JOB OFFER
Postdoctoral position

Federated Statistical Learning for New Generation Meta-Analyses
of Large-scale and Secured Biomedical Data (Fed-BioMED)

Project Description.

FED-BioMED focuses on methodological, technical, and translational advances towards the development of a novel generation of federated learning methods for the analysis of private and large-scale multi-centric biomedical data. The project has a specific focus on the efficient federation of Bayesian non-parametric frameworks, such as Gaussian Processes and Bayesian deep neural networks, consistently with their probabilistic theoretical formulation. The project tackles the following scientific challenges:

- Methodological. Extending the federated paradigm to the Bayesian non-parametric setting, and developing novel scalable approaches to probabilistic modeling and prediction from distributed data.
- Technical. Developing our federated learning framework through a self-contained system that can be securely deployed across different centers and collaborators.
- Translational. Demonstrating federated learning on two applications: 1) Discovering novel genetic underpinnings of neurological and psychiatric disorders, and 2) Predictive modeling of sudden cardiac death from multi-centric imaging and clinical information.

During the project the candidate will:

  • Develop learning methods for federated analysis for private and distributed data;
  • Develop a formalism for federated learning in Bayesian non-parametric modeling;
  • Deploy advanced statistical learning methods into a wide range of biomedical/clinical applications;
  • Interact with INRIA students and researchers, and participate to the scientific life of the group;

Required competences.

Demonstrable experience in some of the following topics (the more the better):

- Statistics, Bayesian Modeling;
- Optimization, Distributed Computing;
- Python and PyTorch/TensorFlow;
- Biomedical Data Analysis;
- Signal Processing;

Strong communication abilities are necessary, as well as motivation in taking responsibilities (e.g. supervision, organization of scientific events).

Hosting Research Group.
Epione team (Inria), located in the tech park of Sophia Antipolis (France).
The longstanding research activity of our group revolves around the analysis and treatment of biomedical data, with a focus in machine learning, medical imaging, computational anatomy and computational physiology. Over the past twenty years the group developed innovative approaches in image processing, statistical learning and patient-specific biophysical modeling, with translation to the clinical domain, and to the creation of several biotech startups.

This goal is accomplished through methodological, technical, and translational advances towards the development of a novel generation of modeling methods in biomedicine. The group is currently composed by 5 permanent researchers, several postdoc fellows and research engineers, and by more than 20 PhD students.
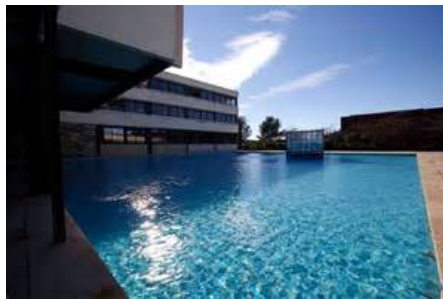
Offer.
Competitive salary (upon experience)
3 years contract
Starting date: March 2020

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References:

- Santiago Silva, Boris Gutman, Barbara Bardoni, Paul M Thompson, Andre Altmann, Marco Lorenzi. *Multivariate Learning in Distributed Biomedical Databases: Meta-analysis of Large-scale Brain Imaging Data*. IEEE International Symposium on Biomedical Imaging (ISBI), Venice, 2019.

- Luigi Antelmi, Nicholas Ayache, Philippe Robert and Marco Lorenzi. *Sparse Multi-Channel Variational Autoencoder for the Joint Analysis of Heterogeneous Data.* Proceedings of the 36th International Conference on Machine Learning (ICML).

- Marco Lorenzi, Maurizio Filippone. *Constraining the Dynamics of Deep Probabilistic Models.* Proceedings of the 35th International Conference on Machine Learning (ICML), PMLR 80:3233-3242, 2018.

- Marco Lorenzi, Andre Altmann, Boris Gutman, et al. *Susceptibility of brain atrophy to TRIB3 in Alzheimer's disease: Evidence from functional prioritization in imaging genetics.* Proceedings of the National Academy of Sciences of the United States of America (PNAS). March 20, 2018. 115 (12) 3162-3167.