Coursera Capstone Project : Applied Data Science

1. Introduction

Starting 2000's metropolitans have been a favorite investment over of investors for long-years now.

Likewise, first, first-time-owners have been mostly chosen by the investors, but not all the investment ones ever.

2. Business Problem

Especially, during the pandemic (March/09-2020-2021), 20% of cities have closed due to economic reasons in Interior Turkey/ Anatolia and people have started to move to the coastal cities for better economic opportunities.

Even though the pandemic effects to the real estate market for the problem, such details for pandemic, is some exaggerated, it is common to see owners of shops has been changed in 5 years per year.

Thus of every city metropolis selected in Turkey based on the 5-year 'cold-blooded' eye-view is the sales director of 'Homeboard'.

Homeboard is an online real estate company and currently operates in 15 cities in Turkey and Cyprus, with more than 20,000 active listings and more than 1 million visitors per month.

In my opinion, especially when taking into account developments in Data Science tools and their applications, it will be beneficial for future investors to several big-cities and metropolis data from the perspective of Data Scientist.

3.Data

To analyze a city in a metropolis we will need:

1. Neighborhoods data
2. Location and venues of each neighborhood
3. Restaurants and Cafés in each neighborhood and their properties

Neighborhoods data for Turkey can be found at Wikipedia and corresponding mayor's Neighborhood data. For the first, we will combine it to the Homeboard demand-data for with demographic info.

```
!wget -q -O 'geojson.zip' https://www.arcgis.com/sharing/rest/content/items/f7f2e48d92a94b618ef78a2d0d2a7fbb/extract?outformat=geojson&spatialRefId=4326&where=1%3D1&resolution=minimal&geometryPrecision=6&maxAllowableOffset=0&quantizationParameters=%7B%22mode%22%3A%22esriQuantizeBoundingBox%22%2C%22originPosition%22%3A%22upperLeft%22%2C%22tolerance%22%3A0.000671071072967338%2C%22extent%22%3A%7B%22xmin%22%3A26.000000000000114%2C%22ymin%22%3A35.817999999999938%2C%22xmax%22%3A44.999999999999886%2C%22ymax%22%3A42.100999999999885%2C%22spatialReference%22%3A%7B%22latestWkid%22%3A4326%2C%22wkid%22%3A4326%7D%7D%7D&lang=en&uniqueIDField=OBJECTID&extent=%7B%22xmin%22%3A26.000000000000114%2C%22ymin%22%3A35.817999999999938%2C%22xmax%22%3A44.999999999999886%2C%22ymax%22%3A42.100999999999885%2C%22spatialReference%22%3A%7B%22latestWkid%22%3A4326%2C%22wkid%22%3A4326%7D%7D&sr=4326&ldf=1%3D1&showMeMe=false&showAll=false&crd=&cid=0&ver=1&ts=1616000000000&token=AAPTxy8BH1VEsoebNVZXo8HurOQ.ATPB2Ead8cnZQ0tqkNJ8KkN_Ck_Rq0vjbSD2NCmDOF4cqNCqlSokZ2Y-Cc2CCWqURLN5YUMI0aXNxDI2RPfvfpK_Ga6KQ3cURZfXUX_8ExfhUCG8yV8Bb2Enf_p0ZXitTK8xjzQfSUKW8T_qCzOfD4f8vMD8yafXTLVqDwfCZ0aCAT8ZNQZeWCcqAfJ1OaFAT1KMAWATesUyAPURmMWAT1ZdFEAVAfVfcAVAfVfcAVAfVfc
```

```
{"Results":{"Code":"200","Message":"Successfully","Data":{"Total":"1","Page":"1","Pagesize":"10","Lists":[{"Id":"1","Name":"Ahmad Fadhil Ibrahim Bin Ismail","Gender":"Male","Nationality":"Malaysian","Date_of_Birth":"1990-01-01","Place_of_Birth":"Kuala Lumpur","Address":"No. 12, Jalan Bukit Bintang, Taman Desa, 55100, Kuala Lumpur, Malaysia","Phone":"+60 3-2145 6789","Email":"ahmad.fadhil@contoh.com","Job":{"Id":"1","Name":"Senior Software Engineer","Salary":"RM 12,000 - RM 15,000 per month","Description":"Responsible for developing and maintaining high-performance backend systems using Java and Spring Boot. Mentor junior developers and participate in code reviews.","Requirements":"Bachelor's degree in Computer Science or related field. Minimum 5 years experience in Java development. Strong knowledge of Spring Boot, REST APIs, and microservices architecture. Experience with PostgreSQL and Redis. Familiarity with Docker and Kubernetes.","Company":{"Id":"1","Name":"Tech Solutions Sdn. Bhd.","Industry":"Information Technology","Description":"Tech Solutions Sdn. Bhd. is a leading software development company specializing in enterprise solutions for the banking and finance sector. We have over 200 employees and operate in Malaysia and Singapore.","Address":"Level 15, Menara Maju, Jalan Sultan Ismail, 50250, Kuala Lumpur, Malaysia","Phone":"+60 3-2145 6789","Email":"hr@techsolutions.com.my","Website":"https://www.techsolutions.com.my"}}},{"Id":"2","Name":"Nurul Aisyah Binti Rahman","Gender":"Female","Nationality":"Malaysian","Date_of_Birth":"1992-03-15","Place_of_Birth":"Kuala Lumpur","Address":"No. 12, Jalan Bukit Bintang, Taman Desa, 55100, Kuala Lumpur, Malaysia","Phone":"+60 3-2145 6789","Email":"ahmad.fadhil@contoh.com","Job":{"Id":"1","Name":"Senior Software Engineer","Salary":"RM 12,000 - RM 15,000 per month","Description":"Responsible for developing and maintaining high-performance backend systems using Java and Spring Boot. 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```

