

Insights for Job Hunters

Grand Circus DataPy Final Project
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QUESTIONS:

1. How do salaries vary across industries and what are the trends in Computer Science careers?
2. How is job growth trending across different industries?
3. Looking at unemployment, is now a good time to job search?



AUDIENCE

Potential Job Seekers and anyone curious about starting a new career in Computer Science

DATA SOURCE

The U.S. Bureau of Labor Statistics Data Tools



PART ONE

Data Pipeline and Cleaning

DATA SOURCE

U.S. Bureau of Labor Statistics

We used a dictionary of Series IDs to make calls to the the BLS API,
then compiled into a Pandas dataframe.

We also sourced a raw data file in XLXS format from the BLS website,
read it into a Jupyter Notebook and converted it to a dataframe

API DATA SOURCE

The BLS API uses Series IDs for calls, each ID corresponds to a very specific data set (i.e. Unemployment data per month for Michigan).

We needed to browse the BLS website in order to find these IDs, after confirming we had the correct ones, we put them into a separate python file that we could then use to call the API.

We then used the dictionary (now split into 3 to prevent limiting errors) to get the json response.

Before we could use it for data analysis, we needed to parse the json responses.

```
{
  "seriesID": "LNS14000025",
  "data": [
    {
      "year": "2023",
      "period": "M12",
      "periodName": "December",
      "value": "3.5",
      "footnotes": [
        {
          ...
        }
      ]
    },
    {
      "year": "2023",
      "period": "M11",
      "periodName": "November",
      "value": "3.7",
      "footnotes": [
        ...
      ]
    },
    {
      "year": "2023",
      "period": "M10",
      "periodName": "October",
      "value": "3.7",
      "footnotes": [
        ...
      ]
    },
    {
      "year": "2023",
      "period": "M09",
      "periodName": "September",
      "value": "3.8",
      "footnotes": [
        ...
      ]
    },
    {
      "year": "2023",
      "period": "M08"
      "periodName": "August",
      "value": "3.7",
      "footnotes": [
        ...
      ]
    }
  ]
}
```

API DATA SOURCE

We wrote a function that first initiates a blank data frame and two lists.

It then for loops through the json response, finds the relevant value and series ID code, appends it to the list, and then averages out all the months to get one aggregate value for the year.

Once we gathered the json data into a dataframe with this, we were ready merge it with additional data and start analyzing.

7	3.650000	Delaware
8	2.908333	Florida
9	3.200000	Georgia
10	2.933333	Hawaii
11	3.083333	Idaho
12	4.458333	Illinois
13	3.341667	Indiana
14	2.958333	Iowa
15	2.650000	Kansas
16	4.158333	Kentucky
17	3.641667	Louisiana
18	2.833333	Maine

XLXS DATA SOURCE

We sourced a raw data file in XLXS format from the BLS website, read it into a Jupyter Notebook and converted it to a dataframe data for all states.

The file provides detailed information by state and occupation, including hourly and annual average wages, broken down into various percentiles. It also includes employment figures for each occupation within each state.

We pulled data from 2023, 2022, and 2021.

Once imported we inspected the data from this file by identifying the data types we would be working with and counting how many values were NA.



HOME SUBJECTS DATA TOOLS PUBLICATIONS ECONOMIC RELEASES CLASSROOM BETA

Bureau of Labor Statistics > Occupational Employment and Wage Statistics

Occupational Employment and Wage Statistics

Search Occupational Em

OEWS Home

OEWS Publications

OEWS Data

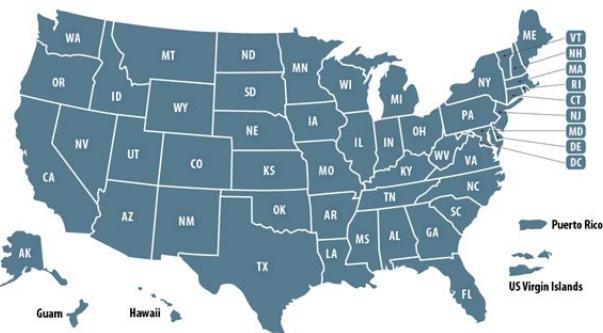
OEWS Methods

About OEWS

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May 2023 State Occupational Employment and Wage Estimates

To view occupational employment and wage estimates for a state, district, territory, or commonwealth, click on the abbreviation on the map below or scroll down to the [alphabetical list](#).



[May 2023 National Occupational Employment and Wage Estimates](#)

[May 2023 Metropolitan Area Occupational Employment and Wage Estimates](#)

A

- [Alabama \(AL\)](#)
- [Alaska \(AK\)](#)
- [Arizona \(AZ\)](#)
- [Arkansas \(AR\)](#)

C

D

G

F

H

XLXS DATA SOURCE

We altered the dataframe in the following ways

1. Converted the data types from objects to numerical values (floats/ints)
2. Updated the column names from abbreviations to more descriptive labels
3. Dropped unnecessary columns

We removed regions other than the 50 US states and then mapped the remaining 50 states to their geographical regions.

We added a column to give each job a category and used the hourly salaries to calculate missing annual salaries (and vice versa).

