

# Lei, Qi

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Email: [qilei@princeton.edu](mailto:qilei@princeton.edu)

<b>Education</b>	University of Texas at Austin, TX, United States August 2014 - May 2020 <ul style="list-style-type: none"><li>• Ph.D., Oden Institute for Computational Sciences and Engineering</li><li>• Advisors: Alexandros G. Dimakis and Inderjit S. Dhillon</li></ul>
	Zhejiang University, Zhejiang, China Sep 2010 - June 2014 <ul style="list-style-type: none"><li>• B.S., School of Mathematics (with honors) (GPA 3.92/4.0, rank 1<sup>st</sup>)</li></ul>
<b>Research Interests</b>	My research aims to bridge the theoretical and empirical boundary of modern machine learning algorithms, with a focus on large-scale optimization and representation/transfer learning.
<b>Professional Experience</b>	Princeton University, NJ, United States July 2020 - Present <ul style="list-style-type: none"><li>• Postdoc Research Associate (CIFellow), Electrical and Computer Engineering Department</li><li>• Postdoc Mentor: Jason D. Lee</li></ul>
	Institute for Advanced Study, Princeton, NJ, United States September 2019 - July 2020 <ul style="list-style-type: none"><li>• Visiting Graduate Student for the “Special Year on Optimization, Statistics, and Theoretical Machine Learning”</li></ul>
	Simons Institute, Berkeley, CA, United States May 2019 - August 2019 <ul style="list-style-type: none"><li>• Research Fellow for the Foundations of Deep Learning Program</li></ul>
<b>Awards and Recognitions</b>	<ul style="list-style-type: none"><li>• Computing Innovation Fellowship (\$150k) Computing Research Association, 2020</li><li>• Simons-Berkeley Research Fellowship Simons Institute, 2019 summer</li><li>• The National Initiative for Modeling and Simulation Research Fellowship (\$225k) UT Austin, 2014</li><li>• Young Investigators Lecturer Caltech, 2021</li><li>• Outstanding Dissertation Award Oden Institute, 2020</li><li>• Rising Star for EECS UIUC, 2019 &amp; MIT, 2021</li><li>• Rising Star for Computational and Data Science UT Austin, 2020</li><li>• Meritorious Winner for The Mathematical Contest in Modeling (MCM) COMAP, 2014</li><li>• The Excellence Scholarship (top honor) Zhejiang Univ, 2014</li></ul>
<b>Publications</b> (* indicates $\alpha$ - $\beta$ order)	<ol style="list-style-type: none"><li>1. Jason D. Lee*, <b>Qi Lei*</b>, Nikunj Saunshi*, Jiacheng Zhuo*, “Predicting What You Already Know Helps: Provable Self-Supervised Learning”, <i>to appear at NeurIPS 2021</i></li><li>2. Baihe Huang*, Kaixuan Huang*, Sham M. Kakade*, Jason D. Lee*, <b>Qi Lei*</b>, Runzhe Wang*, Jiaqi Yang*, “Optimal Gradient-based Algorithms for Non-concave Bandit Optimization”, <i>to appear at NeurIPS 2021</i></li></ol>

