Building Entertainment Places for Workers in CA

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Introduction

- According to [Oxford research](#), happy workers are 13% more productive, and entertainment places provide worker happiness.
- It is hard to measure the happiness degree of each worker, and building entertainment places are costly.
- Leaders can approximate their workers' happiness degree by estimating how many entertainment places are surrounded.
- Government can save budgets when they only build those places in some important areas.

Data

- [Data Source](#)

DETAILED LIST OF THE 100 BIGGEST COMPANIES IN CALIFORNIA

RANK	COMPANY	CITY	EMPLOYEES
1	Concentrix	Fremont	225,000
2	The Walt Disney Company	Burbank	201,000
3	Taco Bell	Irvine	175,000
4	Safeway	Pleasanton	137,000
5	Gap	San Francisco	135,000
6	Apple	Cupertino	132,000
7	Kaiser Permanente	Oakland	128,270

Methodology

1. Search information of top 100 companies in California
2. Search their geographical locations using Geopy
3. Search nearby entertainment places using Foursquare API
4. Model the happiness degree using Gaussian Mixture Model
5. Evaluate the happiness degree for each company based on the density estimation

Methodology

1 - Search information of top 100 companies in California

- Store the data using pandas DataFrame

	name	city	employees
0	Concentrix	Fremont	225000
1	The Walt Disney Company	Burbank	201000
2	Taco Bell	Irvine	175000
3	Safeway	Pleasanton	137000
4	Gap	San Francisco	135000

Methodology

2 - Search their geographical locations using Geopy

- Given the city name, use *geolocator.geocode* to parse the geographical data from each company

- Since the precise company location is hard to retrieve, I approximate it using the city location.

	name	city	latitude	longitude	employees
0	Concentrix	Fremont	37.548270	-121.988572	225000
1	The Walt Disney Company	Burbank	34.181648	-118.325855	201000
2	Taco Bell	Irvine	33.685697	-117.825982	175000
3	Safeway	Pleasanton	37.662431	-121.874679	137000
4	Gap	San Francisco	37.779026	-122.419906	135000

Methodology

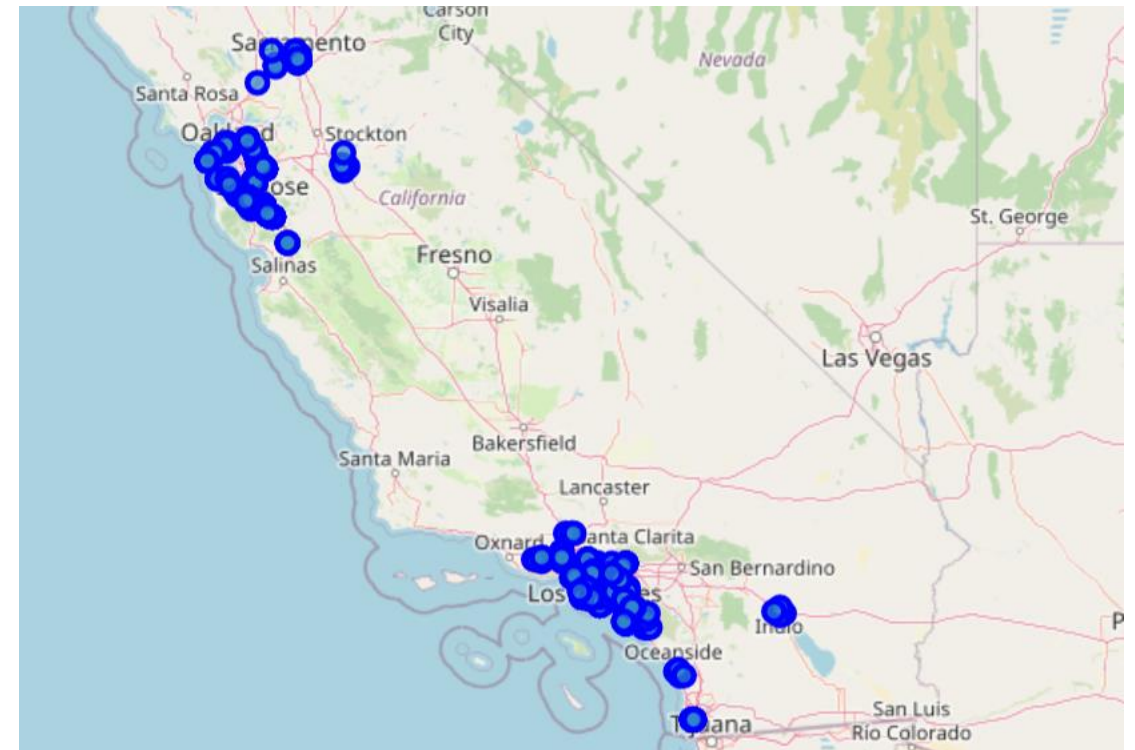## 3 - Search nearby entertainment places using Foursquare API

- For each geographical location, use Foursquare API to search 5 nearby entertainment places (keyword: "fun") and their geographical locations
- "source" attribute means what entertainment places are found.

