

# Final Project: 444

Group 6: Lisette Kamper-Hinson, Diana Salinas, and Kearies Donelson

2022-11-16

Which is the best city for a new postgraduate student to move to based on the average salary of a Computer Science (CS) Major in the area, cost of housing in the area (renting specifically), and percent of computer science related jobs in each major city in the US?

## Major Cities in Each of the States

In this map, we have chosen the most populated cities in each of the 50 states to give information for. Below, you will be able to find information such as average salary, cost of living, and cost of rent.

### What is it exactly?

In this context, we are referring to the annual average salary through each state, which was found by averaging together for all counties and areas in the state.

### How it was found:

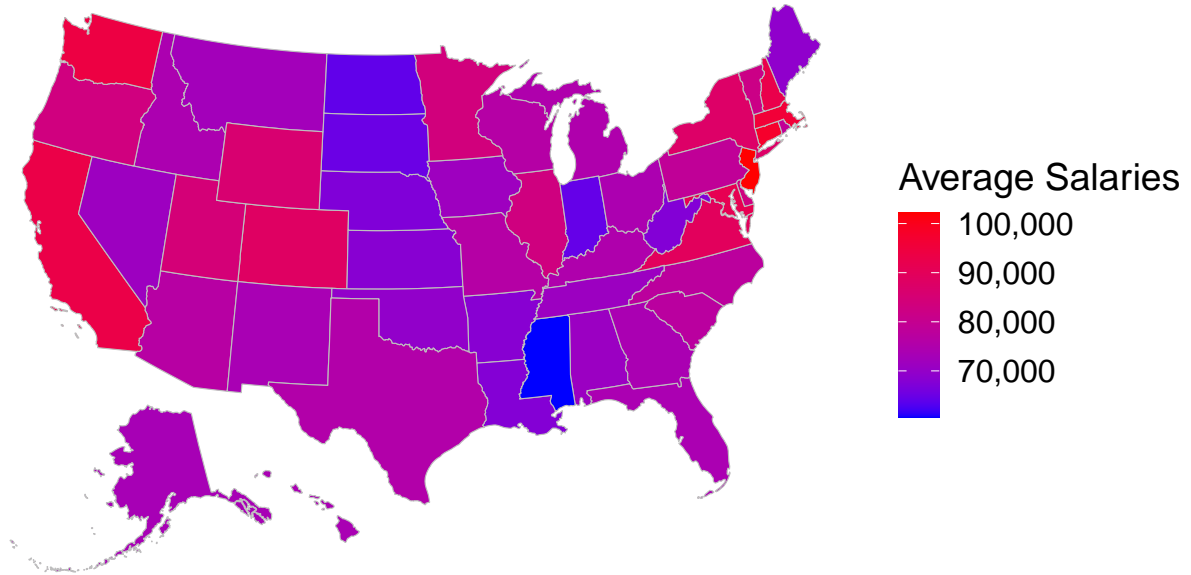
To find the average salary for each state in our dataset, I used the PUMAs data we had collected and saved into our box drive. I had to separate the county and state in one of the columns to create two vectors of state and county names was created. This was used to build an average for each state. Once the data was collected, it was averaged together and then displayed.

Originally Texas had caused some issues when averaging due to the way I had separated the data when creating the vectors. I managed to solve the problem after going back to it.

### Question 1: How is the average salary of a CS major affected by the population and location in each of the major cities?

The average salary is affected by region and major cities. By looking at the map, we are able to see how more populated states have a higher average salary compared to less populated states.

