IMT Atlantique Bretagne-Pays de la Loire École Mines-Télécom **Location: Brest**	**Post-doctoral position – 22 months** **Motif detection in temporal networks** **Applications to Learning Analytics and Online Media Consumption**

LABORATORY DESCRIPTION

The candidate will be recruited by IMT Atlantique in the DECIDE research team, part of the Lab-STICC (CNRS UMR 6285) where researchers work on Social Dynamics. The Lab-STICC brings together more than 500 researchers and federates all the ICT activities in Brittany, France.

RESEARCH OBJECTIVES

While static analysis of social networks is now commonplace and provides information on how communities structure themselves (influence detection, community detection), the dynamics of interactions are still under development. We propose here to study the dynamics of the evolution of these networks by focusing on the detection of motifs on temporal networks. The temporal networks considered can be networks of interactions between individuals or networks of community evolution. Particular attention will be given to the interpretation of these temporal motifs in the context of two application projects, one on the theme of "Learning Analytics", the other on the theme of "Plurality of online information".

This research is supported by Carnot TSN "Digital 2019" and includes a section on the theme of "Learning Analytics" and its explanation. This is an exploratory study whose objective is to produce Learning Analytics that will support learners and teachers in changing their practices. The aim will be to explore the influence of social interactions. We will focus on interactions between learners (or between groups of learners) in order to detect motifs of interaction [1] to qualify how learners help each other and how this mutual support influences learning. At a meta level we will also be able to focus on the evolution of communities of learners [2,3], and on evolution motifs that inform teachers about the overall dynamics of a class.

This research is also supported by the French National Research Agency and the Project "Plurality of Online Information" (PIL) [6] whose objective is to study the ambivalent effects of economic and social transformations caused by digital technology on the quality and pluralism of information. The aim here is to study the dynamics of online social interactions from the point of view of the consumer. In interaction with researchers from natural language processing and sociology fields, you will model a temporal network to look for motifs that allow, for example, the detection of echo chamber phenomena in the sharing of information on social media such as YouTube or Twitter.

MISSIONS

The candidate's missions will be as follows:
- State of the art in the detection of temporal motifs in interaction networks
- An implementation of the detection of interaction motifs
- The correlation of these motifs with business indicators that depend on the application context

The candidate will contribute to the analysis tasks and more precisely the detection of temporal motifs in the data. In Learning Analytics, datasets are learning data from MOOCs [4] and a tool based on mutual assistance and mutual validation of skills [5]. For the social media analysis, datasets are comments on media videos on YouTube and messages on Twitter (e.g. CNN channel).

In each of the application cases, the candidate will have to interpret the results in order to make the link with the knowledge of the fields concerned and interact with a pluridisciplinary team where Economists,

Sociologists or practionners in education study collective phenomena emerging from the interactions of individuals.

TRAINING AND SKILLS

Candidates should have a Ph.D. in computer science as well as evidence of conducting research aligned with the projects' interests. Applicants should have a track record of publishing in the areas of complex network science. Applications should have strong research experience with machine learning, handling large datasets, and Python development. Ideally, candidates have experience in motif detection in temporal networks.

APPOINTMENT

Salary statement: Salary will be commensurate with experience from 2528 € gross/monthly

Appointment status: The position is a full-time appointment (100%) for an initial period of 12 months. Start date will be March 1, 2019.

APPLICATION PROCESS

Application process: To apply for this position, please send your cover letter, CV, up to three related publications, and the name and contact information for three references to Laurent Brisson (laurent.brisson@imt-atlantique.fr) and Cécile Bothorel (cecile.bothorel@imt-atlantique.fr).

Applications will be reviewed on a rolling basis.

Close date for applications: February 14th, 2019

BIBLIOGRAPHY

[1] Paranjape, A., Benson, A. R., & Leskovec, J. (2017, February). Motifs in temporal networks. In Proceedings of the Tenth ACM International Conference on Web Search and Data Mining (pp. 601-610). ACM.

[2] Peixoto, T. P., & Rosvall, M. (2017). Modelling sequences and temporal networks with dynamic community structures. Nature communications, 8(1), 582.

[3] Aggarwal C. & Subbian K. (2014). Evolutionary Network Analysis: A Survey. ACM Comput. Surv. 47, 1, Article 10 (May 2014), 36 pages. DOI: https://doi.org/10.1145/2601412

[4] Gilliot J.M. Bruillard É. (2017), Éditorial du numéro spécial Recherches actuelles sur les MOOC, Revue STICEF, Volume 24, numéro 2, 2017, DOI:10.23709/sticef.24.2.0, ISSN : 1764-7223,

[5] Ruffieux P. (2017), Validation mutuelle des compétences dans une institution de formation d'enseignants, Distances et médiations des savoirs [En ligne], consulté le 20 décembre 2018. URL : http://journals.openedition.org/dms/2044

[6] http://www.anr-pil.org ; http://www.agence-nationale-recherche.fr/Project-ANR-17-CE27-0010