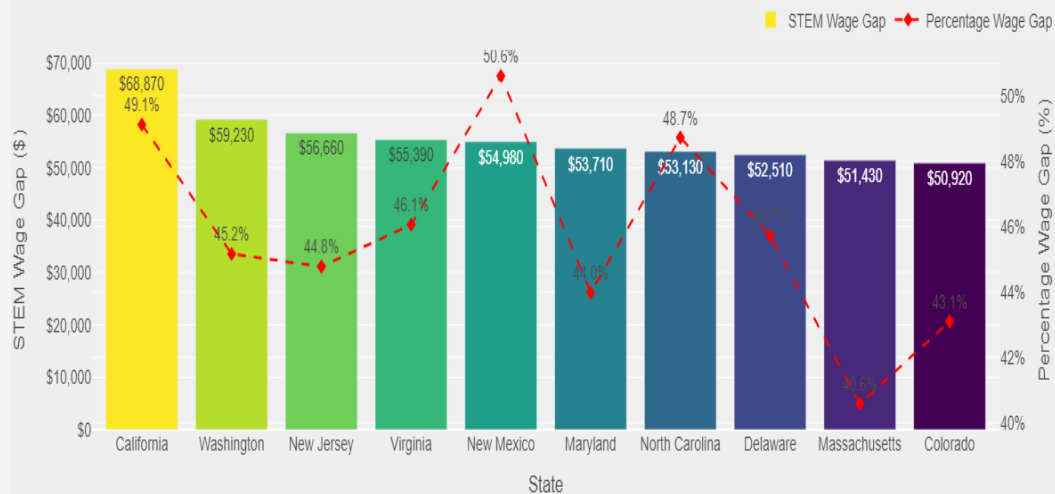
Bottom 10 States: STEM Wage Gap and Percentage (2023)



STEM Employment Growth and Wage Growth by State (2019-2023)