Create new column for job group for each "detail" job, then remove "major" rows

```
cols = list(df_jobs.columns.values)
cols

['State',
 'State Abbreviation',
 'Job Title',
 'Occupation Title',
 'Total Employed',
 'Employment per 1,000 Jobs',
 'Hourly Mean',
 'Annual Mean',
 'Hourly 10th Percentile',
 'Hourly 25th Percentile',
 'Hourly Median',
 'Hourly 75th Percentile',
 'Hourly 90th Percentile',
 'Annual 10th Percentile',
 'Annual 25th Percentile',
 'Annual Median',
 'Annual 75th Percentile',
 'Annual 90th Percentile',
 'USA Region']
```

```
# new column 'Job Type' will be created from a list
newColumnList = []

# iterate through rows to get job type from Job Title for each 'major' job line, add it to the list
for _, row in df_jobs.iterrows():
    if row['Occupation Title'] == 'major':
        jobGroup = row['Job Title']
        newColumnList.append(jobGroup)

# create the new column in the DF
# NOTE: this produces a warning, but not an error; the function completes with results as expected
df_jobs['Job Type'] = newColumnList

# cleanup: remove now-unnecessary "major" rows
df_jobs = df_jobs[df_jobs['Occupation Title'] != 'major']

# rearrange the columns to put the new one before 'Job Title'. Also remove (omit) the now unnecessary columns
cols = ['State', 'State Abbreviation', 'Job Type', 'Job Title', 'Total Employed', 'Employment per 1,000 Jobs',
        'Hourly 10th Percentile', 'Hourly 25th Percentile', 'Hourly Median', 'Hourly 75th Percentile',
        'Annual 10th Percentile', 'Annual 25th Percentile', 'Annual Median', 'Annual 75th Percentile', 'Annual 90th Percentile',
        'USA Region']
df_jobs = df_jobs[cols]

# display the details
df_jobs
```

SQL DATABASE

We spun up a SQL connection via Supabase and loaded the data frame into it for both the API data and the XLXS data.

From there we used the SQL connection to load the data into Power BI to help begin the process of visualizing the data.

Creating Supabase connection and loading data into it

```
DATABASE_URL = 'postgresql://postgres.gouknruvfnjedjxvfpm:fufca5-jUpp0  
engine = create_engine(DATABASE_URL)  
engine
```

```
Engine(postgresql://postgres.gouknruvfnjedjxvfpm:***@aws-0-us-east-2.p  
ostgres)
```

```
with engine.connect() as conn:  
    df_jobs.to_sql("bls_wage_data", conn, index=False, if_exists='repla
```

```
pd.read_sql('SELECT * FROM bls_wage_data', engine).head()
```

	State	State Abbreviation	Job Title	Occupation Title	Total Employed	Employment per 1,000 Jobs	Hourly Median Wage
0	Alabama	AL	Management Occupations	major	105580.0	51.424	56.0
1	Alabama	AL	Chief Executives	detailed	720.0	0.348	106.0
2	Alabama	AL	General and Operations Managers	detailed	34450.0	16.781	62.0
3	Alabama	AL	Legislators	detailed	1140.0	0.555	N/A
4	Alabama	AL	Advertising and Promotions Managers	detailed	70.0	0.032	53.0



PART TWO

Data Insights & Analysis

QUESTION 1

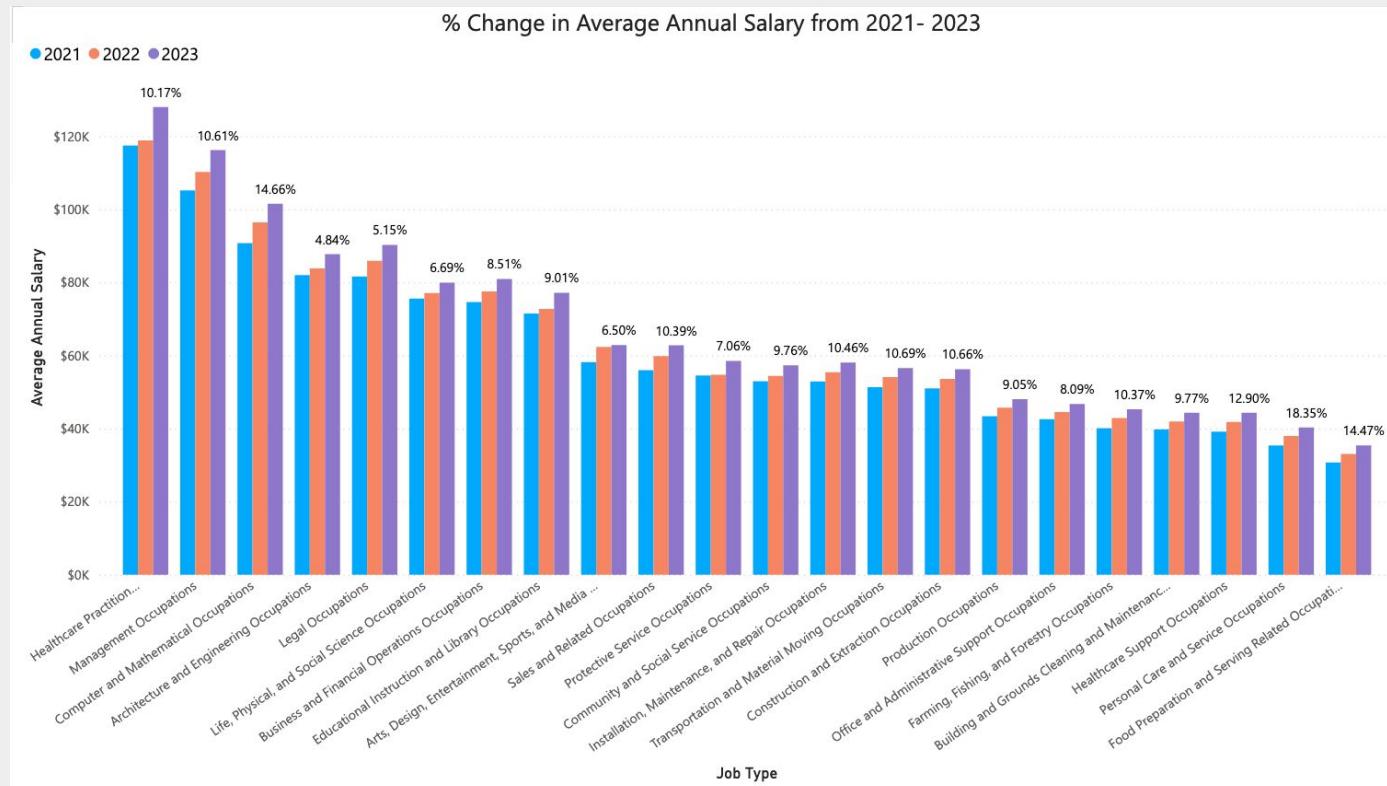
**How Do Salaries Vary Across Industries
and What are the Trends in Computer
Science Careers?**

Annual Salary Over the Years

The Healthcare sector maintains the highest average salary over the past three years.

