



# Cappadocia Venue Recommendation

APPLIED DATA SCIENCE CAPSTONE PROJECT

GULSUM ELCIN SIPAHI

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# Cappadocia



*Cappadocia* is one of the most visited touristic attraction points in **Turkey**

- Fairy chimneys
- Valleys covered with natural rock formations
- Underground Cities
- Historical monasteries
- Boutique hotels
- Hot air balloon tours



# Business Problem & Target Audience

- ▶ **Business Problem:** Recommend venues like hotels, museums, restaurants to visitors who are planning to visit the Cappadocia region according to FourSquare API venue recommendations with map visualizations.
- ▶ According to geographical coordinates of the venues, the most suitable cluster will be recommended for accommodation.

- ▶ **Target Audience:**

- ✓ Tourists
- ✓ Tourism Agencies
- ✓ Investors

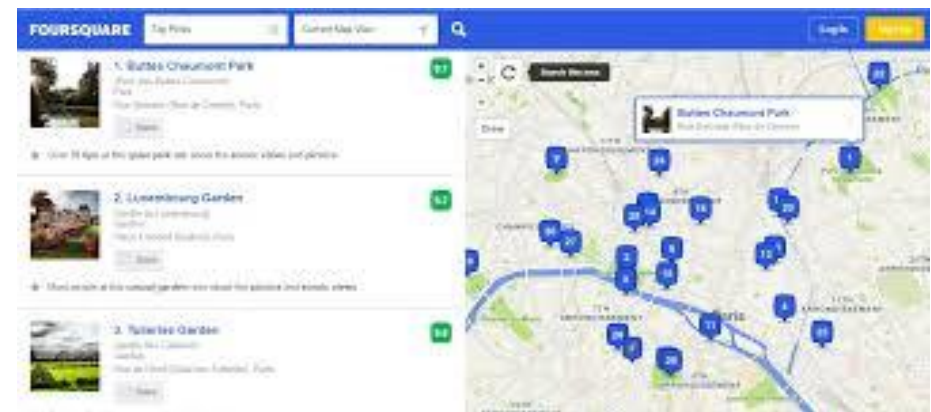


# Data

- ▶ Data: Foursquare location data

## Clean&Analyse Data

- ▶ Delete unnecessary column and rows
- ▶ Clean multiple enteries(Museums etc.)
- ▶ Rename Columns
- ▶ Merge Tables



# Methodology

- ▶ Four Square Credentials
- ▶ Latitude and Longitude Values of Göreme(Cappadocia)

**Göreme is one of the most visited regions of Cappadocia so Göreme's latitude and longitude values are defined.**

```
# define the city and get its Latitude & Longitude
city = 'Goreme'
geolocator = Nominatim(user_agent="foursquare_agent")
location = geolocator.geocode(city)
latitude = location.latitude
longitude = location.longitude
print(latitude, longitude)
```

