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Deep Learning Program Opening Workshop
August 12-16, 2019

SPEAKER TITLES/ABSTRACTS

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"Information Geometric and Topological Approaches to Deep Learning"

Deep learning algorithms determine a high-dimensional data approximation through nonlinear optimization of a multiply-composite function (neural net layers). This talk presents a different viewpoint based upon interpretation of available data as a sample of some unknown statistical distribution. Successive data samples provide different approximations of the underlying distribution, interpreted as a point in the space of probability density functions (PDFs). The main object of interest becomes the support of the PDF points. The intrinsic dimension of this support is determined by persistent homology techniques from computational topology. A manifold of the resulting dimensionality is subsequently constructed and geodesic transport on this manifold in the Fisher metric is used to determine reduced models of lower dimensionality. Applications of the procedure to the problem of "learning" the behavior of complex physical systems are presented including protein dynamics and cellular motility.