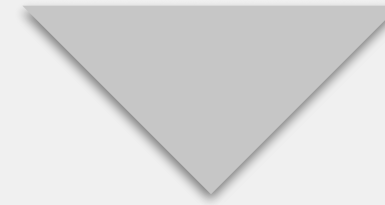# Developing Visualizations

Allie Sauppé | Google CS4HS
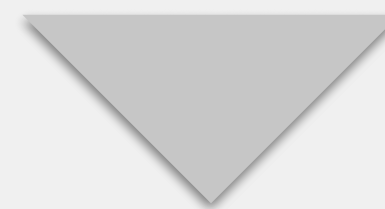March 25, 2017

Main Tasks

load data

manipulate data

build visualization

Outline

Data formats

Visualization libraries

The Yelp dataset

Building a program to visualize data

Outline

Data formats

Visualization libraries

The Yelp dataset

Building a program to visualize data

Data Formats

Several common formats for storing textual data

csv, xml, json

Programming languages often have easy ways to import this data

Example: Data Formats

Storing restaurant data: name, avg. star rating, type of food

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

Data Formats: CSV

comma separated values

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

```
"Name", "AvgRating", "FoodType"
"The Mint", 4.5, "American"
"Iguana's", 4.25, "Mexican
```

Data Formats: XML

extended markup language

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

```
<restaurant>
    <name>The Mint</name>
    <avgRating>4.5</avgRating>
    <foodType>American</foodType>
</restaurant>
```

Data Formats: XML

extended markup language

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

```xml
<restaurant>
    <name>The Mint</name>
    <avgRating>4.5</avgRating>
    <foodType>American</foodType>
</restaurant>
```

Data Formats: XML

extended markup language

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

```
<restaurant>
    <name>The Mint</name>
    <avgRating>4.5</avgRating>
    <foodType>American</foodType>
</restaurant>
```

Data Formats: XML

extended markup language

```xml
<restaurant>
    <name>The Mint</name>
    <avgRating>4.5</avgRating>
    <foodType>American</foodType>
</restaurant>
<restaurant>
    <name>Iguana's</name>
    <avgRating>4.25</avgRating>
    <foodType>Mexican</foodType>
</restaurant>
```

Data Formats: JSON

JavaScript object notation

Name	AvgRating	FoodType
The Mint	4.5	American
Iguana's	4.25	Mexican

```
{
    "name" : "The Mint",
    "avgRating" : 4.5,
    "foodType" : "American"
}
```

Data Formats: JSON

Javascript object notation

```
{
        "name" : "The Mint",
        "avgRating" : 4.5,
        "foodType" : "American"
}
{

        "name" : "Iguana's",
        "avgRating" : 4.25,
        "foodType" : "Mexican"
}
```

Outline

Bokeh

Outline

The Mint ✓ Claimed

★★★★½ 58 reviews | Details

$$$ • American (New), Vegetarian, Vegan

✎ Edit

★ Write a Review   📷 Add Photo   ⬆ Share   🔖 Bookmark

📍 1810 State St
La Crosse, WI 54601   ✎ Edit

📍 Get Directions

📞 (608) 519-5011

🔗 driftmore.com

Great food

See all 56 photos

How would you rate this business?
☆☆☆☆☆

"Add the smokey hot sauce, and this was a **brunch** I will not soon forget." in 7 reviews

"Everything from the bread, jam, sage butter, and on into your entree is being sourced from a **farm** in Wisconsin." in 14 reviews

"**Pork belly** and cheese board appetizers were delicious and prepared with unique flavors abounding." in 5 reviews

Ask the Community

Yelp users haven't asked any questions yet about The Mint.

Ask a Question

Recommended Reviews for The Mint

Search within the revi   🔍   Sort by **Yelp Sort** ▾   Language **English (58)** ▾

☆☆☆☆☆

Start your review of **The Mint**.

