Dynamic Network Analytics:^{*}

Tutorial Outline

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ABSTRACT

Network analytics are widely used in many fields. Increasingly though, the networks of interest are high dimensional. Rather than just focusing on the traditional who is interaction with whom networks, modern network analysis examines the who, what, where, when and why ecology of relations. For example, studies of organizations might look at the social network within the organization as well as the task assignment and knowledge network. Studies using Twitter frequently look at the mentions network at the same time as the hashtag network. Making network science actionable typically involves answering questions about where the network is concentrated or how the network varies over time. This tutorial will cover the basics of Network analytics and demonstrate the use of ORA to support social media analytics using high dimensional network analytics and visualization for social media networks, semantic networks, geo-spatial networks, and dynamic networks. It will cover the basics of visualizing and analyzing time varying networks and spatially positioned networks.

ORA is a powerful network analysis and visualization tool (Carley, 2017). ORA supports the assessment of standard social network data, organizational network data, high-dimensional network data, meta-network data, geo-spatial network data, and dynamic network data.

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CCS CONCEPTS

- Security and privacy → Human and societal aspects of security and privacy
- Networks → Social media networks
- Networks → Online social networks
- Theory of computation → Dynamic graph algorithms

KEYWORDS

Social Networks; Social Media; Dynamic Network Analysis; ORA; Network Visualization

1 Description

This Tutorial consists of a lecture and a hands-on workshop in which attendees learn about network science and the ORA toolkit. Using ORA the attendees will learn how to import, export, visualize, and assess network data. Attention will be focused on processing Twitter, Blogs and YouTube data. Network analytics for content will be discussed. Topic group detection approaches will be presented. Participants will be given with a thorough demonstration of software features used to create a sample network and analyze it. Sample data sets will be available.

This Tutorial session begins with an overview of network analytics, ORA, and techniques for entering, visualizing, and analyzing social and meta-network (high dimensional) data. Special features for handling node attributes are presented. Key node identification, clustering, spatio-temporal analytics and visualization, social media analytic, and semantic networks are then

covered. Visual analytics for placing networks on 2D and 3D maps, networks as trails, trails on maps, time stepping through networks will be considered. Special unique features of ORA such as trail visualization, multi-mode network assessment, two mode metrics, import/export options will be discussed.

2 Who Should Attend?

Those who are interested in assessing social media data, networks derived from texts, groups, organizations or community interaction, or networks with a geo-spatial or dynamic aspect, should attend this workshop. The material and its delivery is suitable for researchers and practitioners, alike. This is designed to be a non-technical workshop, however, by its very nature, the material will involve some mathematics, although this will be minimized as the delivery is driven towards forming an understanding of the concepts, not mastery of the details.

3 Topics Include:

The following topics will be addressed in this tutorial:

- Social Network Analysis
- Dynamic Network Analysis
- Comparing and contrasting networks
- Weighted networks
- Analyzing Social Media data
- Key entity analysis
- Groups, Topic Groups and Community Detection
- Visual analytics
- ORA software
 - Data management, Visualization, Grouping algorithms, Reporting

4 Computer Equipment:

All attendees will be given a trial version of ORA-PRO and de-identified data sets. In addition, the student version of ORA, ORA-LITE (which is only available for PCs), can be downloaded from here:

<http://www.casos.cs.cmu.edu/projects/ora/>

The professional version of ORA, ORA-PRO (which is available for the PC or the mac) is available here: <http://netanomics.com/ora-pro/>

Participants should bring their own laptops to workshop. The software will be screen-projected to the group as a live walk-through demonstration. Participants will be provided with data through a web link. All participants will also be given a SBP-BRiMS 2018 discount on purchasing a non-trial version of the professional version of ORA which is available for both MAC's and PCs.

5 Maximum Number of Attendees

Unlimited.

SUGGESTED READINGS

- [1] Kathleen M. Carley, 2017, "ORA: A Toolkit for Dynamic Network Analysis and Visualization." In Reda Alhajj and Jon Rokne (Eds.) *Encyclopedia of Social Network Analysis and Mining*, Springer. DOI:10.1007/978-1-4614-7163-9_309-1
- [2] Geoffrey P Morgan, Joel Levine and Kathleen M. Carley, 2017, "Socio-Cultural Cognitive Mapping." In *Proceedings of the International Conference Social Computing, Behavioral-Cultural Modeling and Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS 2017)*; pp. 71-76, Dongwon Lee, YuRu Lin, Robert Thompson and Nathaniel Osgood (Eds.) July 5-8, 2017 Washington DC, Springer.
- [3] L. Richard Carley and Kathleen M. Carley, 2012, "Use of Social Network Analysis to Improve Wireless Data Distribution," vol. 5, *Journal of Sociology and Social Anthropology*.
- [4] Kathleen M. Carley, Ju-Sung Lee, Geoffrey P. Morgan, 2014, *Dynamic Network Analysis of the NAS and the Impact of NextGen*, School of Computer Science, Institute for Software Research, Technical Report CMU-ISR-14-110.