

Demand for Healthcare Jobs across the U.S.

Devil in the Data

*Larkyn Baum, Mirella Hernandez, Stella Li, Emma Ning,
and Cas Sweeney*

Healthcare Industry

- ❑ Largest industry on Indeed and in the US in general
- ❑ One of the fastest growing industries, with a third of all job growth
- ❑ Uncertain job market and potential changes in near future due to federal policy shifts
- ❑ Common misconception about what jobs are needed in the healthcare industry.

Categories with Highest Demand in the Field

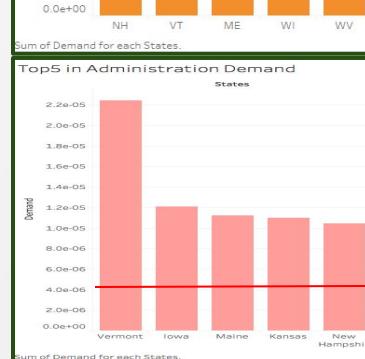
1. Management

Director of Operations
Project Superintendent
Intern Manager
Mean: 7.97e-06



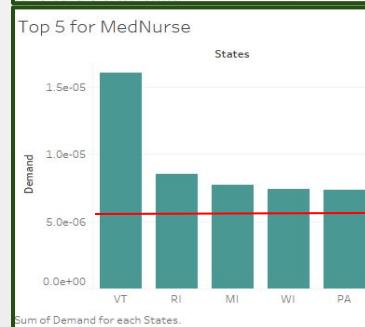
2. Administration

Medical Receptionist
Receptionist
Administrative Assistant
Mean: 6.62e-06



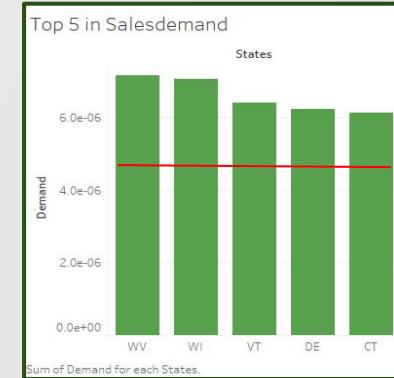
3. Medical Nurse

Nursing Assistant
Registered Nurse
Licensed Practical Nurse
Mean: 5.34e-06



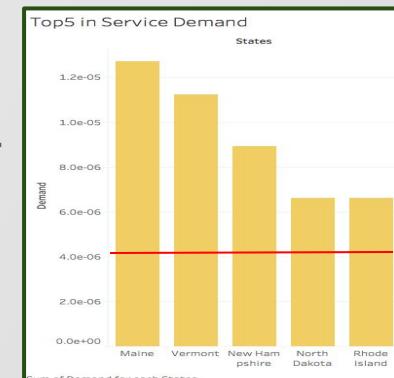
4. Sales

Business Development Representative
Sales Agent
Sales Associate
Mean: 3.97e-06

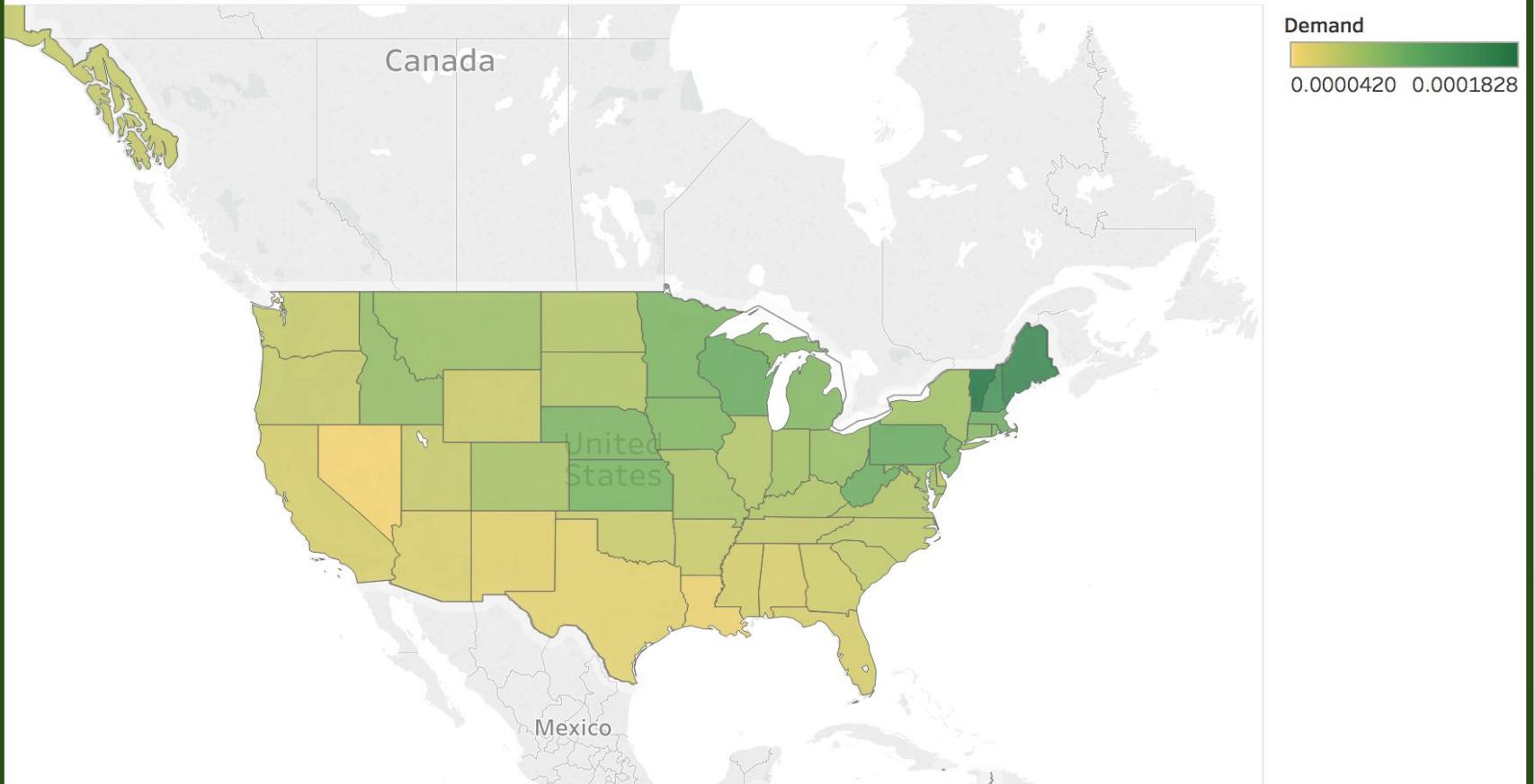


5. Service

Direct Support Professional
Case Manager
Licensed Clinical Social Worker
Mean: 4.25e-06



General Demand



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Demand. Details are shown for Admin1.

Competitiveness: A New Job Search Filter

Team: A-Super-NOVA
Smith College

Audrey Bertin

Riley Boeth

Emma Livingston

Clara Rosenberg

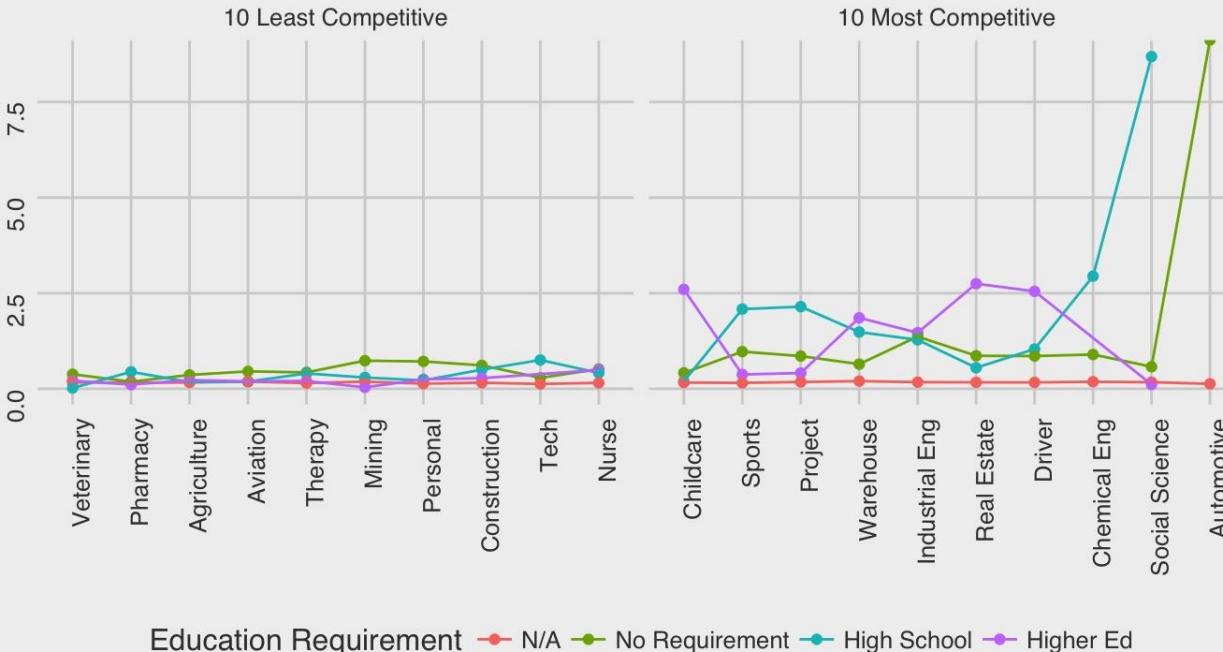
Kara VanAllen

Big Questions:

- How can I gauge my chances of getting a job? - "*Competitiveness*"
 - Where should I go for the best job prospects in my field?
 - What industries should I apply to in my area?
 - Are certain industries more competitive at different education levels?

