

Kernel Methods Meet Deep Neural Networks

Two Intern Positions in Computer Vision and Machine Learning

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MAX-PLANCK-GESSELLSCHAFT

The Empirical Inference Department and the Perceiving Systems Department at the Max Planck Institute for Intelligent Systems are seeking two highly motivated PhD interns interested in advanced topics at the intersection of computer vision and machine learning. The PhD interns will particularly work on cutting-edge projects that combine recent advances in computer vision using deep neural networks and kernel methods in machine learning. The conducted research is expected to highly impact both science and industry and to be published at the top conferences, e.g. CVPR, ICML, or ICLR. The internship positions are expected to last for six months (with possibility of extension) and are funded by the Grassroots program 2019 No. M10334 of the Max Planck Institute for Intelligent Systems.

Project I - Kernelizing Deep Representation

Pooling is one of the fundamental techniques that enables deep learning models to learn meaningful representation efficiently from large-scale data by aggregating statistics of features at various locations of images. In this project, we aim to improve pooling techniques for deep neural networks by means of recent advances in kernel methods, particularly the Hilbert space embedding of distributions. The new pooling techniques provide a more powerful feature representation after pooling, yet require fewer number of model parameters as well as lower computational complexity. We anticipate the impact of the proposed kernel-based pooling methods on a wide range of visual tasks, such as fine-grained image classification and human motion parsing.

Project II - Improving Deep Generative Models with Kernels

A variant of a generative adversarial network (GAN) known as MMD-GAN—which relies on the maximum mean discrepancy (MMD)—has recently emerged as an alternative approach for learning deep generative models. Despite several favourable properties, the MMD-GAN is usually inferior to other variants of GANs in terms of the generative models it produces. This leaves room for further improvement. In this project, we aim to gain some insights into this drawback and to subsequently develop novel algorithmic foundations of integrating kernel methods and deep generative models. Our ultimate goal is to significantly improve the model expressiveness of kernel-based GANs and their computational efficiency to make it more accessible for large-scale real-world settings. The potential applications are realistic image and video synthesis and human motion generation.

Potential Candidates

Applicants should have an excellent Master's degree in computer science, mathematics, or a related field with a focus on mathematical modeling and algorithmic development. You are determined to build the best possible models of the world, and you are not afraid to challenge the status quo. You have previous research experience (e.g. internships, research papers, etc.) and we expect that you know why you want to do an internship with us.

Max Planck Institutes

MPI for Intelligent Systems in Tübingen offers a friendly working environment in a lovely old town, situated in a hilly area south of Stuttgart, Germany, with a high quality of life. Max Planck Institutes are internationally renowned and regarded as one of the world foremost organizations for fundamental research. These internship positions which are open at the Perceiving Systems Department and the Empirical Inference Department will be supervised jointly by Krikamol Muandet and Siyu Tang. The working language is English. The Max Planck Society is an equal opportunity employer; women and people with disabilities are encouraged to apply.

How To Apply

Please send your application to stang@tuebingen.mpg.de and krikamol@tuebingen.mpg.de. Your application must include

1. your CV,
2. university transcripts and other academic records,
3. references to people who can talk about your research abilities and
4. a short research statement (1 page).

Please also include your thesis and your latest research papers. The application deadline is **March 1st, 2019** and the internship should start as soon as possible. Should you have any further questions about these positions, please contact us via email.