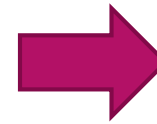
38.642089 34.8296234



# Search for Hotels

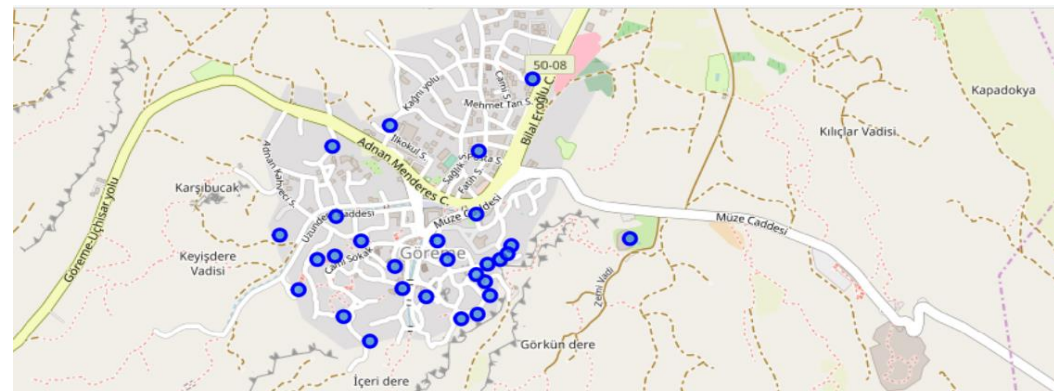
## Clean Data

categories	hasPerk	id	location.address	location.cc	location.city	location.country	location.crossStreet	location.distance	location.formattedAddress	location.labeledLa
[[{"shortName": "Hotel", "icon": {"prefix": "ht...	False	4bd6491e75c0f47aa0ecb03	Gaferli Mah, Göreme	TR	Nevşehir	Türkiye	NaN	237	[Gaferli Mah, Göreme, 50180 Nevşehir, Türkiye]	[[{"label": "display 34.83234538336
[[{"shortName": "Hotel", "icon": {"prefix": "ht...	False	4bd845536a51ce728cbbde3f	Uzundere Cad No: 43	TR	Nevşehir	Türkiye	Göreme	419	[Uzundere Cad No: 43 (Göreme), Nevşehir, Türkiye]	[[{"label": "display 34.8250088044c
[[{"shortName": "Hotel", "icon": {"prefix": "ht...	False	4cac1a4a36fa6dcb77dfdb78	Göreme	TR	Nevşehir	Türkiye	Masat Sokak	459	[Göreme (Masat Sokak), 50180 Nevşehir, Türkiye]	[[{"label": "display 34.8243776770c
[[{"shortName": "Hotel", "icon": {"prefix": "ht...	False	4c7813e693ef236a8107ab0f	Aydınlı Mah. Yavuz Sok. No:1 Göreme Merkez	TR	Nevşehir	Türkiye	NaN	344	[Aydınlı Mah. Yavuz Sok. No:1 Göreme Merkez, 5...	[[{"label": "display 34.82566624634
[[{"shortName": "Hotel", "icon": {"prefix": "ht...	False	53fb94a3498ed0f02cd01a8	Orta Mahalle	TR	Göreme Tarihi Milli Parkı	Türkiye	Ayvaz Efendi Sokak	452	[Orta Mahalle (Ayvaz Efendi Sokak), 50180 Göre...	[[{"label": "display 34.82620066036



	name	formattedAddress	lat	lng
0	Anatolian Houses Hotel	[Gaferli Mah, Göreme, 50180 Nevşehir, Türkiye]	38.642280	34.832345
1	Göreme Kaya Hotel	[Uzundere Cad No: 43 (Göreme), Nevşehir, Türkiye]	38.640995	34.825009
2	Flintstones Cave Hotel	[Göreme (Masat Sokak), 50180 Nevşehir, Türkiye]	38.642591	34.824378
3	Kelebek Special Cave Hotel	[Aydınlı Mah. Yavuz Sok. No:1 Göreme Merkez, 5...	38.641880	34.825666
4	Cappadocia Inn Hotel	[Orta Mahalle (Ayvaz Efendi Sokak), 50180 Göre...	38.645155	34.826201
5	Village Cave House Hotel	[Ünlü Sokak 18, Göreme Tarihi Milli Parkı, Tür...	38.641757	34.831525
6	Sarihan Cave Hotel	[Gaferli Mah. Cevizler Sok. No:20, Goreme-Capp...	38.641880	34.831929
7	Traveller's Cave Hotel	[Aydinli mahallesi gorceli sokak no:7, 50000 N...	38.639513	34.827461