Determining Job Competitiveness

Job Competitiveness in the US



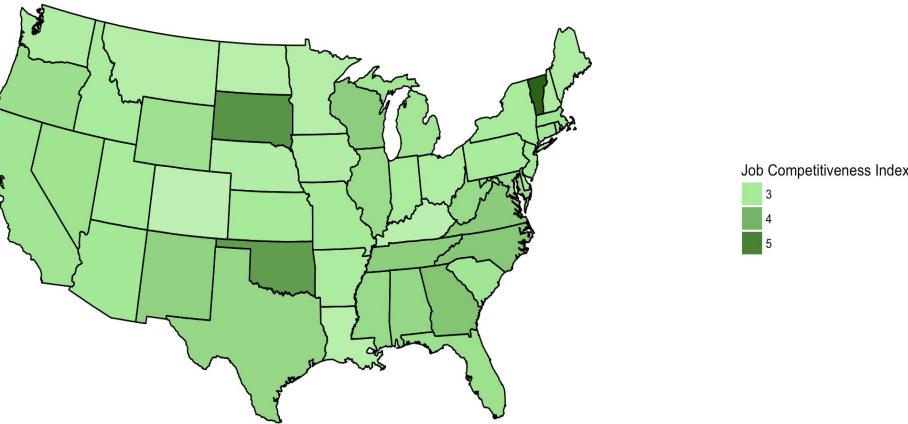
- **Competitiveness Index:**

$$\frac{\text{Applications}}{\text{Number of Jobs}} * \frac{1}{\text{Average Age}}$$

- **Note:**

Currently no coefficients.
Not enough information to determine how/whether to weight importance.

Interactive Map



Where should I go for
Information Technology?

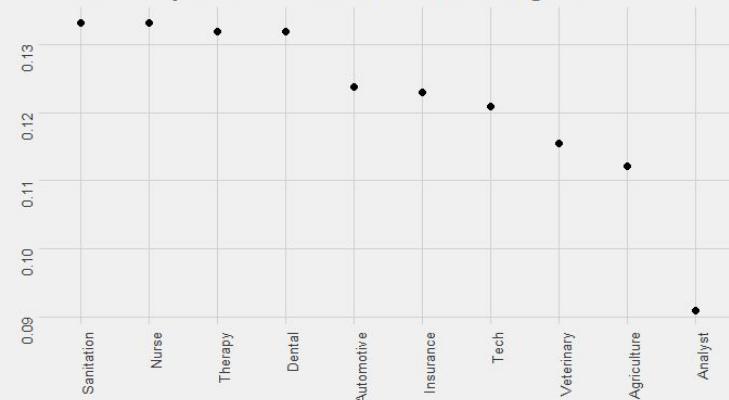
What can I do in New
England?

Example Scenarios:

High School Grad

- Looking in New England
- Looking for IT Jobs

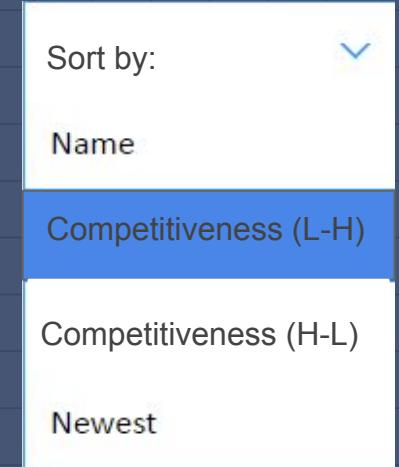
Least Competitive Industries in New England



How Should Indeed Proceed?

FUTURE STEPS

- Indeed should consider allowing sorting by competitiveness
 - Job-seekers: find industries with little competition (e.g. nursing)
 - Job-seekers: decide where to move to have luck in a field (e.g. Colorado for IT)
 - Job-seekers: find a new field to pursue if they want to stay in the same region
 - Companies: decide where they should start if looking for competitive hiring
 - No other major job searches have this. **Might bring traffic.**
- However:
 - Need to redesign competitiveness index to account for importance of variables
 - Possibility: competitiveness index might make uncompetitive jobs much more competitive, so would have to be updated dynamically.



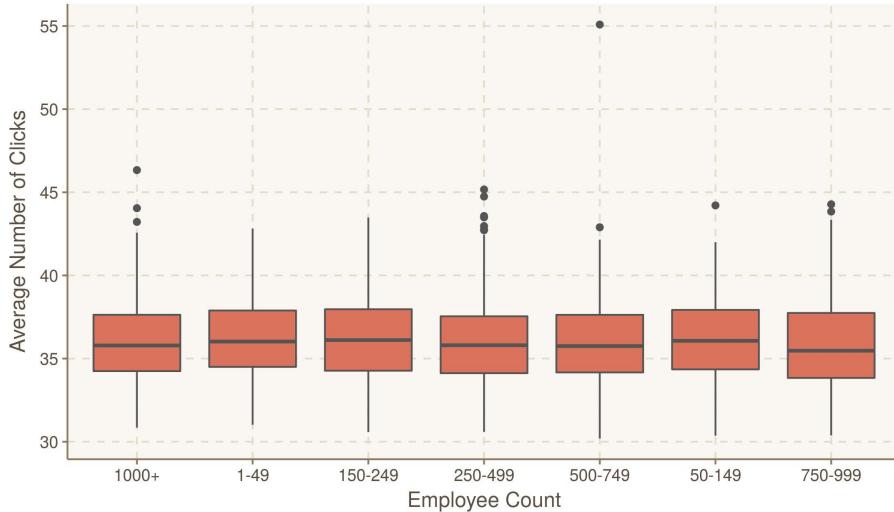
Different Ways to Look at Data

Last Stand -

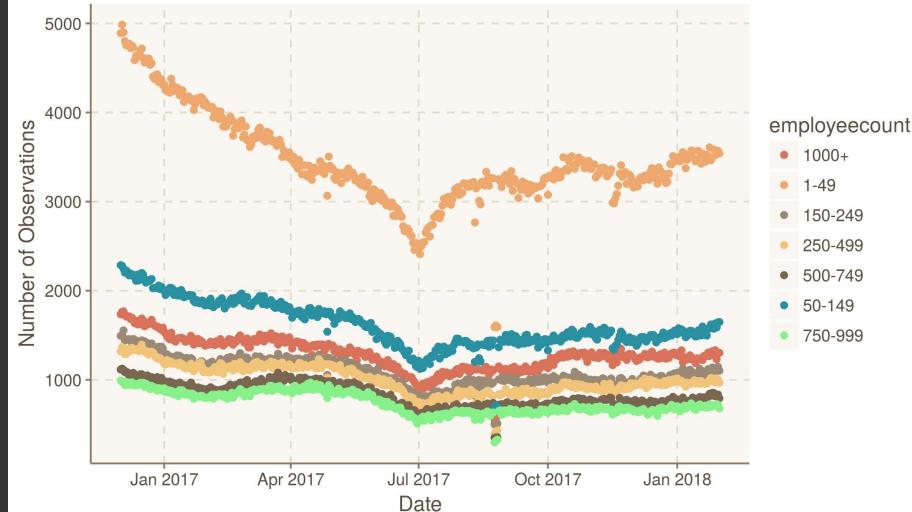
Shukry Zablah, Eugene Melnyk, Andy Ki, Adrian Chen, Shu Amano

