Postdoctoral position

Keywords: Network Science, Dynamic networks, Link Streams, Complex Systems, Cryptocurrencies

With whom: Rémy Cazabet (http://cazabetremy.fr), in the Data Mining and Machine Learning team (https://projet.liris.cnrs.fr/dm2l/#HOME)
Where: At *Claude Bernard University Lyon 1*, in the *LIRIS* Laboratory, **Lyon, France**
Duration: (up to) 2 years
When: Start between October 2023 and January 2024
How much: 1864-2400€/month net salary (depending on experience, duration. Negotiable)
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Topic:
STABLENET: From link streams to stable dynamic networks
Link streams [1] are dynamic networks in which edges are triplets (u, v, t), each representing an interaction located in time between two nodes. Many datasets are naturally available in that form, in particular data coming from human interactions: emails, instant messages, physical proximity, economic transactions, etc.
Most tools of network science are not directly applicable to temporal networks in this form, because the network does not exist in a conventional form at any particular time. The usual way to deal with this problem consists in choosing an aggregation window –with or without overlap, and transforming the network into a sequence of static graphs, often called snapshots. This process suffers from several weaknesses, from the loss of the temporality inside each snapshot to the lack of principled methods to choose an appropriate time window [3]. The objective of this project is instead to develop methods to transform the link stream data into a dynamic network of stable relations [5], i.e., a network in which, at any time *t*, one can observe a conventional static graph, on which usual network analysis tools can be applied.
The problem can be tackled from various perspectives according to the background and interests of the candidates. It relates for instance to problems of information compression [4,7], link prediction [6], and backbone extraction [2].
An application case for the project is to apply those methods to a large network with hundreds of millions of interactions: the network of transactions between entities in cryptocurrencies.

Candidate:
The candidate should have a Ph.D., and prior experience in working in network science/graph theory/network analysis.

Scientific expectations and conditions:
The candidate is welcome to bring their own research questions, to devote time to international collaborations, to scientific organizations, etc. The postdoc will have access to the team budget to hire and supervise grad student interns, attend conferences and summer schools, etc.

Relevant references

[1] Latapy, M., Viard, T., & Magnien, C. (2018). Stream graphs and link streams for the modeling of interactions over time. *Social Network Analysis and Mining*, *8*, 1-29.
[2] Kobayashi, T., Takaguchi, T., & Barrat, A. (2019). The structured backbone of temporal social ties. *Nature communications*, *10*(1), 220.
[3] Chiappori, A., & **Cazabet, R**. (2022). Quantitative evaluation of snapshot graphs for the analysis of temporal networks. In *Complex Networks & Their Applications*. Springer International Publishing.
[4] **Cazabet, R**. (2021). Data compression to choose a proper dynamic network representation. In *Complex Networks & Their Applications IX*. Springer International Publishing.
[5] **Cazabet, R**., Boudebza, S., & Rossetti, G. (2020). Evaluating community detection algorithms for progressively evolving graphs. *Journal of Complex Networks*, *8*(6), cnaa027.
[6] Mensi, F., **Cazabet, R**., & Furno, A. (2020). Traffic speed prediction in the Lyon area using DCRNN. In *Marami 2020*(Vol. 2750).
[7] Duvivier, L., **Cazabet, R.,** & Robardet, C. (2023). Graph model selection by edge probability prequential inference. *Journal of Complex Networks*, *11*(3), cnad011.