Summary
This course describes theory and methods to address three key challenges in data sciences: estimation, prediction, and computation. We use convex analysis and methods as a common connecting theme, and illustrate the main ideas on concrete applications from machine learning and signal processing.

Content
Lecture 1
Overview of the course. Learning-based compressive subsampling. Introduction to submodularity, examples, and properties.
Lecture 2
Lecture 3
Introduction to structured sparsity. Convex relaxation by biconjugation. Structured sparsity via submodular functions.
Lecture 4
Lecture 5
Lecture 6
Lecture 7
Lecture 8
Lecture 9
Lecture 10
Lecture 11
Lecture 12
Project presentations.
Keywords
Optimization, machine learning, signal processing, statistics.

Learning Prerequisites
Required courses
Multivariable calculus, linear algebra.

Recommended courses
Probability theory.

Learning Outcomes
By the end of the course, the student must be able to:

• Carry out advanced research in machine learning and optimization.

Assessment methods
Multiple.

Resources
Websites