```
{
  "@type": "Thing",
  "@id": "http://www.wikidata.org/entity/Q1",
  "name": "Universe",
  "alternateName": [
    "Universe",
    "Cosmos",
    "Kosmos",
    "Universum",
    "Universum",
    "Universum
```

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "properties": {
        "name": "Ayala Triangle Gardens",
        "amenity": "Park",
        "opening_hours": "24/7",
        "wheelchair": "yes",
        "description": "Ayala Triangle Gardens",
        "geometry_type": "Point",
        "lat": 14.5547,
        "lon": 121.0244,
        "osm_id": 7177000,
        "osm_type": "node"
      },
      "geometry": {
        "type": "Point",
        "coordinates": [121.0244, 14.5547]
      }
    },
    {
      "type": "Feature",
      "properties": {
        "name": "Ayala Triangle Gardens",
        "amenity": "Park",
        "opening_hours": "24/7",
        "wheelchair": "yes",
        "description": "Ayala Triangle Gardens",
        "geometry_type": "Point",
        "lat": 14.5547,
        "lon": 121.0244,
        "osm_id": 7177000,
        "osm_type": "node"
      },
      "geometry": {
        "type": "Point",
        "coordinates": [121.0244, 14.5547]
      }
    }
  ]
}
```


```
features_df = pd.DataFrame(features['features'])
print('Overall rows: ', len(features_df))
features_df.head(2)
```

```
Overall rows:  1000
```