However, from 2021 to 2023, Computer and Mathematical Science roles experienced the second largest salary increase at 14.66%.

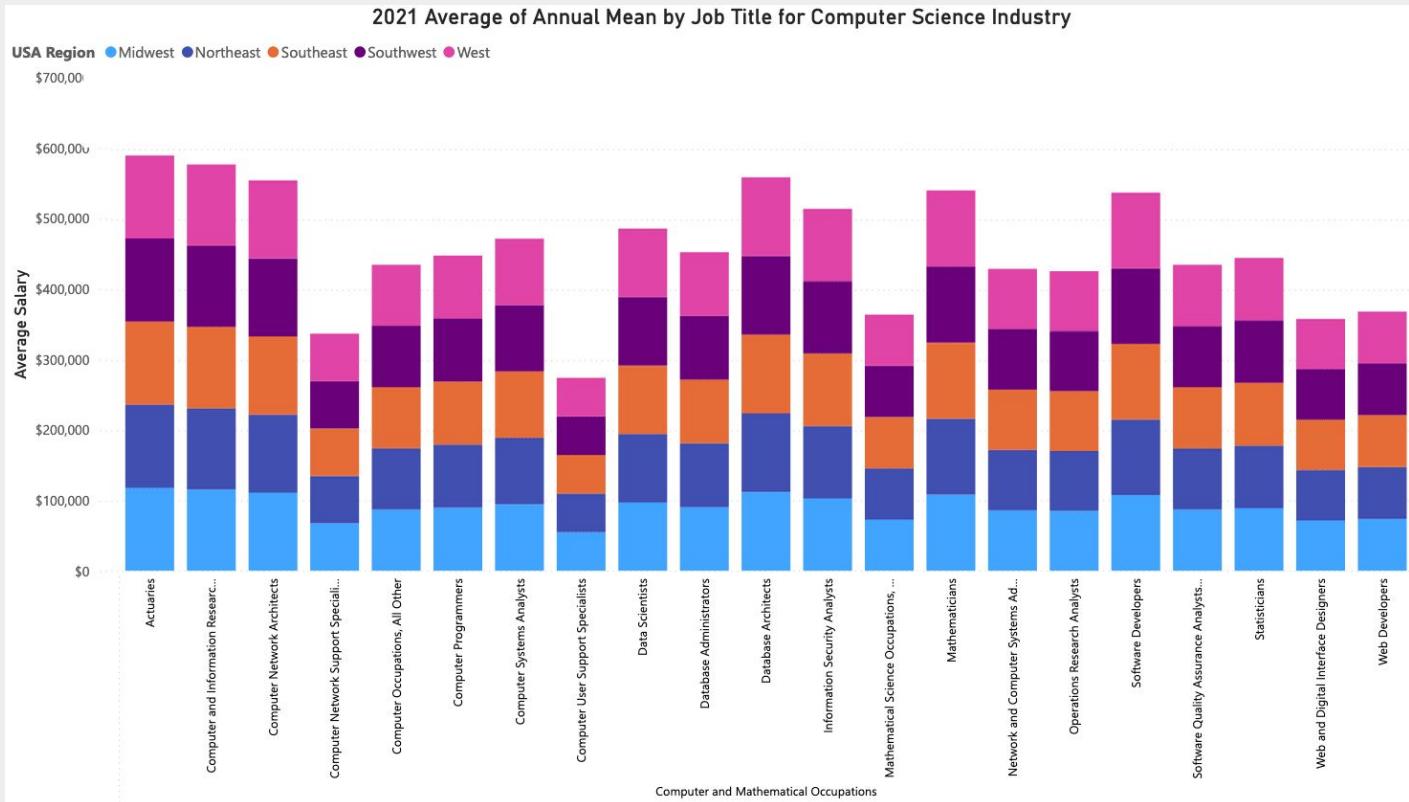
In 2023, when looking at all CS professions the average salary now exceeds 100k in the US



Computer Science Salaries Across the USA from 2021 - 2023

Computer and Information Researchers have the highest salaries in the CS field.

Data Scientists and Software Developers rank in the top half of tech jobs for salary.