Kristi E.
Saint Paul, MN
👥 141 friends
📋 111 reviews
📷 340 photos
Elite '17

★★★★★ 11/11/2016

✓ 1 check-in

I spent the weekend in La Crosse this fall and felt a little underwhelmed at the choices to eat downtown. I wandered into the Root Note, and everything changed. Luckily, that coffee shop is the sister to The Mint, and we

---

Today **11:00 am - 2:00 pm**
🕐 **5:00 pm - 10:30 pm**
Open now

$$$$ Price range **$31-60**

Hours

Mon	Closed	
Tue	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Wed	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Thu	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Fri	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	**Open now**
Sat	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	
Sun	10:00 am - 2:00 pm 5:00 pm - 9:00 pm	

✎ Edit business info

More business info

Takes Reservations	**Yes**
Delivery	**No**
Take-out	**No**
Accepts Credit Cards	**Yes**

The Mint ✔ Claimed

★★★★½ 58 reviews | Details
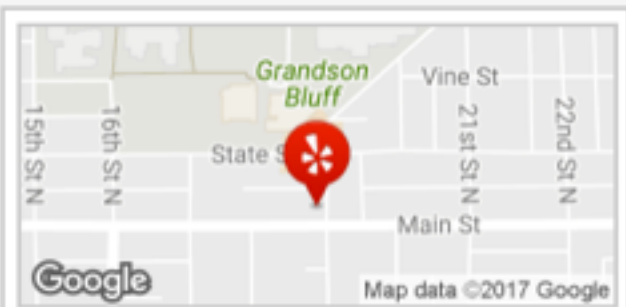
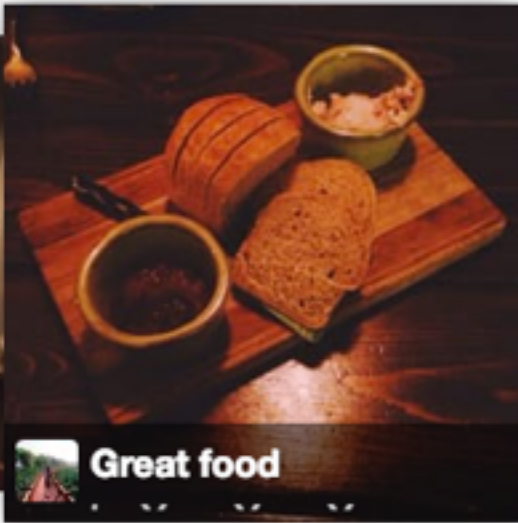★ Write a Review | 📷 Add Photo | ⬆ Share | 🔖 Bookmark

$$$ · American (New), Vegetarian, Vegan

✏ Edit

1810 State St
La Crosse, WI 54601   ✏ Edit

Get Directions

📞 (608) 519-5011

🔗 driftmore.com

Great food

See all 56 photos

How would you rate this business?
☆☆☆☆☆

"Add the smokey hot sauce, and this was a **brunch** I will not soon forget." in 7 reviews

"Everything from the bread, jam, sage butter, and on into your entree is being sourced from a **farm** in Wisconsin." in 14 reviews

"**Pork belly** and cheese board appetizers were delicious and prepared with unique flavors abounding." in 5 reviews

Ask the Community

Yelp users haven't asked any questions yet about **The Mint**.

Ask a Question

Recommended Reviews for The Mint

Search within the reviews | 🔍

Sort by Yelp Sort ▾ | Language English (58) ▾

☆☆☆☆☆
Start your review of **The Mint**.

Kristi E.
Saint Paul, MN
👥 141 friends
📋 111 reviews
📷 340 photos
Elite '17

★★★★★ 11/11/2016
✔ 1 check-in

I spent the weekend in La Crosse this fall and felt a little underwhelmed at the choices to eat downtown. I wandered into the Root Note, and everything changed. Luckily, that coffee shop is the sister to The Mint, and we

---

Today **11:00 am - 2:00 pm**
5:00 pm - 10:30 pm
Open now

$$$$ Price range **$31-60**

Hours

Mon	Closed	
Tue	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Wed	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Thu	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Fri	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	Open now
Sat	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	
Sun	10:00 am - 2:00 pm 5:00 pm - 9:00 pm	

