

Karthik Sridharan

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Research Interests Machine Learning, Statistical Learning Theory, Online Learning and Decision Making, Optimization, Empirical Process Theory, Concentration Inequalities, Game Theory

Education

Ph.D., Computer Science, Sep 2006 - Oct 2011

- Institute : Toyota Technological Institute at Chicago
- Advisor: Nathan Srebro
- Area of Study: Theoretical Machine Learning

M.S., Computer Science, Aug 2004 - Jun 2006

- Institute : University at Buffalo, State University of New York
- Advisor: Venu Govindaraju
- Area of Study: Biomtrics/Applied Machine Learning

B.E., Computer Science and Engineering, Aug 2000 - Jun 2004

- Institute : M.S. Ramaiah Institute of Technology, Bangalore, India

Work Experience

Associate Professor, (2020-current)

- Department : Computer Science
- Institute : Cornell University

Assistant Professor, (2014-2019)

- Department : Computer Science
- Institute : Cornell University

Postdoctoral Research Scholar, (Nov 2011 to 2014)

- Institute : Department of Statistics, University of Pennsylvania
- Supervisor : Prof. Alexander Rakhlin , co-supervisor : Prof. Michael Kearns

Internship, Summer'09

- Institute : Microsoft Research, Redmond
- Mentor : Ofer Dekel
- Projects : Robust selective sampling from single and multiple teachers

Research Assistant, Sep 2004 - Jun 2006

- Institute : Center for Unified Biometrics and Sensors, SUNY Buffalo
- Mentor : Venu Govindaraju
- Projects : Semantic Face Retrieval, Facial Expression Recognition and Analysis

Grants, Fellowships, Awards

Student Best Paper Award - Conference on Learning Theory (COLT), 2019

Best Paper Award - Algorithmic Learning Theory (ALT), 2019

Student Best Paper Award - Conference on Learning Theory (COLT), 2018

Alfred P. Sloan Research Fellow in Computer Science, 2018

NSF CAREER Award, CAREER: New Paradigms for Online Machine Learning, Award Number:1750575, Robust Intelligence, March 2018.

Simons-Berkeley Research Fellowship, long-term visitor, Foundations of ML, Spring'16

NSF (DMS-1521529) Collaborative Research: Novel Computational and Statistical Approaches to Prediction and Estimation (co-PI with A. Rakhlin), CDS&E-MSS, Start: Aug, 2015

Best Paper Award - Conference on Learning Theory (COLT), 2011

Best Paper Award - Conference on Learning Theory (COLT), 2010

Best Paper Award (Second Prize) - IEEE Automatic Identification Advanced Technologies (AutoID), 2005

Graduate Students

Past Students:

- Dylan J. Foster, PhD, Fall 2018
- Chuan Guo, PhD, Co-advised by Kilian Weinberger.

Current Students:

- Ayush Sekhari, PhD, Co-advised by Robert Kleinberg. (I am the primary advisor)
- Wilson Yoo, PhD

Teaching Experience

Fall 2014, 2015, Spring 2018, Fall 2018, Fall 2019

- Course : Machine Learning Theory (CS 6783)
- Institution : Cornell University

Spring 2015, 2016, Fall 2016, 2017, Spring 2019, 2020

- Course : Machine Learning for Data Sciences (CS 4786/5786)
- Institution : Cornell University

Spring 2012, 2014 (Co-Taught with Prof. Alexander Rakhlin)

- Course : Statistical Learning Theory and Sequential Prediction
- Institution : University of Pennsylvania

Teaching Assistant, Winter 2011

- Course : Computational and Statistical Learning Theory
- Instructor : Nathan Srebro
- Institute : TTIC/ University of Chicago

Teaching Assistant, Spring 2010

- Course : Convex Optimization
- Instructor : Nathan Srebro
- Institute : TTIC/ University of Chicago

Publications

(other than publications marked by * all others are listed by alphabetical order)

Conferences :