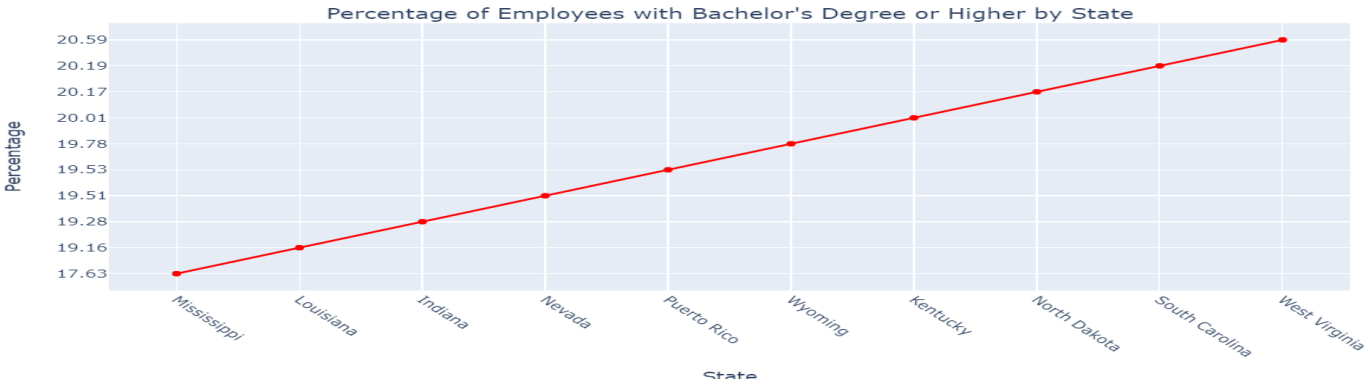
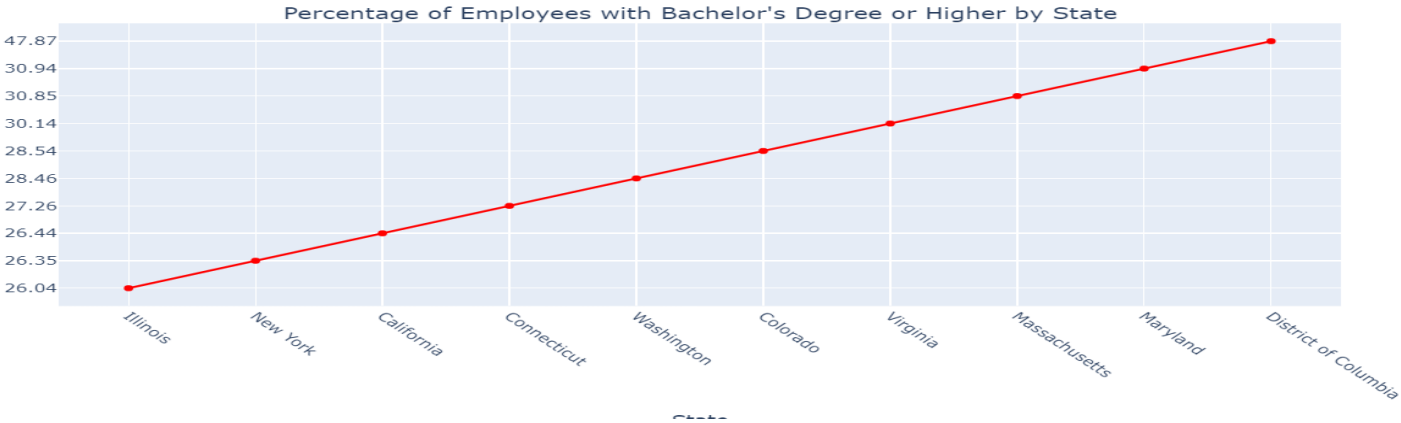
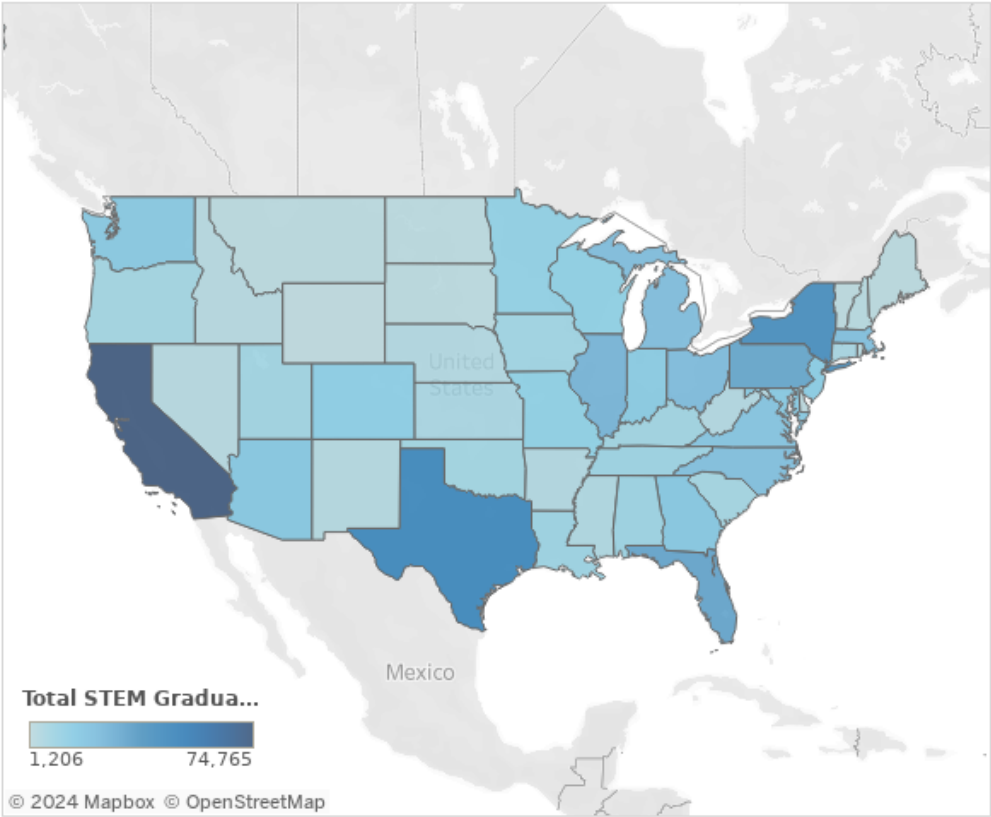


Top 10 States: STEM Wage Gap and Percentage (2023)