	name	source	latitude	longitude
0	Concentrix	Fun Fun Photo Booth	37.523187	-122.001377
1	Concentrix	Fun House Theatrical Costumes	37.402079	-122.054536
2	Concentrix	Laser Nail Therapy- Largest Toenail Fungus Tre...	37.548315	-121.982717
3	Concentrix	Fun	37.649900	-121.870297
4	Concentrix	Funzo's Clownhouse	37.523416	-121.974481

Methodology

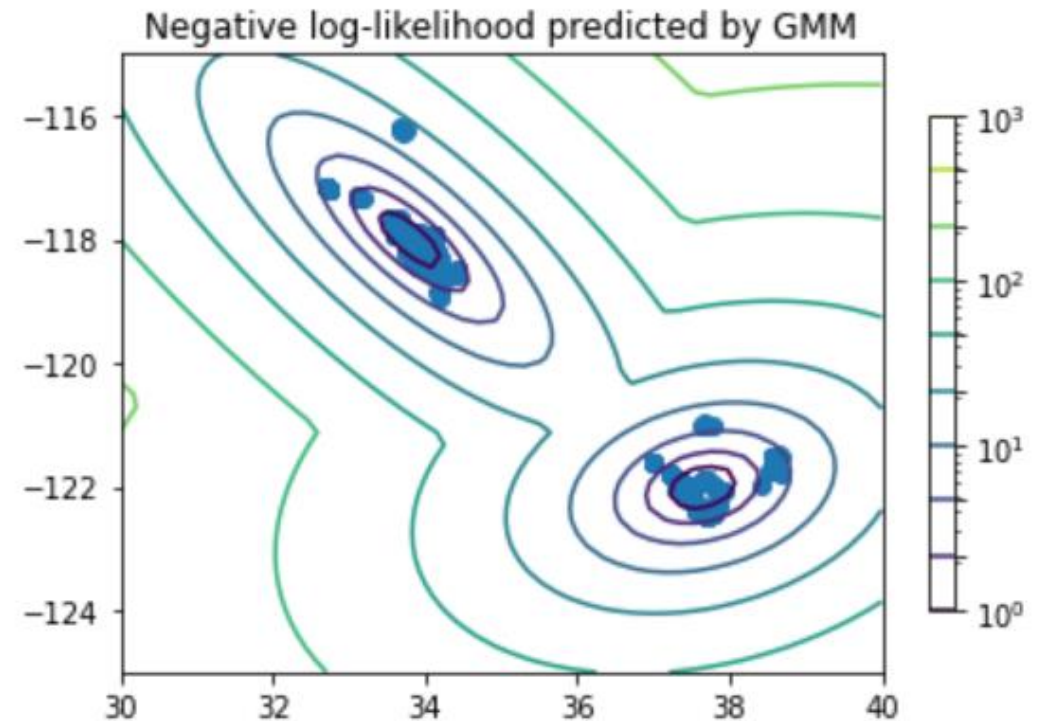### *3 - Search nearby entertainment places using Foursquare API*

- Using Folium, we can see the location for each entertainment place.

- There are two main clusters for the entertainment places.

Methodology

4 - Model the happiness using Gaussian Mixture Model

- Use GMM to measure the density (probability) of the entertainment occurrences.

- Since we observed 2 main clusters, the $n\_component$ is also set to 2.

- Visualization of the GMM:

Negative log-likelihood predicted by GMM

Methodology

5 - Evaluate the happiness degree

- GMM model represents the density of entertainment.
- Use GMM model to predict the probability of happiness for each company's geographical location (using min-max normalization)

