CPSC 536C: Algorithms for Convex Optimization
Open Problems

Department of Computer Science
University of British Columbia

Winter 2026

Student Lecture Schedule

- Stochastic Gradient Descent (Kevin, Feb 9-11)
- Max Flow (Hasti, Feb 23-25)
- Spectral Sparsification (Tong, Feb 23-25)
- Multiplicative Weight Update Method (Inzaghi + Yin, March 2-4)
- Accelerated Gradient Descent (Trevor, March 9-11)
- Spectral Descent Algorithm (Ying Qi, March 9-11)
- Universal Barrier (Yixian, March 30)
- Minimax Theorems and Game Theory (Vasiliki + Mitali, April 6-8)
- Efficient Convex Oracles and Reductions (Arqam, April 6-8)

Open Projects and Student Lectures

- Minimax Theorems and Game Theory
- Efficient Convex Oracles and Reductions
  https://arxiv.org/abs/1706.07357
- Shallow-Cut Barrier Method (Week 4-5)
  Reference [Grotschel, Lovasz, Schrijver 3.3, 4.3]
- Geometric Descent (Week 5-7)
  https://arxiv.org/abs/1506.08187
- Vaidya + Lee-Sidford-Wong Cutting Plane Method (Week 4-5)
  https://arxiv.org/abs/1508.04874
- Stochastic Gradient Descent
- Krylov/ Preconditioning for Linear Systems
- Smoothing for Lower bounds (Week 5-7)
  https://www.sciencedirect.com/science/article/pii/S0885064X14000831
- Smoothing for Acceleration (Week 5-7)
  https://link.springer.com/article/10.1007/s10107-004-0552-5
- Performance Estimation (SDP) Framework (Week 5-8)
  https://link.springer.com/article/10.1007/s10107-013-0653-0
- Accelerated Gradient Descent
  https://www.mathnet.ru/php/archive.phtml?wshow=paper&jrnid=dan&paperid=46009&option_lang=eng, [Nesterov 2.2]
- Acceleration via Linear coupling (Week 7-9)
  https://arxiv.org/abs/1407.1537
- Acceleration via Approx Duality gap (Week 7-9)
  https://epubs.siam.org/doi/10.1137/18M1172314)
- Multiplicative Weight Update Method
  https://www.cs.princeton.edu/~arora/pubs/MWsurvey.pdf
- Laplacian Solvers (Week 7-10)
  https://dl.acm.org/doi/abs/10.1145/1007352.1007372 ...
- Max Flow
  https://www.cs.cmu.edu/~15859n/RelatedWork/LeeRaoStrivastava.pdf
- Spectral Sparsification
  https://arxiv.org/abs/1506.04838
- Learning Rate for Online Optimization (Week 7-10)
  https://proceedings.mlr.press/v119/fang20a.html

- Relative strong convexity/ smoothness (Week 7-10)
  https://epubs.siam.org/doi/10.1137/16M1099546
- Vaidya + Lee-Sidford Barrier (Week 10-12)
  https://ieeexplore.ieee.org/document/63500, https://arxiv.org/abs/1910.08033
- Universal Barrier
  (Nesterov, Nemirovski 2.5)
- Entropic Barrier (Week 10-12)
  https://arxiv.org/abs/1412.1587
- Predictor/Corrector Method for LP (Week 11-13)
  https://www.jstor.org/stable/3690133
- Straight-Line Complexity (Week 11-13)
  https://arxiv.org/abs/2206.08810