RUTGERS - CAMDEN MATH SEMINAR

11-12, FRIDAY APRIL 1ST, BSB 132

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Title: Convergence properties of shallow neural networks: implications and applications in scientific computing

Abstract: The surprising flexibility and undeniable empirical success of machine learning algorithms have inspired many theoretical explanations for the efficacy of neural networks. Here, I will briefly introduce one perspective that provides not only asymptotic guarantees of trainability and accuracy in high-dimensional learning problems but also provides some prescriptions and design principles for learning. Bolstered by the favorable scaling of these algorithms in high dimensional problems, I will turn to the problem of variational high dimensional PDEs. From the perspective of an applied mathematician, these problems often appear hopeless; they are not only high-dimensional but also dominated by rare events. However, with neural networks in the toolkit, at least the dimensionality is somewhat less intimidating. I will describe an algorithm that combines stochastic gradient descent with importance sampling to optimize a function representation of the solution. Finally, I will provide numerical evidence of the power and limitations of this approach.

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