## Averages Across the States

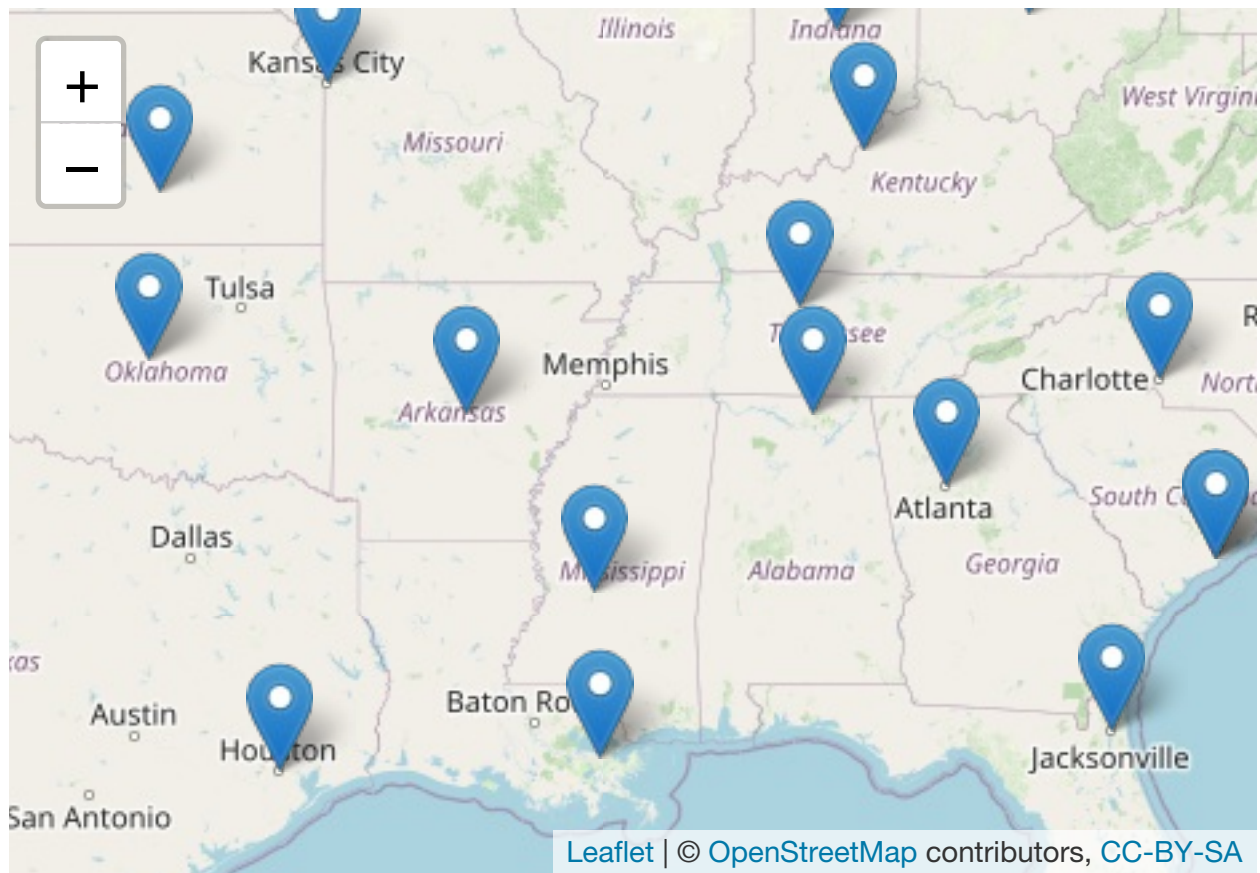


## Interactive Map with Major Cities

Currently the location is centered in Oxford since The University of Mississippi. When zooming out, you will be able to see the surrounding areas and their information.

**Question 2: Based on the leaflet, do you see a common pattern with the popularity of cities and high population density?**

Yes, there is a common pattern that can be seen based on the leaflet. Most of the bigger and more populated cities tend to be close to bodies of water. This makes sense since when people were settling down and forming towns and such, they wanted to live by a resource they could use for farming, crops, bathing, etc.



**Question 3. What are the Top 5 Closest Locations to the University of Mississippi for a Computer Science Student to Move to?**

The 5 Closest Locations to The University of Mississippi are..

1. Jackson, MS
2. Huntsville, AL
3. Little Rock, AR
4. Nashville, TN
5. Atlanta, GA

## Most Populated City for each State and their Average Yearly Income

Below is a table to specifically see each state and their average yearly income in a quick view

## Cost of Living

The cost of living index compares the cost of living in a major city to a corresponding metropolitan area. The index incorporates the expense of various living expenses creating an aggregate measure that workforce entrants can use as a benchmark.

