Coursera IBM Capstone Project: “Hotel in Kyiv”

BY IVAN SOLOVIOV

JUNE 2020

Introduction/Business Problem

- ***a. Background***
- This report is for those who are planning to start a new hotel in the city of Kyiv. It provides a suggestion on what would be the best venue to start a new hotel in a highly visited city with already many good hotels. Kyivi s the capital and most populous city of Ukraine. It is in north-central Ukraine along the Dnieper River. Its population in July 2015 was 2,887,974 (though higher estimated numbers have been cited in the press), making Kiev the sixth-most populous city in Europe.
- Kiev is an important industrial, scientific, educational and cultural center of Eastern Europe. It is home to many high-tech industries, higher education institutions, and historical landmarks. The city has an extensive system of public transport and infrastructure, including the Kiev Metro.
- The city's name is said to derive from the name of Kyi, one of its four legendary founders. During its history, Kiev, one of the oldest cities in Eastern Europe, passed through several stages of prominence and obscurity. The city probably existed as a commercial center as early as the 5th century. A Slavic settlement on the great trade route between Scandinavia and Constantinople, Kiev was a tributary of the Khazars, until its capture by the Varangians (Vikings) in the mid-9th century. Under Varangian rule, the city became a capital of the Kievan Rus', the first East Slavic state. Completely destroyed during the Mongol invasions in 1240, the city lost most of its influence for the centuries to come. It was a provincial capital of marginal importance in the outskirts of the territories controlled by its powerful neighbours, first Lithuania, then Poland and Russia.
- The city prospered again during the Russian Empire's Industrial Revolution in the late 19th century. In 1918, after the Ukrainian National Republic declared independence from Soviet Russia, Kiev became its capital. From 1921 onwards Kiev was a city of the Ukrainian Soviet Socialist Republic, which was proclaimed by the Red Army, and, from 1934, Kiev was its capital. The city was almost completely ruined during World War II but quickly recovered in the postwar years, remaining the Soviet Union's third-largest city.
- Following the collapse of the Soviet Union and Ukrainian independence in 1991, Kiev remained Ukraine's capital and experienced a steady influx of ethnic Ukrainian migrants from other regions of the country. During the country's transformation to a market economy and electoral democracy, Kiev has continued to be Ukraine's largest and wealthiest city. Its armament-dependent industrial output fell after the Soviet collapse, adversely affecting science and technology, but new sectors of the economy such as services and finance facilitated Kiev's growth in salaries and investment, as well as providing continuous funding for the development of housing and urban infrastructure. Kiev emerged as the most pro-Western region of Ukraine; parties advocating tighter integration with the European Union dominate during elections. Kiev, one of the oldest cities of Eastern Europe, played a pivotal role in the development of the medieval East Slavic civilization as well as in the modern Ukrainian nation.

Introduction/Business Problem

- The first known humans in the region of Kiev lived there in the late paleolithic period (Stone Age). The population around Kiev during the Bronze Age formed part of so-called Tripillian culture, as witnessed by objects found in the area. During the early Iron Age certain tribes settled around Kiev that practiced land cultivation, husbandry and trading with the Scythians, and with ancient states of the northern Black Sea coast. Findings of Roman coins of the 2nd to the 4th centuries suggest trade relations with the eastern provinces of the Roman Empire. The carriers of Zarubintsy culture are considered the direct ancestors of the ancient Slavs who later established Kiev.Notable archaeologists of the area around Kiev include Vikentiy Khvoyka.
- Scholars continue to debate about the period in which the city was founded: some date the founding to the late 9th century, other historians have preferred a date of 482 AD. In 1982, the city celebrated its 1,500th anniversary. According to archaeological data, the foundation of Kiev dates to the second half of the 5th century and the first half of the 6th century.There is also a claim to find reference to the city in Ptolemy's 2nd-century work as Metropolity.
- Geographically, Kiev is located on the border of the Polesia woodland ecological zone, a part of the European mixed woods area, and the East European forest steppe biome. However, the city's unique landscape distinguishes it from the surrounding region. Kiev is completely surrounded by Kiev Oblast.
- Originally on the west bank, today Kiev is located on both sides of the Dnieper, which flows southwards through the city towards the Black Sea. The older and higher western part of the city sits on numerous wooded hills (Kiev Hills), with ravines and small rivers. Kiev's geographical relief contributed to its toponyms, such as Podil (means lower), Pechersk (caves), and uzviz (a steep street, "descent"). Kiev is a part of the larger Dnieper Upland adjoining the western bank of the Dnieper in its mid-flow, and which contributes to the city's elevation change. The northern outskirts of the city border the Polesian Lowland. Kiev expanded into the Dnieper Lowland on the left bank (to the east) as late as the 20th century. The whole portion of Kiev on the left bank of the Dnieper is generally referred to as Left bank (Ukrainian: Лівий берег, Livyi bereh). Significant areas of the left bank Dnieper valley were artificially sand-deposited, and are protected by dams.

