



Best locations to set up tourist E-Scooter stations in Paris

Capstone Project

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Presentation outline

- Introduction and Business problem
- Data preparation
- Methodology
- Results & Discussions

Introduction

- Tourism is a major source of income in Paris
- Modern tourism: personalized experience - tourists discover the city in the own plan and pace.
- Electronic scooter (E-Scooter) is an excellent choice for personal sight-seeing



Business problem

- Identify the best locations to set up a series of 5 E-Scooter stations in Paris.
- The stations should cover as many tourist attractions as possible.
- There are many “hidden gems” that makes up the charm of Paris but are never captured in guide books.





Data preparation

Data sources

- List of tourist attractions in Paris using FourSquare venue recommendation API
- Number of likes and user rating from FourSquare venue details API





Data preparation

Data collection

- Collected a list of **250** points of interests within a radius of 10km from the city center of Paris, all having user likes and rating.

	id	name	categories	address	city	country	distance	no_of_likes	rating
0	4bf41231e5eba59334341f90	Place de l'Hôtel de Ville – Esplanade de la Li...	Plaza	Place de l'Hôtel de Ville	Paris	France	60	578.0	9.1
1	4adcda09f964a520e83321e3	Cathédrale Notre-Dame de Paris	Church	6 place du parvis Notre-Dame	Paris	France	413	8513.0	9.4
2	4b5c7d1ff964a5205f3229e3	Tour Saint-Jacques	Historic Site	88 rue de Rivoli	Paris	France	248	272.0	8.6
3	4adcda0af964a520623421e3	Centre Pompidou – Musée National d'Art Moderne	Art Museum	Place Georges Pompidou	Paris	France	458	5322.0	9.1
4	4adcda0af964a520353421e3	Sainte-Chapelle	Church	8 boulevard du Palais	Paris	France	496	583.0	9.1
5	4bae535af964a520f5a23be3	Maison Européenne de la Photographie	Art Museum	5 rue de Fourcy	Paris	France	569	358.0	9.0
6	4cca7e73c4d06dcbb72d6303	Fontaine Stravinsky	Fountain	Place Stravinsky	Paris	France	330	103.0	8.5
7	4dbd336b6a23e294ba405cfa	Square de la Tour Saint-Jacques	Park	88 rue de Rivoli	Paris	France	245	41.0	8.4
8	4b8ebd9df964a5203c3433e3	Théâtre du Châtelet	Theater	1 place du Châtelet	Paris	France	404	228.0	8.6
9	4adcda15f964a520a13721e3	Théâtre de la Ville	Theater	2 place du Châtelet	Paris	France	271	76.0	8.4

Methodology

Data analysis approach

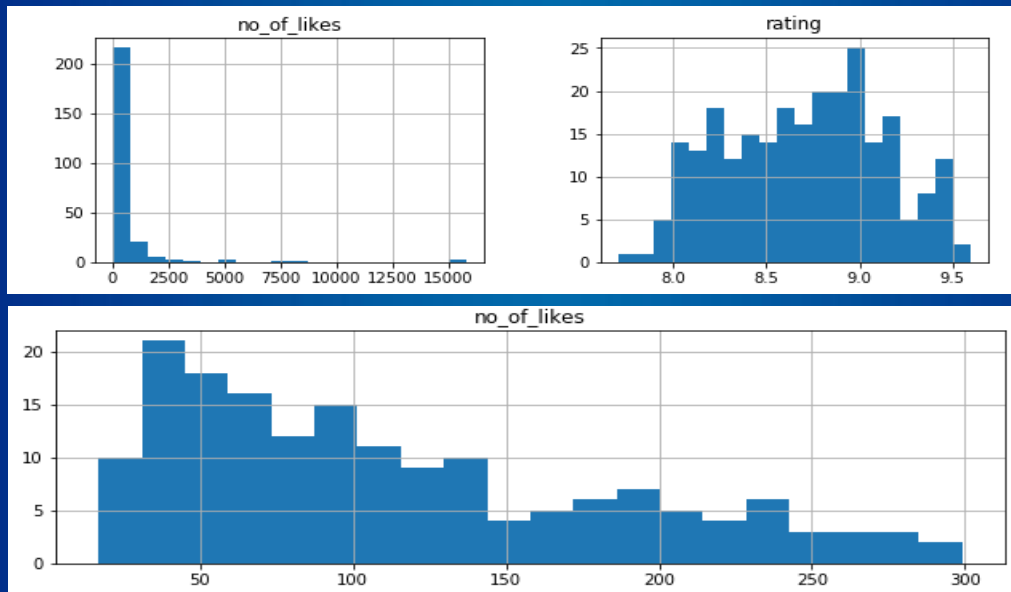
1. Define minimum threshold for *number of likes* and *rating*. Filter out venues below the threshold
2. Run K-Means clustering algorithm with $k=5$. Centroids of these clusters are the best locations to set up E-Scooter stations.
3. Reverse geocoding to translate coordinates of the 5 centroids into physical addresses.