To find the cost of living index for each city in our dataset. A vector of state and city names was created and used to build an individual URL for each city. The url were then used to web-scrap the cost of living, cost of housing, cost of groceries and cost of utilities. This was added to a dataframe and written to a csv.

States	Cities	Longitude	Latitude	Abbreviation	Average Salary
Alabama	Huntsville	-86.586105	34.730370	AL	71136.96
Alaska	Anchorage	-149.900284	61.218056	AK	73324.30
Arizona	Phoenix	-112.072578	33.448200	AZ	76613.18
Arkansas	Little Rock	-92.289597	34.746483	AR	68233.05
California	Los Angeles	-118.243683	34.052235	CA	93156.61
Colorado	Denver	-104.990250	39.739235	CO	88465.34
Connecticut	Bridgeport	-73.189484	41.179192	CT	97654.63
Delaware	Wilmington	-75.545097	39.744431	DE	82987.56
District of Columbia	Washington, D.C.	-76.464844	39.655610	DC	98121.12
Florida	Jacksonville	-81.655647	30.332184	FL	73925.00
Georgia	Atlanta	-84.387985	33.748997	GA	73916.32
Hawaii	Honolulu	-157.858337	21.306944	HI	73701.28
Idaho	Boise	-116.202316	43.615021	ID	74198.73
Illinois	Chicago	-87.629799	41.878113	IL	83051.59
Indiana	Indianapolis	-86.158066	39.768402	IN	64515.87
Iowa	Des Moines	-93.624962	41.586834	IA	71662.37
Kansas	Wichita	-97.335571	37.686020	KS	68217.81
Kentucky	Louisville	-85.758453	38.252666	KY	74884.12
Louisiana	New Orleans	-90.071533	29.951065	LA	67796.98
Maine	Portland	-68.972168	45.512230	ME	69326.25
Maryland	Baltimore	-76.612190	39.290386	MD	91222.13
Massachusetts	Boston	-71.057083	42.361145	MA	95875.05
Michigan	Detroit	-83.045753	42.331429	MI	74945.16
Minnesota	Minneapolis	-93.265015	44.977753	MN	83714.56
Mississippi	Jackson	-90.184807	32.298756	MS	60600.53
Missouri	Kansas City	-94.578568	39.099728	MO	76183.12
Montana	Billings	-108.504578	45.782650	MT	72506.58
Nebraska	Omaha	-95.934502	41.256538	NE	67247.40
Nevada	Las Vegas	-115.139832	36.169941	NV	71388.80
New Hampshire	Manchester	-71.454788	42.995640	NH	92510.96
New Jersey	Newark	-74.174393	40.731510	NJ	102116.36
New Mexico	Albuquerque	-106.650421	35.084385	NM	73629.43
New York	New York City	-74.005974	40.712776	NY	87532.37
North Carolina	Charlotte	-80.841141	35.223789	NC	77584.89
North Dakota	Fargo	-96.784640	46.876960	ND	64160.34
Ohio	Columbus	-82.998795	39.961178	OH	74218.89
Oklahoma	Oklahoma City	-97.516426	35.467560	OK	69718.63
Oregon	Portland	-122.658722	45.512230	OR	83167.85
Pennsylvania	Philadelphia	-75.165222	39.952583	PA	78800.86
Rhode Island	Providence	-71.412750	41.824459	RI	78936.94
South Carolina	Charleston	-79.940918	32.784618	SC	77377.33
South Dakota	Sioux Falls	-96.728333	43.547302	SD	65064.50
Tennessee	Nashville	-86.781601	36.162663	TN	71278.89
Texas	Houston	-95.369804	29.760427	TX	75505.77
Utah	Salt Lake City	-111.891045	40.760780	UT	84613.85
Vermont	Burlington	-73.210999	44.475990	VT	81803.28
Virginia	Virginia Beach	-75.975441	36.845131	VA	89404.37
Washington	Seattle	-122.332069	47.606209	WA	93878.67
West Virginia	Charleston	-79.931053	32.776474	WV	67575.59
Wisconsin	Milwaukee	-87.906471	43.038902	WI	76157.03
Wyoming	Cheyenne	-104.818802	41.140240	WY	85778.64

Website used: <https://www.payscale.com/cost-of-living-calculator/>

To calculate the cost of living in each city the index of each city was collected. This tells us the percent above or below the cities cost of living index is.