Introduction/Business Problem

- According to the UN 2011 evaluation, there were no risks of natural disasters in Kiev and its metropolitan area. he growing political and economic role of the city, combined with its international relations, as well as extensive internet and social network penetration, have made Kiev the most pro-Western and pro-democracy region of Ukraine; (so called) National Democratic parties advocating tighter integration with the European Union receive most votes during elections in Kiev. In a poll conducted by the Kiev International Institute of Sociology in the first half of February 2014, 5.3% of those polled in Kiev believed "Ukraine and Russia must unite into a single state", nationwide this percentage was 12.5.
- With that in mind, I will be able to find the Top 3 districts to open a brand new hotel in the city.

Introduction/Business Problem

- ***b. Business Problem***
- This report focusses on the issue of where to open a new hotel in a city like Kyiv, once one has decided to go ahead. Let's imagine the some investment company willing to open a new luxury hotel, a first and foremost important decision will be the location for its new hotel. The objective is to locate and recommend to the investors, which neighborhood(s) of Kyiv will be the best choice to start their international growth plan. The information gained will assist in choosing the right location by providing data about the population of each neighborhood, in addition to other established venues present in these areas.

Data

- **The necessary information needed by the investment company will come from the following sources:**
- Kyiv has a total of 10 districts. In order to segement the neighborhoods and explore them, I will essentially need a dataset that contains the 10 districts as well as their latitude and logitude coordinates. For thease purpoces I will use free information from Wikipedia about Administrative and territorial structure of Kyiv: https://uk.wikipedia.org/wiki/%D0%90%D0%B4%D0%BC%D1%96%D0%BD%D1%96%D1%81%D1%82%D1%80%D0%B0%D1%82%D0%B8%D0%B2%D0%BD%D0%BE-%D1%82%D0%B5%D1%80%D0%B8%D1%82%D0%BE%D1%80%D1%96%D0%B0%D0%BB%D1%8C%D0%BD%D0%B8%D0%B9_%D1%83%D1%81%D1%82%D1%80%D1%96%D0%B9_%D0%9A%D0%B8%D1%94%D0%B2%D0%B0.To collect information on other venues/competitors in the Districts of Kyiv I will use Foursquare Api: https://ru.foursquare.com/developers/apps

Methodology

DATA COLLECTION

DATA CLEANING

DATA MODELING

DATA VISUALIZATION

RESULTS

Data Preparation

Install libraries for work with data

In [1]:
```
from bs4 import BeautifulSoup as bsoup
from urllib.request import urlopen as uReq
import requests
import lxml
import pandas as pd
from pandas import DataFrame
import numpy as np
import geopy
from geopy.geocoders import Nominatim
from geopy.extra.rate_limiter import RateLimiter
```

In [2]:
```
##### Scrapping Kyiv Districts Table from Wikipedia
```

In [2]:
```
my_url='https://uk.wikipedia.org/wiki/%D0%90%D0%B4%D0%BC%D1%96%D0%BD%D1%96%D1%81%D1%82%D1%80%D0%B0%D1%82%D0%B8%D0%B2%D0%BD%D0%BE-%D1%82%D0%B5%D1%80%D0%B8%D1%82%D0%BE%D1%80%D1%96
```

In [3]:
```
r=requests.get(my_url)
```

In [4]:
```
# Parse the htlm with Soup
page=bsoup(r.text,"html.parser")
page
```

DATA COLLECTION

Take only data about Kyiv districts:

In [5]:
```
response_obj = requests.get('https://uk.wikipedia.org/wiki/%D0%90%D0%B4%D0%BC%D1%96%D0%BD%D1%96%D1%81%D1%82%D1%80%D0%B0%D1%82%D0%B8%D0%B2%D0%BD%D0%BE-%D1%82%D0%B5%D1%80%D0%B8%D1
soup = bsoup(response_obj,'lxml')
Districts_Kyiv = soup.find('table',{'class':'wikitable'})
Districts_Kyiv
```

Out[5]:
```
<table class="wikitable sortable" width="60%">
<tbody><tr bgcolor="# 77D7D7">
<th>Район</th>
<th>Площа, км²</th>
<th>Населення, осіб<sup class="reference" id="cite_ref-3"><a href="#cite_note-3">[3]</a></sup></th>
<th>Щільність населення, <br/>осіб/км²</th>
<th>Місцезнаходження
</th></tr>
<tr>
<td><a href="/wiki/%D0%93%D0%BE%D0%BB%D0%BE%D1%81%D1%96%D1%97%D0%B2%D1%81%D1%8C%D0%BA%D0%B8%D0%B9_%D1%80%D0%B0%D0%B9%D0%BE%D0%BD" title="Голосіївський район">Голосіївський</
a></td>
<td>156</td>
<td>247,6 тис.</td>
<td>1584</td>
<td>Правий берег Дніпра
</td></tr>
<tr>
<td><a href="/wiki/%D0%9E%D0%B1%D0%BE%D0%BB%D0%BE%D0%BD%D1%81%D1%8C%D0%BA%D0%B8%D0%B9_%D1%80%D0%B0%D0%B9%D0%BE%D0%BD" title="Оболонський район">Оболонський</a></td>
<td>110</td>
<td>315,5 тис.</td>
<td>2868</td>
<td>Правий берег Дніпра
</td></tr>
```

DATA COLLECTION

Extracting cells into a dataframe

[11]:
```
records =[]
n=1
while n < nrows :
    District=totals[n].text.split('\n')[1] +' '+'район'+' '+'м.Києва'
    Size=totals[n].text.split('\n')[2]
    Population=totals[n].text.split('\n')[3]
    Population_density=totals[n].text.split('\n')[4]
    Dniper_river_banch=totals[n].text.split('\n')[5]
    records.append((District,Size,Population,Population_density,Dniper_river_banch))
    n=n+1

df=pd.DataFrame(records, columns=['District', 'Size km²', 'Population', 'Population density', 'Dniper river banch'])
df.head(11)
```

Out[11]:

	District	Size km²	Population	Population density	Dniper river banch
0	Голосіївський район м.Києва	156	247,6 тис.	1584	Правий берег Дніпра
1	Оболонський район м.Києва	110	315,5 тис.	2868	Правий берег Дніпра
2	Печерський район м.Києва	27	152,0 тис.	5630	Правий берег Дніпра
3	Подільський район м.Києва	34	198,1 тис.	5826	Правий берег Дніпра
4	Святошинський район м.Києва	110	340,7 тис.	3097	Правий берег Дніпра
5	Солом'янський район м.Києва	40	364,8 тис.	9120	Правий берег Дніпра
6	Шевченківський район м.Києва	27	230,2 тис.	9208	Правий берег Дніпра
7	Дарницький район м.Києва	134	314,7 тис.	2480	Лівий берег Дніпра
8	Деснянський район м.Києва	148	358,3 тис.	2421	Лівий берег Дніпра
9	Дніпровський район м.Києва	67	354,7 тис.	5294	Лівий берег Дніпра

DATA COLLECTION

Extracting cells into a dataframe

[11]:
```
records =[]
n=1
while n < nrows :
    District=totals[n].text.split('\n')[1] +' '+'район'+' '+'м.Києва'
    Size=totals[n].text.split('\n')[2]
    Population=totals[n].text.split('\n')[3]
    Population_density=totals[n].text.split('\n')[4]
    Dniper_river_banch=totals[n].text.split('\n')[5]
    records.append((District,Size,Population,Population_density,Dniper_river_banch))
    n=n+1

df=pd.DataFrame(records, columns=['District', 'Size km²', 'Population', 'Population density', 'Dniper river banch'])
df.head(11)
```

Out[11]:

	District	Size km²	Population	Population density	Dniper river banch
0	Голосіївський район м.Києва	156	247,6 тис.	1584	Правий берег Дніпра
1	Оболонський район м.Києва	110	315,5 тис.	2868	Правий берег Дніпра
2	Печерський район м.Києва	27	152,0 тис.	5630	Правий берег Дніпра
3	Подільський район м.Києва	34	198,1 тис.	5826	Правий берег Дніпра
4	Святошинський район м.Києва	110	340,7 тис.	3097	Правий берег Дніпра
5	Солом'янський район м.Києва	40	364,8 тис.	9120	Правий берег Дніпра
6	Шевченківський район м.Києва	27	230,2 тис.	9208	Правий берег Дніпра
7	Дарницький район м.Києва	134	314,7 тис.	2480	Лівий берег Дніпра
8	Деснянський район м.Києва	148	358,3 тис.	2421	Лівий берег Дніпра
9	Дніпровський район м.Києва	67	354,7 тис.	5294	Лівий берег Дніпра

DATA COLLECTION

DATA CLEANING

Adding latitude and longitude for each Kiev district:

In [13]:
```
geolocator = Nominatim(user_agent="my_app/11")

geocode = RateLimiter(geolocator.geocode, min_delay_seconds=1)
df['location'] = df['District English'].apply(geocode)

df['point'] = df['location'].apply(lambda loc: tuple(loc.point) if loc else None)
```

In [14]:
```
df
```

Out[14]:

	District	Size km²	Population	Population density	Dniper river banch	District English	location	point
0	Голосіївський район м.Києва	156	247,6 тис.	1584	Правий берег Дніпра	Holosiivskyi District	(Голосіївський район, Україна, (50.3273152, 30...	(50.3273152, 30.555650688664976, 0.0)
1	Оболонський район м.Києва	110	315,5 тис.	2868	Правий берег Дніпра	Obolonskyi District	(Оболонський район, Україна, (50.5302072500000...	(50.530207250000004, 30.43386140565119, 0.0)
2	Печерський район м.Києва	27	152,0 тис.	5630	Правий берег Дніпра	Pecherskyi District	(Печерський район, Україна, (50.4287238, 30.54...	(50.4287238, 30.548926992707216, 0.0)
3	Подільський район м.Києва	34	198,1 тис.	5826	Правий берег Дніпра	Podilskyi District	(Подільський район, Україна, (50.4895574, 30.4...	(50.4895574, 30.42850354868418, 0.0)
4	Святошинський район м.Києва	110	340,7 тис.	3097	Правий берег Дніпра	Sviatoshynskyi District	(Святошинський район, Україна, (50.47270305, 3...	(50.47270305, 30.324879460715938, 0.0)
5	Солом'янський район м.Києва	40	364,8 тис.	9120	Правий берег Дніпра	Solomianskyi District	(Солом'янський район, Україна, (50.42054835000...	(50.420548350000004, 30.458485113464562, 0.0)
6	Шевченківський район м.Києва	27	230,2 тис.	9208	Правий берег Дніпра	Shevchenkivskyi District	(Шевченківський район, Україна, (50.4626443500...	(50.462644350000005, 30.45165174635022, 0.0)
7	Дарницький район м.Києва	134	314,7 тис.	2480	Лівий берег Дніпра	Darnytskyi District	(Дарницький район, Україна, (50.4034834, 30.71...	(50.4034834, 30.711279152040262, 0.0)
8	Деснянський район м.Києва	148	358,3 тис.	2421	Лівий берег Дніпра	Desnianskyi District	(Деснянський район, Україна, (50.5190694, 30.6...	(50.5190694, 30.66132100520591, 0.0)
9	Дніпровський район м.Києва	67	354,7 тис.	5294	Лівий берег Дніпра	Dniprovskyi District	(Дніпровський район, Україна, (50.45635625, 30...	(50.45635625, 30.58374541341959, 0.0)

Deviding latitude and longitude into different columns:

In [15]:
```
df['point'][0]
```

Out[15]: (50.3273152, 30.555650688664976, 0.0)

In [16]:
```
df['point'] = df['point'].astype(str)
```

In [21]:
```
Kyivdistricts_df = Kyivdistricts_df.drop(['location','point','2'],axis=1) # clean tableframe
Kyivdistricts_df
```

