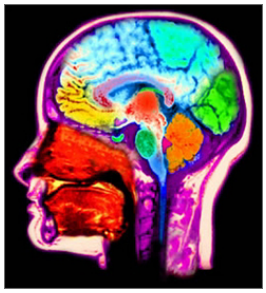
Math 285J – Spring 2018

Prof. Deanna Needell (listed as: Hunter)

Mathematics for High Dimensional Data

Interested in learning what kind of mathematics is needed to handle vastly large amounts of data? Want to understand how compression works on your iPhone? Want to learn how to design faster MRI scans? Want to explore the beauty and chaos of extremely high dimensional space, and the power of randomness in data acquisition?



In today's world, data is exploding at a faster rate than computer architectures can handle. For that reason, mathematical techniques to analyze large-scale objects must be developed. One mathematical method that has gained a lot of recent attention is the use of sparsity, which is at the heart of a new field called compressive sensing. Compressive sensing is a new signal acquisition paradigm at the intersection of mathematics, computer science, statistics and engineering. At the heart of this new technology is a mathematical theory that stipulates far fewer measurements than previously utilized can be used to accurately reconstruct a signal. Moreover, this acquisition scheme yields a compression technique that is performed simultaneously. Its applications are rooted in large-scale settings including imaging, sensing, and communications. These applications also give rise to numerical iterative methods that scale well for large problems. In this course, we study the mathematical theory and methods in these approaches.

Recommended Pre-requisites: 115A, 170A, Program in Computing 10A