Internal Analysis

Average Clicks by Employee Count



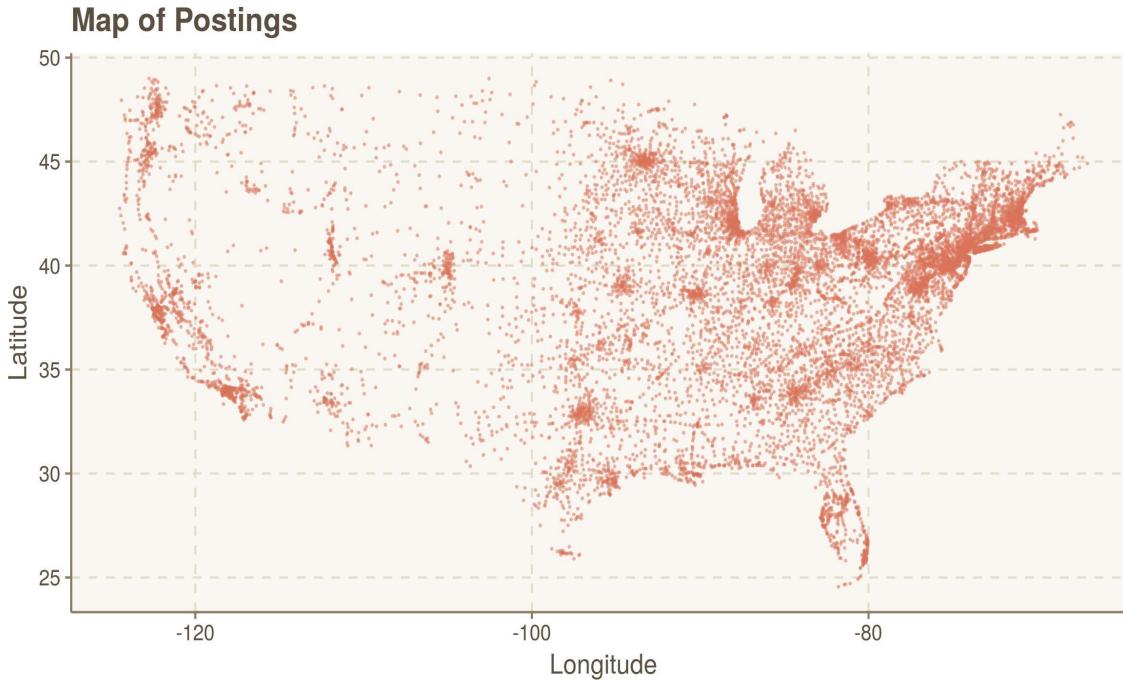
Number of Observations in 2017 per Employee Count



Different company sizes don't attract different numbers of people

The site became less popular in 2017.
Possible explanations: Loss of market share, Lack of job offerings in the country

External Analysis



The company operates at a national scale .

The job postings are concentrated in the metropolitan areas.

How can we get more people?

Information Business

Information is
MONEY

Aggregate information of user attributes

Indeed.com's trend in 2017 is not good news.

Less job postings = less users = less
information = less money.

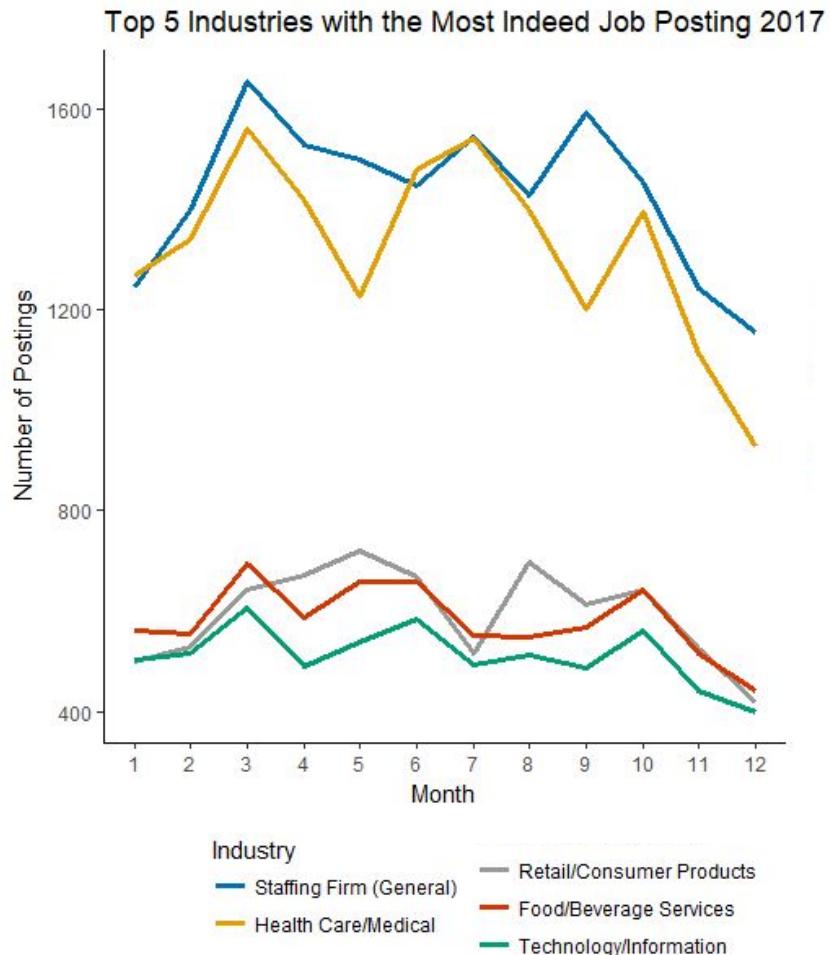
What, Where, and When: An Examination of Opportunities Posted on



Team Tie Dad: Anya Conti, Brittany Pine, Corwin Burdick,
Edward McCormick, Jeffrey Spahl

Modeling

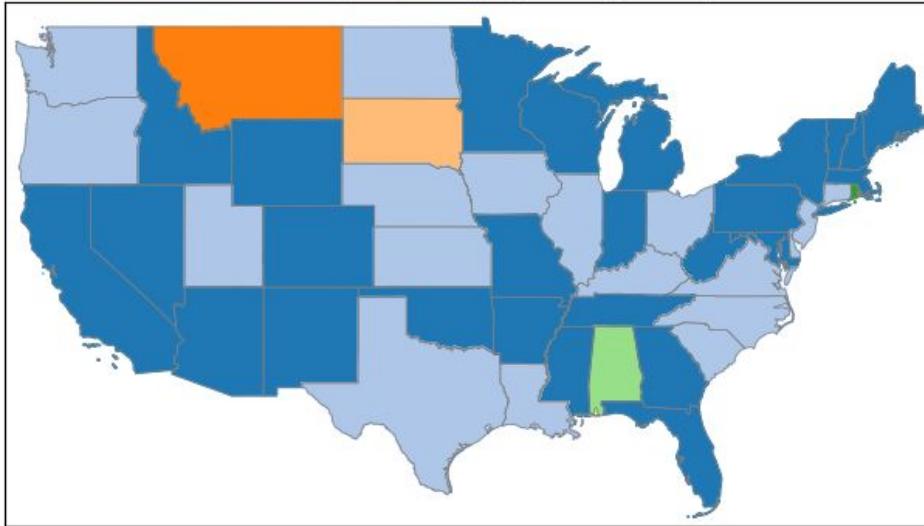
- Number of jobs posted per month, per industry, and per state
- Created a linear model¹:
 - $\ln(\# \text{jobs}) \sim \ln(\text{pop}) + \text{quarter} + \text{industry} + \text{region}$
 - Adjusted r-squared: 0.955
- Test for homoscedasticity: reject → correct standard errors
- F-test for each categorical variable - statistically significant
- 1% increase in pop → 0.87% increase in postings
 - Holding quarter, industry, and region constant
- Highest industries: staffing and health care / medical
- Highest regions: New England and Mid Atlantic



¹Region and Population data from U.S. Census Bureau

US States by Most Job Postings Industry

Most common job posting by state, January 2017



Link to gif:

<https://imgur.com/a/hKvfS>

Industry

Health Care/Medical	Retail/Consumer Products	Defense/Security
Staffing Firm (General)	Telecom	Real Estate
Automotive	Education	Agriculture
Transportation/Logistics	Manufacturing	Legal
Construction/Engineering	Food/Beverage Services	Hospitality/Travel
Technology/Information	Accounting/Consulting	Non-Profit/Association
		Other

Conclusions:

Tips for Prospective Job Seekers:

- Most jobs are in or near cities
- States with the most opportunities are in the New England and Mid-Atlantic regions
- Most openings are in Healthcare/Medicine and Staffing Industries
- Fewest openings occur around the end of the year