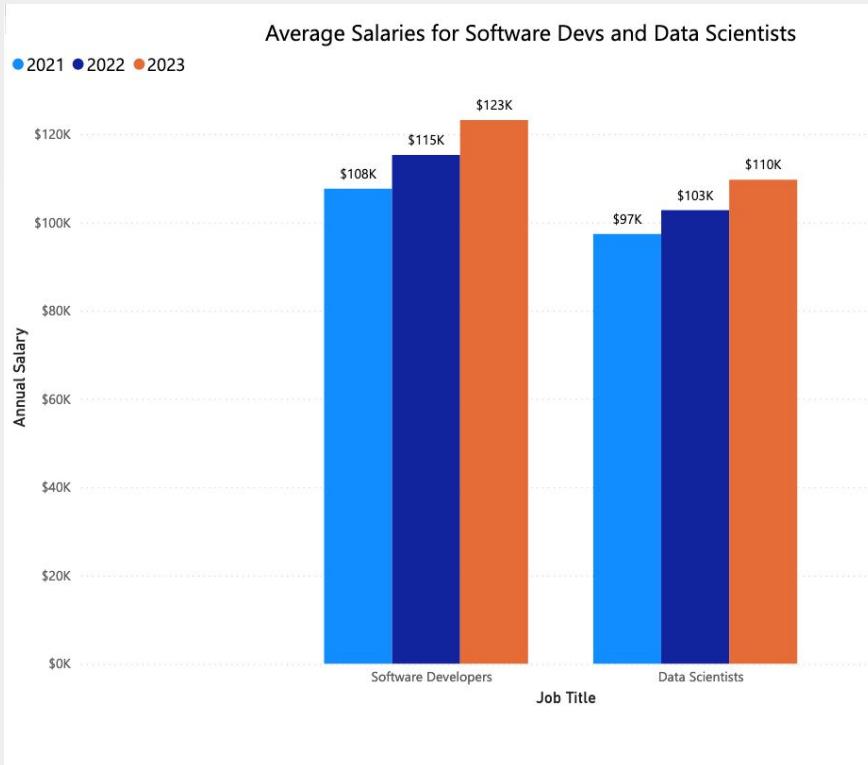
Software Devs & Data Scientist Salaries

Average salaries for software developers are generally higher.

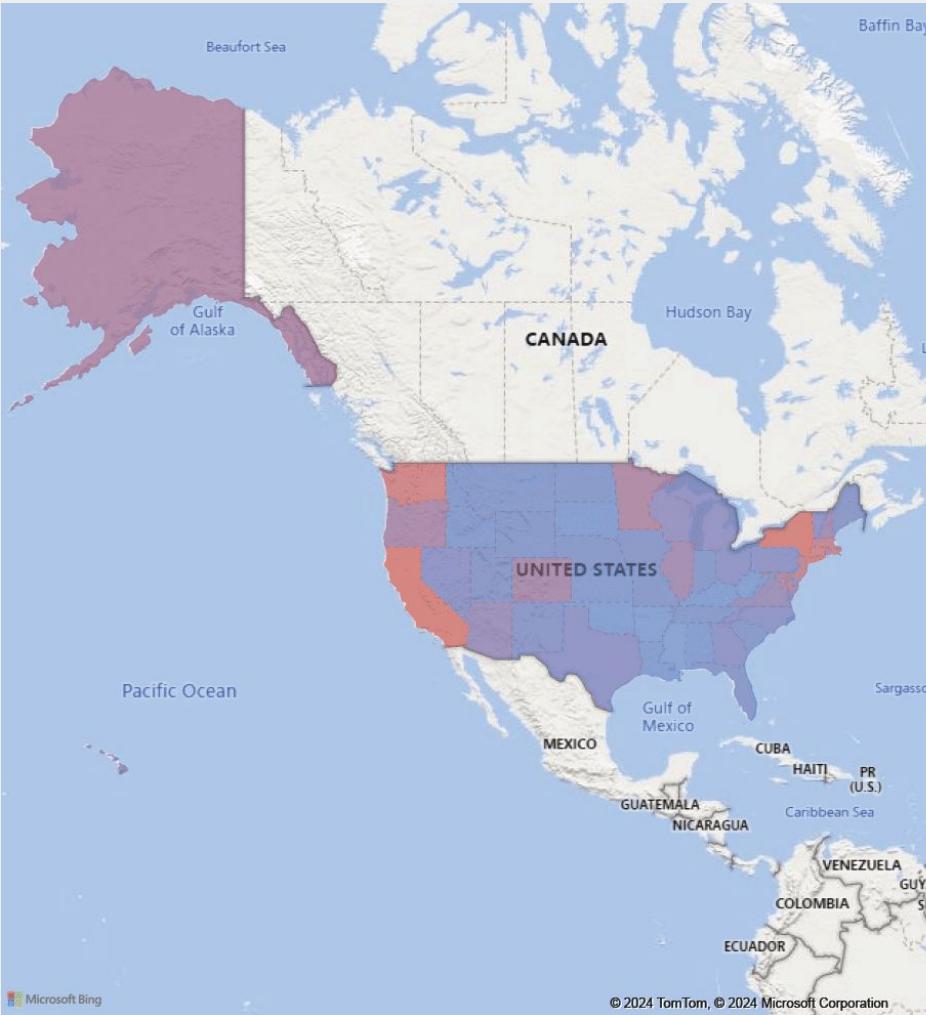
In 2021, the average salary was just slightly below that of data scientists in 2023.

8 out of the top 15 Software Developer salaries are located in eastern states.

10 out of the top 15 Data Scientists salaries are also in eastern states.



Job Title	Annual Mean	State
Software Developers	\$173,780	California
Software Developers	\$159,990	Washington
Software Developers	\$150,740	Maryland
Software Developers	\$150,020	New York
Software Developers	\$146,580	Massachusetts
Software Developers	\$145,630	Alaska
Software Developers	\$145,420	Colorado
Software Developers	\$139,920	Virginia
Software Developers	\$135,030	Rhode Island
Software Developers	\$135,000	Idaho
Software Developers	\$134,970	New Jersey
Software Developers	\$133,490	Nevada
Software Developers	\$131,650	Delaware
Software Developers	\$131,380	Montana
Software Developers	\$131,310	Oregon
Job Title	Annual Mean	State
Data Scientists	\$148,730	Washington
Data Scientists	\$140,490	California
Data Scientists	\$139,080	Virginia
Data Scientists	\$134,830	New York
Data Scientists	\$134,140	New Jersey
Data Scientists	\$130,520	Delaware
Data Scientists	\$127,380	Rhode Island
Data Scientists	\$126,190	Idaho
Data Scientists	\$126,080	Hawaii
Data Scientists	\$126,020	Maryland
Data Scientists	\$125,950	North Carolina
Data Scientists	\$125,330	Wyoming
Data Scientists	\$125,100	Massachusetts
Data Scientists	\$124,480	Oregon
Data Scientists	\$124,430	Vermont