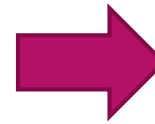
## Map of Hotels



# Search for Museums

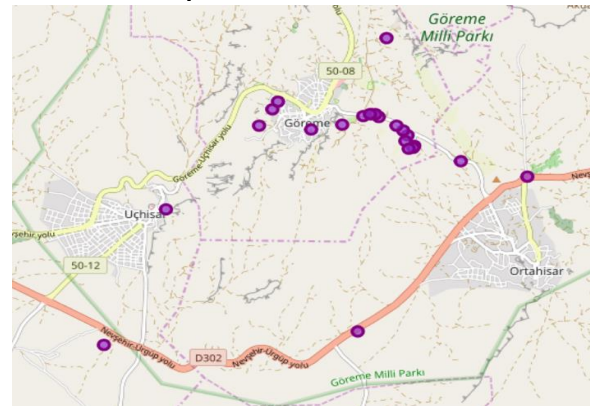
## Clean Data

location.city	location.country	location.crossStreet	location.distance	location.formattedAddress	location.labeledLatLngs	location.lat	location.lng	location.postalCode	location.state	name	referralId
Nevşehir	Türkiye	NaN	1361	[Göreme Milli Parkı, 50180 Nevşehir, Türkiye]	NaN	38.640302	34.845119	50180	Nevşehir	Göreme Açık Hava Müzesi	v-1560677039
Göreme Tarihi Milli Parkı	Türkiye	NaN	1303	[Göreme Tarihi Milli Parkı, Türkiye]	[[{"lat": 38.641041259414024, "label": "display..."}]]	38.641041	34.844558	NaN	Nevşehir	Tokalı Kilise	v-1560677039
NaN	Türkiye	NaN	971	[Türkiye]	[[{"lat": 38.64289261837788, "label": "display..."}]]	38.642893	34.840748	NaN	NaN	Saklı Kilise	v-1560677039
Göreme Tarihi Milli Parkı	Türkiye	NaN	1488	[Göreme Tarihi Milli Parkı, Türkiye]	[[{"lat": 38.638911628677945, "label": "display..."}]]	38.638912	34.846247	NaN	Nevşehir	Çarıklı Kilise	v-1560677039
Aktepe	Türkiye	NaN	4234	[Zelve Yolu, Aktepe, Türkiye]	[[{"lat": 38.66939601696848, "label": "display..."}]]	38.669396	34.863531	NaN	Nevşehir	Zelve Açık Hava Müzesi	v-1560677039



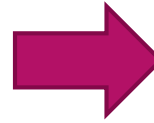
	name	formattedAddress	lat	lng
0	Göreme Açık Hava Müzesi	[Göreme Milli Parkı, 50180 Nevşehir, Türkiye]	38.640302	34.845119
1	Tokalı Kilise	[Göreme Tarihi Milli Parkı, Türkiye]	38.641041	34.844558
2	Saklı Kilise	[Türkiye]	38.642893	34.840748
3	Çarıklı Kilise	[Göreme Tarihi Milli Parkı, Türkiye]	38.638912	34.846247
4	Zelve Açık Hava Müzesi	[Zelve Yolu, Aktepe, Türkiye]	38.669396	34.863531
5	Elmalı Kilise	[50180 Göreme Belediyesi, Türkiye]	38.639540	34.844933
6	Karanlık Kilise	[Göreme Açık Hava Müzesi, Göreme Tarihi Milli ...]	38.638551	34.846021
7	Yılanlı Kilise	[Göreme Açık Hava Müzesi, Ürgüp, Türkiye]	38.638528	34.845307