Out[21]:

	District	Size km²	Population	Population density	Dniper river banch	District English	latitude	longitude
0	Голосіївський район м.Києва	156	247,6 тис.	1584	Правий берег Дніпра	Holosiivskyi District	50.3273152	30.555650688664976
1	Оболонський район м.Києва	110	315,5 тис.	2868	Правий берег Дніпра	Obolonskyi District	50.530207250000004	30.43386140565119
2	Печерський район м.Києва	27	152,0 тис.	5630	Правий берег Дніпра	Pecherskyi District	50.4287238	30.548926992707216
3	Подільський район м.Києва	34	198,1 тис.	5826	Правий берег Дніпра	Podilskyi District	50.4895574	30.42850354868418
4	Святошинський район м.Києва	110	340,7 тис.	3097	Правий берег Дніпра	Sviatoshynskyi District	50.47270305	30.324879460715938
5	Солом'янський район м.Києва	40	364,8 тис.	9120	Правий берег Дніпра	Solomianskyi District	50.420548350000004	30.458485113464562
6	Шевченківський район м.Києва	27	230,2 тис.	9208	Правий берег Дніпра	Shevchenkivskyi District	50.462644350000005	30.45165174635022
7	Дарницький район м.Києва	134	314,7 тис.	2480	Лівий берег Дніпра	Darnytskyi District	50.4034834	30.711279152040262
8	Деснянський район м.Києва	148	358,3 тис.	2421	Лівий берег Дніпра	Desnianskyi District	50.5190694	30.66132100520591
9	Дніпровський район м.Києва	67	354,7 тис.	5294	Лівий берег Дніпра	Dniprovskyi District	50.45635625	30.58374541341959

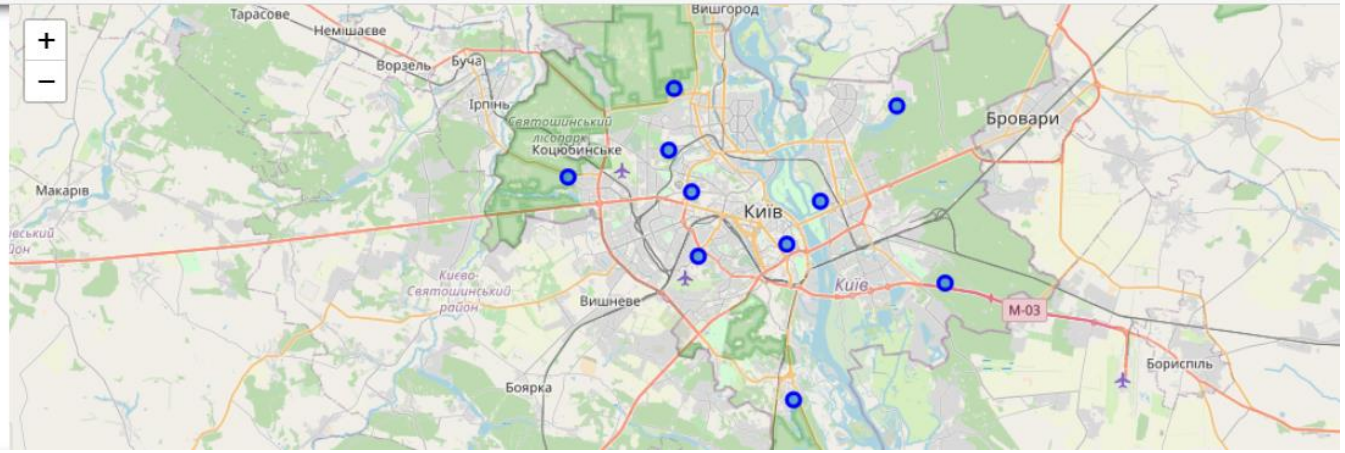
DATA CLEANING

```
latitude = 50.4547
longitude= 30.5238
# create map of Kyiv using latitude and longitude values above:
map_Kyiv = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, label in zip(Kyivdistricts_df['latitude'], Kyivdistricts_df['longitude'], Kyivdistricts_df['District English']):
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_Kyiv)

map_Kyiv
```

]:



