Call for a Post-Doc on Structured Low-Rank Approximations

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General Information :   The post-doc is funded by the ANR project MACARON[1]. He will be mentored by **Julien Mairal** and collaborate with other members of the project: **Laurent Jacob** (CNRS, LBBE laboratory, Lyon), **Joseph Salmon** (Telecom ParisTech), **Michael Blum** (CNRS, TIMC laboratory, Grenoble) and **Zaid Harchaoui** (Inria, Grenoble).

Research Topic and Objectives: The goal of the MACARON project is to use data for solving scientific problems and automatically converting data into scientific knowledge by using machine learning techniques. We propose a research direction motivated by applications in bioinformatics and image processing. Low-rank matrix approximation is a popular tool for building web recommender systems [1] and plays an important role in large-scale classification problems in computer vision [2]. In many applications, we need however a different point of view. Data matrices are not exactly low-rank, but admit local low-rank structures [3]. This shift of paradigm is expected to achieve groundbreaking improvements over the classical low-rank paradigm, but it raises significant challenges that should be solved during the post-doc.

The first objective is to develop new methodological tools to efficiently learn local low-rank structures in data. This will require both modeling skills (designing the right model) and good knowledge of optimization techniques (for efficient learning). The second objective is to adapt these tools to genomic imputation problems and inverse problems in image processing.

Location: The post-doc will take place at the Inria Rhône-Alpes research center near Grenoble. The unit includes more than 600 people, within 26 research teams and 10 support services. Grenoble is a lively city which hosts many foreign students and researchers. Located in the heart of the French Alps its direct surroundings offer great outdoor recreation including skiing, cycling, and hiking. Paris can be reached from Grenoble in 3h by train.

Duration: for one year, with a possible extension to two years.

Desired Skills: The candidate should have a strong background in mathematics and computer science, and some experience in statistical machine learning. He should be motivated by highly pluri-disciplinary research and excited by difficult computational challenges. He should be familiar with a high-level programming language (Python, Matlab, and/or R), and a low-level one (C++ and/or C).

References

[1] R. Bell and Y. Koren. Lessons from the netflix prize challenge. *ACM SIGKDD*, 9(2):75–79, 2007.

[2] Z. Harchaoui, M. Douze, M. Paulin, M. Dudik, and J. Malick. Large-scale image classification with trace-norm regularization. In *Proc. CVPR*, 2012.

[3] J. Lee, S. Kim, G. Lebanon, and Y. Singer. Local low-rank matrix approximation. In *ICML*, 2013.

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[1] `http://lear.inrialpes.fr/people/mairal/macaron/index.html`