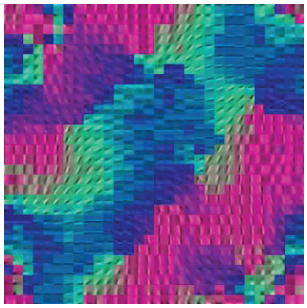
INSTITUTE FOR PURE AND APPLIED MATHEMATICS

Los Angeles, California



IPAM Summer School: Deep Learning, Feature Learning

July 9 - 27, 2012

ORGANIZING COMMITTEE: Yoshua Bengio (Université de Montreal), Geoffrey Hinton (University of Toronto), Yann LeCun (Courant Institute, NYU), Andrew Ng (Stanford University), Stan Osher (UCLA)

Scientific Overview

One of the challenges for machine learning, AI, and computational neuroscience is the problem of learning representations of the perceptual world. This summer school will review recent developments in feature learning and learning representations, with a particular emphasis on "deep learning" methods, which can learn multi-layer hierarchies of representations.

Topics will include unsupervised learning methods such as stacked restricted Boltzmann machines, sparse coding, denoising auto-encoders, and methods for learning over-complete representations; supervised methods for deep architectures, metric learning criteria for vector-space embeddings; deep convolutional architectures and their applications to images, video, audio, and text; compositional hierarchies and latent-variable models.

Mathematical issues will be addressed, particularly how to characterize the low-dimensional structure of natural data in high-dimensional spaces; training density models with intractable partition functions; the geometry of non-convex and ill-conditioned loss functions for deep learning; efficient optimization methods for inference and deep learning; the representational efficiency of deep architectures, and the advantages of high-dimensional and over-complete representations.

Participation

This summer school, co-sponsored by the Canadian Institute for Advanced Research, will provide a rare opportunity for researchers in the mathematical sciences, computer science, neuroscience, and engineering sciences to learn about recent research directions and future challenges in this area. Funding is available to support graduate students and recent PhDs, as well as more senior researchers interested in undertaking new research in this area. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. The application is available online, and is due March 15, 2012.

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