Mathematical Topics in Data Science

Outline: Data science is an increasingly important area of academic and nonacademic research. The era of ‘big data’ promises to transform many aspects of our daily lives. With this in mind, the intention of this course is to explore some of the mathematics of data science. Or more precisely, the mathematical theory that underlies some of the most well-known algorithms in this field. Potential topics to be covered include: foundations of deep learning, compressed sensing, clustering, dimensionality reduction, matrix completion, randomized numerical linear algebra.

Disclaimer: the aim of this course is the mathematical understanding of these algorithms, rather than their implementation and use. If, for example, your objective is to learn how to design and train a neural network, this course is likely not for you. On the other hand, if you want to begin to understand how such algorithms work and why, then consider taking this course.

Textbook: This course will be based on a selection of readings, which will be provided. There is no textbook.

Grading: Homework problems, class participation, midterm and a final project.

Prerequisites: STAT 270, MATH 242, MATH 232 or 240, programming experience. Or permission of the instructor.

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