

CPSC 536C: Algorithms for Convex Optimization

Open Problems

Department of Computer Science
University of British Columbia

Winter 2026

Open Projects and Student Lectures

- Minimax Theorems and Game Theory
- **Efficient Convex Oracles and Reductions** (Week 4-5)
<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 (Week 5-7)
- Krylov/ Preconditioning for Linear Systems (Week 7-8)
- 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 (Week 7-9)
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://pubs.siam.org/doi/10.1137/18M1172314>

- Multiplicative Weight Update Method (Week 8-10)
<https://www.cs.princeton.edu/~arora/pubs/MWsurvey.pdf>
- Laplacian Solvers (Week 7-10)
[https://dl.acm.org/doi/abs/10.1145/1007352.1007372 ...](https://dl.acm.org/doi/abs/10.1145/1007352.1007372)
- **Max Flow** (Week 7-10)
<https://www.cs.cmu.edu/~15859n/RelatedWork/LeeRaoStrivastava.pdf>
- Spectral Sparsification (Week 8-10)
<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://pubs.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** (Week 10-12)
(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>