

**PhD research topic proposal**  
**BME, Doctoral School of Mathematics and Computer Science**

**Name and degree of supervisor :**

Roland Molontay, PhD

**Are you willing to supervise Stipendium Hungaricum applicants?**

Yes

**Title of the topic:**

**Data science and network science algorithms for solving social science problems**

**Short description:**

Data science has enabled researchers to harness large volumes of social data, facilitating the analysis of complex human behaviors, societal dynamics, and interactions at unprecedented scales. Through network analysis, researchers can uncover underlying patterns within social networks, such as information flow, influence propagation, and the formation of social clusters, enabling a deeper comprehension of social phenomena and the dynamics of social relationships.

The aim of the PhD program is to research and develop interpretable machine learning, network science, and other data-intensive solutions that can effectively address significant social science problems. During the program, the PhD student would work with various social datasets, such as student data (e.g., Neptun), research data (e.g., MTMT, OpenAlex), and social media data (e.g., Twitter, Reddit).

The research can be extended in various directions based on the candidate's interests and experience. For instance, it may involve the analysis of university instructors' teaching and research profiles using econometric methods, the development of network science algorithms for identifying citation cartels, or gaining a better understanding of the diffusion of memes on social media using interpretable machine learning and network science tools.

**Requirements:** An MSc degree in (applied) mathematics, physics, or computer science with a solid background in graph theory, algorithms, probability, statistics and machine learning. Strong programming skills (preferably in Python and/or R) are needed. Prior experience with complex networks and interpretable machine learning is an advantage.

**Contact:**

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**Place of work:**

Human and Social Data Science Lab, Department of Stochastics, Institute of Mathematics, BME