## Map of Museums



# Search for Restaurants

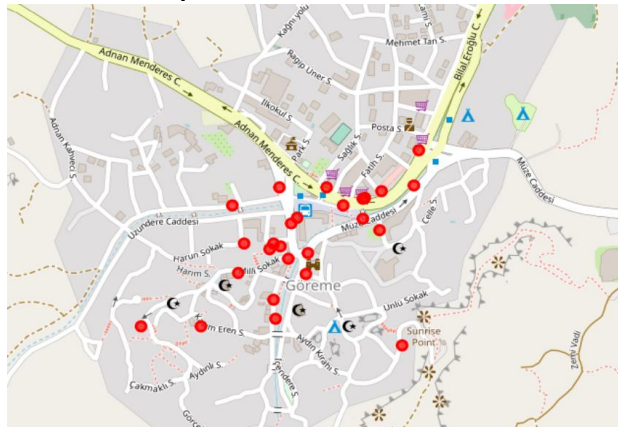
## Clean Data



	categories	hasPerk	id	location.address	location.cc	location.city	location.country	location.crossStreet	location.distance	location.formattedAddress	locati
0	[[{"primary": True, "id": "4bf58dd3d48988d1c494..."}]]	False	4c22570413c00f47635587de	Belediye Cd.	TR	Göreme Tarihi Milli Parkı	Türkiye	NaN	127	[Belediye Cd., 50180 Göreme Tarihi Milli Parkı...]	3
1	[[{"primary": True, "id": "4bf58dd3d48988d1c494..."}]]	False	56e3f6b1498e8a4e8acbe205	Orta Aydınli Mah. Milli Sk. Göreme	TR	Ürgüp	Türkiye	NaN	107	[Orta Aydınli Mah. Milli Sk. Göreme, Ürgüp, Tü...]	3
2	[[{"primary": True, "id": "4bf58dd3d48988d1c494..."}]]	False	544f57f498ea30870927516	Orta Mah Uzun Dere Cad. No 9	TR	Göreme Tarihi Milli Parkı	Türkiye	NaN	201	[Orta Mah Uzun Dere Cad. No 9, 50180 Göreme Ta...]	3
3	[[{"primary": True, "id": "4bf58dd3d48988d1c494..."}]]	False	51eae36c498e9c7da2723ee8	NaN	TR	Nevşehir	Türkiye	NaN	97	[50000 Nevşehir, Türkiye]	3
4	[[{"primary": True, "id": "4bf58dd3d48988d1c494..."}]]	False	510fe1ede4b0aaab99f9ce8c1	Orta Mah. Milli Sok. No: 6 Göreme	TR	Nevşehir	Türkiye	NaN	110	[Orta Mah. Milli Sok. No: 6 Göreme, Nevşehir, ...]	3

	name	formattedAddress	lat	lng
0	One Way Cafe Restaurant	[Belediye Cd., 50180 Göreme Tarihi Milli Parkı...]	38.643175	34.829141
1	Viewpoint Cafe & Restaurant	[Orta Aydınli Mah. Milli Sk. Göreme, Ürgüp, Tü...]	38.642711	34.828678
2	Şaziye Restaurant	[Orta Mah.Uzun Dere Cad. No:9, 50180 Göreme Ta...]	38.643803	34.828888
3	Cappadocia Pide House Restaurant	[50000 Nevşehir, Türkiye]	38.641496	34.828805
4	My Mother's Cafe & Restaurant	[Orta Mah. Milli Sok. No: 6 Göreme, Nevşehir, ...]	38.642821	34.828761
5	Alaturka Restaurant	[Goreme, Cappadocia, Türkiye]	38.643253	34.830709
6	Dibek Cafe & Restaurant	[Hakki Paşa Meydanı No: 1 Göreme (Kapadokya), ...]	38.642551	34.829095
7	Köy Evi Restaurant	[Göreme Tarihi Milli Parkı, Türkiye]	38.641024	34.831573
8	Mozaik Restaurant	[Belediye Caddesi, El Sanatları Çarşısı, No 31...]	38.643264	34.829287
9	Urzip Korean Restaurant	[Türkiye]	38.643494	34.830290
10	Millocal Restaurant Kapadokya	[Tekeli Mah. Divanlı Sok. No:20 (Göreme), Üçhi...]	38.631171	34.808063
11	Old Cappadocia Cafe & Restaurant	[Göreme Tarihi Milli Parkı, Türkiye]	38.641825	34.828764

## Map of Restaurants





# Machine Learning: K- Means Algorithm

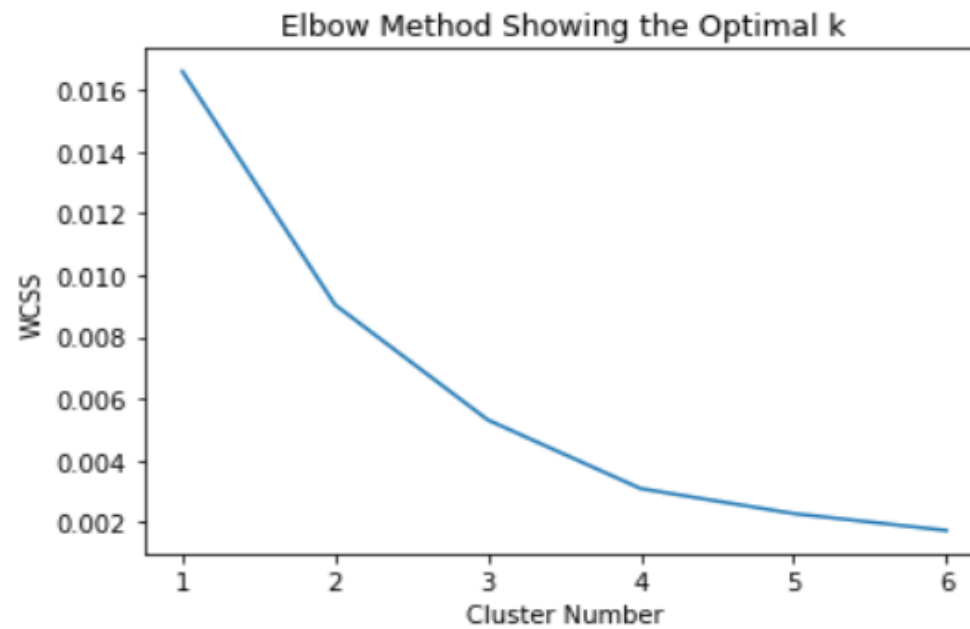
- ▶ Aim: Find the best region to accommodate which is near to venues as much as possible. To do this K- means algorithm is used.
- ▶ Merged all the hotels, museums and restaurants tables into a single table

```
df_new = pd.concat([museum_dataframe4,hotel_dataframe3,resto_dataframe3])  
df_new.shape
```

```
]:(87, 5)
```

