



Ph.D. Position – Call for Applications

Title: Robust graph representation learning and applications in misinformation detection

Supervising team:

- Thomas Bonald¹, Professor (Data, Intelligence and Graphs team, Télécom Paris, Institut Polytechnique de Paris)
- Fragkiskos Malliaros², Assistant Professor (Centre for Visual Computing, Inria OPIS team, CentraleSupélec, Université Paris-Saclay)

Keywords: Machine learning, graph mining, graph representation learning, graph neural networks, misinformation detection

Overview of the Ph.D. topic

Graph data appear in almost all disciplines. Developing machine learning algorithms for graphs is a crucial task, with a plethora of interdisciplinary applications. As a prominent paradigm, graph representation learning aims to embed nodes in a low-dimensional space, preserving the structural properties of the network. Nevertheless, this is a challenging task for various reasons that are mainly related to the large scale, complex structure, and inherent noise of graphs appearing in real-life applications. To address such challenges, the goal of the proposed Ph.D. project aims to design robust graph representation learning models. Capitalizing on the methodological outcomes, we will pursue the quest to address the challenging task of misinformation detection in social media.

On the methodological side, the main objective of the Ph.D. project is to propose a denoising framework for robust graph representation learning, focusing on Graph Neural Networks (GNNs). The framework will be based on a novel combination of graph diffusion and simplification processes that will first enhance the structure of the graph, towards alleviating the effect of noisy (or missing) links, but at the same time will limit the training time of the GNN model towards being able to scale to large graphs. We aim to study both unsupervised and supervised variants of the proposed framework.

On the application side, we aim to leverage the proposed GNN models to deal with the task of misinformation detection in social media. We will study propagation-based misinformation detection algorithms, exploiting knowledge about news content, influence among users, and the dynamics of information cascades.

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Candidate profile

- M.Sc. (M2) degree in Engineering, Computer Science, Applied Mathematics, or a related discipline, with a strong background in machine learning, natural language processing, graph theory, and probability theory.
- The candidate should also be interested to explore machine learning methods on graph-structured data and their real-world applications.
- Excellent programming skills in Python.
- Fluent written and verbal communication skills in English.

Environment and conditions

The Ph.D. student will be enrolled in the Doctoral School of the Institut Polytechnique de Paris. The thesis work will be conducted at the Inria OPIS team, CentraleSupélec, Université Paris-Saclay and at the Data, Intelligence and Graphs team, Télécom Paris, Institut Polytechnique de Paris. Both institutions are located at the Plateau de Saclay, about 45 minutes south of Paris by public transport.

The Ph.D. position will be funded by a DigiCosme Ph.D. grant for a duration of 3 years. The starting date of the Ph.D. is estimated to be in Fall 2021 (no later than December 2021). There is also the possibility of a research internship before starting the Ph.D.

How to apply

Please send your application material (pdf format) by email to Fragkiskos Malliaros (fragkiskos.malliaros@centralesupelec.fr) and Thomas Bonald (thomas.bonald@telecom-paris.fr) with subject: "DigiCosme PhD Application - Your First and Last Name", including the following:

- Full CV (including education, work experience, personal code repository (e.g., GitHub or Bitbucket), publications).
- A motivation letter (max 1 page).
- Transcript of records.
- (Optional but recommended) Name and contact information of up to two references (the actual recommendation letters will be requested afterward).

Also, please **submit your application to the official website** of the Doctoral School (ADUM): https://www.adum.fr/as/ed/voirproposition.pl?langue=&site=TelecomPT&matricule_prop=37433

The applications will be reviewed as they are received, until the position is filled. For any further information, please contact the supervising team.

Useful links

- Inria OPIS team: <https://opis-inria.eu/>
- CentraleSupélec: <https://www.centralesupelec.fr/>
- Data, Intelligence and Graphs team: <https://dig.telecom-paris.fr/blog>
- Télécom Paris: <https://www.telecom-paris.fr/>