STEM Education Level

STEM Graduates by State



III. Takeaways



U.S. STEM job markets are increasing rapidly



High disparities between STEM and nonSTEM jobs



Low barriers to enter STEM markets



High chance of salary increase in the near future in STEMs

Future Directions






- Research on county levels
- Case study in a state: District of Columbia, California, Washington
- Machine learning model to rank best places to start new-grad jobs for STEMs
- Dive in specific STEMs fields such as Software Engineer, Data Engineer, Bio Chemistry
- Gathering data on patents, Phds enrollment

Behind The Scene



Data Sources

- Bureau Labor of Statistics
- Census Bureau

 stem_2019	10/2/2024 6:58 PM	MICROSOFT EXCEL WORKSHE...	273 KB
 stem_2020	10/2/2024 6:58 PM	Microsoft Excel Workshe...	282 KB
 stem_2021	10/2/2024 6:58 PM	Microsoft Excel Workshe...	285 KB
 stem_2022	10/2/2024 6:58 PM	Microsoft Excel Workshe...	291 KB
 stem_2023	10/1/2024 2:49 PM	Microsoft Excel Workshe...	291 KB

Data Gathering & Preprocessing

```
# Merge the two dataframes to calculate the percentage of STEM employees
employment_merged = pd.merge(total_employment_by_state, stem_employment_by_state, on='area_name', suffixes=('_total', '_STEM'))

# Calculate the percentage of STEM employees
employment_merged['STEM_percentage'] = (employment_merged['tot_emp_STEM'] / employment_merged['tot_emp_total']) * 100

# Calculate average state income
df['tot_hr_earn'] = df['h_mean'] * df['tot_emp']
df['tot_yr_earn'] = df['a_mean'] * df['tot_emp']

sumup = df.groupby('area_name').agg({"tot_hr_earn": "sum", "tot_yr_earn": "sum", "tot_emp": "sum"})