Thank you! 😊

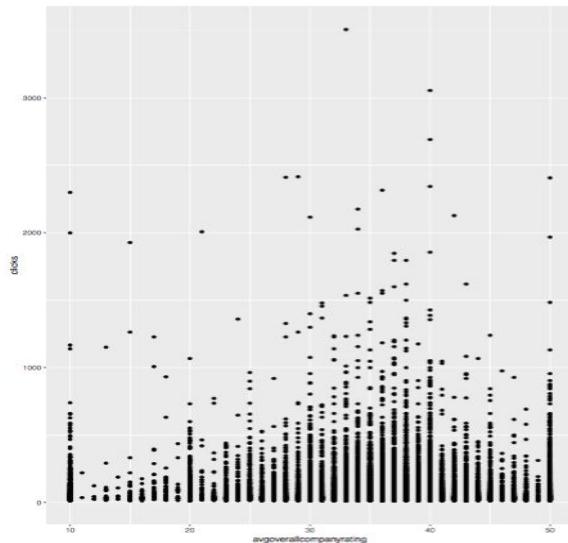
Insights for job seekers

- Jobs on Indeed.com normally does not require high school degree
- Top 5 states have significant more job supply
- CA has largest supply of jobs, especially for IT. But not Food Industry.
 - Food: FL, TX
 - Health: NY, CA
 - Others: CA, FL
 - Retail: NY, PA
 - IT: CA, TX



Insights for employer

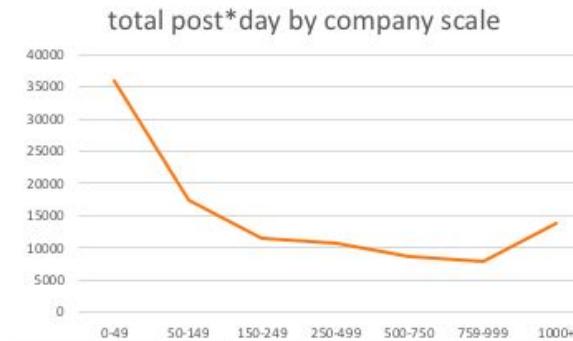
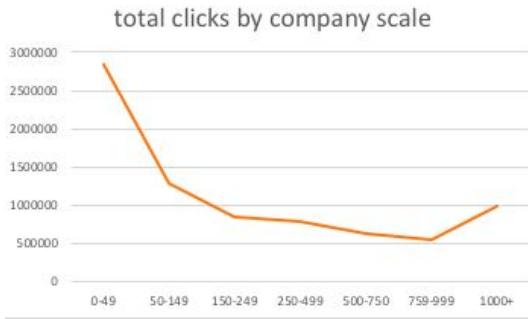
- Clicks = 0.09-0.005 Rating-0.04 description length (normalized)
- Description length does **NOT** influence number of clicks
- Rating between 30-40 are most popular.



Number of
clicks by
company
ratings
excluding
rating of 0

Insights for employer

- Smaller companies have more post*day event and more clicks
- Averagely 75.23 clicks/job*day. Little variance on company scale
- Company scale does not affect number of clicks



Insights for Indeed.com

- Consistent with data from Bureau of Labor Statistics
- Specify industry on the job posted by Staffing Firm
- Description length does not matter
- Scale of Rating (30-40 is more popular)
- Use of **75 clicks/job*day.**

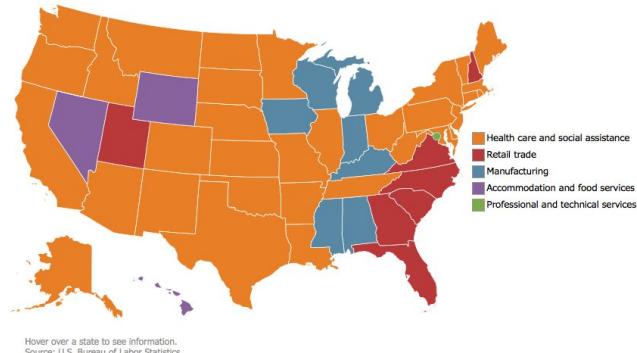
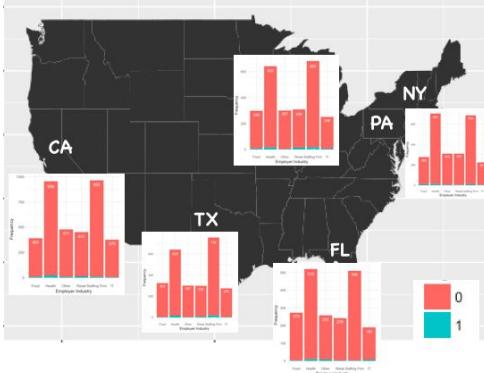


Figure from Bureau of Labor Statistics
Major industries with highest employment

Team: 404 Found
Members: Weijia Bao, Xinyi Cheng, Jessica Feng, Keting Yang



Susan Williams



Susan

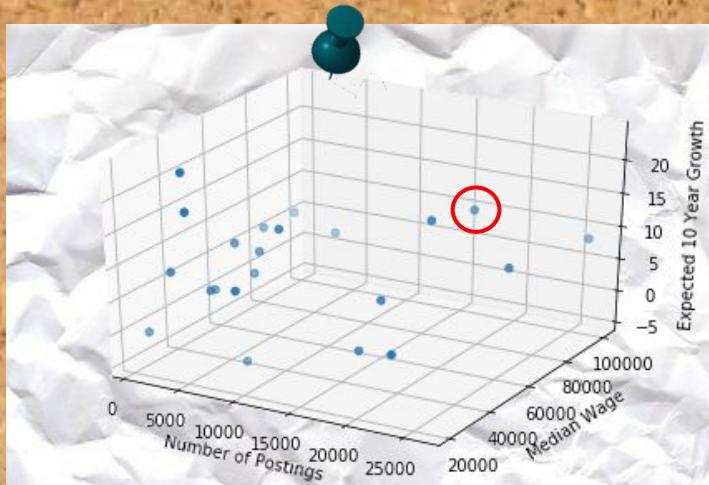
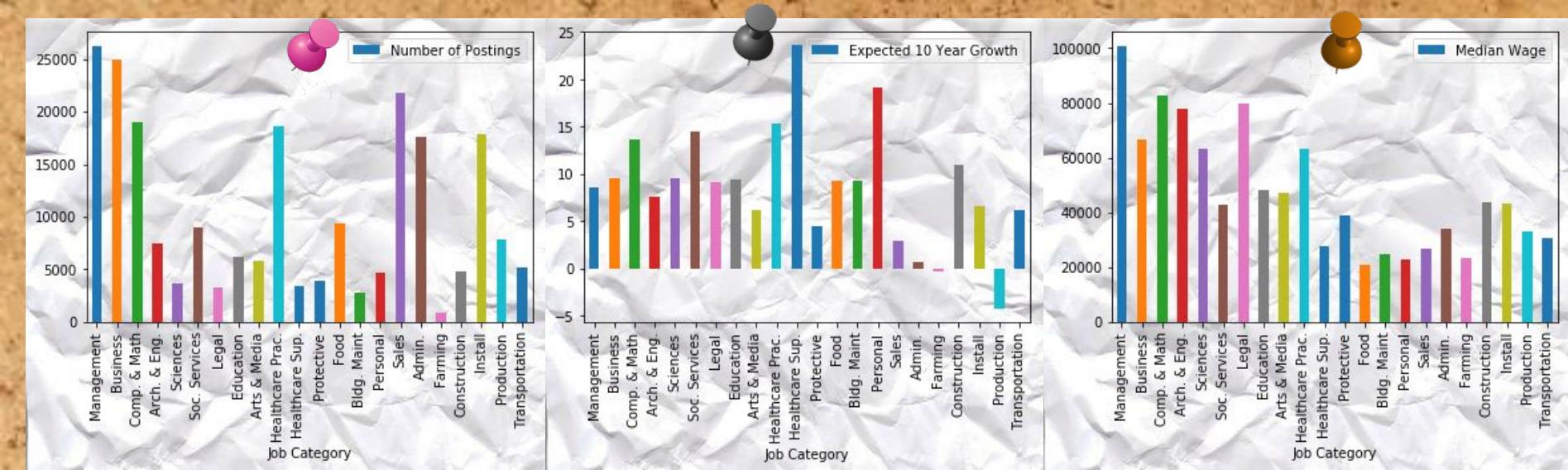
- High School senior
- Picking major
- From California
- Career???