3. Kurtland Chua, **Qi Lei**, Jason D. Lee. “How Fine-Tuning Allows for Effective Meta-Learning”, *to appear at NeurIPS 2021*
4. Baihe Huang\*, Kaixuan Huang\*, Sham M. Kakade\*, Jason D. Lee\*, **Qi Lei\***, Runzhe Wang\*, Jiaqi Yang\*, “Going Beyond Linear RL: Sample Efficient Neural Function Approximation”, *to appear at NeurIPS 2021*
5. **Qi Lei**, Wei Hu, Jason D. Lee. “Near-Optimal Linear Regression under Distribution Shift”, *International Conference of Machine Learning (ICML), 2021: 6164-6174*
6. Tianle Cai\*, Ruiqi Gao\*, Jason D Lee\*, **Qi Lei\***. “A Theory of Label Propagation for Subpopulation Shift”, *International Conference of Machine Learning (ICML), 2021: 1170-1182*
7. Jay Whang, **Qi Lei**, Alexandros G. Dimakis. “Solving Inverse Problems with a Flow-based Noise Model”, *International Conference of Machine Learning (ICML), 2021: 11146-11157*
8. Simon S. Du\*, Wei Hu\*, Sham M. Kakade\*, Jason D. Lee\*, **Qi Lei\***. “Few-Shot Learning via Learning the Representation, Provably”, *International Conference on Learning Representations, 2021*
9. **Qi Lei\***, Sai Ganesh Nagarajan\*, Ioannis Panageas\*, Xiao Wang\*. “Last iterate convergence in no-regret learning: constrained min-max optimization for convex-concave landscapes”, *International Conference on Artificial Intelligence and Statistics, 2021: 1441-1449*
10. Xiao Wang, **Qi Lei**, Ioannis Panageas. “Fast Convergence of Langevin Dynamics on Manifold: Geodesics meet Log-Sobolev”, *Proc. of Neural Information Processing Systems (NeurIPS), 2020*
11. Jiacheng Zhuo, **Qi Lei**, Alexandros G. Dimakis, Constantine Caramanis. “Communication-Efficient Asynchronous Stochastic Frank-Wolfe over Nuclear-norm Ball”, *The 23rd International Conference on Artificial Intelligence and Statistics, 2020: 1464-1474*
12. **Qi Lei**, Jason Lee, Alexandros G. Dimakis, Contantinos Daskalakis. “SGD Learns One-Layer Networks in WGANs”, *International Conference of Machine Learning (ICML), 2020: 5799-5808*
13. **Qi Lei**, Jiacheng Zhuo, Constantine Caramanis, Inderjit S. Dhillon, Alexandros G. Dimakis. “Primal-Dual Block Frank-Wolfe”, *Proc. of Neural Information Processing Systems (NeurIPS), 2019: 13866-13875*
14. **Qi Lei**, Ajil Jalal, Inderjit S. Dhillon, Alexandros G. Dimakis. “Inverting Deep Generative models, One layer at a time”, *Proc. of Neural Information Processing Systems (NeurIPS), 2019: 13910-13919*
15. **Qi Lei**, Jinfeng Yi, Roman Vaculin, Lingfei Wu, Inderjit S. Dhillon. “Similarity Preserving Representation Learning for Time Series Analysis”, *The 28th International Joint Conference on Artificial Intelligence (IJCAI), 2019: 2845-2851*
16. **Qi Lei**, Lingfei Wu, Pin-Yu Chen, Alexandros G. Dimakis, Inderjit S. Dhillon, Michael Witbrock. “Discrete Adversarial Attacks and Submodular Optimization with Applications to Text Classification”, *Systems and Machine Learning (MLsys), 2019 (covered by Nature News )*
17. Jinfeng Yi, **Qi Lei**, Wesley M Gifford, Ji Liu, Junchi Yan, Bowen Zhou. “Fast Unsupervised Location Category Inference from Highly Inaccurate Mobility Data”, *Proceedings of the 2019 SIAM International Conference on Data Mining 2019: 55-63*

18. Zhewei Yao, Amir Gholami, **Qi Lei**, Kurt Keutzer, Michael W. Mahoney. “Hessian-based Analysis of Large Batch Training and Robustness to Adversaries”, *Neural Information Processing Systems (NIPS)*, 2018: 4954-4964
19. Jiong Zhang, **Qi Lei**, Inderjit S. Dhillon. “Stabilizing Gradients for Deep Neural Networks via Efficient SVD Parameterization”, *International Conference of Machine Learning (ICML)*, 2018: 5801-5809
20. Jinfeng Yi, **Qi Lei**, Junchi Yan, Wei Sun. “Session expert: A lightweight conference session recommender system”, *IEEE International Conference on Big Data (Big Data)*, 2018: 1677-1682
21. Lingfei Wu, Ian En-Hsu Yen, Jinfeng Yi, Fangli Xu, **Qi Lei**, Michael Witbrock. “Random Warping Series: A Random Features Method for Time-Series Embedding”, *AISTATS 2018*: 793-802
22. Hsiang-fu Yu, Cho-Jui Hsieh, **Qi Lei**, Inderjit S. Dhillon. “A Greedy Approach for Budgeted Maximum Inner Product Search”, *Neural Information Processing Systems (NIPS)*, 2017: 5453-5462
23. **Qi Lei**, Enxu Yen, Chao-yuan Wu, Inderjit S. Dhillon, Pradeep Ravikumar. “Doubly Greedy Primal-Dual Coordinate Methods on Sparse Empirical Risk Minimization”, *International Conference of Machine Learning (ICML)*, 2017: 2034-2042
24. Rashish Tandon, **Qi Lei**, Alexandros G. Dimakis, Nikos Karampatziakis, “Gradient Coding: Avoiding Stragglers in Distributed Learning”, *International Conference of Machine Learning (ICML)*, 2017: 3368-3376
25. **Qi Lei**, Kai Zhong, Inderjit S. Dhillon. “Coordinate-wise Power Method”, *Neural Information Processing System(NIPS)*, 2016: 2056-2064
26. Arnaud Vandaele, Nicolas Gillis, **Qi Lei**, Kai Zhong, Inderjit S. Dhillon. “Coordinate Descent Methods for Symmetric Nonnegative Matrix Factorization”, *IEEE Transactions on Signal Processing*, 64.21 (2016): 5571-5584
27. Maria R. D’Orsogna, **Qi Lei**, Tom Chou, “First assembly times and equilibration in stochastic coagulation-fragmentation”, *The Journal of Chemical Physics*, 2015: 143.1, 014112
28. Jiazhou Chen, **Qi Lei**, Yongwei Miao, Qunsheng Peng, “Vectorization of Line Drawing Image based on Junction Analysis”, *Science China Information Sciences*, 2014:1-14
29. Jiazhou Chen, **Qi Lei**, Fan Zhong, Qunsheng Peng, “Interactive Tensor Field Design Based on Line Singularities”, *Proceedings of the 13th International CAD/Graphics*, 2013

