Joint Analysis of geospatial and “friendship” of Gowalla data

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Outline

Data Presentation

- Gowalla and Google Places

Data processing

Understanding the data

Prediction methodology

KNN-G cross validation

KNN-G results for Gowalla

Conclusions

Outline

Figure 1. Overview of the steps constituting the KDD process

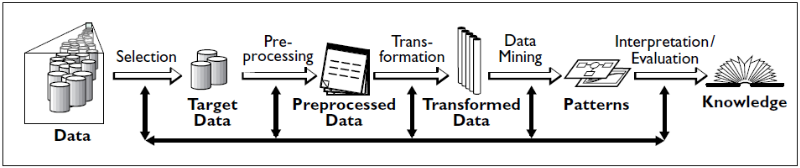


Figure 1: General pipeline

From: ***Data iku***
https://blog.dataiku.com/2016/07/06/fundamental-steps-data-project-success

Data Presentation 1/2

keypoints Gowalla-Stanfor data:

- undirected social network graph database [clean]
- selected fields: user, check-in timestamp and position, spot, user friendship links
- from 02/2009 to 10/2010
- $\sim$6 Million check-ins and $>$100000 single users
- Multiple cities in US and include Paris (turistic)
- Paris data: 17496 check-ins (1 year data from 09/2009)

Data Presentation 2/2

keypoints Google Places

- Web Service API that returns JSON objects (used only `nearbysearch`)
- Not 100% clean
- Limited to 1000 queries/day: batch and optimization of queries
- more info at http://developers.google.com/plaes/webservice/search

other sources:

- OpenstreetMap webservice to get geographical features (JSON objects)

Data processing 1/2

Gowalla

- selected ***users*** and check-in ***positions*** around 30km Paris
- Data is clean and in csv format
- 17496 check-ins, 1366 users

Google

- Selected all unique locations (4178) in Gowalla-Paris and requesting around 100m in Google Places
- Request all types of venues: hotels, monuments, shops, etc
- 30286 points of interest, 23074 after data cleaning
- extracted: ***locations***, ***place-ids***, ***names*** and ***types***
- each ***location*** contains different ***types***, ***types*** were cleaned and projected from binary feature space with $d = 128$

Data processing 2/2

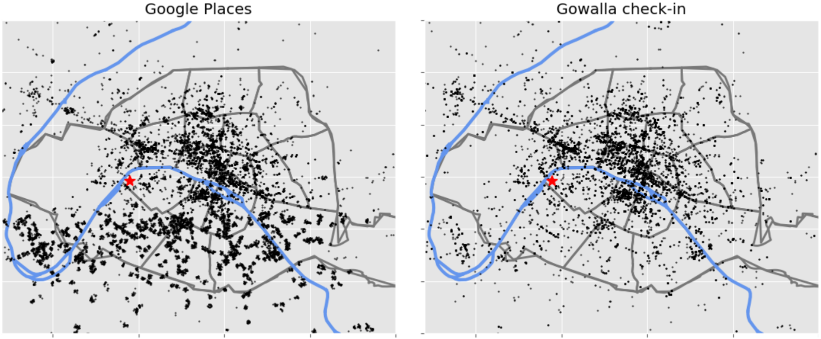
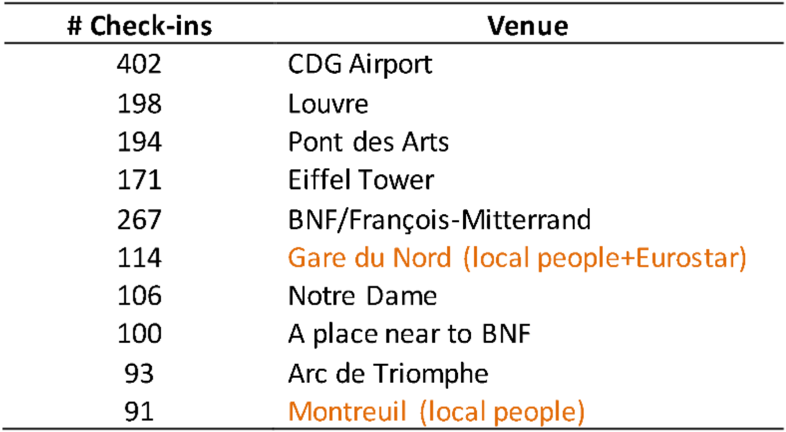


Figure 2: Map of selected Gowalla and Google data

Understanding the data 1/2



# Check-ins	Venue
402	CDG Airport
198	Louvre
194	Pont des Arts
171	Eiffel Tower
267	BNF/François-Mitterrand
114	Gare du Nord (local people+Eurostar)
106	Notre Dame
100	A place near to BNF
93	Arc de Triomphe
91	Montreuil (local people)