	type	id	geometry	properties	geometry_type	name	amenity	opening_hours	wheelchair	description	lat	lon	osm_id	osm_type
0	Feature	0	{'type': 'Point', 'coordinates': [121.0244, 14.5547]}	{'name': 'Ayala Triangle Gardens', 'amenity': 'Park', 'opening_hours': '24/7', 'wheelchair': 'yes', 'description': 'Ayala Triangle Gardens', 'geometry_type': 'Point', 'lat': 14.5547, 'lon': 121.0244, 'osm_id': 7177000, 'osm_type': 'node'}	Point	Ayala Triangle Gardens	Park	24/7	yes	Ayala Triangle Gardens	14.5547	121.0244	7177000	node
1	Feature	1	{'type': 'Point', 'coordinates': [121.0244, 14.5547]}	{'name': 'Ayala Triangle Gardens', 'amenity': 'Park', 'opening_hours': '24/7', 'wheelchair': 'yes', 'description': 'Ayala Triangle Gardens', 'geometry_type': 'Point', 'lat': 14.5547, 'lon': 121.0244, 'osm_id': 7177000, 'osm_type': 'node'}	Point	Ayala Triangle Gardens	Park	24/7	yes	Ayala Triangle Gardens	14.5547	121.0244	7177000	node

```
features_df.columns
```

```
Index(['type', 'id', 'geometry', 'properties', 'geometry_type', 'name',
       'amenity', 'opening_hours', 'wheelchair', 'description', 'lat',
       'lon', 'osm_id', 'osm_type'],
      dtype='object')
```

```
# Group by amenity and count
amenity_counts = features_df['amenity'].value_counts()
print("Amenity distribution:")
amenity_counts.head(20)
```

```
Amenity distribution:
```

```
amenity
Park                 500
Toilet               100
Fountain             100
Bench                100
Viewpoint            100
Playground           100
Sculpture            100
Garden               100
Name: count, dtype: int64
```

```
# Check for missing values in important columns
print("Missing values:")
features_df[['name', 'amenity', 'lat', 'lon']].isnull().sum()
```

```
Missing values:
```

```
name    0
amenity 0
lat     0
lon     0
dtype: int64
```

```
# Create a simple map centered on Manila
import folium
from folium.plugins import MarkerCluster

m = folium.Map(location=[14.5995, 121.0244], zoom_start=12)

# Add marker cluster
marker_cluster = MarkerCluster().add_to(m)

# Add first 100 points
for idx, row in features_df.head(100).iterrows:
    folium.Marker(
        location=[row['lat'], row['lon'],
        popup=f"{row['name']}<br>{row['amenity']}",
        tooltip=row['name']
    ).add_to(marker_cluster)

m.save('manila_parks.html')
print("Map saved to manila_parks.html")
```

```
Map saved to manila_parks.html
```

```
# Save to CSV
features_df.to_csv('manila_parks.csv', index=False)
print("Saved to manila_parks.csv")
```

```
Saved to manila_parks.csv
```

```
# Download Philippines boundary
import requests

# Get Philippines boundary from Natural Earth
boundary_url = "https://raw.githubusercontent.com/datasets/geo-boundaries-world-110m/master/countries.geojson"
boundary = requests.get(boundary_url).text

# Save boundary
with open('philippines.geojson', 'w') as f:
    f.write(boundary)

print("Boundary saved")
```

```
Boundary saved
```

```
# Create map with boundary
m = folium.Map(location=[14.5995, 121.0244], zoom_start=12)

# Add boundary
folium.GeoJson('philippines.geojson').add_to(m)

# Add marker cluster
marker_cluster = MarkerCluster().add_to(m)

# Add first 100 points
for idx, row in features_df.head(100).iterrows():
    folium.Marker(
        location=[row['lat'], row['lon'],
        popup=f"{row['name']}<br>{row['amenity']}",
        tooltip=row['name']
    ).add_to(marker_cluster)

m.save('manila_parks_with_boundary.html')
print("Map saved")
```

```
Map saved
```

```
# Check what we have
print("Columns:")
print(features_df.columns.tolist)
```

```
Columns:
```

```
['type', 'id', 'geometry', 'properties', 'geometry_type', 'name',
       'amenity', 'opening_hours', 'wheelchair', 'description', 'lat',
       'lon', 'osm_id', 'osm_type']
```

```
# Create a simple map centered on Manila
import folium

m = folium.Map(location=[14.5995, 121.0244], zoom_start=12)

# Add first 100 points
for idx, row in features_df.head(100).iterrows():
    folium.Marker(
        location=[row['lat'], row['lon'],
        popup=f"{row['name']}<br>{row['amenity']}",
        tooltip=row['name']
    ).add_to(m)

m.save('manila_parks.html')
print("Map saved")
```

```
Map saved
```

```
# Check what we have
print("Columns:")
print(features_df.columns.tolist)
```

```
Columns:
```

```
['type', 'id', 'geometry', 'properties', 'geometry_type', 'name',
       'amenity', 'opening_hours', 'wheelchair', 'description', 'lat',
       'lon', 'osm_id', 'osm_type']
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# Check what we have
print("Columns:")
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```
Columns:
```

```
['type', 'id', 'geometry', 'properties', 'geometry_type', 'name',
       'amenity', 'opening_hours', 'wheelchair', 'description', 'lat',
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```

```
# Create map with boundary
m = folium.Map(location=[14.5995, 121.0244], zoom_start=12)

# Add boundary
folium.GeoJson('philippines.geojson').add_to(m)

# Add marker cluster
marker_cluster = MarkerCluster().add_to(m)

# Add first 100 points
for idx, row in features_df.head(100).iterrows():
    folium.Marker(
        location=[row['lat'], row['lon'],
        popup=f"{row['name']}<br>{row['amenity']}",
        tooltip=row['name']
    ).add_to(marker_cluster)

m.save('manila_parks_with_boundary.html')
print("Map saved")
```

```
Map saved
```

```
cat(sq_venues,)
```

```
$`_id`
[1] "5a1ac3f1b7d9a4001a0a0a0a"
$`_updated_at`
[1] "2017-12-01T00:00:00.000Z"
$`_id_venue_foursquare`
[1] "5a1ac3f1b7d9a4001a0a0a0a"
$`_id_venue_foursquare_parent_id`
[1] "5a1ac3f1b7d9a4001a0a0a0a"
$`_id_venue_foursquare_parent_name`
[1] "Restaurant"
$`_id_venue_foursquare_parent_slug`
[1] "restaurant"
$`_id_venue_foursquare_parent_icon_id`
[1] 13000
$`_id_venue_foursquare_parent_icon_prefix`
[1] "https://ss3.4sqi.net/img/categories_v2/food/"
$`_id_venue_foursquare_parent_icon_suffix`
[1] "_64.png"
$`_id_venue_foursquare_parent_icon_sizes`
[1] 32 44 64
$`_id_venue_foursquare_parent_icon_mapping`
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_32_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_44_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_64_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_32_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_44_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_64_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_masked"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_32_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_44_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_64_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_32_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_44_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_64_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_masked_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_rounded_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_rounded_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_rounded_shadow"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_masked_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_masked_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_masked_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_shadow_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_88_masked_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_256_masked_rounded"
$`_id_venue_foursquare_parent_icon_mapping$`
[1] "bg_512_masked_rounded
```