DATA MODDELING

Writting the code to run the function on each neighborhood and create a new dataframe called Kyiv_venues.

```
iv_venues = getNearbyVenues(names=Kyivdistricts_df['District English'],
                            latitudes=Kyivdistricts_df['latitude'],
                            longitudes=Kyivdistricts_df['longitude']
                             )
```

```
 Holosiivskyi District
 Obolonskyi District
 Pecherskyi District
 Podilskyi District
Sviatoshynskyi District
 Solomianskyi District
 Shevchenkivskyi District
 Darnytskyi District
 Desnianskyi District
 Dniprovskyi District
```

```
int(Kyiv_venues.shape)
iv_venues
```

```
(79, 7)
```

	District	District Latitude	District Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Holosiivskyi District	50.327315	30.555651	Отель Разгуляево	50.328039	30.560617	Hotel
1	Holosiivskyi District	50.327315	30.555651	Тропинка в лесу	50.326141	30.561410	Forest
2	Holosiivskyi District	50.327315	30.555651	Фруктовый Рыночек□□□□	50.325776	30.561480	Farmers Market
3	Holosiivskyi District	50.327315	30.555651	Раки на Обуховской	50.325489	30.561653	Market
4	Obolonskyi District	50.530207	30.433861	Трамвайна зупинка "Дитячий санаторій#"	50.528812	30.434973	Tram Station
5	Pecherskyi District	50.428724	30.548927	ШоуРум GoldVintage	50.429030	30.550825	Thrift / Vintage Store
6	Pecherskyi District	50.428724	30.548927	Царський Парк / Tsarsky Park	50.427279	30.544623	Park
7	Pecherskyi District	50.428724	30.548927	TsarSky	50.426779	30.544184	Gym / Fitness Center
8	Pecherskyi District	50.428724	30.548927	InVINO	50.432677	30.547282	Wine Shop
9	Pecherskyi District	50.428724	30.548927	Bánh Mì Vs Marketing	50.432752	30.547128	Sandwich Place
10	Pecherskyi District	50.428724	30.548927	Львівські круасани (Львівські Круасани)	50.431686	30.544131	Bakery

DATA MODDELING

Grouping rows by district and by the mean of the frequency of occurrence of each category

```
Kyiv_grouped = Kyiv_onehot.groupby('District').mean().reset_index()
Kyiv_grouped
```

:

	District	Auto Dealership	Auto Garage	Bakery	Basketball Court	Beach	Bus Line	Café	Camera Store	Caucasian Restaurant	Coffee Shop	Creperie	Dance Studio	Drive-in Theater	Eastern European Restaurant	Electronics Store	Falafel Restaurant	Farmers Market	Fast Food Restaurant	Film Studio	Food & Drink Shop	Food Truck	Forest	F
0	Darnytskyi District	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000	0.00	0.00	0.5	0.00	
1	Dniprovskyi District	0.00	0.000000	0.000000	0.000000	0.222222	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00	0.00	0.222222	0.000000	0.00	0.00	0.000000	0.00	0.00	0.0	0.00	
2	Holosiivskyi District	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.00	0.25	0.000000	0.00	0.00	0.0	0.25	
3	Obolonskyi District	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000	0.00	0.00	0.0	0.00	
4	Pecherskyi District	0.00	0.000000	0.090909	0.090909	0.000000	0.00	0.00	0.00	0.000000	0.090909	0.000000	0.00	0.00	0.000000	0.090909	0.00	0.00	0.000000	0.00	0.00	0.0	0.00	
5	Podilskyi District	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000	0.00	0.25	0.0	0.00	
6	Shevchenkivskyi District	0.04	0.040000	0.000000	0.000000	0.000000	0.04	0.04	0.04	0.000000	0.040000	0.000000	0.04	0.04	0.000000	0.080000	0.04	0.00	0.000000	0.04	0.00	0.0	0.00	
7	Solomianskyi District	0.00	0.052632	0.052632	0.000000	0.000000	0.00	0.00	0.00	0.052632	0.000000	0.052632	0.00	0.00	0.000000	0.000000	0.00	0.00	0.052632	0.00	0.00	0.0	0.00	
8	Sviatoshynskyi District	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.25	0.00	0.000000	0.000000	0.000000	0.25	0.00	0.000000	0.000000	0.00	0.00	0.000000	0.00	0.00	0.0	0.25	

```
Kyiv_grouped.shape
```

