



Using Location-Based Social Media for Ranking Individual Familiarity with Places

A Case Study with Foursquare Check-in Data

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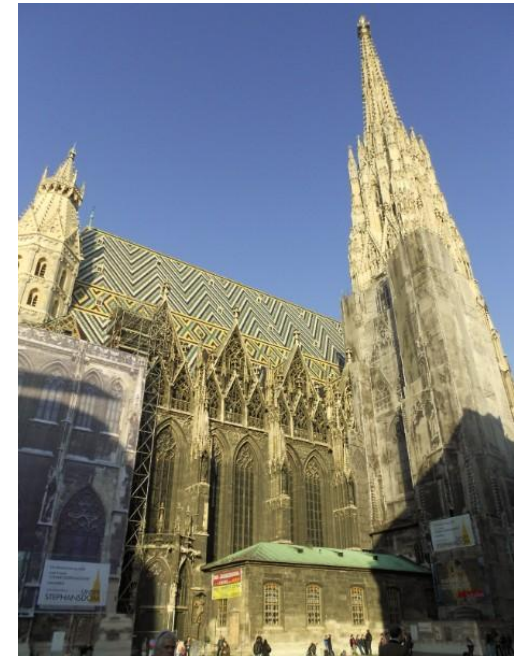
Outline

- **Introduction and research objective**
- **Methodology**
 - Identifying individually meaningful places
 - Ranking individual familiarity with places
- **Conclusions and future work**

1. Introduction and research objective

1.1 Introduction

- **Meaningful place**
 - A place that is associated with certain activities and meanings
- **Individual familiarity with a place**
 - How familiar is a place to an individual
 - Can be inferred as visiting frequency, the extensity and intensity of the experiences
- Location-based services adapted to individual priori spatial knowledge



1.2 Research objective

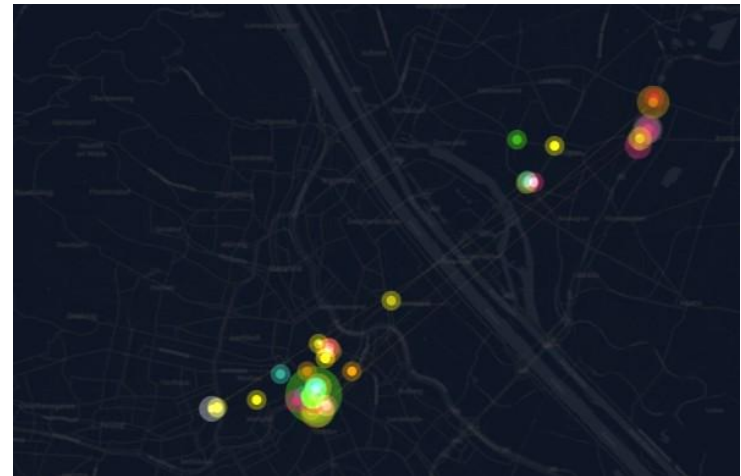
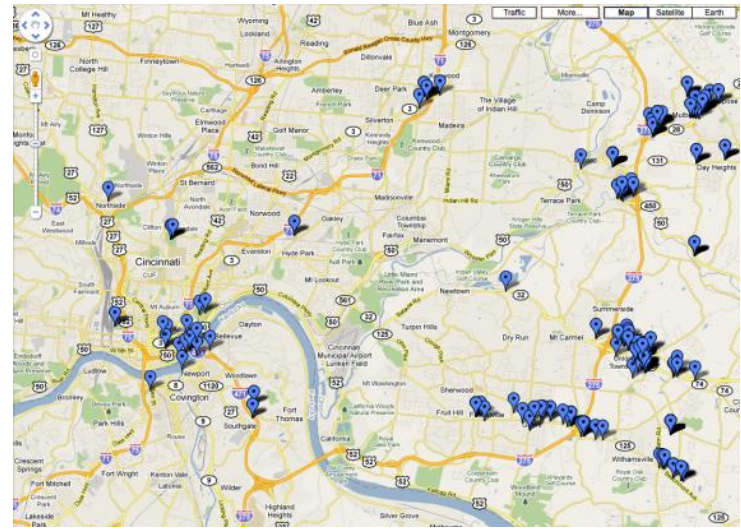
- **This research aims at ranking individual familiarity with places using Foursquare check-in data.**
 - Identifying individually meaningful places
 - Ranking individual familiarity with places