## Workshop Articles

1. Kaixuan Huang\*, Sham M. Kakade\*, Jason D. Lee\*, **Qi Lei**\*, “A Short Note on the Relationship of Information Gain and Eluder Dimension”, *ICML 2021 Workshop on Reinforcement Learning Theory*
2. Jason D. Lee\*, **Qi Lei**\*, Nikunj Saunshi\*, Jiacheng Zhuo\*, “Predicting What You Already Know Helps: Provable Self-Supervised Learning”, *NeurIPS 2020 Workshop: Self-Supervised Learning - Theory and Practice*
3. Jay Whang, **Qi Lei**, Alex Dimakis, “Compressed Sensing with Invertible Generative Models and Dependent Noise”, *NeurIPS 2020 Workshop: Deep Learning and Inverse Problems*
4. **Qi Lei**, Ajil Jalal, Inderjit Dhillon, Alexandros Dimakis, “Inverting Deep Generative models, One layer at a time”, *ICML 2019 Workshop on Invertible Neural Networks and Normalizing Flows*

	5. Rashish Tandon, <b>Qi Lei</b> , Alexandros G. Dimakis, Nikos Karampatziakis, “Gradient Coding”, <i>NIPS 2016 Workshop on ML Systems (MLSys)</i>
<b>Under Review Preprints</b>	<ol style="list-style-type: none"> <li>1. Lemeng Wu, Mao Ye, <b>Qi Lei</b>, Jason D. Lee, and Qiang Liu. “Steepest Descent Neural Architecture Optimization: Escaping Local Optimum with Signed Neural Splitting”, <i>arXiv preprint</i></li> <li>2. Minhao Cheng, <b>Qi Lei</b>, Pin-Yu Chen, Inderjit Dhillon, Cho-Jui Hsieh. “CAT: Customized Adversarial Training for Improved Robustness”, <i>arXiv preprint</i></li> </ol>
<b>Patents</b>	<ul style="list-style-type: none"> <li>• “Method and System for General and Efficient Time Series Representation Learning via Dynamic Time Warping.” <b>Q. Lei</b>, J. Yi, R. Vaculin, and W. Sun</li> <li>• “Real-Time Cold Start Recommendation and Rationale within a Dialog System”. <b>Q. Lei</b>, J. Yi, R. Vaculin, M. Pietro</li> </ul>
<b>Teaching</b>	<p><i>Department of Electrical and Computer Engineering, Princeton</i>      Fall 2020</p> <ul style="list-style-type: none"> <li>• Theory of Deep Learning: Representation and Weakly Supervised Learning: <i>Teaching Assistant</i></li> </ul> <p><i>Department of Electrical and Computer Engineering, UT Austin</i>      Fall 2019</p> <ul style="list-style-type: none"> <li>• Scalable Machine Learning: <i>Teaching Assistant</i></li> </ul> <p><i>Oden Institute for Computational Engineering and Sciences, UT Austin</i>      Fall 2015</p> <ul style="list-style-type: none"> <li>• Mathematical Methods in Applied Engineering and Sciences: <i>Instructor Intern</i></li> </ul>
<b>Industry Experience</b>	<p><i>Facebook/Photo&amp;Video Search</i>      June 2018 - September 2018</p> <ul style="list-style-type: none"> <li>• Explored offline/online evaluation gaps by estimating expected number of clicks based on historical logging data.</li> </ul> <p><i>Amazon/A9 Product Search</i>      May 2017 - August 2017</p> <ul style="list-style-type: none"> <li>• Inline search suggestions: used deep learning methods for NLP user search tasks.</li> </ul> <p><i>Amazon Web Services (AWS Deep Learning Team)</i>      January 2017 - April 2017</p> <ul style="list-style-type: none"> <li>• Documentations for MXNet: a deep learning framework designed for both efficiency and flexibility.</li> </ul> <p><i>IBM Thomas J. Watson Research Center</i>      May 2016 - October 2016</p> <ul style="list-style-type: none"> <li>• Partnered with one of the largest American financial companies on a challenge problem of predicting its clients’ propensity of trading options</li> <li>• Create World of Watson Session recommendation system: <a href="https://myibm.ibm.com/events/wow/watson/">https://myibm.ibm.com/events/wow/watson/</a></li> </ul>
<b>Service</b>	<p>Co-organizing Mathematical Data Science Reading Group, which is a weekly departmental seminar series on Machine Learning Theory in ECE, Princeton, 2020</p> <p>Student mentor (for a female Ph.D. student), Oden Institute, 2018</p> <p><i>Conference Reviewer:</i> MLSys (19,20,Meta-reviewer’21), COLT (21), STOC (20), NeurIPS (16,17,18,19,20,21), ICML (18,19,20,21), ICLR (18,19,20,21), AISTATS (18,19,20,21),</p>

