



Postdoc positions in scientific machine learning / machine learning theory in the group of Ivan Dokmanić

100% / February 2021

start possible immediately

We are looking for two postdocs to work on scientific and mathematical machine learning with applications in inverse problems and imaging. The positions are partially funded by an ERC Starting Grant Signals, Waves, and Learning-A Data-Driven Paradigm for Wave-Based Inverse Problems (SWING). In broad strokes the two positions involve:

1. Designing and analyzing machine learning methods (especially deep neural networks) that learn maps between high-dimensional spaces, as well as function spaces. These maps model solution operators to forward and inverse problems in biomedical and geo imaging. The project addresses questions of inductive bias of operator learning and the related questions of sample complexity and training dynamics. The goal is to understand the fundamental performance limits of emerging methods based on deep learning and to develop new algorithms for key applications.
2. Designing and analyzing machine learning and data mining algorithms for problems with complex invariances and equivariances which arise in biology, chemistry and physics. The research will rely on ideas from manifold learning, topology, and learning on graphs to advance scientific problems with rich discrete and continuous symmetries. Examples of such problems are molecular imaging (e.g., Cryo-EM), NMR spectroscopy, the nanostructure problem, molecular design, and inverse spectral problems. We will work to establish fundamental performance bounds of learning with invariances as well as design new architectures.

Your position

The two postdoc openings address fundamental research questions at the interface of machine learning, inverse problems, and signal processing. The positions further entail supervision of PhD and MSc thesis projects as well as teaching duties.

Your profile

We are looking for candidates with a strong academic record in computer science, applied math, physics, numerical analysis, and/or related disciplines. The candidates should have an excellent mathematical background, strong understanding of machine learning, and a good publication record. They should be able to code in Python and be familiar with one of the deep learning frameworks. Experience in signal processing or inverse problems is a plus. The candidates should be good team players and interested in interdisciplinary research. Since the positions involve teaching and supervision, the candidates should possess strong communication and project management skills.

We offer you

University of Basel is the oldest university in Switzerland with an exceptionally strong presence in math, imaging, and life sciences including the relevant high-end experimental facilities. The math department is associated with giants like the Bernoulli brothers and Leonhard Euler. Working in our group includes a stimulating research environment, plentiful opportunities for collaboration in Europe (EPFL, ETHZ in Switzerland, ENS Paris, ENS Lyon, TU Munich) and in the United States (UIUC, Rice, MIT), traveling to workshops, conferences, summer and winter schools, and a friendly, fun, and productive group atmosphere. The group consists of a mixture of people with excellent understanding of mathematical physics, machine learning, signal processing, and inverse problems and provides an intellectually stimulating environment.

Application / Contact

Applications should be sent directly to Ivan Dokmanić (ivan.dokmanic@unibas.ch). Please include a short statement of motivation describing your interest in the project areas, a curriculum vitae, grade transcripts, and contact information of a possible reference.