What Susan wants

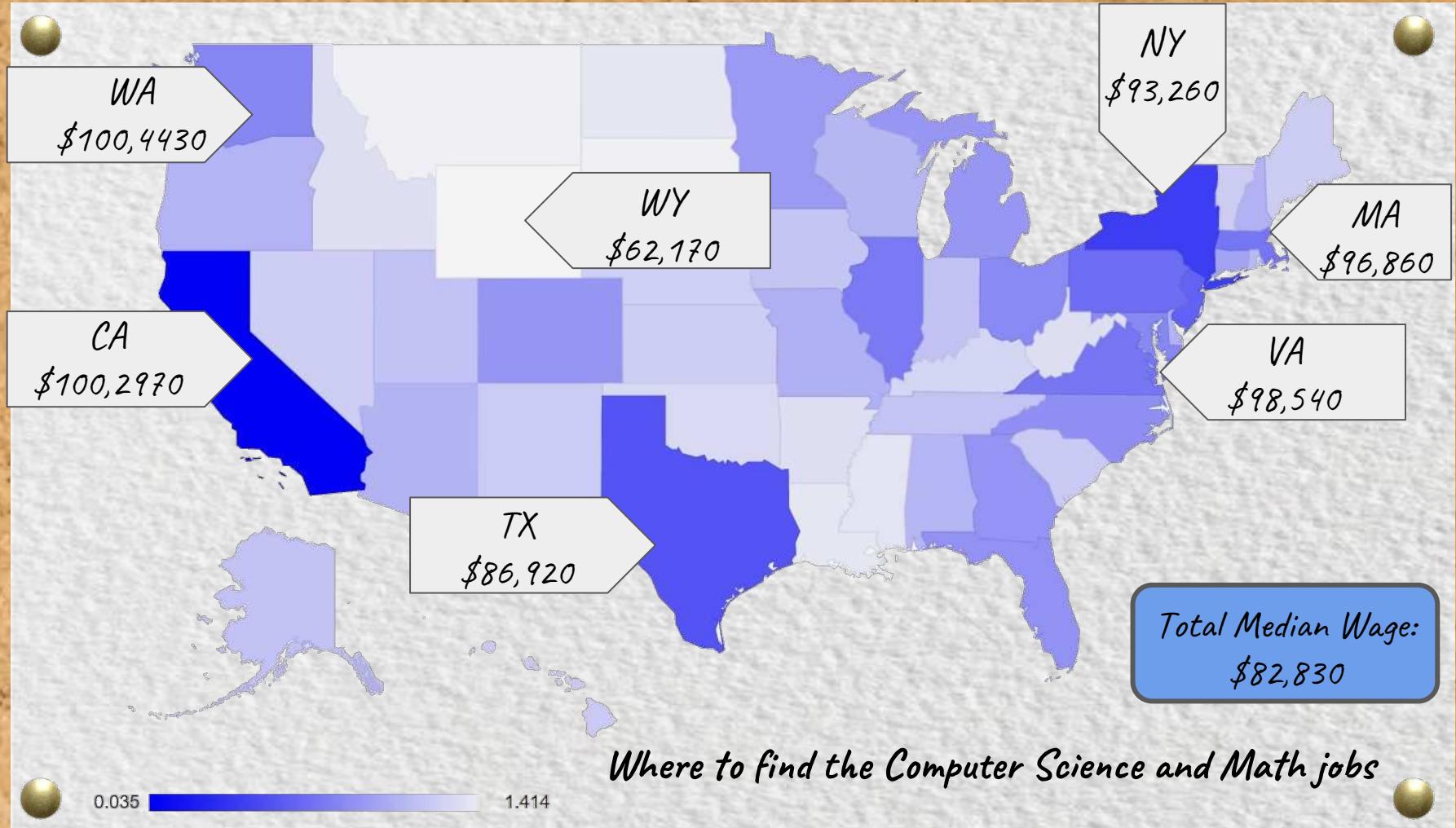
- College
- Good job prospects
- High pay
- Good location

What Susan needs to know

- Industry
- Major
- Expected pay
- Location info



Computer
Science &
Math!





Susan Williams



Summary

- Major in Computer Science or Math
- Plenty of jobs
- Could work anywhere!
 - Stay close to home?
- Expect to make \$82k a year!
- Expect industry growth

Eros Erdős

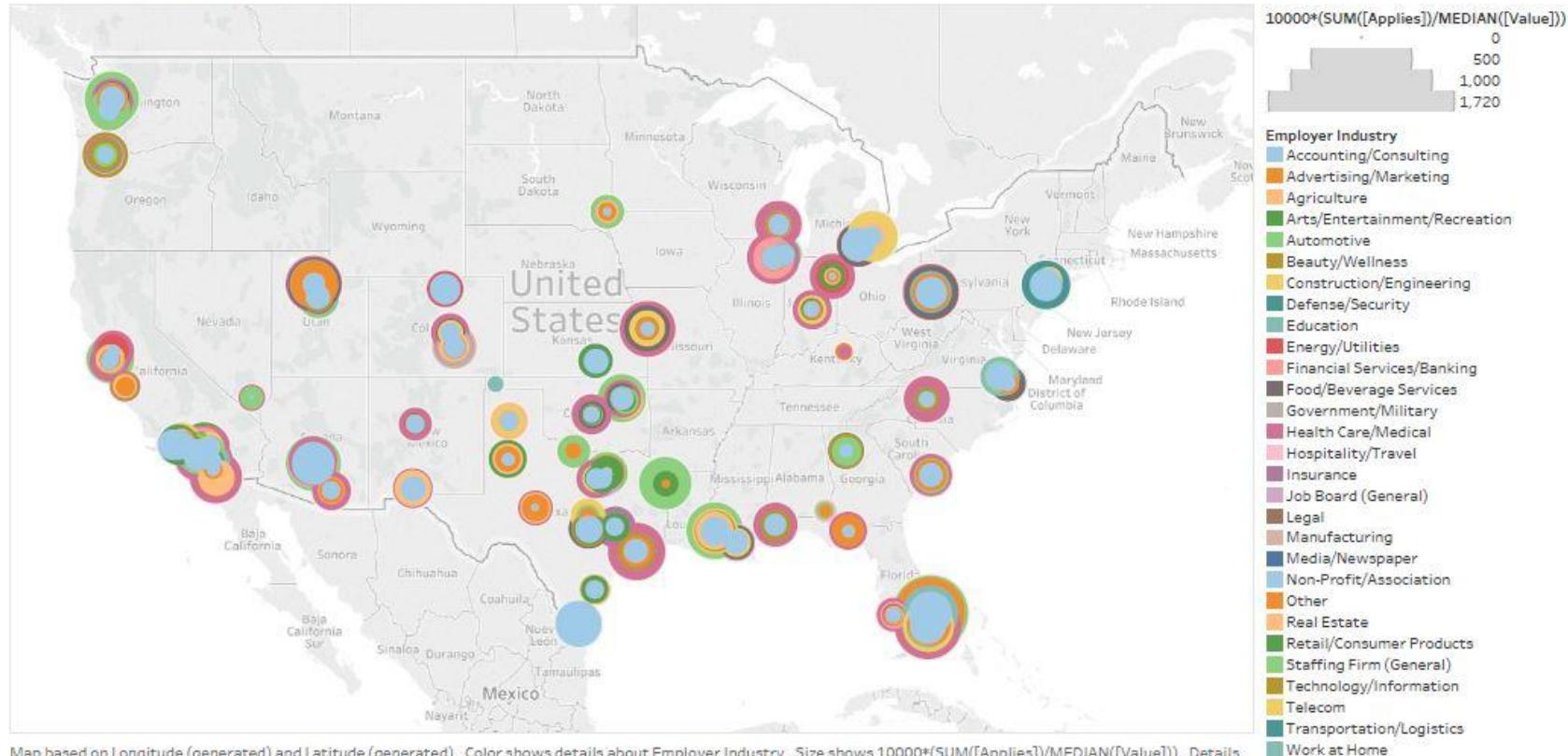
Michelle Heeney
Abigail Bouldin
Kirs Imsong
Roy Jackman
Jack Kenney

Sunday March 25, 2018

Mapping Industry Patterns

UMassAmherst

Using U.S. Census Information and Indeed Data Set: [GIF](#)



Map based on Longitude (generated) and Latitude (generated). Color shows details about Employer Industry. Size shows $10000 * (\text{SUM}([\text{Applies}]) / \text{MEDIAN}([\text{Value}]))$. Details are shown for City. The view is filtered on $10000 * (\text{SUM}([\text{Applies}]) / \text{MEDIAN}([\text{Value}]))$, which ranges from 0 to 1,720.

Predict Overall Company Rating

with 75% Confidence

UMassAmherst

Machine Learning Pipeline

Using a neural network, we are able to predict a company rating, and, by extension, a post rating using the other job posting data.