2. Identification of individually meaningful places:

comparison of existing clustering algorithms

2.1 Methodology

- Clustering user's check-ins to find out potential personal meaningful places
- Comparison of existing clustering algorithms
 - SLINK
 - K-means
 - DBSCAN
 - EM algorithm for Gaussian mixture model



2.2 Evaluation

- **Study design:**
 - 12 participants
 - Users' check-in histories
 - Their provided meaningful places lists , each place is a cluster of check-ins
- **Evaluation metrics:**
 - Precision, recall, tolerance factor and F1-score

2.3 Results

Algorithm	Precision	Recall	Tolerance Factor	F1-score	Precision + Tolerance Factor
SLINK	0.516	0.647	0.281	0.574	0.797
K-means	0.672	0.441	0.134	0.533	0.806
DBSCAN	0.631	0.520	0.286	0.570	0.917
EM	0.537	0.353	0.119	0.426	0.656

- The algorithms' performances vary on different data sets, i.e., different distribution of the data points
- In general, DBSCAN balanced the best among the four algorithms.

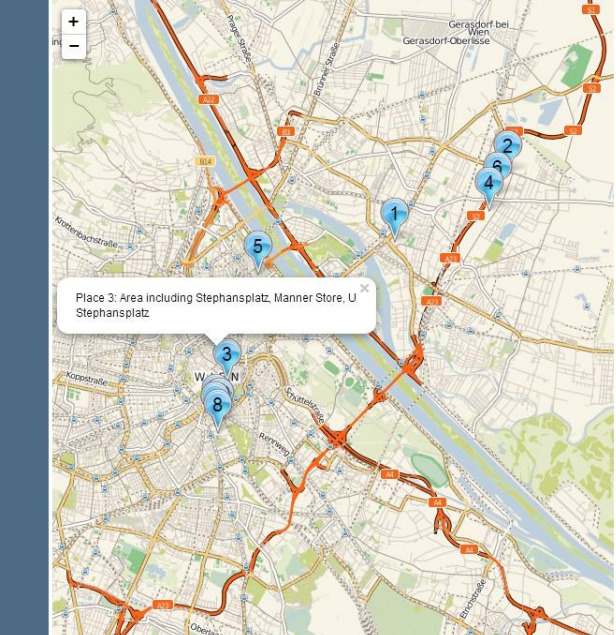
3. Ranking individual familiarity with places

3.1 Methodology

- Influencing factors of the familiarity with a place: visiting frequency, the extensity and intensity of the experiences
- **Frequency:** Foursquare check-ins
- **Extensity:** impractical to estimate
- **Intensity :** weight each check-in by user's tagging activities ("shout", "photos" and "like")
 - Each check-in has an initial weighting of 1;
 - "shout", "photos" and "like" inside a check-in item each weights 1;
 - The weighting of a check-in is at least 1 and can sum up to at most 4.
- Ranking the discovered places according to their weightings

3.2 Evaluation

- **Study design:**
 - 23 participants
 - User's ranking of the discovered places
 - Comparison with random rankings
- **Evaluation metrics**
 - Spearman's rank correlation coefficient (ρ)
 - Paired t-test