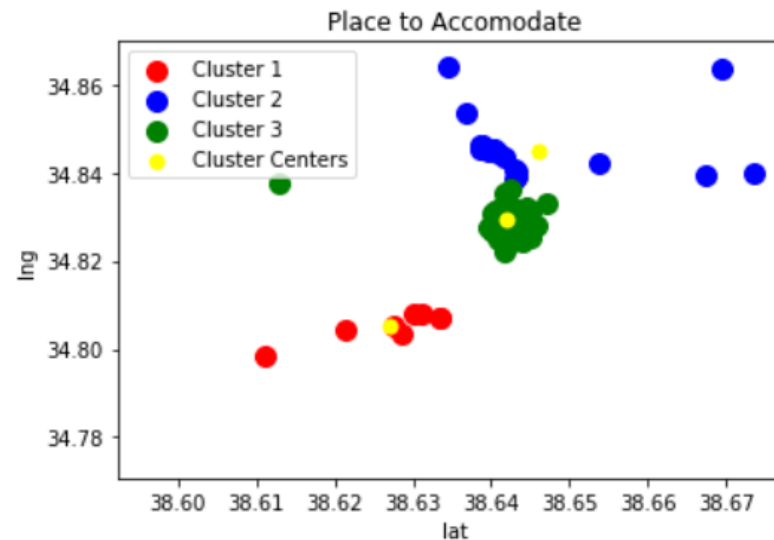
- ▶ New table(df\_new) consists **87 rows** and **5 columns**

# Elbow Method



# K-Means algorithm & Results

- The K-Means algorithm clustered the venues in the 3 areas shown in green, red and blue colors. The cluster centers of each cluster are shown with yellow points.



# Discussion

- ▶ Cappadocia is a region spreading an area covering the provinces particularly to Nevsehir, Kirsehir, Nigde, Aksaray and Kayseri.
- ▶ The main worthseeing places are Ürgüp, Ayanos, Göreme, Akvadi, Uçhisar and Ortahisar Castles, Güvercinlik Valley, Derinkuyu, Kaymaklı, Özkonak underground cities, Ihlara Valley, Çavuşin, Güllüdere Valley.
- ▶ In this study I mainly focused on the Göreme region but the study can be **expanded including the above regions and attraction points**. As there is such variety, different approaches can be tried in clustering and classification studies.
- ▶ I used the Kmeans algorithm as a machine learning method. When I tested the Elbow method, I set the optimum k value to 3. However, if the study is expanded to other regions and attraction points, other **clustering methods** can be preferred.
- ▶ In this study to recommend the best cluster to accommodate I cluster the areas according to geographical proximity. Other data like **prices of the hotels** and **ratings** can also be analyzed together to gain a better insight.

# Conclusion

- ▶ **Cappadocia** is one of the most visited touristic attraction points in Turkey which is known for its fairy chimneys, natural rock formations, historical monasteries, boutique hotels, hot air balloon tours.
- ▶ In this study, according to **FourSquare API** venue recommendations I listed the tables of hotels, museums, restaurants in the **Göreme region** and visualized the **map** of these venues.
- ▶ I merged all the tables into a single table and **used K-means clustering algorithm** as a **machine learning** method to cluster the venues according the distances between the venues. I defined centroids of the clusters and found that Cluster 1 will be the best choice to accommodate.
- ▶ This kind of data analysis will be useful not only for **tourists** visiting a city for the first time but also for **tourism agencies** to inform & recommend their customers about the city and also for **investors** to invest in the city for new opportunities.





THANK YOU