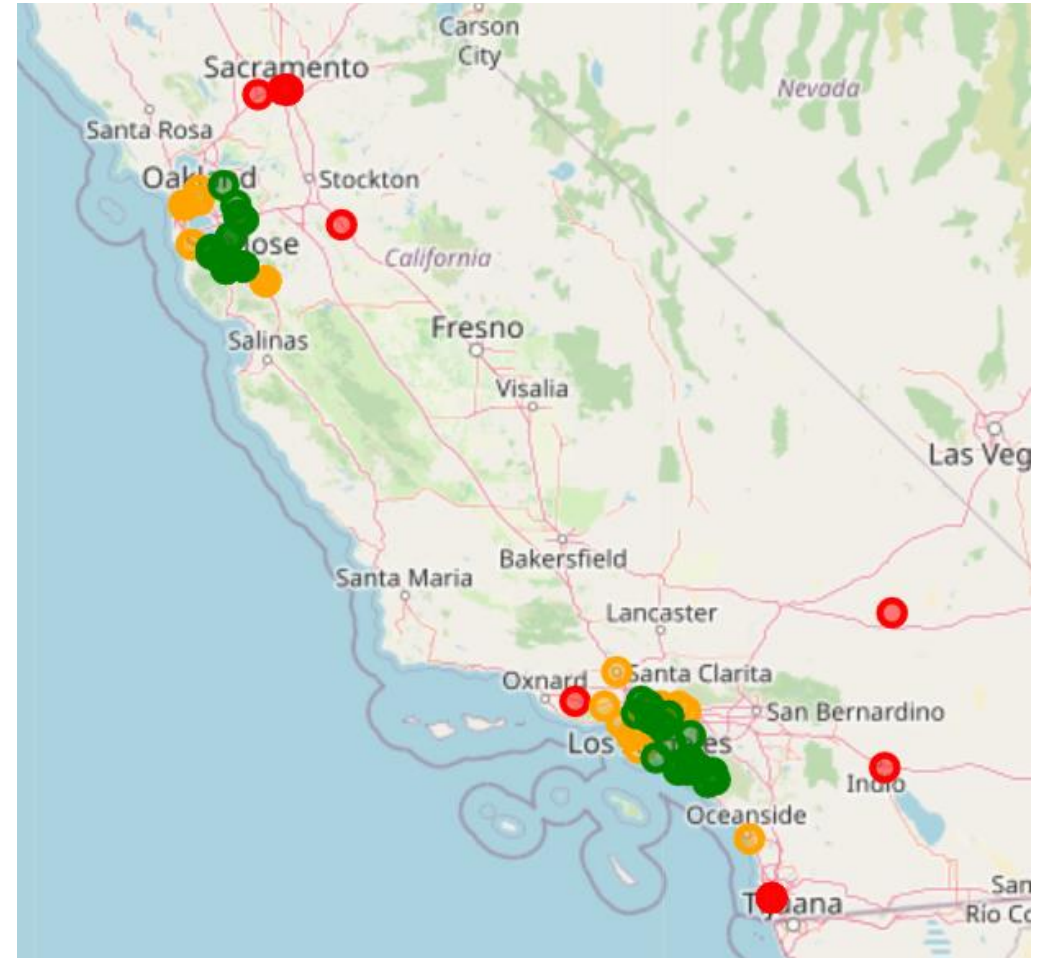|	name	city	latitude	longitude	prediction
52	Stater Bros. Markets	San Bernardino	34.825302	-116.083314	0.000000
43	Vons	Coachella	33.686566	-116.153277	0.630059
56	Save Mart Supermarkets	Modesto	37.639097	-120.996878	0.883029
8	PORAC	Sacramento	38.581061	-121.493895	0.928773
10	State of California	Sacramento	38.581061	-121.493895	0.928773

Discussion

- Companies such as Stater Bros. Markets, Vons and Save Mart Supermarkets have no enough entertainment places surrounded.
- They may have potential of higher unhappiness among their workers.

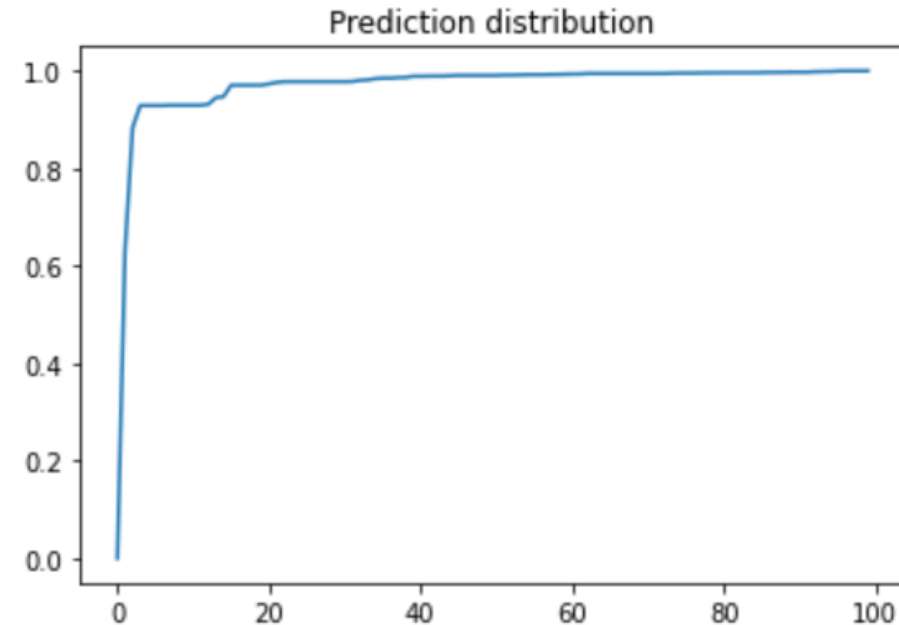|	name	city	latitude	longitude	prediction
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Discussion

- Companies farther from the cluster has fewer entertainment places.

- Companies in Sacramento has less entertainment places around.

- We can suggest these companies to build more entertainment places.

Discussion

- Only few cases have little prediction values.
- If we only build extra entertainment places around these cases, we may save our budget and increase the average work efficiency at the same time.

Prediction distribution

Conclusion

- We assume more entertainment places bring more happiness to workers, and more happiness brings forth more efficient works.

- According to the GMM model, companies like Stater Bros. Markets, Vons, and Save Mart Supermarkets have no enough entertainment places surrounded, which suggests a higher potential of unhappiness among their workers.

- Extra entertainments can be placed around certain few companies, which enable the government to spend their money worthily.