Methodology

Define thresholds to filter the list of venues

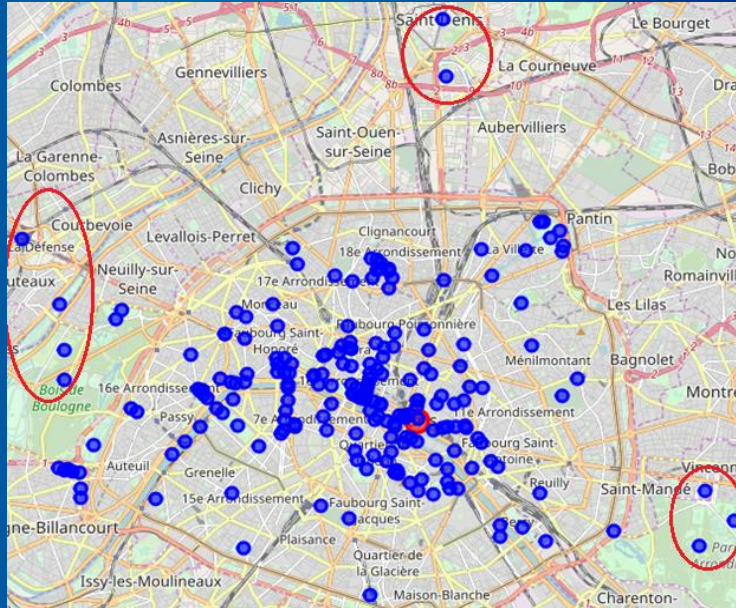
- Used histogram to decide: **number of likes** ≥ 50 and **user rating** ≥ 8.0



Methodology

Outliers detection and removal (1/2)

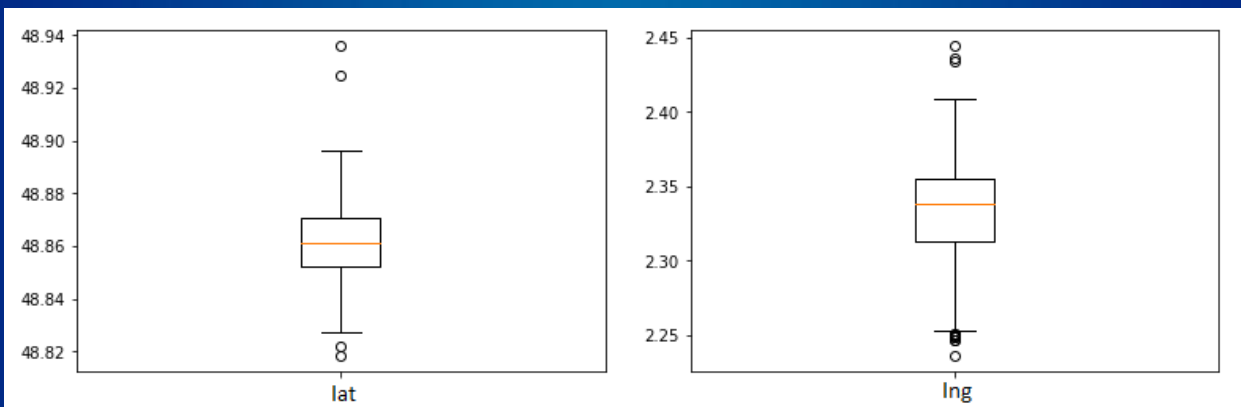
- Some venues are significantly isolated. E-Scooter stations covering these venues are not economically efficient



Methodology

Outliers detection and removal (2/2)

- Draw box plots of lat, lng with default whisker length = 1.5 IQR
- Venues falling out of upper and lower whiskers are outliers
- **195/209** venues remains



Methodology

K-Means clustering

- **Algorithm** : K-Means with $K = 5$
- **Input** : 195 venues scattered 10km from Paris center
- **Features** : coordinates (latitude, longitude) of venues
- **Output** : 5 cluster centroids