1. **Online learning with dynamics: A minimax perspective** Kush Bhatia, Karthik Sridharan Neural Information Processing Systems (NeurIPS), 2020
2. **Reinforcement Learning with Feedback Graphs** Christoph Dann, Yishay Mansour, Mehryar Mohri, Ayush Sekhari, Karthik Sridharan NeurIPS 2020. Short version at ICML 2020 Theoretical Foundations of RL workshop.
3. **Second-Order Information in Non-Convex Stochastic Optimization: Power and Limitations** Yossi Arjevani, Yair Carmon, John C Duchi, Dylan J Foster, Ayush Sekhari, Karthik Sridharan COLT 2020.
4. **Hypothesis Set Stability and Generalization** Dylan J. Foster, Spencer Greenberg, Satyen Kale, Haipeng Luo, Mehryar Mohri, Karthik Sridharan Neural Information Processing System (NeurIPS 2019)

5. **The Complexity of Making the Gradient Small in Stochastic Convex Optimization** Dylan J. Foster, Ayush Sekhari, Ohad Shamir, Nathan Srebro, Karthik Sridharan, Blake Woodworth
Conference on Learning Theory (COLT 2019) (*Student Best paper award*)
6. **Distributed Learning with Sublinear Communication** Jayadev Acharya, Christopher De Sa, Dylan J. Foster, Karthik Sridharan
International Conference on Machine Learning (ICML 2019) (*oral $\approx 4.5\%$ acceptance*).
7. **Training Well-Generalizing Classifiers for Fairness Metrics and Other Data-Dependent Constraints** Andrew Cotter, Maya Gupta, Heinrich Jiang, Nathan Srebro, Karthik Sridharan, Serena Wang, Blake Woodworth, Seungil You
International Conference on Machine Learning (ICML 2019)
8. **Two-Player Games for Efficient Non-Convex Constrained Optimization** Andrew Cotter, Heinrich Jiang and Karthik Sridharan
Algorithmic Learning Theory (ALT 2019) (*Best paper award*)
9. **Uniform Convergence of Gradients for Non-Convex Learning and Optimization** Dylan Foster, Ayush Sekhari, Karthik Sridharan
Neural Information Processing System (NeurIPS 2018)
10. **Online Learning: Sufficient Statistics and the Burkholder Method**
Dylan Foster, Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT 2018)
11. **Logistic Regression: The Importance of Being Improper**
Dylan Foster, Satyen Kale, Haipeng Luo, Mehryar Mohri, Karthik Sridharan
Conference on Learning Theory (COLT 2018) (*Student Best paper award*)
12. **Small-loss bounds for online learning with partial information**
Thodoris Lykouris, Karthik Sridharan, Eva Tardos
Conference on Learning Theory (COLT 2018)
13. **Inference in Sparse Graphs with Pairwise Measurements and Side Information**
Dylan Foster, Daniel Reichman, Karthik Sridharan
Artificial Intelligence and Statistics (AISTATS 2018)
14. **Parameter-Free Online Learning via Model Selection**
Dylan Foster, Satyen Kale, Mehryar Mohri, Karthik Sridharan
Neural Information Processing Systems (NIPS 2017) (*spotlight $\approx 4.94\%$ acceptance*)
15. **ZIGZAG: A new approach to adaptive online learning**
Dylan Foster, Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT 2017)
16. **On Equivalence of Martingale Tail Bounds and Deterministic Regret Inequalities**
Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT 2017)
17. **Efficient Multiclass Prediction on Graphs via Surrogate Losses**
Alexander Rakhlin, Karthik Sridharan
Artificial Intelligence and Statistics (AISTATS 2017)
18. **Learning in Games: Robustness of Fast Convergence**
Dylan Foster, Zhiyuan Li, Thodoris Lykouris, Karthik Sridharan, Eva Tardos
Neural Information Processing Systems (NIPS 2016)
19. **Exploiting the Structure: Stochastic Gradient Methods Using Raw Clusters***
Zeyuan Allen-Zhu*, Yang Yuan*, Karthik Sridharan
Neural Information Processing Systems (NIPS 2016) (* - main contributors)
20. **BISTRO: An Efficient Relaxation-Based Method for Contextual Bandits**
Alexander Rakhlin, Karthik Sridharan
International Conference on Machine Learning (ICML 2016)
21. **Differentially Private Causal Inference**
Matt Kusner, Yu Sun, Karthik Sridharan, Kilian Weinberger
Artificial Intelligence and Statistics (AISTATS 2015)

