



Network Science Institute
at Northeastern University
London



Discipline: Network Science
Northeastern University London Fully Funded PhD Scholarship

Network and data science to model the behaviour of complex systems of human and non-human social animals

Northeastern University London > Network Science

Deadline: 1 April 2024

Funded PhD Project (UK or International Students)

Funding provider: Northeastern University London (NU London)

Subject areas: Complex Systems, Network Science, Data Science, Computational Social Science, Animal Behaviour, Social Networks

Project start date: 1 October 2024

Supervisors (*lead):

- [Iacopo Iacopini](#)* (Network Science Institute, Northeastern University London)
- [Christoph Riedl](#) (Network Science Institute, Northeastern University)
- [Eleni Matechou](#) (University of Kent)

Aligned programme of study: PhD in Network Science

Mode of study: Full-time

About the Network Science Institute (NetSI)

In 2023, [NetSI established a new institute hub](#) in London, UK at Northeastern University London. The new NetSI in London was created to advance research, education, and innovation centred around network science. The hub in London will also facilitate the development and growth of collaborations and partnerships within the UK and across Europe and US. The London hub, along with others in the US, is part of the NetSI Global program which is dedicated to engaging and integrating regional network science communities and partnering with regional talent, institutions, ecosystems of innovation.

The PhD student, even though based in London, will be a member of the Network Science



Network Science Institute
at Northeastern University
London



Institute (NetSI), which has offices in Boston MA, Portland MA, and London UK. NetSI, founded in 2014, has emerged as a world leader of multidisciplinary research communities in the field of network science. NetSI brings together expertise from diverse disciplines, from the physical, information, and social sciences, with the goal to build and expand common, synthesising methodology and theory of networks, and to apply these tools to important societal challenges.

The successful doctoral student will be connected to NetSI's vibrant community, with dozens of externally funded research programs, diverse faculty, and a uniquely skilled pool of fellow doctoral students and postdoctoral researchers across the global network.

About Northeastern University London

As part of a major investment, Northeastern University London (NU London) has multiple, fully-funded PhD studentships available to accelerate its interdisciplinary research in the humanities, social sciences, and computing, maths, engineering and natural sciences. Each scholarship is fully-funded for three and a half years (UKRI rates) and includes full course fees, an annual stipend (including an additional London allowance) and associated costs, such as training.

NU London is both a UK university governed by UK higher education regulations, and the European campus of Northeastern University – a large, top-tier research intensive, Boston-based institution. Founded in 1898, Northeastern University is known for its high-impact research, aimed at solving problems across the globe. Interdisciplinarity, experiential learning, and connection to partners beyond academia are at the heart of the Northeastern University ethos. Northeastern received \$230.7m of external research funding in 2022, and is the recognized leader in experience-driven lifelong learning. It has campuses across the United States and Canada (in Boston; Charlotte, North Carolina; Portland, Maine; Oakland, California; San Francisco; Seattle; Silicon Valley; Arlington, Virginia; the Massachusetts communities of Burlington and Nahant; Toronto and Vancouver). Whilst the PhD will be a UK qualification, students will have the opportunity to engage with and visit the Northeastern University network overseas as part of their London-based doctoral studies, providing a truly unique and highly sought-after dimension to their research training.

The Project

Social interactions are the building blocks of our society as humans —and animals in general— communicate and gather in close social circles. Complex networks provide a powerful tool to represent and model these complex evolving social structures given their capacity to encode the fundamental interaction patterns among individuals at different



Network Science Institute
at Northeastern University
London



scales. Recently, group interactions have been at the forefront of network science research and non-pairwise representations [1] provided new routes to the emergence of—at times unexpected— macroscopic phenomena [2,3].

