Math 808: Advanced Linear Programming

Instructor:	Tamon Stephen
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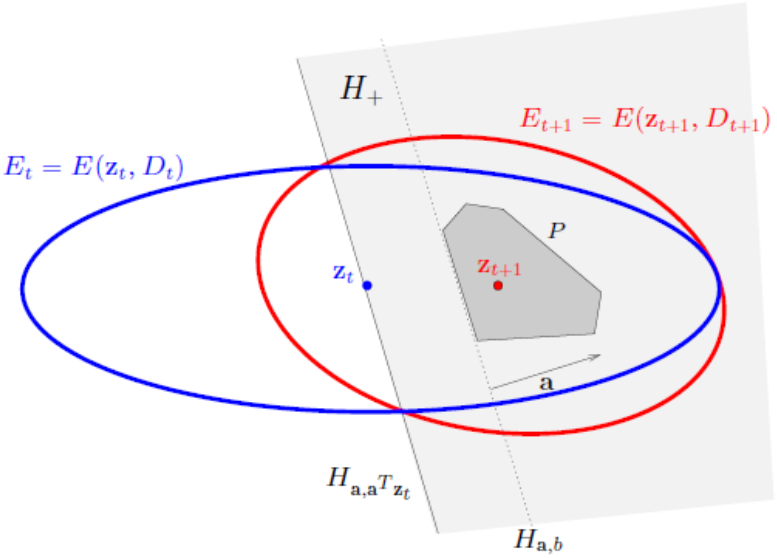
Tentative **Time:**	W 3:30–5:20 and F 2:30–4:20 in SUR 5060
Grading:	20% Homework, 20% Presentation, 20% Midterm, 40% Final

Math 808 (Advanced Linear Programming) will be offered in the Spring 2026 term at the Surrey campus.

A linear program the mathematical problem of optimizing a linear function over a set defined by linear inequalities. This question leads quickly to deep ideas in combinatorics, geometry and computer science. Besides being beautiful mathematically, linear programming is distinguished by its enormous range of practical applications. It is an important part of the foundation of both discrete and continuous (non-linear) optimization.

In this course, we begin by reviewing the simplex method, including examples of cycling and the Klee-Minty cube, sensitivity analysis and techniques for handling large scale problems such as decompositions and column generation. We then proceed to the ellipsoid method[1] and why it is a fundamental but problematic technique in establishing polynomial-time algorithms for linear programming and other combinatorial optimization problems. Finally, we discuss interior point methods for linear programming, including affine scaling and logarithmic barriers. Time permitting, there will be a short introduction to semidefinite programming.



This course will roughly follow the outline of Introduction to Linear Optimization by Bertsimas and Tsitsiklis, though there is no required textbook. Nor are there formal prerequisites, but students should be reasonably comfortable with undergraduate mathematical material, especially linear algebra.

[1] Illustrated: the ellipsoid method, from lecture notes of Marco Cuturi.