✏ Edit business info

More business info

Takes Reservations **Yes**
Delivery **No**
Take-out **No**
Accepts Credit Cards **Yes**

The Mint ✓ Claimed

★★★★½ 58 reviews | Details

★ Write a Review | 📷 Add Photo | ↗ Share | 🔖 Bookmark

$$$ • American (New), Vegetarian, Vegan
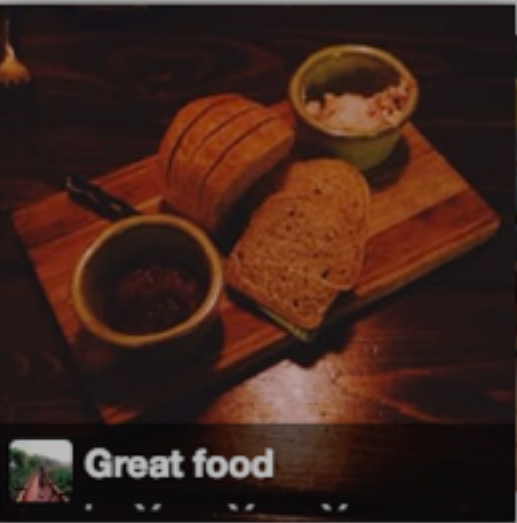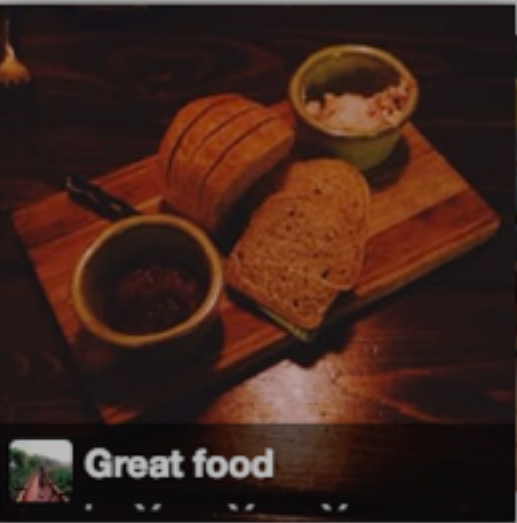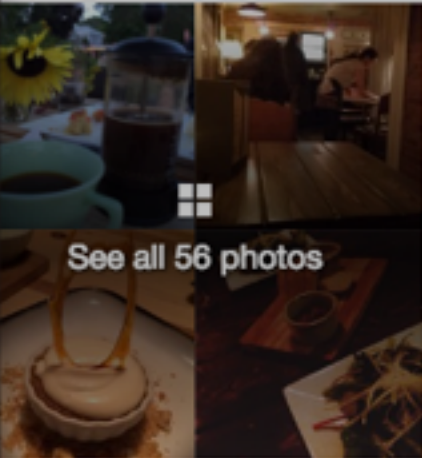
✎ Edit

1810 State St
La Crosse, WI 54601   ✎ Edit

Get Directions

☎ (608) 519-5011

↗ driftmore.com

Great food

See all 56 photos

👤 **How would you rate this business?**
☆☆☆☆☆

"Add the smokey hot sauce, and this was a **brunch** I will not soon forget." in 7 reviews

"Everything from the bread, jam, sage butter, and on into your entree is being sourced from a **farm** in Wisconsin." in 14 reviews

"**Pork belly** and cheese board appetizers were delicious and prepared with unique flavors abounding." in 5 reviews

Ask the Community

Yelp users haven't asked any questions yet about **The Mint**.

Ask a Question

Recommended Reviews for The Mint

Search within the revi...   🔍

Sort by **Yelp Sort** ▾   Language English (58) ▾

👤 📋

☆☆☆☆☆
Start your review of The Mint.