sumup['state_avg_hr_earn'] = sumup['tot_hr_earn'] / sumup['tot_emp']
sumup['state_avg_yr_earn'] = sumup['tot_yr_earn'] / sumup['tot_emp']

# Merge
state = pd.merge(employment_merged, sumup, on='area_name', suffixes=('_total', '_STEM'))
state = state[['area_name', 'tot_emp_STEM', 'STEM_percentage', 'state_avg_hr_earn', 'state_avg_yr_earn']]

# New additions
df_stat = df[df['STEM_group'] == "STEM"][['area_name', 'h_mean', 'a_mean']]
df_m = pd.merge(df_stat, state, on='area_name', suffixes=('_total', '_STEM'))

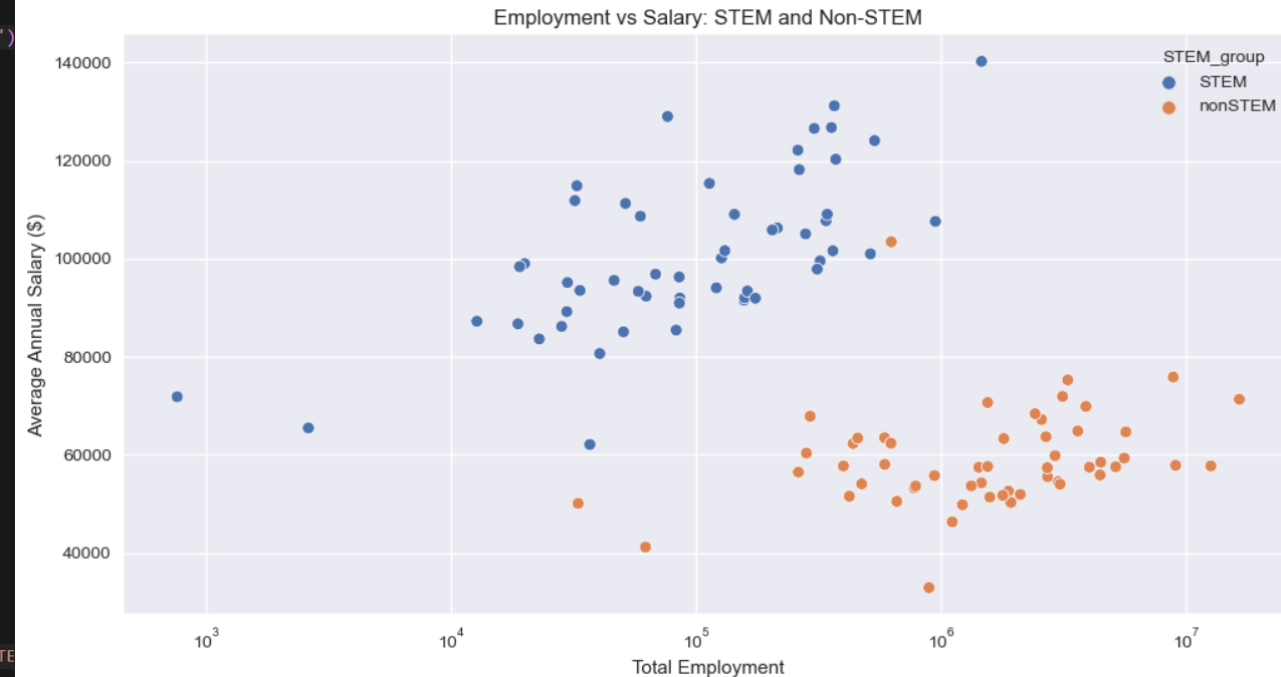
df_m['avg_wagegap(hr)_STEM_vs_state'] = df_m['h_mean'] - df_m['state_avg_hr_earn']
df_m['avg_wagegap(yr)_STEM_vs_state'] = df_m['a_mean'] - df_m['state_avg_yr_earn']

df_m = df_m[['area_name', 'h_mean', 'avg_wagegap(hr)_STEM_vs_state', 'a_mean', 'avg_wagegap(yr)_STEM_vs_state', 'tot_emp_STEM', 'STEM_percentage']]

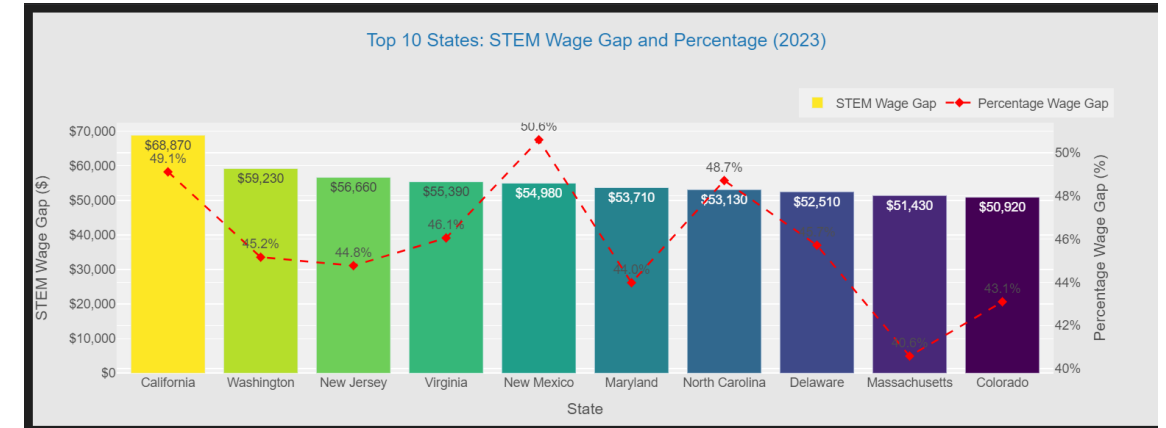
return df_m
```

+ Implemented Pandas to modify/extract data from different files, compose into a single file, and design key metrics for analysis

+ Utilized matplotlib to draw basic visualizations for data exploration and data quality check

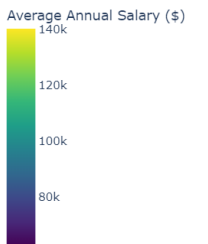
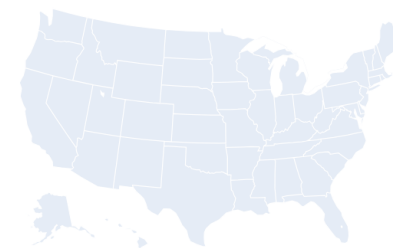


Data Visualization



STEM vs Non-STEM: Salary and Employment by State

STEM Non-STEM STEM Employment Non-STEM Employment



Optimize Plotly and PowerBI to draw interactive charts where I could interact and compare stats of each states to each others + look more lively

THANK YOU
FOR
LISTENNING!