Healthcare Practitioners and Technical Occupations

127,995.93
Average of Annual Mean

Management Occupations

116,173.40
Average of Annual Mean

Computer and Mathematical Occupations

101,518.21
Average of Annual Mean

Legal Occupations

90,255.43
Average of Annual Mean

California

85,253.46
Average of Annual Mean

Pediatric Surgeons

384,034.00
Average of Annual Mean

New York

84,077.58
Average of Annual Mean

Orthopedic Surgeons, Except Pediatric

372,178.57
Average of Annual Mean

Washington

82,429.79
Average of Annual Mean

Surgeons, All Other

363,960.29
Average of Annual Mean

Connecticut

81,579.87
Average of Annual Mean

Dermatologists

348,680.37
Average of Annual Mean

The background of the slide features a photograph of a forest. The scene is filled with tall, thin trees, likely birches, with white bark and dark, horizontal lichen or moss markings. Sunlight filters down from the top through the dense canopy of green leaves and smaller branches, creating bright highlights on the trunks and dappled light on the forest floor. The overall atmosphere is misty and serene.

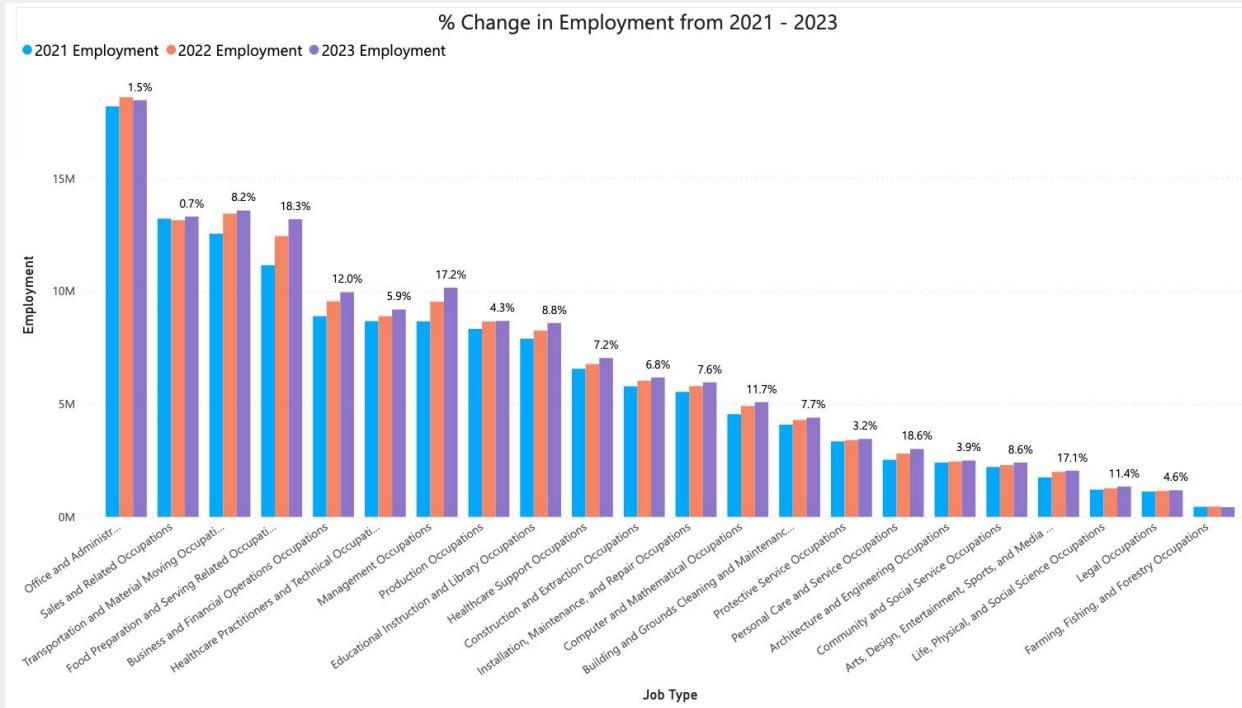
QUESTION 2

How Is Job Growth Trending Across Different Industries?

Employment Changes from 2021 - 2023

Office and Administrative positions maintains the highest employment count over the past three years.

From 2021 to 2023, Computer and Mathematical Science roles experienced a growth of **11.7%** which is the 5th highest across all job types.