Kristi E.
Saint Paul, MN
👥 141 friends
📋 111 reviews
📷 340 photos
Elite '17

★★★★★ 11/11/2016

✓ 1 check-in

I spent the weekend in La Crosse this fall and felt a little underwhelmed at the choices to eat downtown. I wandered into the Root Note, and everything changed. Luckily, that coffee shop is the sister to The Mint, and we

---

Today **11:00 am - 2:00 pm**
🕐 **5:00 pm - 10:30 pm**
Open now

$$$$ Price range **$31-60**

Hours

Mon	Closed
Tue	11:00 am - 2:00 pm 5:00 pm - 9:30 pm
Wed	11:00 am - 2:00 pm 5:00 pm - 9:30 pm
Thu	11:00 am - 2:00 pm 5:00 pm - 9:30 pm
Fri	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	Open now
Sat	11:00 am - 2:00 pm 5:00 pm - 10:30 pm
Sun	10:00 am - 2:00 pm 5:00 pm - 9:00 pm

✎ Edit business info

More business info

Takes Reservations **Yes**
Delivery **No**
Take-out **No**
Accepts Credit Cards **Yes**

The Mint ✔ Claimed

★★★★½ 58 reviews · Details

★ Write a Review | 📷 Add Photo | ⬆ Share | 🔖 Bookmark

$$$ · American (New), Vegetarian, Vegan

✎ Edit

📍 1810 State St
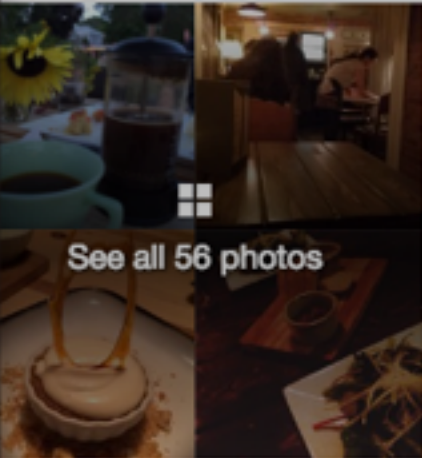La Crosse, WI 54601 ✎ Edit

📍 Get Directions

📞 (608) 519-5011

🔗 driftmore.com

Great food

See all 56 photos

How would you rate this business?
★★★★★

"Add the smokey hot sauce, and this was a **brunch** I will not soon forget." in 7 reviews

"Everything from the bread, jam, sage butter, and on into your entree is being sourced from a **farm** in Wisconsin." in 14 reviews

"**Pork belly** and cheese board appetizers were delicious and prepared with unique flavors abounding." in 5 reviews

Ask the Community

Yelp users haven't asked any questions yet about **The Mint**.

Ask a Question

Recommended Reviews for The Mint

Search within the revi... 🔍

Sort by **Yelp Sort** ▾   Language **English (58)** ▾

★★★★★
Start your review of **The Mint**.

Kristi E.
Saint Paul, MN
👥 141 friends
📝 111 reviews
📷 340 photos
Elite '17

★★★★★ 11/11/2016
✔ 1 check-in

I spent the weekend in La Crosse this fall and felt a little underwhelmed at the choices to eat downtown. I wandered into the Root Note, and everything changed. Luckily, that coffee shop is the sister to The Mint, and we

---

Today 11:00 am - 2:00 pm
🕐 5:00 pm - 10:30 pm
Open now

$$$$ Price range **$31-60**

Hours

Mon	Closed	
Tue	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Wed	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Thu	11:00 am - 2:00 pm 5:00 pm - 9:30 pm	
Fri	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	**Open now**
Sat	11:00 am - 2:00 pm 5:00 pm - 10:30 pm	
Sun	10:00 am - 2:00 pm 5:00 pm - 9:00 pm	

✎ **Edit business info**

More business info

Takes Reservations **Yes**
Delivery **No**
Take-out **No**
Accepts Credit Cards **Yes**

The Yelp Dataset

Part of a larger competition for students[1]

    ninth year of competition

Yelp information on reviews for businesses in multiple cities/countries

    business info

    review data

    user info

Intriguing Questions

How do cultural trends influence user reviews?

Are there seasonal trends affecting businesses?

Can a user's star rating be predicted from their language?