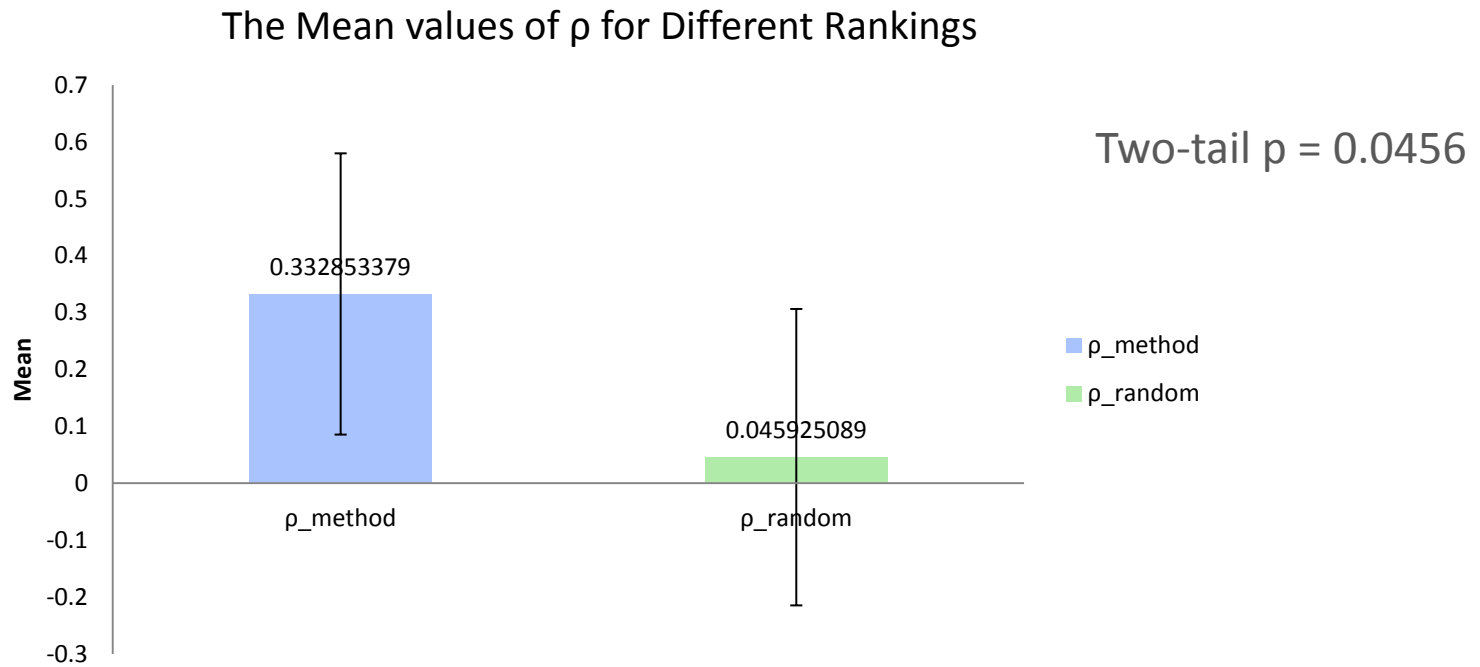


Discovered Places

Based on your Foursquare checkin history, the following places(areas) are discovered. The place numbers are randomly assigned and are corresponding to the marker numbers on the map.

- Place 1:** Area including **Donauzentrum (26A, 93A, N25)** (Austria) , **Starbucks Kiosk im Donauzentrum** (Wagramer Straße 81, 1200, Wien, Austria)
- Place 2:** Area including **Rautenweg** (Austria)
- Place 3:** Area including **Stephansplatz** (Stephansplatz, 1010, Vienna, Austria) , **Manner Store** (Stephansplatz, Wien, Austria) , **U Stephansplatz** (Stephanspl., 1010, Wien, Austria)
- Place 4:** Area including **MERKUR Ihr Markt** (Zwerchackerweg 20 - 24, 1220, Wien, Austria)
- Place 5:** Area including **S Traisengasse** (Traisengasse, 1200, Wien, Austria)
- Place 6:** Area including **IKEA** (Sverigestr. 1a, 1220, Wien, Austria) , **IKEA Restaurant** (IKEA, Sverigestraße 1a, 1220, Wien, Austria)
- Place 7:** Area including **TU Wien Mensa** (Wiedner Hauptstr. 8-10, TU Wien Freihaus, 1040, Wien, Austria) , **TU Wien Freihaus** (Wiedner Hauptstraße 8-10, 1040, Wien, Austria) , **Universitätsbibliothek der Technischen Universität Wien** (Resselgasse 4, TU Wien, 1040, Wien, Austria) , ...
- Place 8:** Area including **Erzherzog-Johann-Platz** (Erzherzog-Johann-Platz, 1040, Wien, Austria) , **Fachschaft Geodäsie** (Austria) , **TU Wien Neues EI** (Gusshausstraße 24-29, 1040, Wien, Austria)

3.3 Results



- **Able to rank individual familiarity with places**
- **Positive association, but not strong**
 - Simple weighting scheme: differentiated weightings for tagging activities, different intensities of a same tagging activity
 - Limitation of Foursquare API: combination of different location-based social media

4. Conclusion and future work

- **Using location-based social media is able to rank individual familiarity with places.**
- **Refining the weighting scheme**
 - A deeper insight on the influencing factors of human familiarity with places
 - Natural Language Processing on the text descriptions
 - Training set and validation set
- **Combination of different location-based social media**
- **A categorization of individual importance instead of a ranking**
- ...

Thank you very much for your attention!