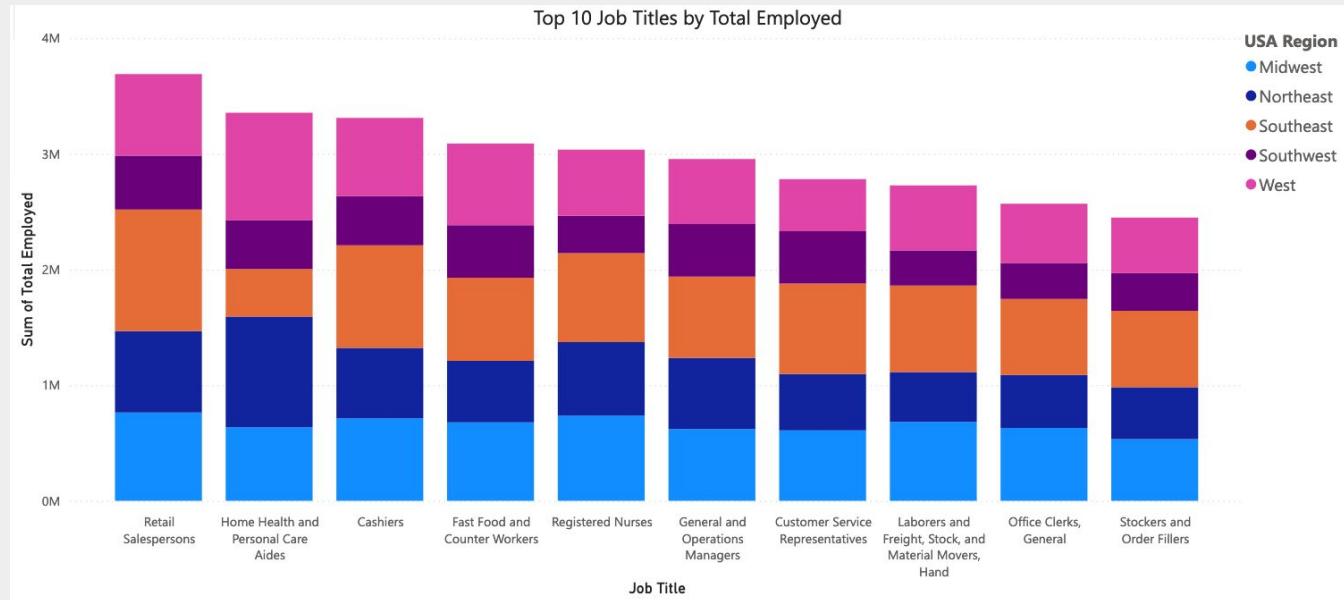


Top 10 Job Titles in 2023

We wanted to take a look at the top 10 jobs for employment and see which region employs the most.

Most of these are customer service jobs such as retail, cashier, fast food workers etc.

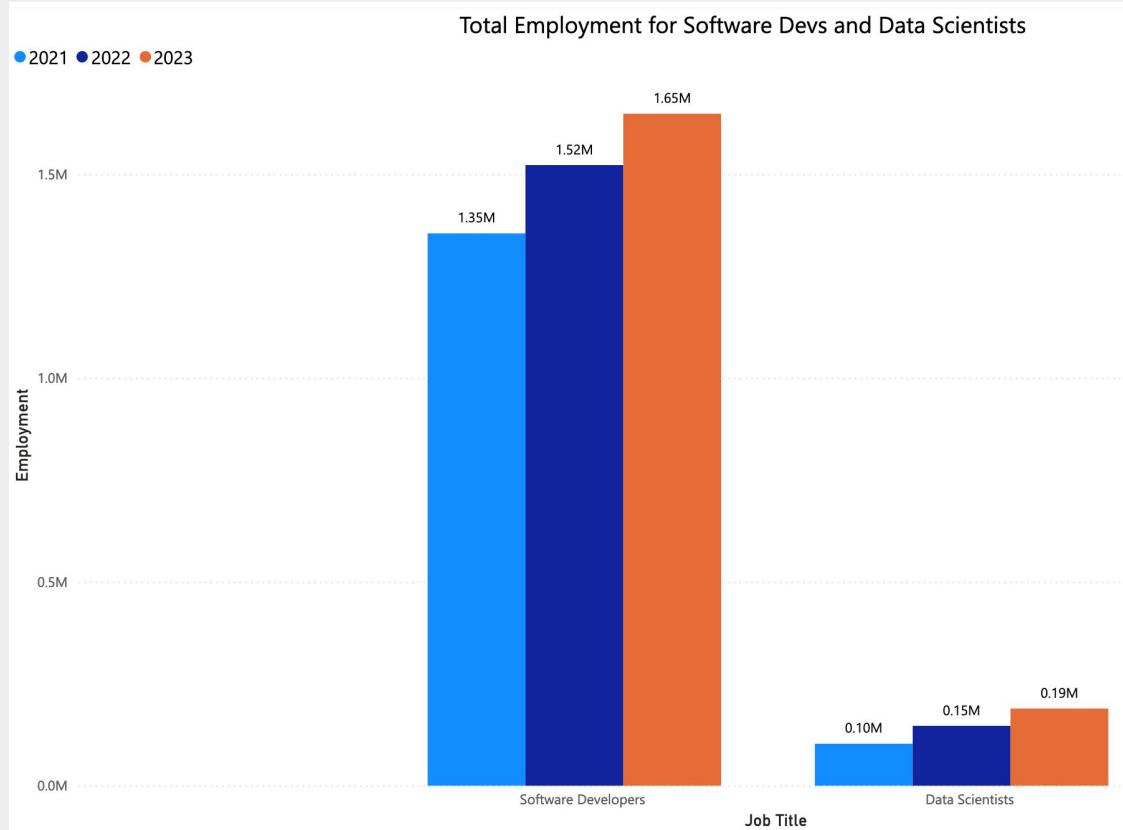
There are two healthcare professions in the top 10, but no tech jobs included.