Are some users regularly ahead of new trends?

What is the average rating of businesses in each state?

Outline

Main Tasks

load data

▼

manipulate data

▼
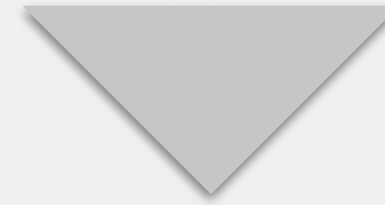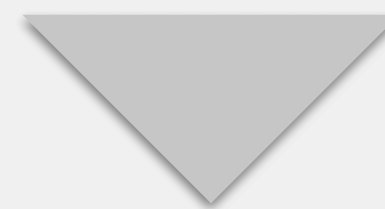
build visualization

Main Tasks

load data

manipulate data

build visualization

download the Yelp dataset

move the dataset

load it in Python

Main Tasks

load data
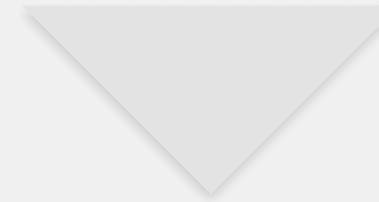
manipulate data
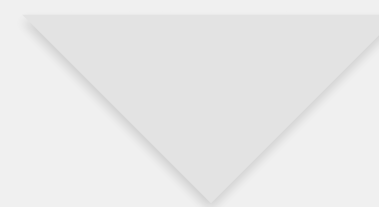
Q: what is the average rating by state?

calculate the averages

build visualization

Calculating Averages

```
{"state": "WI", "stars": 5}
{"state": "WI", "stars": 4}
{"state": "OH", "stars": 2}
{"state": "NY", "stars": 3}
{"state": "OH", "stars": 4}
```

Calculating Averages

```
> {"state": "WI", "stars": 5}
  {"state": "WI", "stars": 4}
  {"state": "OH", "stars": 2}
  {"state": "NY", "stars": 3}
  {"state": "OH", "stars": 4}
```

▽
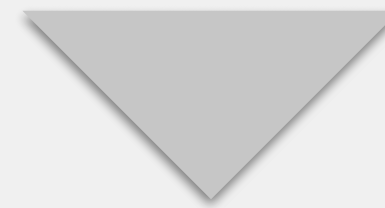
```
{"state": "WI", "totalStr": 5, "totalRatings": 1}
```
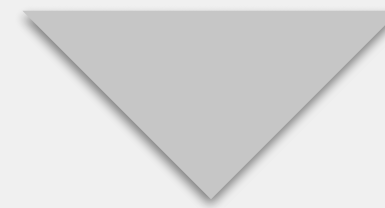
Calculating Averages

```
    {"state": "WI", "stars": 5}
>   {"state": "WI", "stars": 4}
    {"state": "OH", "stars": 2}
    {"state": "NY", "stars": 3}
    {"state": "OH", "stars": 4}
```

▽
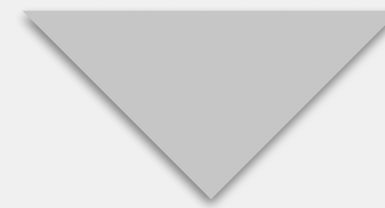
```
{"state": "WI", "totalStr": 9, "totalRatings": 2}
```

Calculating Averages

```
        {"state": "WI", "stars": 5}
        {"state": "WI", "stars": 4}
    >   {"state": "OH", "stars": 2}
        {"state": "NY", "stars": 3}
        {"state": "OH", "stars": 4}
```

▽

```
{"state": "WI", "totalStr": 9, "totalRatings": 2}
{"state": "OH", "totalStr": 2, "totalRatings": 1}
```
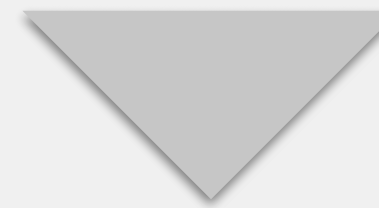
Calculating Averages

```
        {"state": "WI", "stars": 5}
        {"state": "WI", "stars": 4}
        {"state": "OH", "stars": 2}
    >   {"state": "NY", "stars": 3}
        {"state": "OH", "stars": 4}
```

