

# Towards Explainable Complex Network Analysis

Spyroula Masiala and Martin Atzmueller

Tilburg University, Department of Cognitive Science and Artificial Intelligence,  
Warandelaan 2, 5037 AB Tilburg, The Netherlands  
{s.masiala,m.atzmuller}@uvt.nl

## Abstract

Over the past decades, the study of complex interaction networks has emerged as a prominent research direction. Examples of complex networks include interactions through social media, co-authorships between researchers and connections of smart devices [5]. Social network analysis is concerned with mining structures and patterns in these novel and complex networks [6]. Moreover, with the emergence of Internet of Things as well as ubiquitous devices, we have access to multi-modal social interaction datasets which can be modeled as networks. The analysis and mining of social interaction patterns and their dynamics, e.g., [1] is an important task. In particular, it also requires appropriate explanation-aware techniques e.g. for increasing the acceptance of the patterns and their evaluation [4]. The large resulting set of interesting patterns that the user needs to assess, for example, requires further exploration and interpretation [2].

We outline and discuss concepts of explicative data mining in the context of complex network analysis, relating to different kinds and goals of explanations [7,4]. Moreover, we present explanation examples on social interaction networks [3] and we conclude with first results on the explainable analysis of a real-world social interaction network in the context of a student career day.

## References

1. Atzmueller, M.: Data Mining on Social Interaction Networks. *Journal of Data Mining and Digital Humanities* **1** (June 2014)
2. Atzmueller, M.: Onto Explicative Data Mining: Exploratory, Interpretable and Explainable Analysis. In: *Proc. Dutch-Belgian Database Day*. TU Eindhoven (2017)
3. Atzmueller, M.: Compositional Subgroup Discovery on Attributed Social Interaction Networks. In: *Proc. Discovery Science*. Springer, Heidelberg, Germany (2018)
4. Atzmueller, M., Roth-Berghofer, T.: The Mining and Analysis Continuum of Explaining Uncovered. In: Bramer, M., Petridis, M., Hopgood, A. (eds.) *Research and Development in Intelligent Systems XXVII*. pp. 273–278. Springer London (2011)
5. Du, Z., Hu, L., Fu, X., Liu, Y.: Scalable and Explainable Friend Recommendation in Campus Social Network System. In: *Frontier and Future Development of Information Technology in Medicine and Education*. pp. 457–466. Springer (2014)
6. Lewis, T.G.: *Network Science: Theory and Applications*. John Wiley & Sons, Hoboken (2009)
7. Sormo, F., Cassens, J., Aamodt, A.: Explanation in Case-Based Reasoning Perspectives and Goals. *Artif Intell Rev* **24**(2), 109–143 (Oct 2005)

*Preprint of: Spyroula Masiala and Martin Atzmueller (2018) Towards Explainable Complex Network Analysis. In: Proc. Dutch Belgian Database Day (DBDBD) 2018, Hasselt, Belgium*