

Project Topics

Below is a list of possible project topics. Some of these are open-ended, meaning that you are required to come up with a new algorithm or model, and formulate it yourselves. Such projects may require more effort, but they will be also graded based on the effort, as well as the final result. Others are more straight-forward, you would need to obtain a complex dataset and apply algorithms on this dataset. There are also more theoretical projects, and more practical ones, so you can pick depending on your preference.

You will also have to present in class one paper related with you project. The list below includes the paper for each project.

Papers also vary in difficulty and scope. For experimental papers, that just report results of experimental studies, we expect that you just present and explain the main findings. Since such papers require less effort, you will be asked to present 2 such papers.

You also need to create a web page for the project (including the final report and dataset used).

Projects should be done **in teams of at most two** students.

Deliverables and Timeline:

- *Week before Christmas vacations*
 - A two-page project proposal outlining what you plan to do. This should include the topic (and papers) of your presentation
 - A 15' presentation of the project proposal
 - First version of the web page (include the link in the project proposal)
- *Week after Christmas vacations*
 - A 20' presentation of 1-2 research papers related to your project (presentations tentatively scheduled for 11/1)
- *End of January*
 - The source code of your project
 - A final report describing your project (the report needs to follow a specific format)
 - Final version of the web page

Topic 1

Team formation with negative links

Project:

Extend the model and algorithms for team formation described in class to the case of negative edges. Implement and test them.

Paper:

Mehdi Kargar, Aijun An: Discovering top-k teams of experts with/without a leader in social networks. CIKM 2011: 985-994

Topic 2

Fairness-aware team formation

Project:

Consider that one or more protected attributes (e.g., sex, race) is associated with each individual and that the decision whether a particular individual will be a member of the team should not be affected by the value of these attributes. Provide a definition of fair team formation. This is a research-oriented project, so, you will need to be creative. For example, you may consider individual fairness and ask that two individuals with similar skills should have similar probabilities of being selected as members of the team. Another alternative would be group- or, parity-based fairness in which case we ask that each group is proportionally represented in the team.

Paper:

Anirban Majumder, Samik Datta, K. V. M. Naidu: Capacitated team formation problem on social networks. KDD 2012: 1005-1013

Topic 3

Identifying communities in evolving networks

Project:

Most real work networks evolve over time. The goal of this project is to detect communities in such network. You will also test your algorithms using graph snapshots of the DBLP dataset; where each snapshot will correspond to co-authorships within one year.

Paper:

Derek Greene, Dónal Doyle, Padraig Cunningham: Tracking the Evolution of Communities in Dynamic Social Networks. ASONAM 2010: 176-183

Or

Chayant Tantipathananandh, Tanya Y. Berger-Wolf, David Kempe: A framework for community identification in dynamic social networks. KDD 2007: 717-726

Topic 4

Recommending tags for influence maximization

Project:

Often tags (or, keywords) are associated with resources (such as articles, photos, or posts). A basic criterion for selecting tags is their relevance to the resource. In this project, you will investigate another aspect. Given a set of m tags, an estimation of their relevance to the resource and the corresponding tag diffusion network, select the $k < m$ tags that would maximize the diffusion of the resource.

Paper:

Eriko Otsuka, Scott A. Wallace, David Chiu, A hashtag recommendation system for twitter data streams, Computational Social Networks, 2016

The following papers may also be useful:

Eriko Otsuka, Scott A. Wallace, David Chiu, Design and Evaluation of a Twitter Hashtag Recommendation System. IDEAS 2014

F. Godin, V. Slavkovicj, W. De Neve, B. Schrauwen, R. Van de Walle. Using Topic Models for Twitter Hashtag Recommendation. WWW Companion Volume 2013

Topic 5

Virus immunization in evolving networks

Project:

Consider a virus propagation in a network, and assume that we want to block it by immunizing some nodes. Now what happens is the network is evolving over time. We need to decide not only who to immunize but also when to immunize them. Study this problem, propose algorithms, and perform experiments.

Paper:

Jure Leskovec, Andreas Krause, Carlos Guestrin, Christos Faloutsos, Jeanne M. VanBriesen, Natalie S. Glance: Cost-effective outbreak detection in networks. KDD 2007: 420-42

This paper may also be useful:

Hanghang Tong, B. Aditya Prakash, Tina Eliassi-Rad, Michalis Faloutsos, Christos Faloutsos: Gelling, and melting, large graphs by edge manipulation. CIKM 2012: 245-254

Topic 6

Diversity in social networks

Project:

There is a concern that due to homophily, users in social network are exposed only to homogeneous opinions and content thus creating echo chambers. A recent study (E Bakshy, S Messing, LA Adamic, Exposure to ideologically diverse news and opinion on Facebook, Science 348 (6239), 1130-1132) measures this phenomenon in Facebook. For this project, you are asked to create and implement a similar small-scale experiment using data collected from another social network, e.g., Twitter.

Paper:

Kiran Garimella, Gianmarco De Francisci Morales, Aristides Gionis, Michael Mathioudakis: Quantifying Controversy in Social Media. WSDM 2016: 33-42

This paper may also be useful:

Pedro Henrique Calais Guerra, Wagner Meira Jr., Claire Cardie, Robert Kleinberg: A Measure of Polarization on Social Media Networks Based on Community Boundaries. ICWSM 2013

Topic 7

Troll vulnerability

Project:

Trolling is an important problem in social media. There are techniques for detecting trolls, but less about detecting the trolls' candidate targets. Propose algorithms for identifying primarily users, but also posts that are likely to become troll targets. Use Slashdot for the evaluation.

Paper:

Justin Cheng, Cristian Danescu-Niculescu-Mizil, Jure Leskovec. Antisocial Behavior in Online Discussion Communities. ICWSM 2015: 61-70

The following paper is also very related:

P. Tsantaliotis, E. Pitoura, P. Tsaparas, Troll Vulnerability in Online Social Networks. International Conference on Advances in Social Networks Analysis and Mining (ASONAM), 2016

Topic 8

Community detection using random walks

Project:

The goal of this project is to experiment with an algorithm that performs community detection using random walks. The algorithm is similar to K-means, it iteratively finds a "center" and the best partition around it. You should implement it and compare with other algorithms.

Paper:

Usha Nandini Raghavan, Reka Albert, Soundar Kumara, Near linear time algorithm to detect community structures in large-scale networks. *Physical Review E* 76, 2007.

Topic 9

Comparing Social and Behavioral ties

Project:

The goal is to study whether behaviorally similar users, or socially close users are more useful in predicting user preferences. Using data from Yelp challenge compare purely social recommendation algorithms, and collaborative filtering recommendation algorithms. Try to understand if there is any differentiation depending on the category or type of venues.

Paper:

N. Mishra, D. Romero, P. Tsaparas, Estimating the Relative Utility of Networks for Predicting User Activities. *ACM International Conference on Information and Knowledge Management (CIKM)*, October 2013.

The following paper may also be useful:

A Bellogín, I Cantador, F Díez, P Castells, E Chavarriaga, An empirical comparison of social, collaborative filtering, and hybrid recommenders. *ACM Transactions on Intelligent Systems and Technology (TIST)* 4 (1), 14

Topic 10

Another option is to suggest a project of your own, based on what you have seen in the class so far, questions you may have thought of, and things that are related to your research area. In this case you should create a project proposal (initially just a paragraph or an idea) and contact us to discuss it.