▼
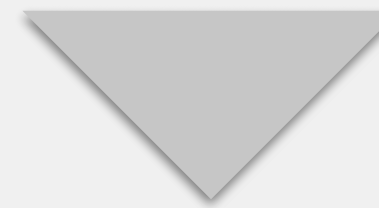
```
{"state": "WI", "totalStr": 9, "totalRatings": 2}
{"state": "OH", "totalStr": 2, "totalRatings": 1}
{"state": "NY", "totalStr": 3, "totalRatings": 1}
```

Calculating Averages

{"state": "WI", "stars": 5}
{"state": "WI", "stars": 4}
{"state": "OH", "stars": 2}
{"state": "NY", "stars": 3}
> {"state": "OH", "stars": 4}

{"state": "WI", "totalStr": 9, "totalRatings": 2}
{"state": "OH", "totalStr": 6, "totalRatings": 2}
{"state": "NY", "totalStr": 3, "totalRatings": 1}

Calculating Averages

```
{"state": "WI", "totalStr": 9, "totalRatings": 2}
{"state": "OH", "totalStr": 6, "totalRatings": 2}
{"state": "NY", "totalStr": 3, "totalRatings": 1}
```

Calculating Averages

> {"state": "WI", "totalStr": 9, "totalRatings": 2}
  {"state": "OH", "totalStr": 6, "totalRatings": 2}
  {"state": "NY", "totalStr": 3, "totalRatings": 1}

▼

{"state": "WI", "average": 4.5}

Calculating Averages

```
  {"state": "WI", "totalStr": 9, "totalRatings": 2}
> {"state": "OH", "totalStr": 6, "totalRatings": 2}
  {"state": "NY", "totalStr": 3, "totalRatings": 1}
```

▽

```
{"state": "WI", "average": 4.5}
{"state": "OH", "average": 3}
```

Calculating Averages

{"state": "WI", "totalStr": 9, "totalRatings": 2}
{"state": "OH", "totalStr": 6, "totalRatings": 2}
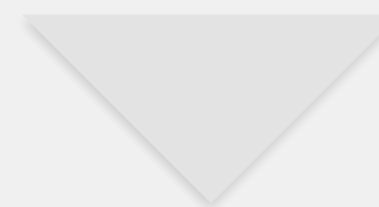> {"state": "NY", "totalStr": 3, "totalRatings": 1}

▼

{"state": "WI", "average": 4.5}
{"state": "OH", "average": 3}
{"state": "NY", "average": 3}
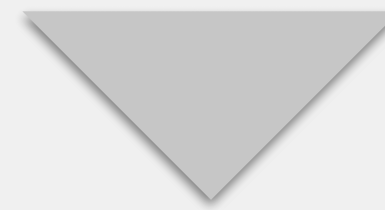
Main Tasks

load data
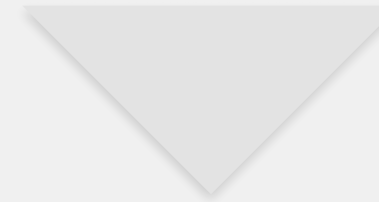
manipulate data

build visualization

determine type of visualization

rearrange data appropriately

build visualization

Rearranging Data

{"state": "WI", "average": 4.5}
{"state": "OH", "average": 3}
{"state": "NY", "average": 3}

▼

x = {"WI", "OH", "NY"}
y = {4.5, 3, 3}

Resources

Interesting Datasets

17 places to find data sets for data science projects

https://www.dataquest.io/blog/free-datasets-for-projects/

19 free public data sets for your first data science project

https://www.springboard.com/blog/free-public-data-sets-data-science-project/

Awesome public data sets

https://github.com/caesar0301/awesome-public-datasets

Visualization Libraries

Bokeh

matplotlib

Seaborn

plotly

geoplotlib (geographic data only)