Post-doctoral position (M/F) on statistical models for sparse hypergraphs at Sorbonne Université (Jussieu Campus, Paris).

Offer: A one-year post-doctoral research contract (12 to 15 months) is open at the Laboratoire de Probabilités, Statistique & Modélisation (LPSM, UMR 8001, Sorbonne Université, Université Paris Cité and CNRS) in the Stochastics and Biology group (SGB). SBG gathers probabilists and statisticians of the LPSM interested in mathematical problems inspired by biology and/or applying mathematics to biological problems. The position will be supervised by Dr. Catherine Matias, in Paris.

The selected candidate will be responsible for the development of new statistical models for density-sparse hypergraphs.

Context: Higher-order interactions have recently received increased attention, as a mounting body of evidence shows that taking these structures into account can enhance our modeling capacities and help us understand and predict the dynamical behavior of complex systems. In this line, hypergraphs provide the most general formalization of high-order interactions. As a consequence, modelling random hypergraphs is a current important challenge. Some probabilistic models have started to emerge. However, the main bottleneck lies in the computational complexity of the induced algorithms. Indeed, while networks methods concentrate on pairwise interactions, hypergraph modelling requires to handle size-m interactions (the size is the number of nodes involved in the interaction), inducing an exponential increase in computation times. In this context, it is crucial to rely on an important property of real-world hypergraphs: they are density sparse; more precisely they contain few hyperedges of large size.

The selected candidate will contribute to the development of computationally efficient parameter estimation and eventually node clustering algorithms in density-sparse hypergraphs, relying on new dedicated statistical models. He/she will be responsible for software development, data analysis and scientific dissemination of results (writing scientific papers in English, participation in international meetings and conferences).

Profile of the candidate: The candidate should:
- hold a PhD in mathematics and/or statistics and/or computer science,
- have knowledge in the modeling of interaction data, for e.g. through graphs
- be an expert in software developments in an efficient language (e.g. C/C++)
- be fluent in English (written and spoken)
- be interested in multidisciplinary projects, for e.g. in the analysis of interaction data coming from Ecology
- demonstrate autonomy, rigor, critical thinking, and ability to integrate into an international team.

The successful candidate will join the Stochastics and Biology group (SGB) and will also work in close contact to the Statistics, data and algorithms (SDA) group in LPSM. The LPSM lab provides an excellent intellectual environment and infrastructure for the research project, with several postdocs and PhD students working on complementary topics. In addition, the research project will benefit from the interactions with the EcoNet group, gathering senior researchers around the modeling of interaction data in the specific context of Ecology.

Contact:
For any additional information, send an email to catherine.matias@math.cnrs.fr

How to apply:
Interested candidate should send an email with:
- Cover letter with a brief account of your research interests and motivation for applying for the position,
- Resume and complete list of publications,
- Name and email addresses of 2 reference people,

to catherine.matias@math.cnrs.fr
Deadline for application is **October 15th, 2023**