

CS 355: Course Introduction

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What is this course about?

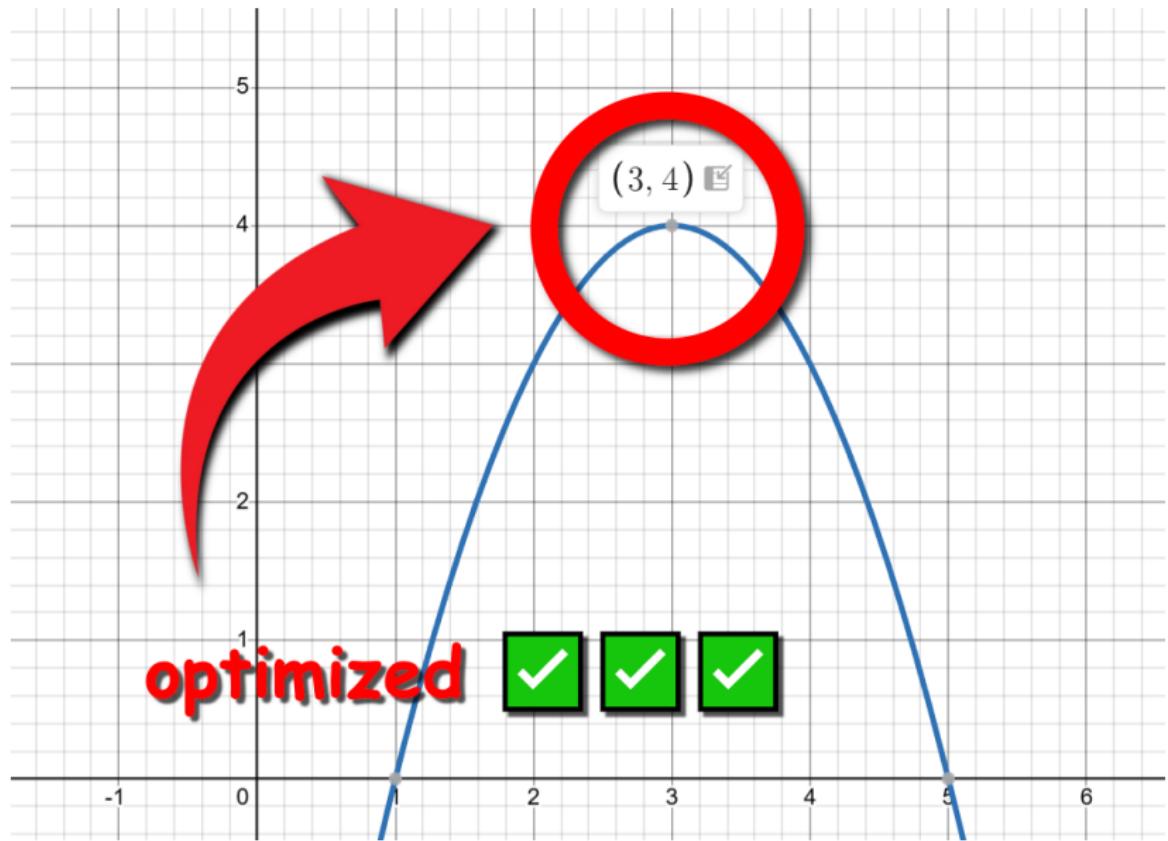
High level:

- ▶ Optimization
- ▶ Problem solving
- ▶ Thinking outside the box
- ▶ Proving some things
- ▶ What is easy and what is hard (to solve)