: (9, 58)

DATA MODDELING

Clustering districts

Run *k*-means to cluster the neighborhood into 5 clusters. ¶

```
# set number of clusters
kclusters = 5

Kyiv_grouped_clustering = Kyiv_grouped.drop('District', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(Kyiv_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:11]
```

```
array([0, 2, 4, 3, 2, 2, 2, 2, 1], dtype=int32)
```

New dataframe for clusters and top 10 venues for each district

```
# add clustering labels

districts_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)
```

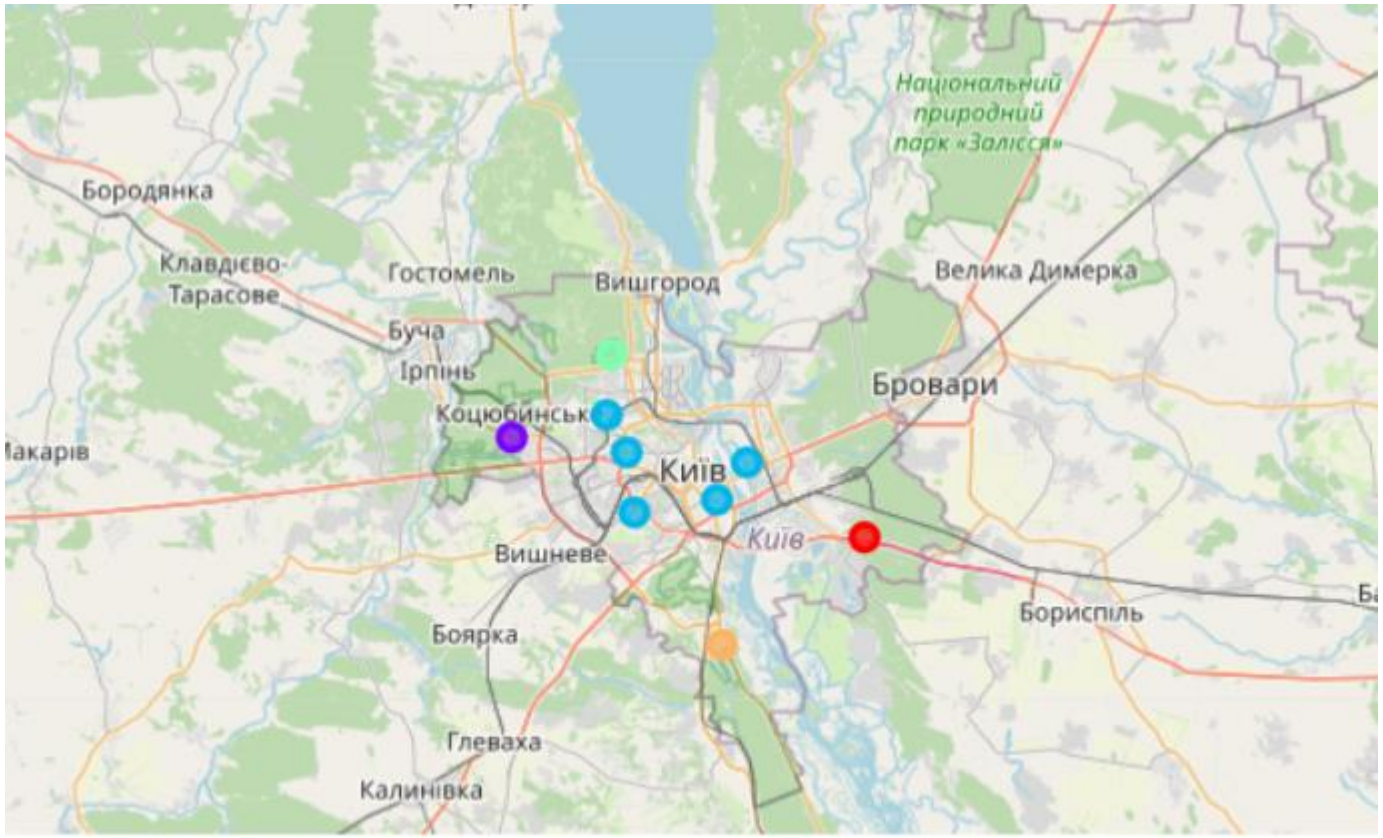
```
districts_venues_sorted
```

	Cluster Labels	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	0	Darnytskyi District	Tourist Information Center	Food Truck	Wine Shop	Eastern European Restaurant	Gym / Fitness Center	Gym	Grocery Store	Furniture / Home Store	Forest	Food & Drink Shop
1	2	Dniprovskyi District	Eastern European Restaurant	Beach	Health & Beauty Service	Sauna / Steam Room	Pet Store	Pier	Harbor / Marina	Café	Falafel Restaurant	Gym
2	4	Holosiivskyi District	Hotel	Forest	Market	Farmers Market	Wine Shop	Electronics Store	Gym	Grocery Store	Furniture / Home Store	Food Truck
3	3	Obolonskyi District	Tram Station	Wine Shop	Eastern European Restaurant	Gym / Fitness Center	Gym	Grocery Store	Furniture / Home Store	Forest	Food Truck	Food & Drink Shop
4	2	Pecherskyi District	Wine Shop	Spa	Park	Electronics Store	Gym / Fitness Center	Coffee Shop	Sandwich Place	Gym	Thrift / Vintage Store	Basketball Court
5	2	Podilskyi District	Tree	Food & Drink Shop	Park	Pizza Place	Wine Shop	Eastern European Restaurant	Gym	Grocery Store	Furniture / Home Store	Forest
6	2	Shevchenkivskyi District	Electronics Store	Auto Dealership	Photography Studio	Gym / Fitness Center	Halal Restaurant	Film Studio	Turkish Restaurant	Hookah Bar	Karaoke Bar	Falafel Restaurant
7	2	Solomianskyi District	Pharmacy	Salon / Barbershop	Plaza	Fast Food Restaurant	Italian Restaurant	Kids Store	Middle Eastern Restaurant	Music Venue	Park	Creperie
8	1	Sviatoshynskyi District	Gym / Fitness Center	Forest	Café	Dance Studio	Wine Shop	Electronics Store	Gym	Grocery Store	Furniture / Home Store	Food Truck

```
Kyiv_merged= Kyivdistricts_df
Kyiv_merged = Kyiv_merged.join(districts_venues_sorted.set_index('District'), on='District English')

