Outlines

• Staff
  – Instructor: CK Cheng, TA: Ariel Wang

• Logistics
  – Websites, Textbooks, References, Grading Policy

• Classification
  – History and Category

• Scope
  – Coverage
Information about the Instructor

• Instructor: CK Cheng
• Education: Ph.D. in EECS UC Berkeley
• Industrial Experiences: Engineer of AMD, Mentor Graphics, Bellcore; Consultant for technology companies
• Research: Design Automation, Brain Computer Interface
• Email: ckcheng+203B@ucsd.edu
• Office: Room CSE2130
• Office hour will be posted on the course website
  – 330-430PM T
• Websites
  – http://cseweb.ucsd.edu/~kuan
  – http://cseweb.ucsd.edu/classes/wi19/cse203B
Staff

Teaching Assistant

• Ariel Wang, xiw193@ucsd.edu
• Discussion Session, 5-6PM Wed, CSE4140
• Office Hours, TBA
Logistics: Class Schedule

Class Time and Place: 2-320PM TTH, Room CSE4140
Discussion Session: 5-6PM W, Room CSE4140
Out of Town: 3/13-21/2019, i.e. Last class of the quarter is 3/12 T
Logistics: Grading

Home Works (30%)
- Exercises (Grade by completion)
- Assignments (Grade by content)

Project (40%)
- Theory or applications of convex optimization
- Survey of the state of the art approaches
- Outlines, references (W4)
- Presentation (W9,10)
- Report (W11)

Exams (30%)
- Midterm, 2/12/2019, T (W6)
Logistics: Textbooks

Required text:

- Convex Optimization, Stephen Boyd and Lieven Vandenberghe, Cambridge, 2004
- Review the appendix A in the first week

References

Classification: Brief history of convex optimization

Theory (convex analysis): 1900–1970

Algorithms
- 1947: simplex algorithm for linear programming (Dantzig)
- 1970s: ellipsoid method and other subgradient methods
- since 2000s: many methods for large-scale convex optimization

Applications
- before 1990: mostly in operations research, a few in engineering
- since 1990: many applications in engineering (control, signal processing, communications, circuit design, . . . )
- since 2000s: machine learning and statistics
## Classification

<table>
<thead>
<tr>
<th>Tradition</th>
<th>Linear Programming</th>
<th>Nonlinear Programming</th>
<th>Discrete Integer Programming</th>
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<tbody>
<tr>
<td>Simplex</td>
<td>Lagrange multiplier</td>
<td>Trial and error</td>
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<td>Primal/Dual</td>
<td>Gradient descent</td>
<td>Cutting plane</td>
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<tr>
<td>Interior point method</td>
<td>Newton’s iteration</td>
<td>Relaxation</td>
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<table>
<thead>
<tr>
<th>This class</th>
<th>Convex Optimization</th>
<th>Nonconvex, Discrete Problems</th>
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<tbody>
<tr>
<td>Primal/Dual, Lagrange multiplier</td>
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Scope of Convex Optimization

For a convex problem, a local optimal solution is also a global optimum solution.
Scope

Problem Statement (Key word: convexity)
- Convex Sets (Ch2)
- Convex Functions (Ch3)
- Formulations (Ch4)

Tools (Key word: mechanism)
- Duality (Ch5)
- Optimal Conditions (Ch5)

Applications (Ch6,7,8) (Key words: complexity, optimality)
  Coverage depends upon class schedule

Algorithms (Key words: Taylor’s expansion)
- Unconstrained (Ch9)
- Equality constraints (Ch10)
- Interior method (Ch11)