3iA Côte d'Azur
Interdisciplinary Institute for Artificial Intelligence

Postdoctoral research topic

- Title of the proposed topic: Machine Learning for Finance
- Research axis of the 3IA: Axe 1 - Core Elements of AI
- **Supervisor: Maurizio Filippone, EURECOM, maurizio.filippone@eurecom.fr**
- Co-supervisor: Motonobu Kanagawa, EURECOM, motonobu.kanagawa@eurecom.fr
- The laboratory and/or research group: Data Science Department, EURECOM

Apply by sending an email directly to the supervisor.
The application will include:
- Letter of recommendation of the supervisor indicated above
- Curriculum vitæ including the list of the scientific publications
- Motivation letter
- Letter of recommendation of the thesis supervisor

Description of the topic:

One purpose of finance is to provide a way of managing risks in the face of uncertainty. For instance, when individuals manage their assets for retirement savings, they face various risks, such as inflation and longevity risks. Farmers face risks caused by the inherent uncertainty in weather and climate. Finance provides a mathematically principled way of mitigating such risks in the form of insurance, for example.

There are, however, two critical issues for finance to work well in practice: one is uncertainty quantification, and the other is accurate modeling of the system of interest. For instance, to manage climate change-related risks, one needs an accurate model for the climate dynamics and their impacts on the economy; but there are various uncertainties in such a model, such as uncertainties in the model parameters and the model itself, and the inherent uncertainty in the forecasting of future events.

This project focuses on the above two critical issues in finance by using machine learning, particularly Bayesian statistical approaches. These methods provide principled ways of calibrating and uncertainty quantification of computer simulation models based on available data, and thus make financial devices work reliably in the real world. In particular, the project studies Bayesian machine learning techniques based on Gaussian processes, such as Gaussian process regression and Bayesian optimization, in financial applications.