Input

- employeeJobCount
- employeeCount
- descriptionLengthChars
- licenseRequiredJob
- noEducationRequirementsJob
- highschoolEducationRequirementsJob
- higherEducationRequirementsJob
- supervisingJob
- jobAgeDays
- city

Process

- Neural Network takes in numerical data
- Trained on 90% of the data
- Tested on 10% of the data

Output

- Estimate of overall company rating

- Predicting company rating
 - Given post characteristics
- Mapping industries and company sizes
 - Discovered industry hotspots by type and company size
- Using NN as function
 - Can optimize post characteristics
 - To approach target company rating
- Bottomline: **Tool to rate job posting before submission**



Our Process

Overview of Data

- ◊ Date, Employer Industry, city, admin1(state)
- ◊ Determined Indeed's job listing throughout regions of the US
- ◊ Normalized to average the population throughout each state(job listings per capita)
- ◊ The states with the most searches for "Indeed" is observed to show largest industries

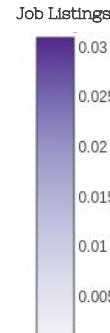
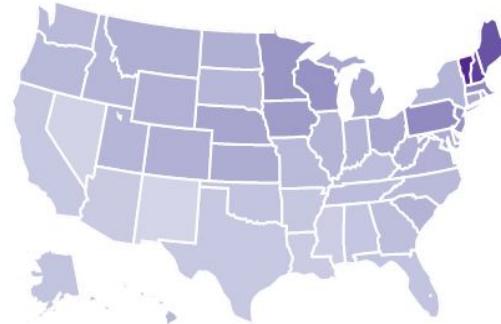
External Data

- ◊ Google Trends search for "Indeed" throughout the US
- ◊ US 2010 Census Population data
 - Used to derive the Job Listings per Capita
- ◊ US Bureau of Labor Statistics
 - Job trends of Mississippi for the last 20 years

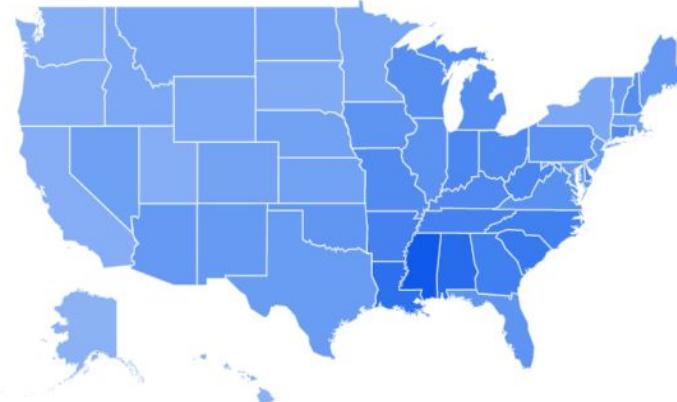


Indeed's Job Listings vs. Searches

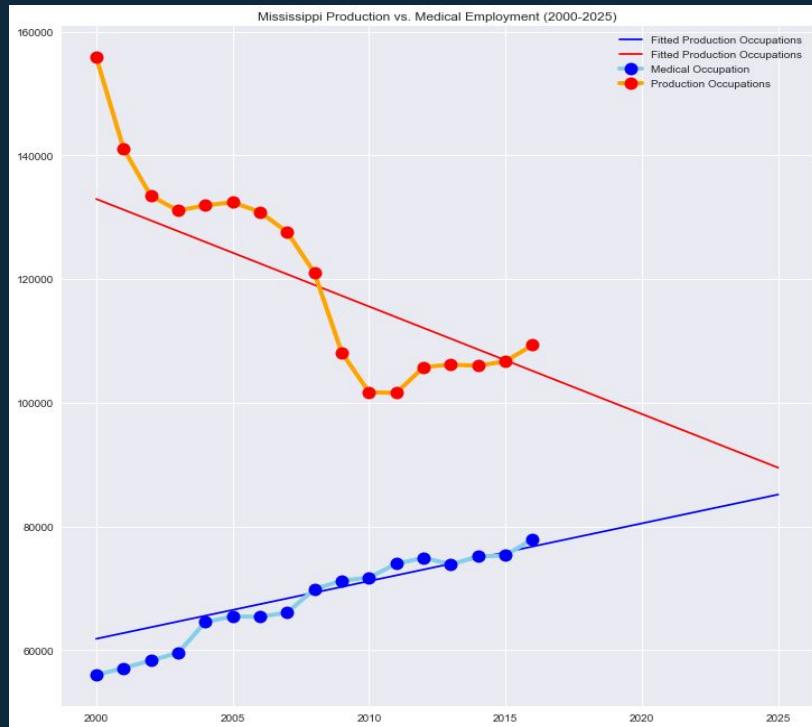
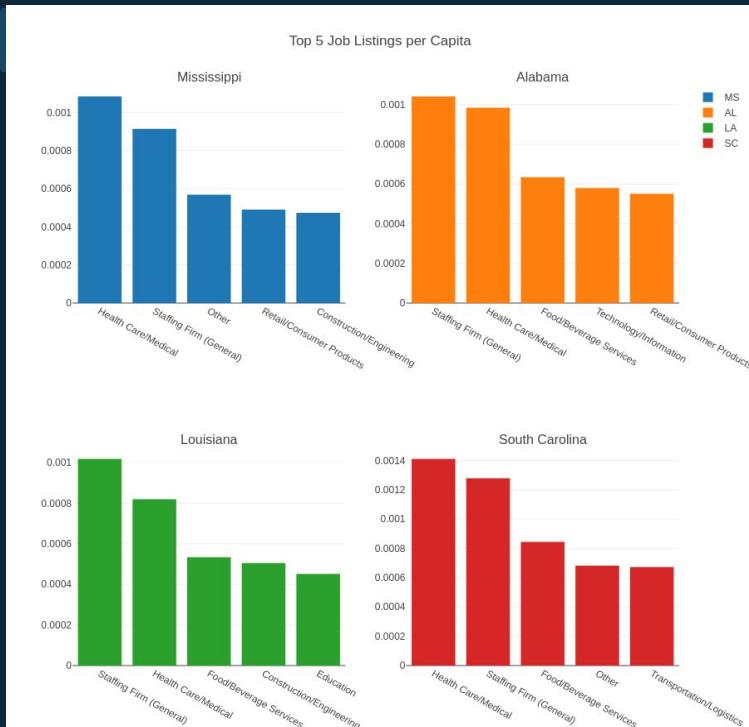
Job Listings per Capita



Google Trends Indeed Search Interest



Deeper Analysis





New Southern Market Strategy

Support

- ◊ Falling industries result in the unemployment of millions. Sponsor companies and organizations that provide industry switching education programs. These programs will efficiently allow individuals to experience new opportunities quickly new positions towards employment.

Benefits

- ◊ Offer special perks to graduates like premium job listings, priority applications, guaranteed interviews, etc...

Partnerships

- ◊ Work with hiring companies to maximize their visibility to potential job candidates.

20,000

Potential Applicants from Mississippi Production Industry

120,000

Applicants in Southern US from Production Industry

2%

Percent increase of unique monthly visitors from just four states



2018 Data Fest

indeed[®]
one search. all jobs.

Group: WE R



**High
School**

Finish
High School

Drop
High School

Attend
College

Don't Attend
College

College

Finance

Manufacturing

Other
Industries
.....