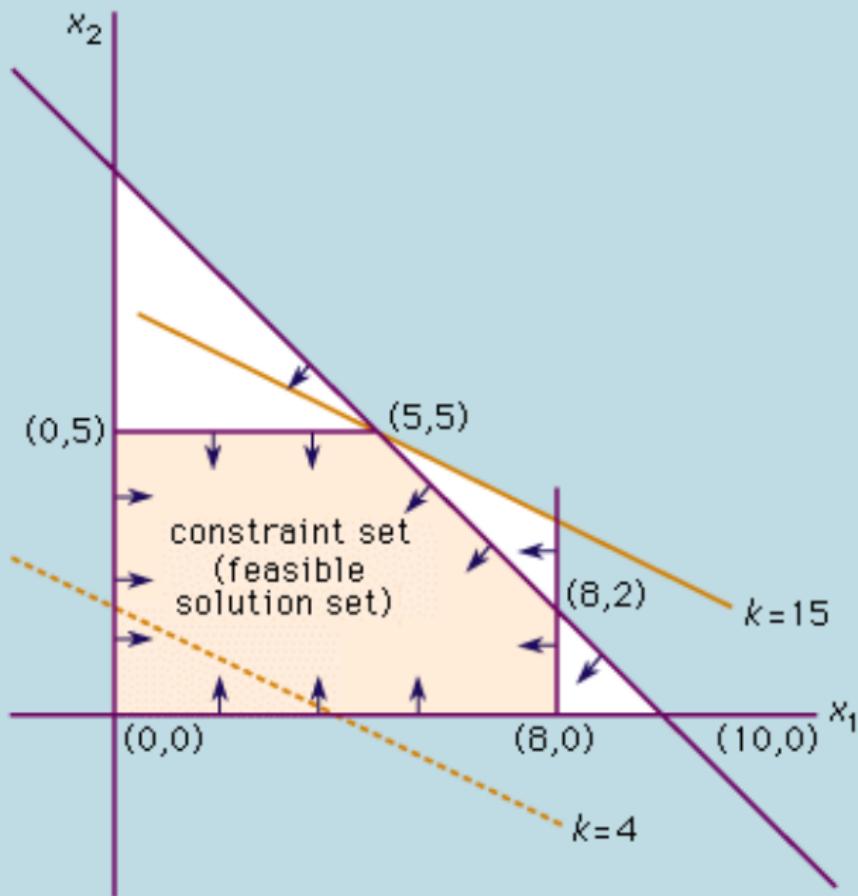
Specific:

- ▶ Linear, integer linear, and quadratic “programming”
- ▶ Using software that solves these types of problems
- ▶ Familiarity with common methods of modeling problems so that they fit into these categories