**Example** Cost of Living Index for the US: 100

Cost of Living in Dollars: \$62,064

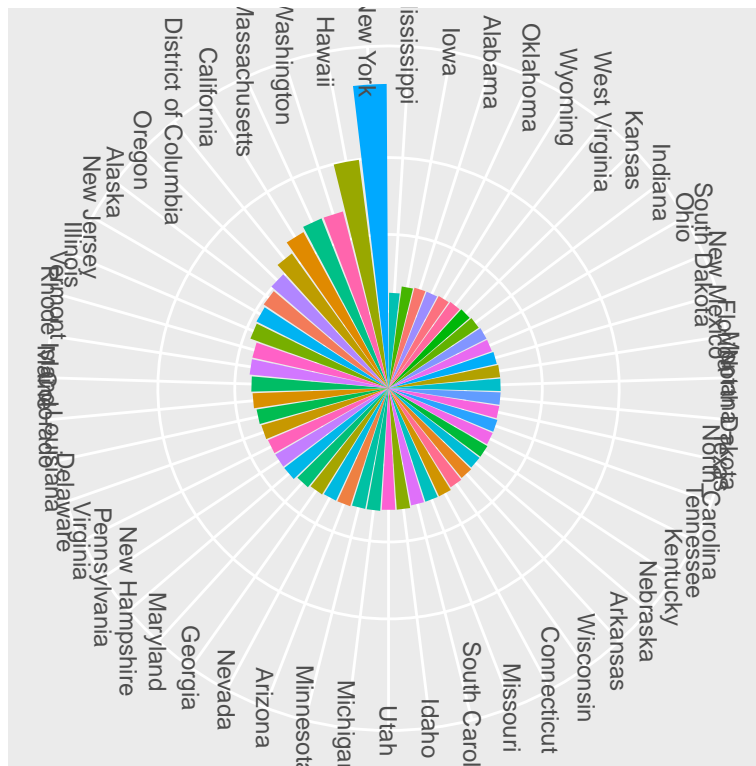
Wyoming has a cost of living index of 88, 12% lower than the national average.