**CAREER
PATH**

UNIQUE JOBS BY EDUCATION REQUIREMENTS

37631 Jobs with no education requirement

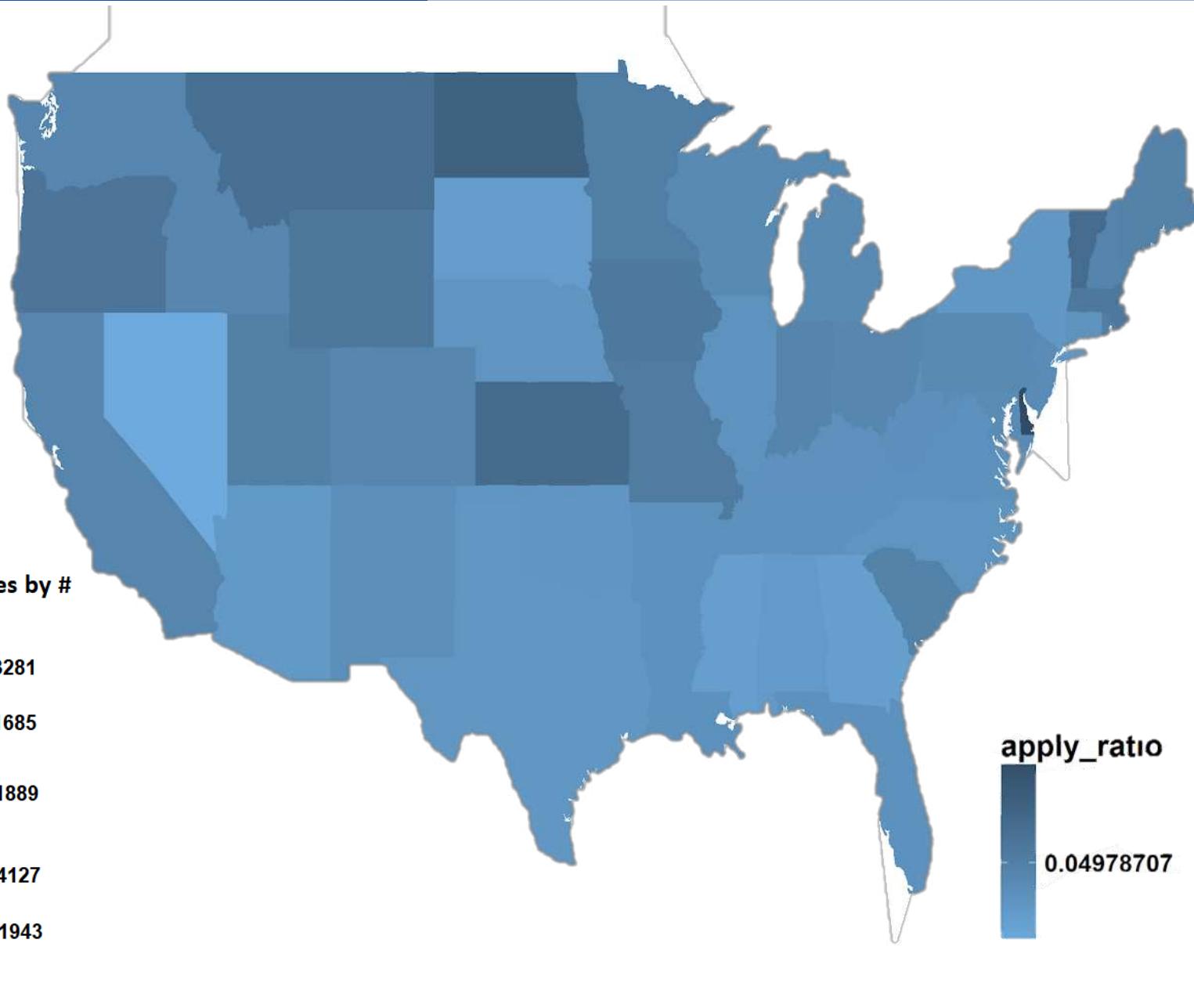
5.45 apps per position per day

9700 Jobs with higher education requirement

4.08 apps per position per day

9070 Jobs with high school requirement

5.76 apps per position per day

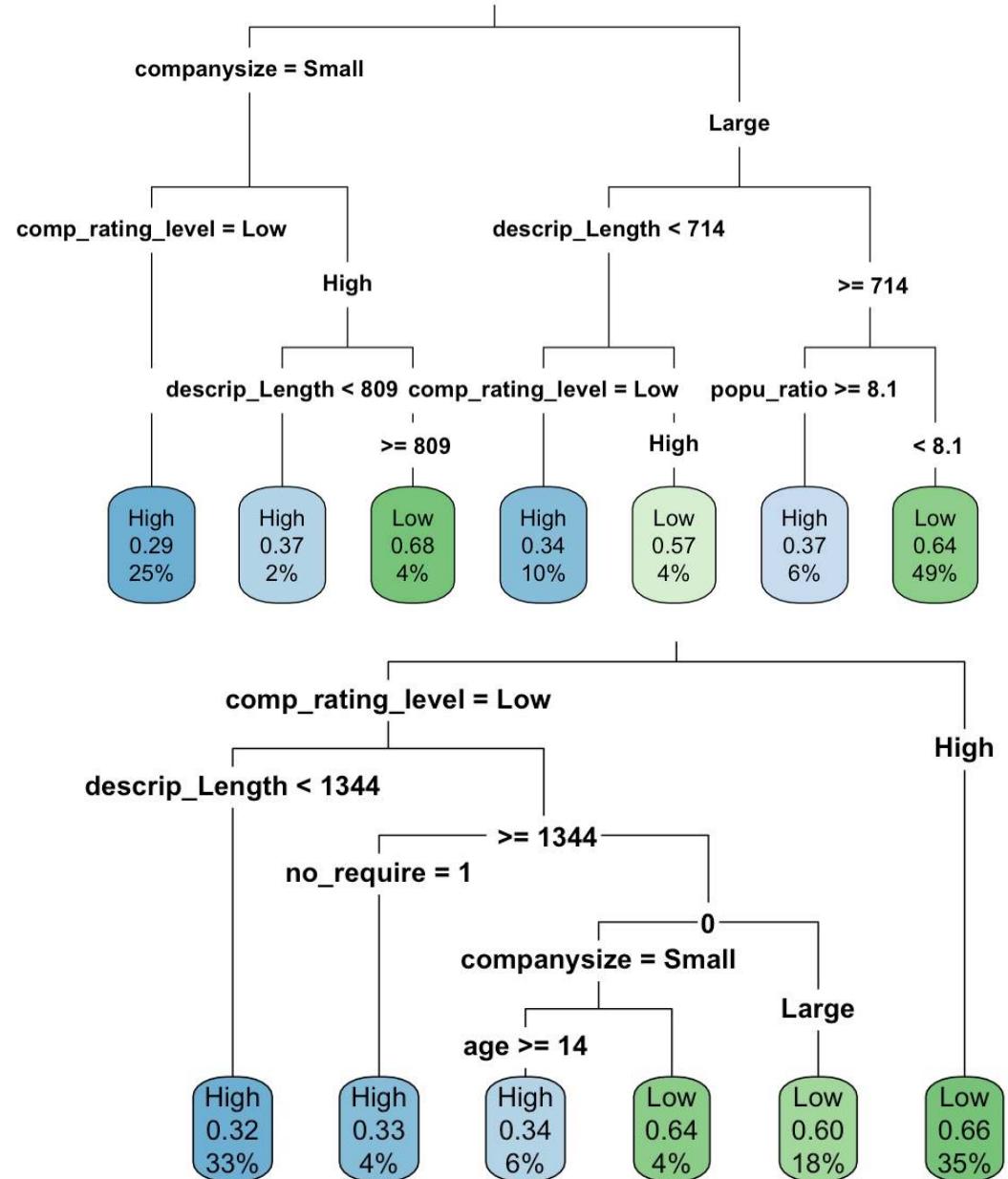


HS Grads: Top 5 Industries by # Positions

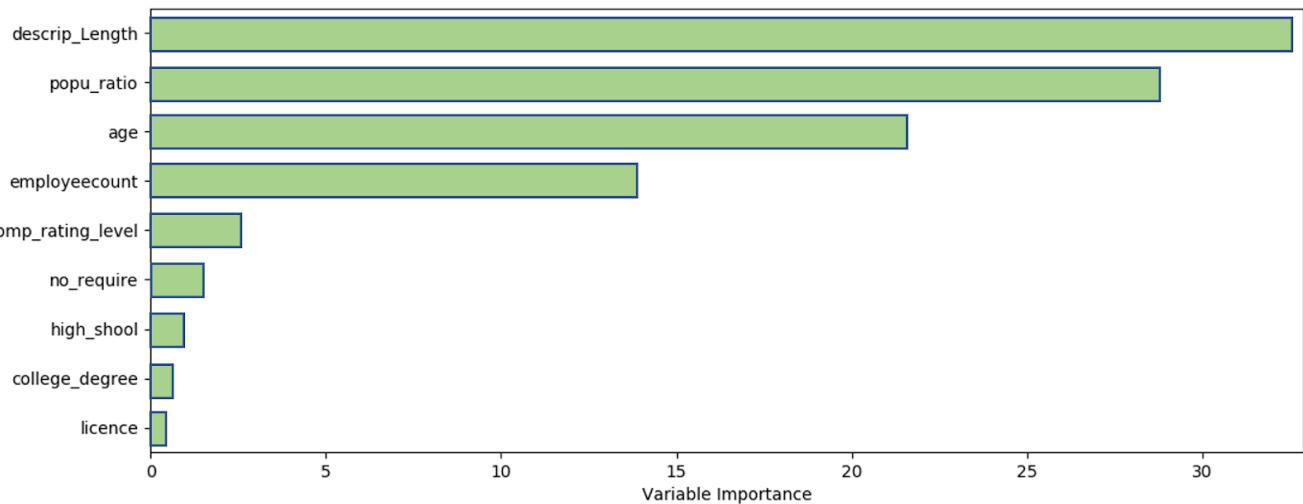
795	Staffing Firm (General)
519	Retail/Consumer
460	Other
882	Health Care/Medical
372	Food/Beverage Services