22. **Adaptive Online Learning**
Dylan Foster, Alexander Rakhlin, Karthik Sridharan
Neural Information Processing Systems (NIPS 2015) (*spotlight \approx 4.46% acceptance*)
23. **Hierarchies of Relaxations for Online Prediction Problems with Evolving Constraints**
Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT), 2015
24. **Learning with Square Loss: Localization through Offset Rademacher Complexity**
Tengyuan Liang, Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT), 2015
25. **Online Optimization : Competing with Dynamic Comparators**
Ali Jadbabaie, Alexander Rakhlin, Shahin Shahrampour, Karthik Sridharan
Artificial Intelligence and Statistics (AISTATS), 2015
26. **Online Non-parametric Regression**
Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT), 2014
27. **On Semi-Probabilistic Universal Prediction**
Alexander Rakhlin, Karthik Sridharan
Proceedings of IEEE Information Theory Workshop, 2013. Invited paper
28. **Optimization, Learning, and Games with Predictable Sequences**
Alexander Rakhlin, Karthik Sridharan
Neural Information Processing Systems (NIPS) 2013.
29. **Competing With Strategies**
Wei Han, Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT) 2013.
30. **Online Learning With Predictable Sequences**
Alexander Rakhlin, Karthik Sridharan
Conference on Learning Theory (COLT) 2013.
31. **Localization and Adaptation in Online Learning**
Alexander Rakhlin, Ohad Shamir, Karthik Sridharan
Artificial Intelligence and Statistics (AISTATS) 2013.
32. **Relax and Randomize : From Value to Algorithms**
Alexander Rakhlin, Ohad Shamir, Karthik Sridharan
Neural Information Processing Systems (NIPS) 2012 (*oral \approx 1.36% acceptance*).
33. **Making Stochastic Gradient Descent Optimal for Strongly Convex Problems**
Alexander Rakhlin, Ohad Shamir, Karthik Sridharan
International Conference on Machine Learning (ICML), 2012
34. **Minimizing The Misclassification Error Rate Using a Surrogate Convex Loss**
Shai Ben-David, David Loker, Nathan Srebro, Karthik Sridharan
International Conference on Machine Learning (ICML), 2012
35. **On the Universality of Online Mirror Descent**
Nathan Srebro, Karthik Sridharan, Ambuj Tewari
Neural Information Processing Systems (NIPS), 2011
36. **Better Mini-Batch Algorithms via Accelerated Gradient Methods**
Andrew Cotter, Ohad Shamir , Nathan Srebro, Karthik Sridharan
Neural Information Processing Systems (NIPS), 2011
37. **Online Learning: Stochastic and Constrained Adversaries**
Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Neural Information Processing Systems (NIPS), 2011
38. **Online Learning: Beyond Regret**
Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Conference on Learning Theory (COLT) 2011 (*Best paper award*).

39. **Complexity-based Approach to Calibration with Checking Rules**
Dean Foster, Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Conference on Learning Theory (COLT) 2011.
40. **Online Learning: Random Averages, Combinatorial Parameters and Learnability**
Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Neural Information Processing Systems (NIPS) 2010 (*oral \approx 1.64% acceptance*).
41. **Smoothness, Low Noise and Fast Rates**
Nathan Srebro, Karthik Sridharan, Ambuj Tewari
Neural Information Processing Systems (NIPS) 2010.
42. **Learning Kernel-Based Halfspaces with the Zero-One Loss**
Shai Shalev-Shwartz, Ohad Shamir, Karthik Sridharan
Conference on Learning Theory (COLT), 2010 (*Best paper award*).
43. **Robust Selective Sampling from Single and Multiple Teachers**
Ofar Dekel, Claudio Gentile, Karthik Sridharan
Conference on Learning Theory (COLT), 2010
44. **Convex Games in Banach Spaces**
Karthik Sridharan, Ambuj Tewari
Conference on Learning Theory (COLT), 2010
45. **Learning exponential families in high-dimensions: Strong convexity and sparsity**
Sham Kakade, Ohad Shamir, Karthik Sridharan, Ambuj Tewari
International Conference on Artificial Intelligence and Statistics (AISTATS), 2010
46. **Learnability and Stability in the General Learning Setting**
Shai Shalev-Shwartz, Ohad Shamir, Nathan Srebro, Karthik Sridharan
Conference on Learning Theory (COLT), 2009
47. **Stochastic Convex Optimization**
Shai Shalev-Shwartz, Ohad Shamir, Nathan Srebro, Karthik Sridharan
Conference on Learning Theory (COLT), 2009
48. **The Complexity of Improperly Learning Large Margin Halfspaces**
Shai Shalev-Shwartz, Ohad Shamir, Karthik Sridharan
Open Problems, Conference on Learning Theory (COLT), 2009
49. **Multi-View Clustering via Canonical Correlation Analysis**
Kamalika Chaudhuri, Sham Kakade, Karen Livescue, Karthik Sridharan
International Conference on Machine Learning (ICML), 2009
50. **On the Complexity of Linear Prediction: Risk Bounds, Margin Bounds and Regularization**
Sham Kakade, Karthik Sridharan, Ambuj Tewari
Neural Information Processing Systems (NIPS), 2008
51. **Fast Rates for Regularized Objectives**
Shai Shalev-Shwartz, Nathan Srebro, Karthik Sridharan
Neural Information Processing Systems (NIPS), 2008
52. **Information Theoretic Framework for Multi-view Learning***
Karthik Sridharan, Sham Kakade
Conference on Learning Theory (COLT), 2008
53. **Competitive Mixtures of Simple Neurons***
Karthik Sridharan, Matthew J Beal, Venu Govindaraju
International Conference on Pattern Recognition (ICPR), 2006
54. **Identifying handwritten text in mixed documents***
Faisal Farooq, Karthik Sridharan, Venu Govindaraju
International Conference on Pattern Recognition (ICPR), 2006
55. **Classification of Machine Print and Handwritten Arabic Documents***
Karthik Sridharan, Faisal Farooq, Venu Govindaraju
Symposium on Document Image Understanding Technology (SDIUT), 2005