AAAI (20,21), ACML (19), and more

*Journal Reviewer*: JSAIT(20), MOR (18,19,20), TNNLS (19,20), TKDE (19), ISIT (17,18), TIIIS (17), IT (16,17), and more

## Invited Talks

“Optimal Gradient-based Algorithms for Non-concave Bandit Optimization.”

- BLISS seminar, UC Berkeley, virtual 2021
- Sampling Algorithms and Geometries on Probability Distributions Workshop, Simons Institute, CA, 2021

“Few-Shot Learning via Learning the Representation, Provably.”

- IAS, Princeton, NJ, 2020
- Simons Institute Reunion, virtual, 2020
- UC Berkeley, virtual, 2020

“Predicting What You Already Know Helps: Provable Self-Supervised Learning.”

- Institute for Foundations of Machine Learning, virtual, 2020
- One-World ML seminar, virtual, 2020
- UW-Madison, virtual, 2020

“Provable representation learning.”

- Young Researcher Spotlight Talk at “Seeking Low-dimensionality in Deep Learning” workshop, virtual, 2020
- Microsoft Research, virtual, 2021
- Caltech Young Investigators Lecture Series, virtual, 2021

“SGD Learns One-Layer Networks in WGANs.”

- International Conference of Machine Learning (ICML), virtual, 2020
- Workshop on Learning and Testing in High Dimensions, Simons Institute, 2020

“Deep Generative models and Inverse Problems.”

- Minisymposium on Machine Learning for Solving Partial Differential Equations and Inverse Problems, 2019 SIAM Texas-Louisiana Section, Dallas, TX, USA, 2019
- Google Research, virtual, 2021

“Similarity Preserving Representation Learning for Time Series Analysis.”

- The 28th International Joint Conference on Artificial Intelligence (IJCAI), Macao, 2019

“Discrete Adversarial Attacks and Submodular Optimization with Applications to Text Classification.”

- Simons-Berkeley Fellows Talk, Berkeley, CA, USA & SysML19, Stanford, CA, USA, 2019

“Recent Advances in Primal-Dual Coordinate Methods for ERM.”

- Minisymposium on Recent Progress in Coordinate-wise Descent Methods, SIAM Conference on Computational Science and Engineering, Spokane, WA, USA, 2019
- International Conference of Machine Learning (ICML), Sydney, 2017

“Coordinate Descent Methods for Matrix Factorization.”

- Minisymposium on Recent Advances in Nonnegative Matrix Factorization, SIAM Annual Meeting, Boston, USA, 2016

**Programming  
Skills**

C/C++(proficient), Python(proficient), Matlab(proficient), C#(prior experience)

Familiar with Deep Learning packages(Pytorch, Tensorflow, Theano, MXNet)