HS Drop Outs: Top 5 Industries by # Positions

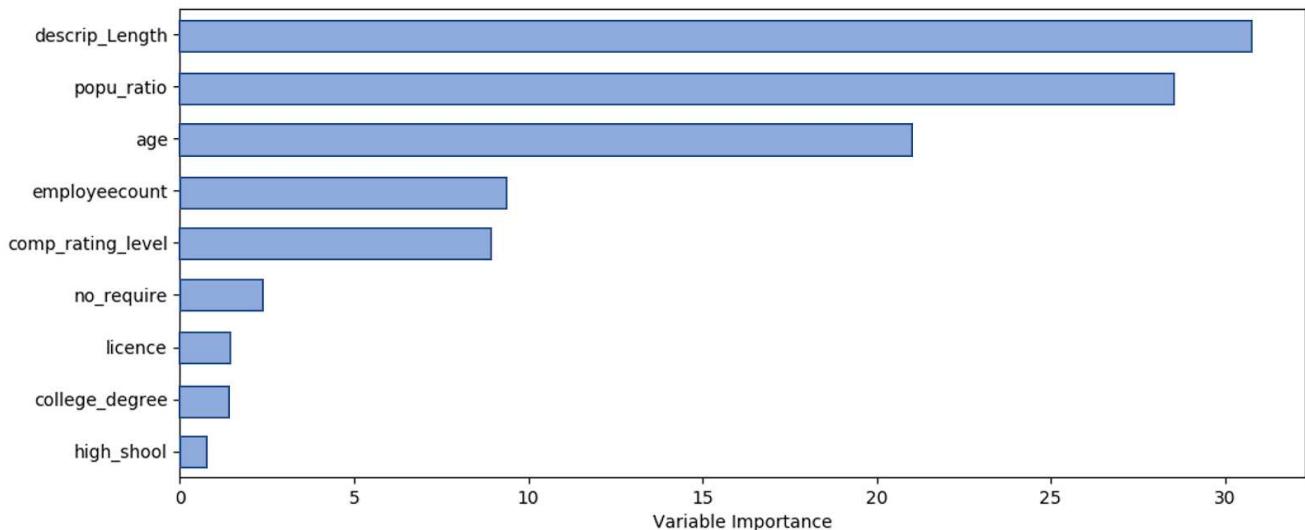
3281	Staffing Firm (General)
1685	Retail/Consumer
1889	Other
4127	Health Care/Medical
1943	Food/Beverage Services

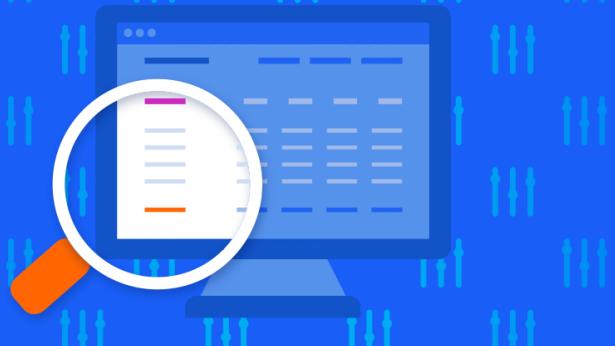


The Variable Importance of Manufacturing Industry



The Variable Importance of Finance Service/Banking





Conclusion

1. Education level, region, different industries, length of job descriptions, company size and rating can affect the competitiveness of a job.
2. If the description of the job is relatively long, the job is recently posted and the company size is relatively large, the competitiveness of the job is predicted to be low.
3. Between industries, the significance of the factors in determining the competitiveness of jobs may differ based on the structure of the industry and required skills, etc.



Future Work

1. Show the competitiveness of jobs in different industries using Shiny app.
2. Combine external resources to conduct more rigorous research.

Thank You

In 5 minutes,
we'll tell you the truth about Indeed
and online job search

DataFest 2018

Team RudeGirlz: Angelica Kim, Julie Kim, Yejin Ko, Emily Kwon, Hea Rim Yoon

Background

As students, we are going through recruiting season...



New Survey Reveals 85% of All Jobs are Filled Via Networking

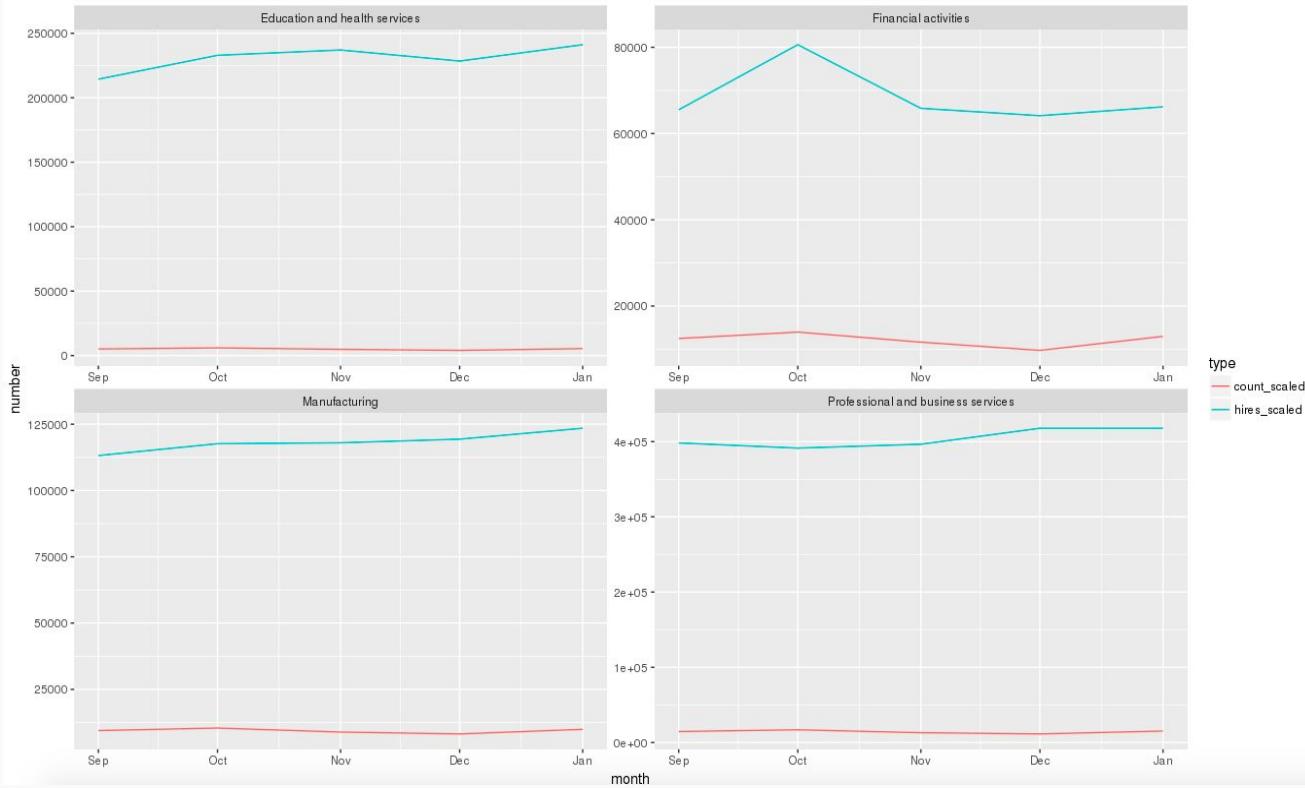
Published on February 29, 2016

Resource: <https://www.linkedin.com/pulse/new-survey-reveals-85-all-jobs-filled-via-networking-lou-adler/>

A screenshot of a LinkedIn search results page for Amherst College. The sidebar on the left shows a navigation menu with options like Home, Jobs & Internships, Amherst Jobs & Internships, My Job Applications, My OCR Applications, NACElink Network, and Recommended Jobs. The main content area is titled "Job Postings" and shows a search bar and a list of job results. A message at the bottom indicates 5-20 of 1118 results.

80 PERCENT OF JOB OPENINGS AREN'T ADVERTISED

Results



- Data for Fall 2017–Jan 2018
- Hires_scaled (blue) refers to total number of people hired
- Counts_scaled (red) refers to job postings online through Indeed

Percent of jobs that are posted online:

- Education and Health Services: 2.65%
- Professional and Business Services: 3.51%
- Manufacturing: 7.92%
- Financial Activities: 17.75%

Implications/ Recommendations/ Limitations

Limitations

- Made certain assumptions to level the given data and the external data
- Sep 2017 – Jan 2018

Implications

- Many jobs available, but not through online databases
- Indeed has potential to grow

Recommendations

- Gain access to jobs not posted online but still available via (i.e. networking) unique partnerships with companies

Thank you!