$\text{dollarAmount} = (88/100) * 62064$

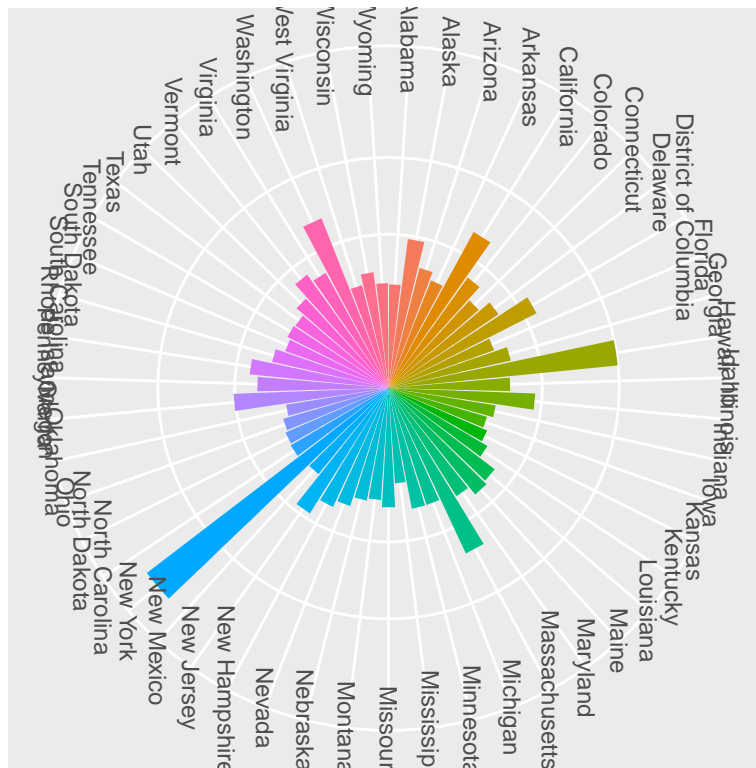
$\text{dollarAmount} = \$54,616.32$

Therefore the cost of living in dollars is \$54,616.32

Cost of Living in each city labeled by State



## Cost of Living in each city labeled by State



## Median Gross Rent

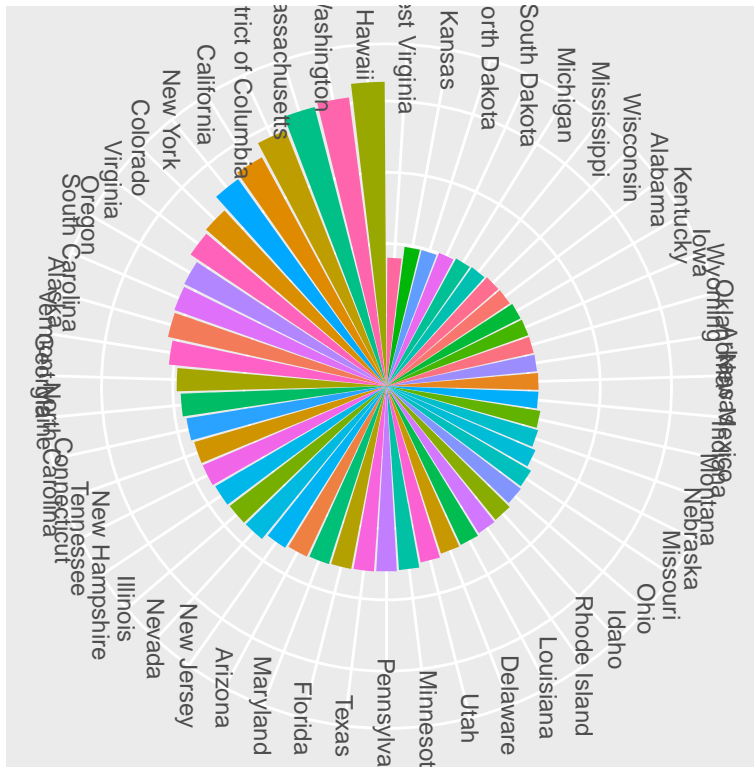
Gross rent provides information on the monthly housing cost expenses for renters. Gross rent is the contract rent plus the estimated average monthly cost of utilities.

Originally we wanted to use housing information. This included the values of a mortgage, cost to outright buy a home and the cost of living with and without a mortgage. For the majority of us in the room the next step is not buying a home but renting therefore Median Gross Rent was the best choice.

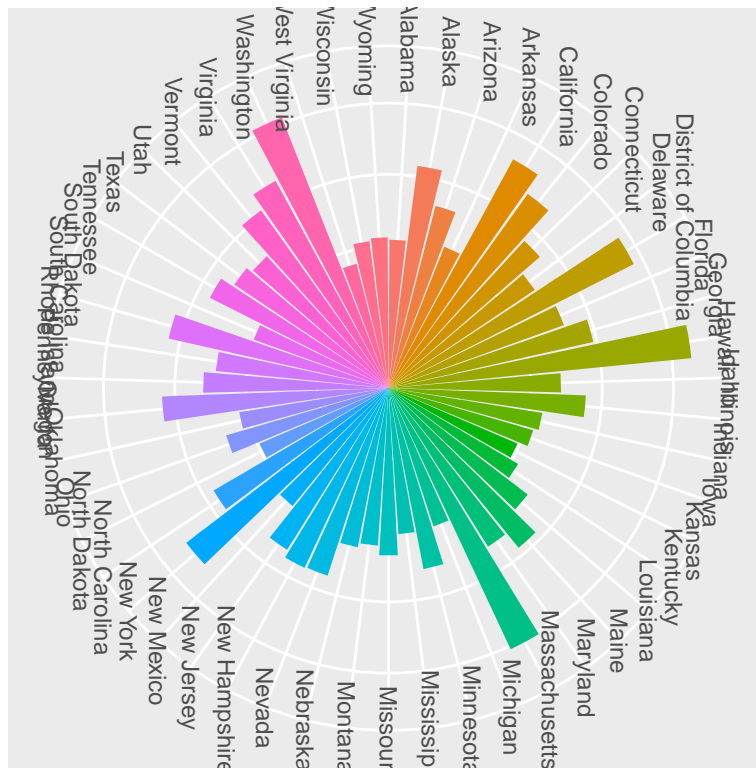
Once the median gross rent of scraped and added to the tibble it was multiplied by 12 the find the yearly rent.