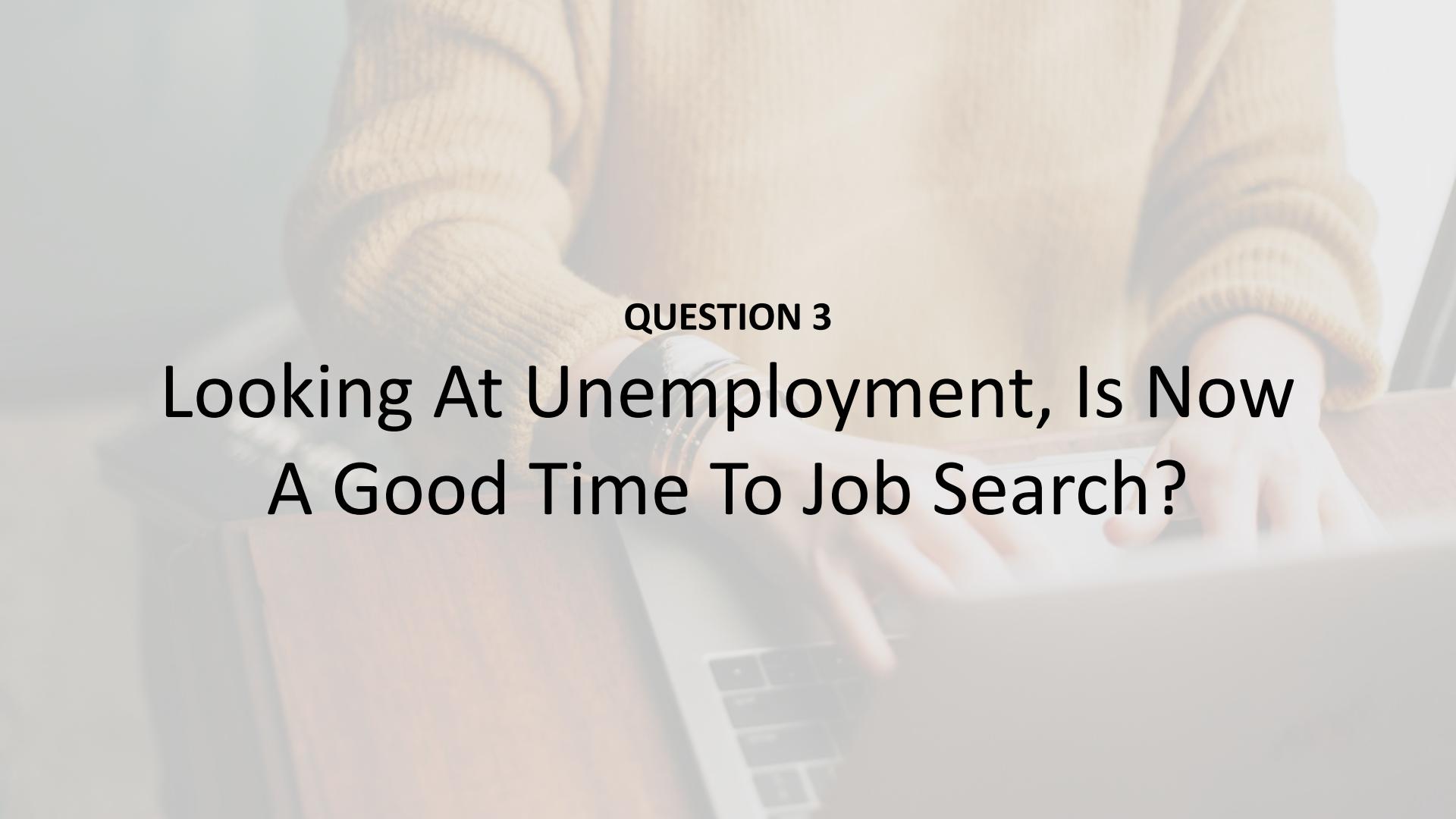


Employment for Software Development and Data Scientists

Software developers have a much higher employment count than a data scientist does.

However, the growth for both careers seems to be on the rise year over year.

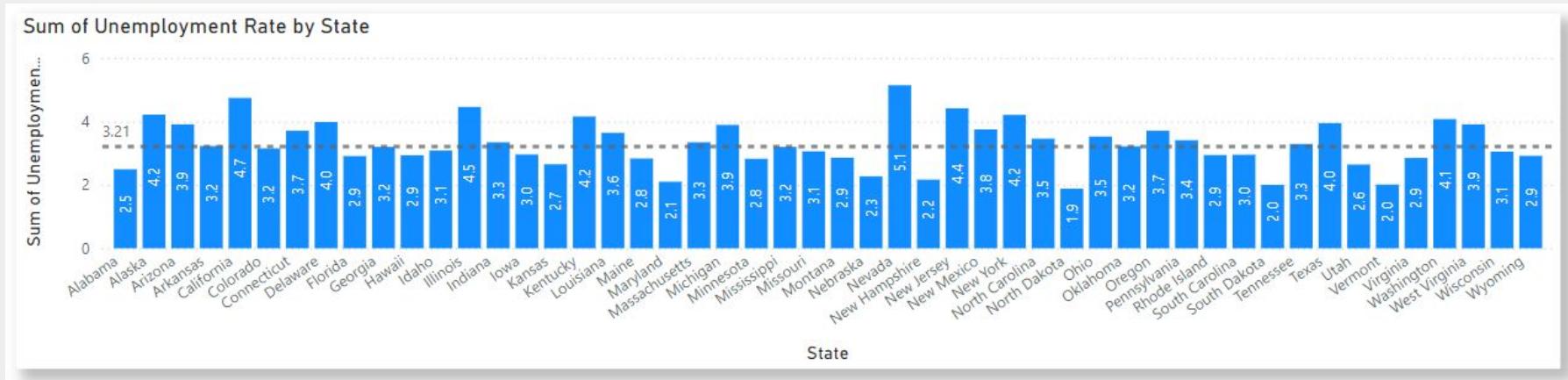




QUESTION 3

Looking At Unemployment, Is Now A Good Time To Job Search?

Unemployment by State, with overall average

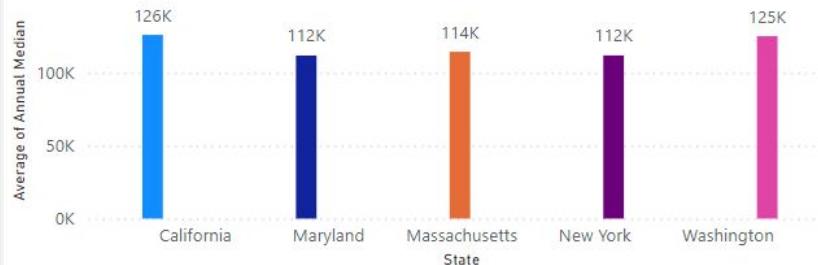


When considering whether to change jobs, one relevant factor to consider is how high unemployment is in the state where you might be job hunting.