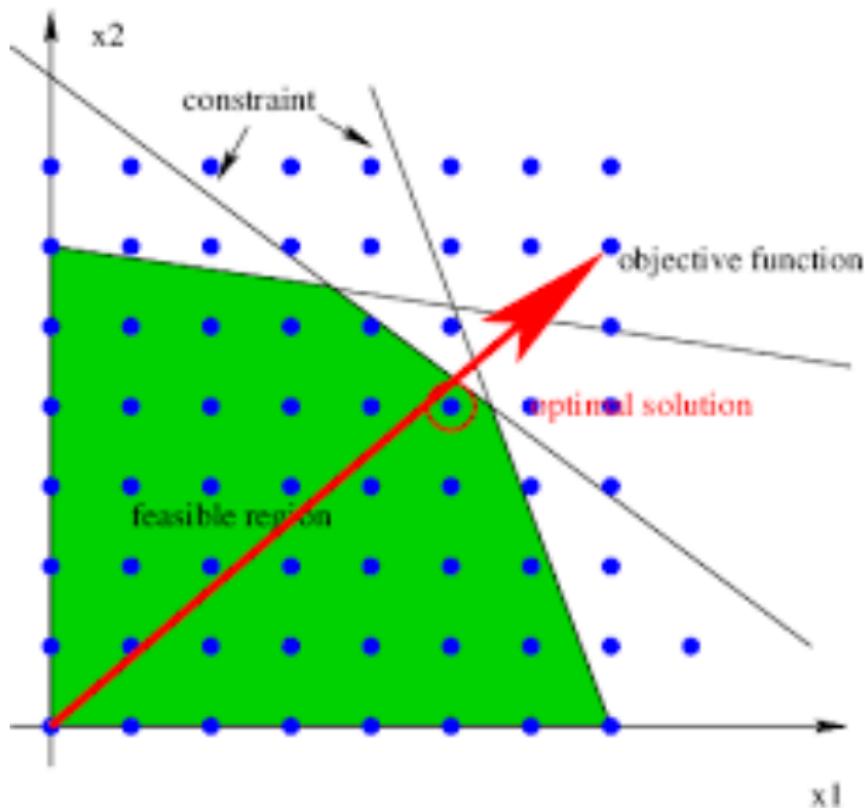
Optimization



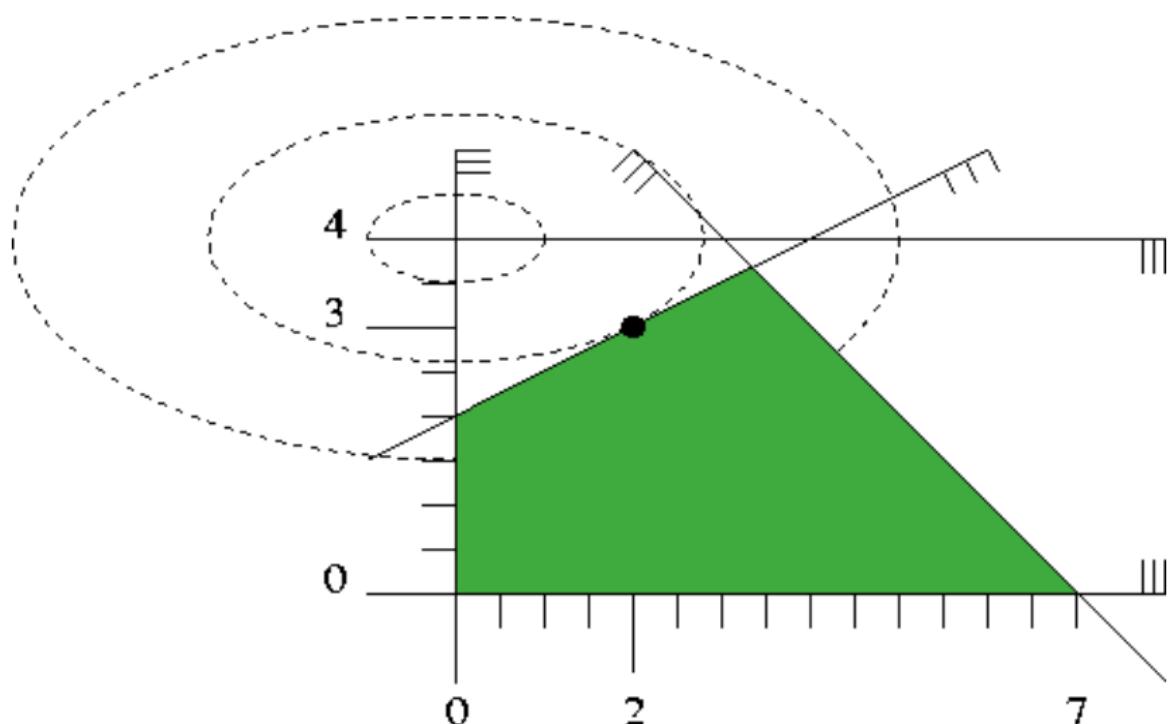
Linear programming



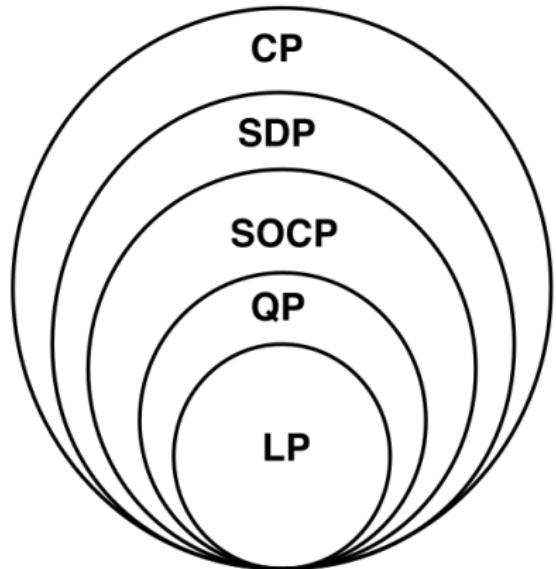
Integer linear programming



Quadratic programming



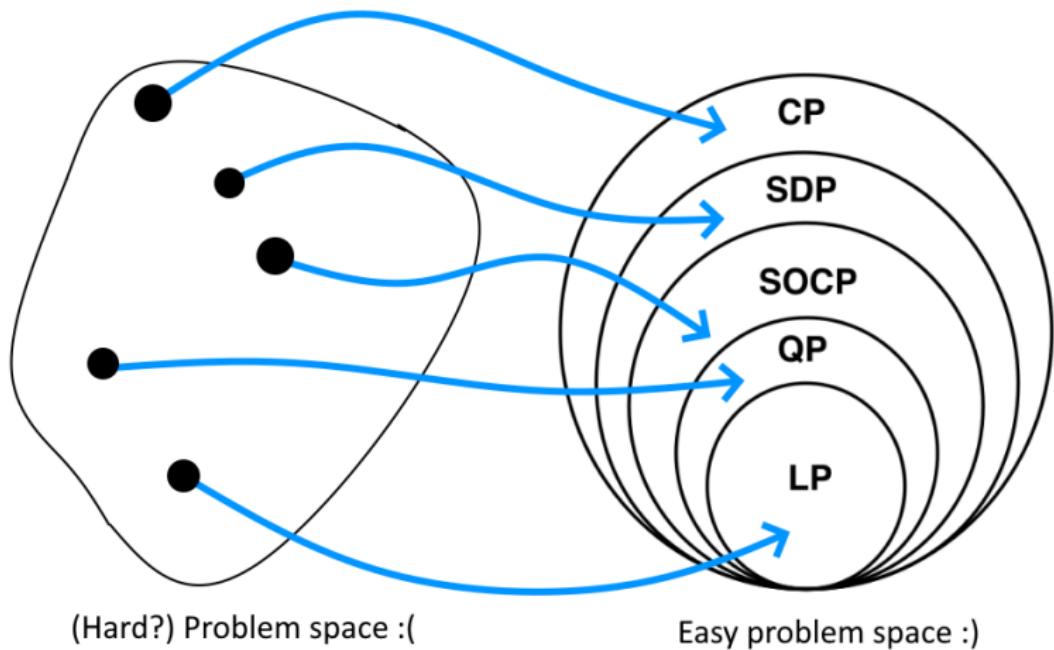
Convex programming hierarchy



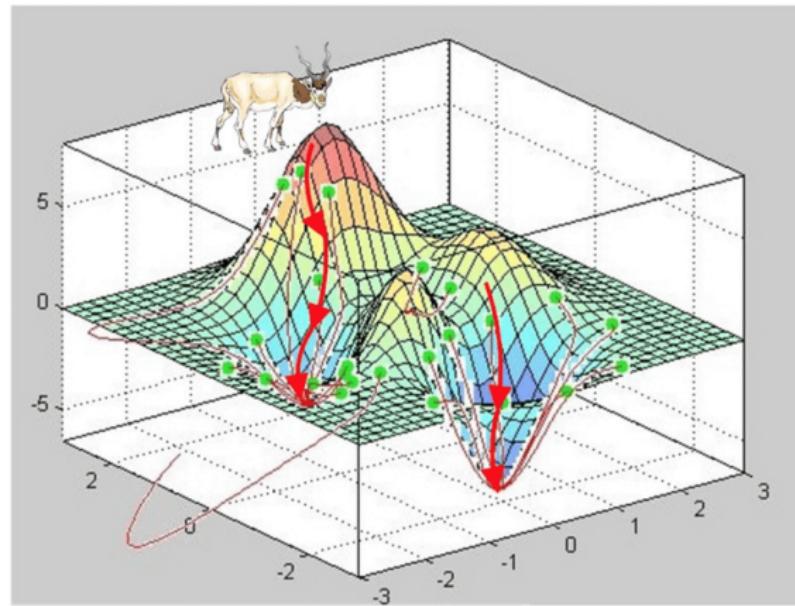
- ▶ CP: Convex programming (convex optimization)
- ▶ SDP: Semi-definite programming
- ▶ SOCP: Second-order cone programming
- ▶ QP: Quadratic programming
- ▶ LP: Linear programming

Big picture

- ▶ Certain types of problems are easy to solve
- ▶ If we transform problems into those formats, we can solve them efficiently (polynomial time)



Side note: gradient descent



Main differences:

- We have constraints
- Gradient descent is used (mainly?) for non-convex functions

Prerequisites

Need to have (but we will review)

- ▶ Python
- ▶ Linear algebra/matrix algebra
- ▶ “Mathematical maturity”

Nice to have (but we will also review)