Website used: <https://www.census.gov/quickfacts/fact/table/>

Median Gross Rent in each city labeled by State



Median Gross Rent in each city labeled by State

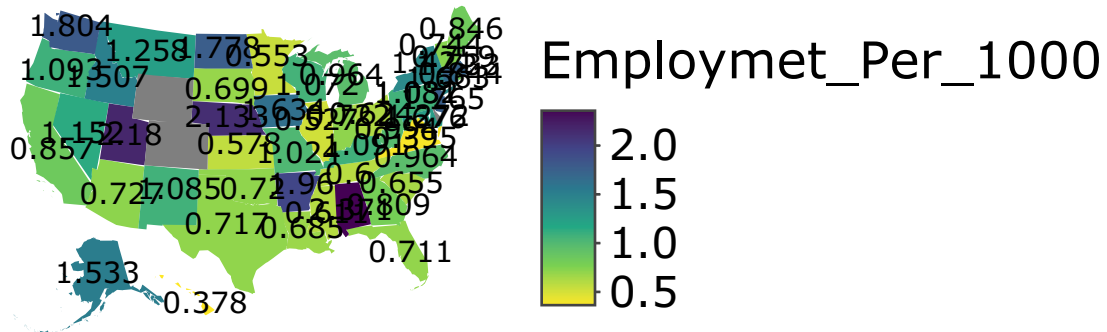


#1) What is the Percentage of Employment in each major city ?



