

EECS E6699: Topics in data-driven analysis and computation:
Mathematics of Deep Learning
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Course description. In recent years, deep learning methods have achieved an unparalleled success in various application areas of machine learning. However, the theoretical understanding of why deep learning works well remains limited. This course will cover some of the emerging mathematical aspects and understanding of deep learning methods. The preliminary list of topics that will be covered include the expressive power of deep learning, depth separation results, global versus local optimality, generalization error, deep generative probabilistic models (e.g., deep Boltzmann machines), etc.

Textbooks. No textbook. Research papers and lecture notes will be used.

Prerequisites. Solid undergraduate knowledge of multivariate calculus, linear algebra and probability/statistics.

Grading. Majority of the grade will be based on a final project. The students will have a choice to make their project more mathematical or experimental, or adopt a balance between the two. (The experimental part of the project can be implemented in R or Python)