- ▶ Multivariable calculus
- ▶ Algorithms experience
- ▶ Understanding of computational complexity (basically big-O notation)

Semester outline

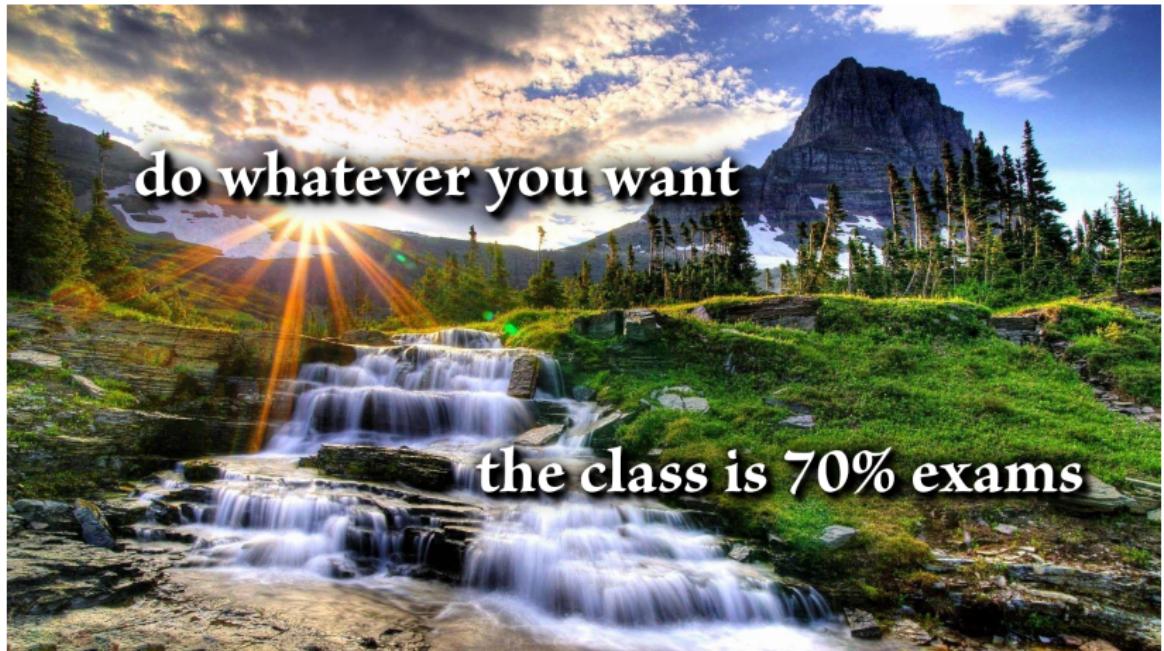
topics	exams	homework	projects
LP		HW 1	
	Midterm (LP)		Project 1
ILP		HW 2	
			Project 2
QP		HW 3	
	Final (LP/ILP/QP)		

The diagram illustrates the semester outline with a vertical timeline. At the top, there is a header row with four columns: 'topics', 'exams', 'homework', and 'projects'. Below this is a horizontal line with four vertical arrows pointing downwards, each corresponding to one of the four weeks. Week 1 (LP) has a solid arrow and includes a Midterm exam and HW 1. Week 2 (ILP) has a solid arrow and includes HW 2. Week 3 (QP) has a dotted arrow and includes HW 3. Projects are assigned in weeks 1 and 3: Project 1 is associated with LP and week 1, and Project 2 is associated with QP and week 3. A final exam is indicated at the bottom, covering all topics from LP to QP.

Grading

Category	Weight
Homework	15%
Projects	15%
Midterm exam	30%
Final exam	40%

A note on LLMs and academic integrity



Logistics

Course materials:

- ▶ Homeworks, projects, slides, etc. will be on the course site:
 - ▶ <https://benrosenberg.info/teaching/sp26/csci35500.html>

Submissions:

- ▶ Submit assignments on Brightspace
- ▶ Please type up your homework, using LaTeX or Word. If I can't read something I can't grade it
- ▶ Please submit PDF files

Questions:

- ▶ If you have questions, raise your hand during class (preferred) or email me at benjamin.rosenberg24@myhunter.cuny.edu
- ▶ If you email me, please put "CS 355" or something similar in the subject line so I can find your emails