Kyiv_merged.head(11) # check the last columns!
```

DATA MODDELING



DATA VISUALIZATION

RESULT

- **The following are the highlights of the 5 clusters above:**
- Hotels are clearly located only in Cluster 4 (Holosiivskyi District), which makes the choice of the final location very easy, in case investors does want to reduce risks.
- As for restaurants, bars and coffe shops are very popular in the Centr of Kyiv -Pecherskyi District, Shevchenkivskyi District, Podilskyi District.
- Although, the Clusters have variations, a very visible presence is the predominance of different bars and restaurants, which is typically for any Kyiv city.

RESULT

- Generally, as we could see on Cluster map - Cluster 2 are present definatly in the city center. And it could say that probably Districts: Pecherskiy, Shevchenkivskyi, Podilskyi -are prefered for new hotel, couse in there are many other places for touristers(bars, restaurants etc). But Holosiivskyi District more preferable for tourists that like more nature (parks, forests etc)

Discussion and Conclusion

- It is noticable that Clusters 2 and 4 is the most viable clusters to build a new luxury hotel with guarantees. The proximity to a big number of Restaurants (lunch and dinner venues for guests), Coffee shops and other amenities and accessibility to station are also very important points to take into account when making the right choice. This clusters has 4 districts (Pecherskiy, Shevchenkivskyi, Podilskyi and Holosiivskyi).
- This project would have had better results if there were more available data in terms of actual land pricing data within the area, public transportantion access and allowance of more venues exploration with the Foursquare (limited venues for free calls).
- In conclusion, the scope of this of the analysis is somewhat limited. The hospitality industry is ever changing, and the information afforded us may be dated due to relying on user information via Foursquare. Overall though, the model created can easily be replicated again and again with monitored data via the Foursquare API and the data from the forthcoming census in 2021. With the data analyzed and scoring system established by the investors, we stand by the recommendations made.

COME AND VISIT KYIV!

IVAN SOLOVIOV