Figure 3: Top 10 Places in Paris from Gowalla/Google data

Understanding the data 2/2

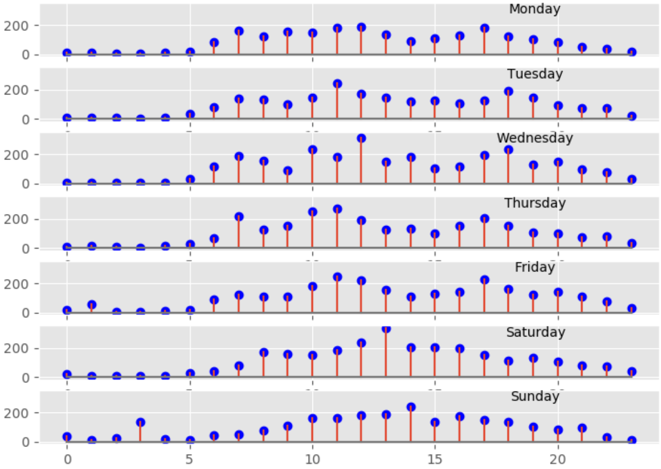


Figure 4: Temporal distribution of Gowalla check-ins in Paris

Feature Engeniering 1/2

Tools

- Web-fetching and data preprocesing and cleaning, with ****nix***: bash, wget, awk, seed. +Efficient & -Work for the size of databases (<1G data)
- Data analysis with python/C++:
  - data management with pandas
  - ML with scikit-learn and FAISS
  - data analysis with scikit and networkx
  - visualization with matplotlib and networkx
- General project versioning with git (https://github.com/jubenjum/dssp5-proj)

Feature Engeniering 2/2

Features

Gowalla data → Google Places types

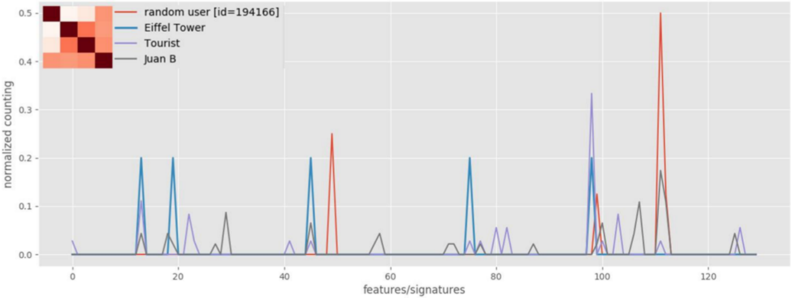
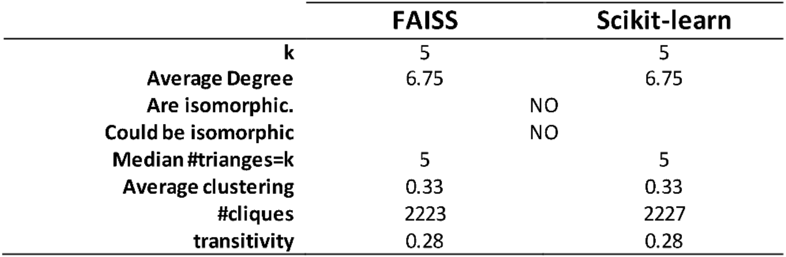


Figure 5: Spot signature; Eiffel Tower (blue), random user (red), λ-tourist (violet) and me (gray)

Signature ∼ people preferences

KNN-G cross validation

Objective: cross validation of FAISS and scikit-learn KNN-graph on CPU using Gowalla-Paris data

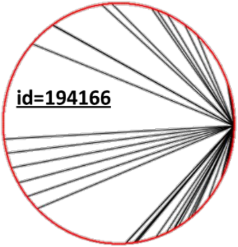


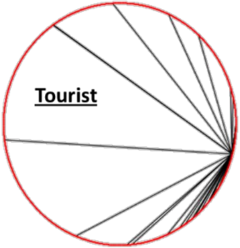
	FAISS	Scikit-learn
k	5	5
Average Degree	6.75	6.75
Are isomorphic.	NO	
Could be isomorphic	NO	
Median #trianges=k	5	5
Average clustering	0.33	0.33
#cliques	2223	2227
transitivity	0.28	0.28

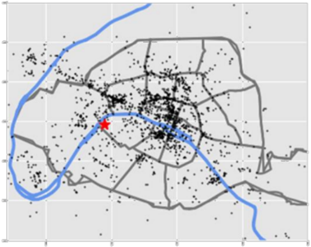
Figure 6: Summary results from networkx on FAISS and scikit-learn

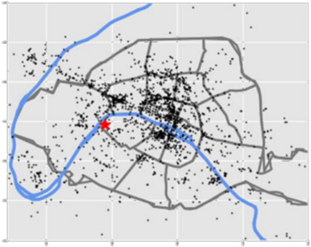
KNN-G results for Gowalla

- **K=50** friends using L2 similarty metric






Selection for user 194166


Selection for turist

Conclusions & Future work

- It does exist patterns in check-ins in time and location
- It is possilbe to build a recommendation system that learns from the patterns of check-ins
- It could be interesting to test different hyper-parameter and different metrics (cosine)
- Explore the GPU capabilities of FAISS