Plotting Employment rate per 1000 for Computer Programmer by each State

## Employment Per 1000 by Major City

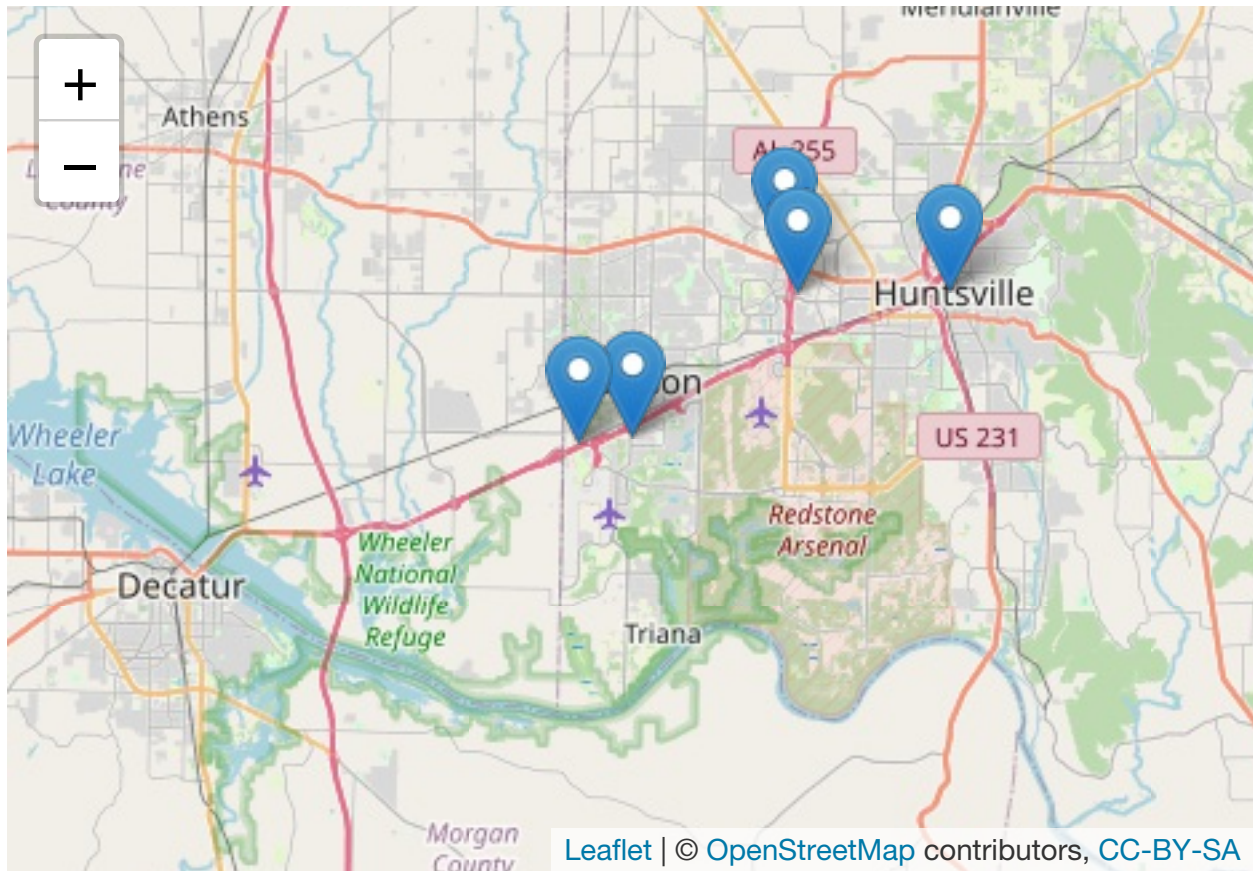


#2) What major city has the highest percentage in?

#3) What are the top five companies in that major city?

### Plotting Top 5 Companies

- The city with highest employment rate per 1000 for Computer Programmer is Huntsville AL. I found Top Tech Companies from builtin.com



What are the top 5 most populated cities in the US by state for Computer Science majors based on the criteria we have created, average salary, gross median rent, and percent of computer science related jobs in the area?

## The Top 5 Cities for Post-Grad Computer Science Majors to Move

Note: This list was created based on the following metrics. They must...

1. have a salary above the national average salary
2. have a positive Salary vs. Cost of Living value
3. have a high Employment per 1000 jobs

To find the cities that pass this metric this formula was used:

Salary vs Cost of Living and Rent = (Average Salary in Each State - (Cost of Living+ Median Gross Rent))

Once the Salary vs. Cost of Living and Rent were calculated the negative values were filtered out.

Any city below the national average salary of \$78, 241, according to ziprecruiter, was filtered out.

Slice max was used to find the top 5 cities based on the employment per 1000 jobs available.

*Table A*

State	City	Average Salary in Each State	Cost of Living	Median Gross Rent	Salary vs Cost of L
Utah	Salt Lake City	\$84613.85	\$63305.28	\$12600	\$8708.57000000001
Connecticut	Bridgeport	\$97654.63	\$62064	\$14052	\$21538.63
New Jersey	Newark	\$102116.36	\$76959.36	\$13392	\$11765
Maryland	Baltimore	\$91222.13	\$66408.48	\$13128	\$11685.65
Delaware	Wilmington	\$82987.56	\$68891.04	\$12360	\$1736.51999999999

## What are the main tech companies located in the city?

### Salt Lake City, Utah

SoFi, Overstock, M1,Quickbase and Angle Health

**Bridgeport, Connecticut** Infosys, Cognizant Technology Solution, Wipro, Amazon, and IBM

**Newark, New Jersey** Panasonic, KL Software technologies, Gadget Software, Amazon, and DataBank

**Baltimore, Maryland** Catalyte, Whitebox, ZeroFOX, Zentech Manufacturing and Potomac Laser

**Milwaukee, Wisconsin** Formlabs FIS, ServiceNow, Wipfli, and Expert Institutes

## Are there any major companies that are headquartered here that affect these results?

**Salt Lake City, Utah** Daz Productions: a 3D-content and software company specializing in providing rigged 3D human models, associated accessory content, and software to the hobbyist as well as the prosumer market.

