**2018-00235 - [NEO] PhD Position / Networks and Telecommunications**

**Contract type:** Public service fixed-term contract  
**Level of qualifications required:** Graduate degree or equivalent  
**Fonction:** PhD Position  
**Level of experience:** Recently graduated

**About the research centre or Inria department**

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)."

**Context**

PhD Opening at Inria Sophia Antipolis, France  
[https://www.inria.fr/](https://www.inria.fr/)  
at Team NEO  
[https://team.inria.fr/neo/presentation/](https://team.inria.fr/neo/presentation/)  
under the supervision of Prof. K. Avrachenkov  
e-mail: K.Avrachenkov@inria.fr  
[http://www-sop.inria.fr/members/Konstantin.Avratchenkov/me.html](http://www-sop.inria.fr/members/Konstantin.Avratchenkov/me.html)

This PhD position is within framework of the joint laboratory Inria - Nokia Bell Labs.

**Assignment**

**Topic:** Statistical Physics Methods for Distributed Machine Learning

**Detailed description:** Over the last few years, research in computer science has shifted focus to machine learning methods for the analysis of increasingly large amounts of user data. As the research community has sought to optimize the methods for sparse data and high-dimensional data, more recently new problems have emerged, particularly from a networking perspective that had remained in the periphery. These new directions go beyond sparsity of data and concern the distributed nature of data sources as well as the computation itself.

We feel that statistical physics methods such as Gibbs sampling [3] and Generalized Potts Model [2,4] are particularly well suited to design light complexity, distributed machine learning methods for the tasks of unsupervised and semi-supervised learning [1].

The student is expected to work on both theoretical and practical aspects of the topic. We intend to employ both mean-field methods [5] and replica method [6] for the analysis of the statistical physics based machine learning algorithms.

**References:**

Generalized optimization framework for graph-based semi-supervised learning.  
Clustering data through an analogy to the Potts model.  


A Spin-Glass Model for Semi-Supervised Community Detection.  

[5] Nishimori, H.  
Statistical physics of spin glasses and information processing: An introduction.  

Oxford University Press.

**Main activities**

Preparation of PhD Thesis by writing journal and conference articles, developing algorithms with possible patent application.

**Skills**

**Required skills:** solid knowledge of mathematics;  
advanced knowledge of probability and statistics is a plus;  
knowledge of python is another plus.

**Benefits package**

- Subsidised catering service  
- Partially-reimbursed public transport  
- Social security  
- Paid leave  
- Flexible working hours  
- Sports facilities

**Remuneration**

Duration: 36 months  
Location: Sophia Antipolis, France  
Gross Salary per month: 1982€ brut per month (year 1 & 2) and 2085€ brut/month (year 3)