



Evolution of personal online social networks: new techniques and comparisons

Keywords:

Social networks, data mining, frequent itemsets, personal (ego-centric) networks

Supervisors:

- Claudia Marinica, ETIS lab, MIDI team, Claudia.Marinica@u-cergy.fr
<https://perso-etis.ensea.fr//marinica/>

Description:

Nowadays, Online Social Networks (OSNs) allow to the users to be in direct contact, to exchange information, messages, etc.; these networks evolve with the evolution of the life of the users. Moreover, a social network can be seen as a group of several smaller networks centered around one individual. These small networks are called Online Personal Networks (OPNs) [1], because they are composed of a central individual (the ego) and several additional individuals (called the alters) that are connected to the ego directly or indirectly.

Moreover, the OPNs (as classical OSNs) evolve over time, but, given that their study is very recent, it is still not clear if their evolution is comparable to the one of OSNs. In the last studies that we conducted in [2], we analyzed the evolution of collaboration networks (such as DBLP - <https://dblp.uni-trier.de/xml/>) by analyzing the evolution of the values of several metrics. Currently, we are proposing a specific evolution model.

This internship deals with two issues: (1) the study of the OPNs by using other techniques in order to compare and validate the results obtained in our previous studies, and (2) make available to the community the tools developed so far.

The first issue concerns the use of data mining techniques in order to assess the evolution of OPNs. Indeed, a specific representation of a social network at a time t could allow to extract a set of information like "if a network has 2 new nodes at time t , then it also has the tendency to have 2 new nodes in time $t+1$ ". In this context, several challenges can be outlined, such as the choice of the data mining technique and the modelling of the data in order to apply the chosen technique. These challenges are clearly related, and several techniques can be used, depending on the expected result.

The second issue concerns the development of a tool for the analyses of the evolution of OPNs selected from an OSN. This tool would be used by the experts studying a specific OSN and who would like to understand how the OPNs from the OSN evolve over the time. In this part, existing developments (produced during an ongoing PhD) can/should be used and should be completed by the propositions made during the internship.



e-mail : sec.etis@ensea.fr - www-etis.ensea.fr

• Site principal : ETIS - ENSEA, 6 avenue du Ponceau, 95014 Cergy-Pontoise Cedex - France
Tél : 33 1 30 13 66 10 - Fax : 33 1 30 73 66 27

• Site St Martin : ETIS - UCP St Martin I, 2 rue Adolphe Chauvin, 95302
Cergy-Pontoise, Cedex France

Tél : 33 1 34 25 66 33 - Fax : 33 1 34 25 28 39





Objectives:

In the last years, a set of studies on the analysis of social networks was dedicated to the understanding of their evolution over time. These works tried to develop generative models for big networks reproducing the properties of real networks, like the scale free networks (where the degrees follow a power law), the high clustering coefficient, and low shortest path (known as small-world phenomenon [3]).

Nevertheless, the studies related to the evolution of personal networks and quite limited. For example, some of the works tried to understand if the personal online networks are comparable to the offline ones studied in sociology [5]; these works focused on the evolution of each level of alters in a personal network by using the conclusions from the studies on cognitive charge of an individual [4].

Even if these conclusions are important and that they can be used in order to modify the evolution of these types of relations, they do not allow to understand the evolution of the structure of a personal network. In [2], we propose a methodology to study the evolution of personal networks based on the evolution of a set of metrics.

This internship had two objectives:

1/ The first one is to propose a new methodology for the analysis of the evolution of OPNs which will allow us to compare the results already obtained in our previous studies. The new methodology will integrate data mining techniques. We propose here to use the frequent pattern mining technique because it allows us to detect frequent pattern of the evolution of OPNs. In this context, a state of the art should be done, but also a study in order to chose a specific pattern among the different existing patterns: transactional, sequential, graph, etc.

2/ The second one concerns the development of an online tool accessible by the community and the experts. Mainly the tool should:

- Display the OSN;
- Select the ego and other parameters allowing to extract one or several OPNs;
- Display the OPNs;
- Select the metric to compute on the chosen OPNs;
- Display the value of the metrics of OPNs;
- Display the result of the data mining technique;
- Compare the two previous results.

References :

[1] S. Djemili, C. Marinica, M. Malek, D. Kotzinos (2016). A Definitions' Framework for Personal/Egocentric Online Social Networks. 7ème conférence sur les modèles et l'analyse des réseaux: Approches mathématiques et informatiques (MARAMI'16).

[2] Sarah Djemili, Claudia Marinica, Maria Malek, Dimitris Kotzinos. Personal Networks of Scientific Collaborators: A Large Scale Experimental Analysis of Their Evolution. Information Search, Integration, and



e-mail : sec.etis@ensea.fr - www-etis.ensea.fr

• Site principal : ETIS - ENSEA, 6 avenue du Ponceau, 95014 Cergy-Pontoise Cedex - France
Tél : 33 1 30 13 66 10 - Fax : 33 1 30 73 66 27

• Site St Martin : ETIS - UCP St Martin I, 2 rue Adolphe Chauvin, 95302 Cergy-Pontoise, Cedex France

Tél : 33 1 34 25 66 33 - Fax : 33 1 34 25 28 39



Personalization. Communications in Computer and Information Science., 760, Springer, Cham, 2017.

[3] Travers, Jeffrey and Milgram, Stanley. The small world problem. Psychology Today. pages: 61-67. 1967.

[4] Arnaboldi, Valerio and Conti, Marco and Passarella, Andrea and Dunbar, Robin. Dynamics of personal social relationships in online social networks: a study on twitter. Proceedings of the first ACM conference on Online social networks. pages: 15-26, 2013.

[5] Sutcliffe, Alistair and Dunbar, Robin and Binder, Jens and Arrow, Holly. Relationships and the social brain: integrating psychological and evolutionary perspectives. British journal of psychology. pages: 149-168. 2012.



e-mail : sec.etis@ensea.fr - www-etis.ensea.fr

• Site principal : ETIS - ENSEA, 6 avenue du Ponceau, 95014 Cergy-Pontoise Cedex - France
Tél : 33 1 30 13 66 10 - Fax : 33 1 30 73 66 27

• Site St Martin : ETIS - UCP St Martin I, 2 rue Adolphe Chauvin, 95302 Cergy-Pontoise, Cedex France

Tél : 33 1 34 25 66 33 - Fax : 33 1 34 25 28 39