Here, the national average unemployment rate is 3.21%. Many states are below this, but a fair number are well above it.

Unemployment by State, Compared to Salaries

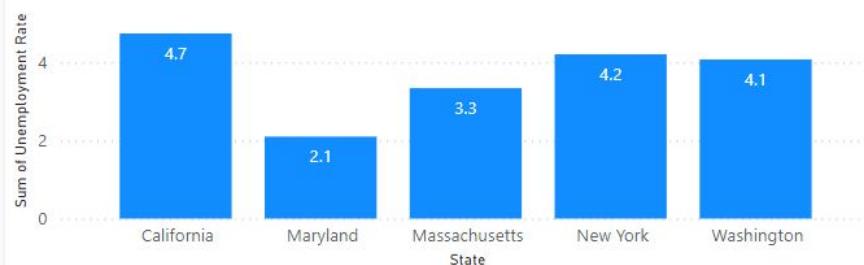
Top 5 states for Median Income



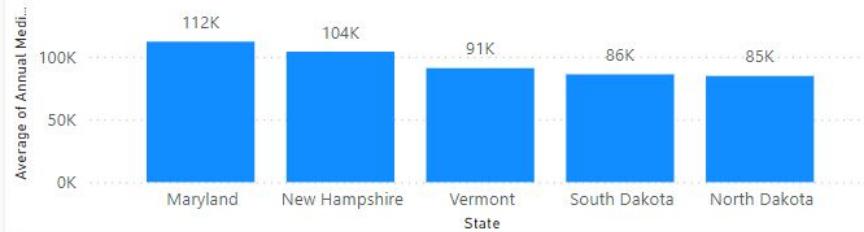
States with Lowest Unemployment Rate



Unemployment in Top 5 Earning States



Median Computers & Math Income for states with lowest unemployment



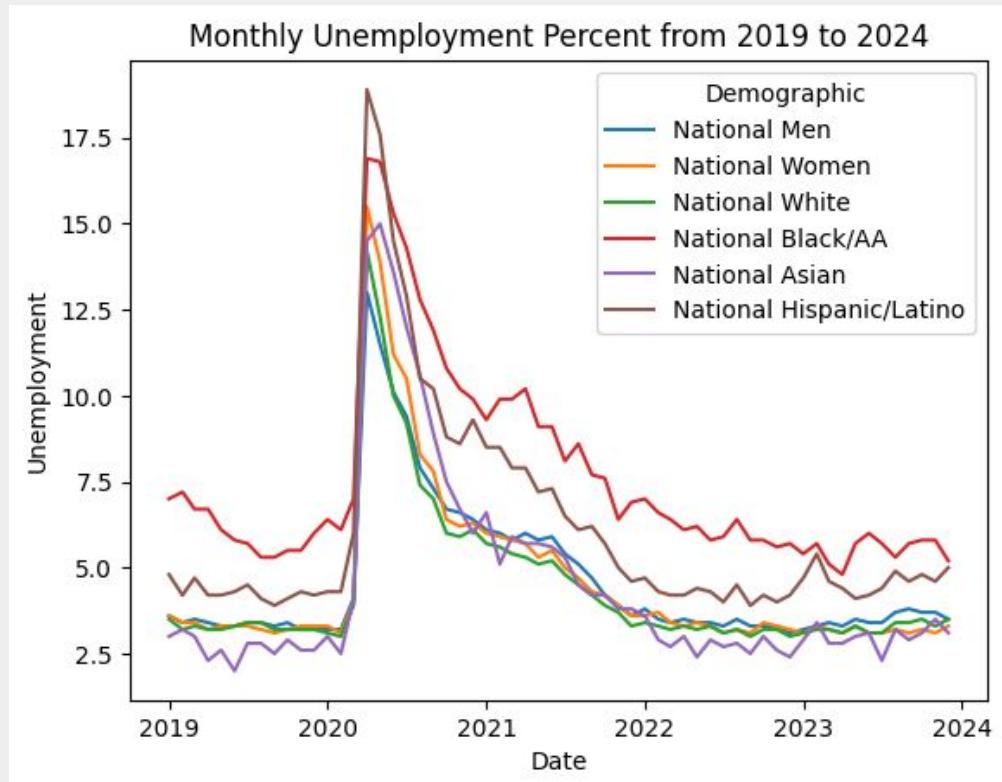
Unemployment is another consideration beyond yearly earnings; high unemployment probably indicates a difficult job market, forcing one to weigh the reward of employment against the difficulty of achieving it.

Here, for example, we see that while Tech pay in California is about 10% higher than in Maryland, the unemployment rate is more than double. New Hampshire is also attractive with good pay and low unemployment.

Unemployment by Demographic Over Time

This line chart shows the spike in unemployment in early 2020 due to the COVID pandemic. There are some interesting insights into demographics. Nationally the rate of unemployment in Hispanic and Latino people skyrocketed more than any other demographic, but also recovered quickly.

All demographics have mostly recovered to pre-COVID levels.



PART THREE

Final Conclusions

ANSWER ONE

How do salaries vary across industries and what are the trends in Computer Science careers?

Salaries across all industries are trending upwards, some more quickly than others. Computer science has the strongest growth among all job types, with software engineering being slightly better than data science.

ANSWER TWO

How is job growth trending across different industries?

Job growth is also trending upwards across all industries. Food preparation and serving has the highest growth at 18.3% and computer science is still strong at 11.7%.

ANSWER THREE

Looking at unemployment, is now a good time to job search?

By the end of 2023, unemployment levels for all demographics have recovered to pre-COVID levels.

However, job seekers should take into account that different states experience substantially different levels of unemployment, which may affect the odds of landing a new job.

Thank
you!