The project will help bridge the gap between these recent theoretical advances in foundational network science and applications in computational social sciences and animal behaviour. Building on the latest developments in higher-order network representations and leveraging the increasing availability of large-scale longitudinal data sources, we will test the impact of individual and group dynamics on processes that take place on the evolving social structures, with a particular focus on the dynamics of adoption, synchronisation, coordination, teamwork, and discovery [4,5]. We will rely on a wide set of both existing empirical data and ad-hoc data collection experiments that involve human and non-human animals (online discussions, collaborative tasks, co-authorship, communication records, GPS traces, proximity and face-to-face data) to link mechanisms at the level of groups with emergent collective behaviours. Examples could include group formation and evolution [6], or coordination [7], but the candidate will have the opportunity to shape the project and proactively contribute to its development according to their background and personal interests.

The investigated topics are strictly related to contemporary societal issues and challenges [8]: social contagion, norm emergence, misinformation, team efficiency and performance. Spanning from data collection and analysis to modelling, the project will be intrinsically multidisciplinary and will heavily rely on methods coming from sociophysics, network science, data, and behavioural sciences. Supported by a network of international collaborators and world leading experts, the candidate will have the opportunity to develop a diverse set of skills and participate in truly interdisciplinary collaborations.

[1] [Battiston F., et al. *Physics Reports* \(2020\)](#), [2] [Iacopini I. et al. *Nature Communications* \(2019\)](#), [3] [Skardal P.S. et al. *Communications Physics* \(2020\)](#), [4] [Iacopini I. et al. *Physical Review Letters* \(2020\)](#), [5] [Iacopini I. et al. *Frontiers in Physics* \(2021\)](#), [6] [Iacopini I. et al. *Arxiv 2306.09967* \(2023\)](#), [7] [Iacopini I. et al. *Arxiv 2309.03783* \(2023\)](#), [8] [Iacopini I. et al. *Communications Physics* \(2022\)](#)

The ideal candidate has:

- MSc (or equivalent) in Complex Systems, Networks, Data Science, Computational Social Science, Theoretical or Applied Physics, Mathematics, Statistics, Computer Science, or related subjects.
- Strong modelling, computational, and code development skills.
- Familiarity with complex systems and network science concepts. Experience with dynamical processes, statistical mechanics, machine learning, or topological data



Network Science Institute
at Northeastern University
London



analysis is an asset, as well as previous experience in the design of controlled experiments or animal behaviour.

- Good programming skills in at least one of the following languages: Python, Julia, R, Rust, C++, Matlab.
- Fluency in English, both spoken and written.
- Highly collaborative spirit, personal initiative, and genuine interest in interdisciplinary teamwork.
- Excellent personal and good communication skills.
- An inquiring mind and the desire to challenge themselves.

The successful candidates will benefit from a brand-new campus on the banks of the River Thames next to Tower Bridge. This is an interdisciplinary, vibrant research environment with international collaboration and networking opportunities and dedicated research space. It will form the hub of a highly experienced, multi-institution supervisory team from NU London, Northeastern University and the University of Kent. In addition, successful candidates will benefit from the unique connection to the wider Northeastern University network in North America, providing a range of additional research opportunities and learning resources.

Shortlisted candidates will be interviewed in April 2024. Candidates are welcome to contact the NU London supervisor with informal enquiries before the application deadline:

iacopo.iacopini@nulondon.ac.uk

Eligibility

- Bachelor's degree in a relevant subject - 2:1 or 1st (essential)
- Master's degree in a relevant subject (strongly recommended)

English Language requirements:

If applicable – IELTS 7 overall (with a score of at least 6.5 in each individual component) or equivalent.

Nationality

Applications are open to UK and international students. Please indicate if you are likely to require a visa on your application. We are unable to support visa costs.

Funding

This scholarship covers the full cost of tuition fees and provides an annual stipend (set at UKRI rates) with an additional London allowance, for 3.5 years. For the 2024/2025 academic year the total annual stipend is £21,237. Annual increments will be in line with UKRI rates.

International travel



Students will have the opportunity to optionally travel to Northeastern University in North America to further their research training and experience.

How to Apply

Please send a CV and a Covering Letter stating how you meet the requirements and why you are interested in the proposed research project by clicking on [this link](#). Please reference your application “**PHDGD0224**”