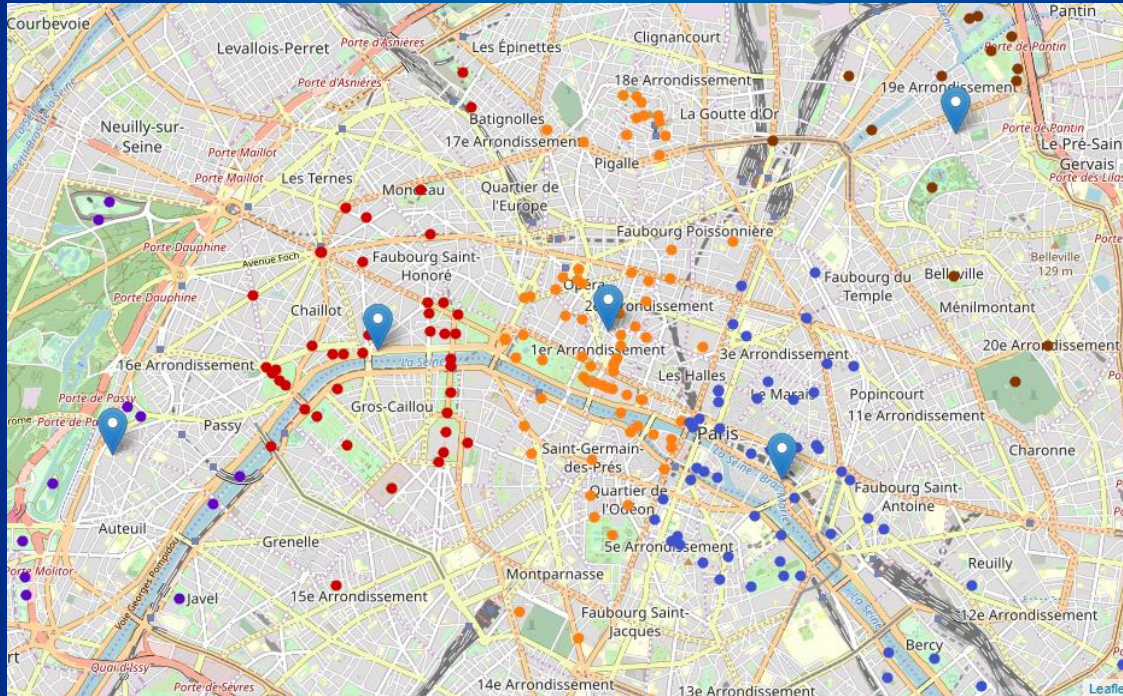
	id	name	clusterLabel	categories	city	country	no_of_likes	rating
0	4bf41231e5eba59334341f90	Place de l'Hôtel de Ville – Esplanade de la Li...	1	Plaza	Paris	France	579.0	9.1
1	4adcda09f964a520e83321e3	Cathédrale Notre-Dame de Paris	1	Church	Paris	France	8518.0	9.4
2	4b5c7d1ff964a5205f3229e3	Tour Saint-Jacques	1	Historic Site	Paris	France	272.0	8.7
3	4adcda0af964a520623421e3	Centre Pompidou – Musée National d'Art Moderne	1	Art Museum	Paris	France	5325.0	9.2
4	4adcda0af964a520353421e3	Sainte-Chapelle	1	Church	Paris	France	585.0	9.1
6	4cca7e73c4d06dcbb72d6303	Fontaine Stravinsky	1	Fountain	Paris	France	103.0	8.5
7	4b8ebd9df964a5203c3433e3	Théâtre du Châtelet	1	Theater	Paris	France	228.0	8.6



Results & Discussions

Visualization of five clusters

Centroids are visualized as placemarkers



Results & Discussions

Reverse geocoding centroid locations

- Coordinates of the 5 cluster centroids

```
centroids = kmeans.cluster_centers_  
centroids  
  
array([[48.85022711,  2.36611467],  
       [48.86425525,  2.33842997],  
       [48.85450928,  2.26530539],  
       [48.88482816,  2.3852195 ],  
       [48.86413735,  2.30325019]])
```

- Reverse geocoding to translate these coordinates to physical addresses



Results & Discussions

Recommendations

E-Scooter stations should be set up at the following 5 addresses:

1. 14 Rue Crillon, 75004 Paris, France
2. 13 Rue de Valois, 75001 Paris, France
3. 18 Rue du Docteur Blanche, 75016 Paris, France
4. 10 Rue André Danjon, 75019 Paris, France
5. 51 Cours Albert 1er, 75008 Paris, France





Thank you!