PITAGORA: Recommending Users and Local Experts in an Airport Social Network

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The Social Network

PITAGORA is a mobile web contextual social network designed to be used in the check-in area of an airport. It provides **recommendation** of **potential friends**, **local experts** and **targeted services**.

PITAGORA has been developed as a mobile web application. The goal of the application is to improve passengers experience providing an enhanced people recommender **by exploiting situational information**.

Recommendations are mainly constituted by suggestions of other users who share the same interests. Users are also provided with a recommendation of local experts, present at the airport, on the basis of their flight destination.

In the check-in area of an airport people have the opportunity to get in touch with other people.

Usually, passengers are in airports for **business** or **leisure** and it has been demonstrated that they are more open to social interactions than usual.

Recommendation systems can be improved taking into account motivations and needs of users temporary co-located in the same place.

In the case of an airport check-in area, for example, the **passenger's destination** and **the reason of the travel** (professional or not) can be essential infos **to improve general-purpose recommenders**.

Data Analysis and Users' Recommendation

Users are profiled analysing data extracted from **Facebook** and **LinkedIn** accounts. When the user logs into the system the following **data** are **extracted**:
a) demographic infos, connections, level of education, job history (Facebook and LinkedIn);
b) page 'likes', photo albums (Facebook)
c) groups and companies followed (LinkedIn).

Profiles are described as **vectors of pages** on which users have expressed a 'like' and groups or companies followed.

A **co-occurrence matrix** is used **to infer additional possible resources of interests**.
Users' recommendation is then achieved with a standard user-based algorithm considering the distribution of user's interests and computing a **nearest-N users' neighbourhood** with the Euclidean distance.

Local Experts Recommendation

Local experts are identified analysing social media extracted from **Facebook**. In particular, user travels and location history are computed using geo-tagged pictures: travels are identified considering **photos and photo albums metadata**, **birthplaces** and **places of residence** and exploited to produce **destination-based recommendations**.

Count of city visits, **social media analysis**, **user activity in the social network** and **cities' correlation** are used to estimate the **user travel experience per city**.

The **travel experience** E of the user considers the number of travels in cities

$$E_n = E_{n-1} \cdot V \cdot V^T$$

The **correlation between two cities** is expressed as **U'** represents the group of users who has visited both c_i and c_j, $\mathbf{e_k}$ is the component of **E** relative to the user u_k. The weight factor **α**, with $0 < \alpha \leq 1$ is defined taking into account the Euclidean distance between latitude and longitude of the two cities.

$$CORR(c_i, c_j) = \sum_{u_k \in U'} \alpha * e_k$$

The **level of experience** of a user u for a given city c is defined using also $\mathbf{n_k}$ as the number of visits of the user u in the city c_k. $\mathbf{p_k}$ is the number of geo-tagged photos that the user has published in c_k on Facebook

$$exp_{u,c} = \sum_{k=0}^{|C|} (1 + p_k) * n_k * CORR(c, c_k)$$

User Interface and evaluation

The user interface is composed by two main views: 1) a **search view** and a 2) **browsing view**.

At the first access the user is provided with an autosuggest search input which allows to identify his/her own flight.

Once the user has selected the flight, the interface proposes a **sliding menu based panel** organised in several sections:

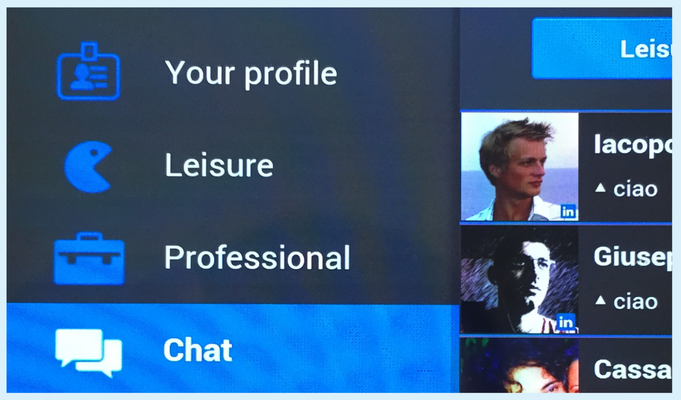
1) profile: it displays flight infos, allows to login with both Facebook and LinkedIn and provides recommendation of destination-based local experts;

2) leisure: it provides recommendation of users considering Facebook data;

3) professional: it provides recommendation of users considering LinkedIn data;

4) chat: it allows to chat in realtime;

5) search flight: it can be used to go back to the search view.



The proposed users' recommendation system is based on the ranking of user similarities and can be seen as an **information retrieval system**, considering a user as a query term.

To evaluate the relevance of the recommendations the **normalised Cumulative Discounted Gain** (nDCG) measure has been used.

Relevance scores are computed comparing the list of recommended users with the ideal list given by the user.

The **ground truth** has been collected asking 150 users to express a relevance score (on a 0 to 3 scale) for the first J people suggested by the system. In this experiment, a logarithm with base 2 is used to ensure all positions are discounted.

The **nDCG** for the top-J item results in values of 0.767 with j=5 and 0.872 for j=10.

Watch the demo video of the PITAGORA Social Network online