**Bridgeport, Connecticut** Aquarion Water Company: Aquarion Water Company, a subsidiary of Ever-source, is the public water supply company for approximately 236,000 customer accounts or more than 750,000 people in 72 cities and towns in Connecticut, Massachusetts and New Hampshire.

**Newark, New Jersey** Prudential Financial: an American Fortune Global 500 and Fortune 500 company whose subsidiaries provide insurance, retirement planning, investment management, and other products and services to both retail and institutional customers throughout the United States and in over 40 other countries

**Baltimore, Maryland** T Rowe Price: an American publicly owned global investment management firm that offers funds, subadvisory services, separate account management, and retirement plans and services for individuals, institutions, and financial intermediaries.

**Milwaukee, Wisconsin** Rockwell Automation: an American provider of industrial automation whose brands include Allen-Bradley, FactoryTalk software and LifecycleIQ Services.

What are the top 5 mostly populated cities in the US by state that have an average salary above \$78,214, the average salary for a computer science major? (This might differ from the overall top 5 because of gross median rent and percentage of jobs available in the desired field.)

State	City	Average Salary in Each State	Cost of Living	Median Gross Rent	Salary vs Cost
New Jersey	Newark	\$102116.36	\$76959.36	\$13392	\$11765
Connecticut	Bridgeport	\$97654.63	\$62064	\$14052	\$21538.63
New Hampshire	Manchester	\$92510.96	\$68270.4	\$13920	\$10320.56
Maryland	Baltimore	\$91222.13	\$66408.48	\$13128	\$11685.65
Virginia	Virginia Beach	\$89404.37	\$68270.4	\$16560	\$4573.96999999

State	City	Average Salary in Each State	Cost of Living	Median Gross Rent	Salary vs Cost of Living
Arizona	Phoenix	\$76613.18	\$64546.56	\$13200	\$-1133.38
California	Los Angeles	\$93156.61	\$92475.36	\$18276	\$-17594.75
Illinois	Chicago	\$83051.59	\$76338.72	\$13848	\$-7135.13
New York	New York City	\$87532.37	\$158263.2	\$17868	\$-88598.83
Texas	Houston	\$75505.77	\$58340.16	\$13032	\$4133.61

## The cities above the national average salary

Table B

Looking through this list it is important to note both Newark, New Jersey and Bridgeport, Connecticut show up in table A and table B. This is important to take into consideration when deciding the number one place for post-graduate computer science majors to move to.

## Now let take a look at the most populated cities on our list.

Those cities are...

1. New York City, New York
2. Los Angeles, California
3. Chicago, Illinois
4. Houston, Texas
5. Phoenix, Arizona

The only city to have a positive Salary vs Cost of Living value is Houston, Texas, but the average salary of this city is below the national average therefore taking it out of the running for number one city to move to post-grad.

The other four cities in the list have a negative Salary vs. Cost of Living value also making these cities ineligible to be the number one city.

Also each of the these have a comparably low Employment per 1000 jobs ratio which could be due to the high population density of each of the cities.

## The number one city for post-graduate computer science majors to move to is...

### Newark, New Jersey

Newark, New Jersey is the best city to move to for post-graduate computer science majors. This city has an average salary above the national average, a positive salary vs. cost of living index and has a considerably high employment per 1000 jobs ratio

State	City	Average Salary in Each State	Cost of Living	Median Gross Rent	Salary vs Cost of Living
New Jersey	Newark	\$102116.36	\$76959.36	\$13392	\$11765