56. **A Sampling Based Approach to Facial Feature Extraction***
Karthik Sridharan, Venu Govindaraju
IEEE Automatic Identification Advanced Technologies (AUTOID), 2005
(*Best paper award, 2nd prize*)
57. **A Probabilistic Approach to Semantic Face Retrieval***
Karthik Sridharan, Sankalp Nayak, Sharat Chikkerur, Venu Govindaraju
Audio and Video-based Biometric Person Authentication (AVBPA), 2005
58. **A Dynamic Migration Model for Self-adaptive Genetic Algorithms***
K.G. Srinivasa, Karthik Sridharan, P. D. Shenoy, Venugopal K.R., L.M. Patnaik
International Conference on Intelligent Data Engineering and Automated Learning, 2004
59. **An Effective Content-Based Image Retrieval System Using STI features and Relevance feedback***
K.G. Srinivasa, Karthik Sridharan, P. D. Shenoy, Venugopal K.R., L.M. Patnaik
International Conference on Knowledge Based Computer Systems (KBCS), 2004
60. **EASOM: An Efficient Soft Computing Method for Predicting the Share Values***
K.G. Srinivasa, Karthik Sridharan, P. D. Shenoy, Venugopal K.R., L.M. Patnaik
International Conference on Artificial Intelligence and Applications (AIA), 2004

Journals :

61. **Optimization with Non-Differentiable Constraints with Applications to Fairness, Recall, Churn, and Other Goals**
Andrew Cotter, Heinrich Jiang, Serena Wang, Taman Narayan, Maya Gupta, Seungil You, Karthik Sridharan
Journal of Machine Learning Research, (to appear) 2019
62. **Empirical Entropy, Minimax Regret and Minimax Risk**
Alexander Rakhlin, Karthik Sridharan, Alexandre Tsybakov
Bernoulli Journal, Volume 23, Number 2, 789-824.
63. **Online Learning via Sequential Complexities**
Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Journal of Machine Learning Research (JMLR), vol 16, pp. 155–186, 2015
64. **Sequential Complexities and Uniform Martingale Laws of Large Numbers**
Alexander Rakhlin, Karthik Sridharan, Ambuj Tewari
Probability Theory and Related Fields, 2015, Volume 161, Issue 1-2, pp 111-153.
65. **Selective Sampling and Active Learning from Single and Multiple Teachers**
Ofer Dekel, Claudio Gentile, Karthik Sridharan
Journal of Machine Learning Research (JMLR), 2012
66. **Learning Kernel Based Half-spaces with the 0-1 Loss**
Shai Shalev-Shwartz, Ohad Shamir, Karthik Sridharan
SIAM Journal of Computing, 2011
67. **Learnability, Stability and Uniform Convergence**
Shai Shalev-Shwartz, Ohad Shamir, Nathan Srebro, Karthik Sridharan
Journal of Machine Learning Research (JMLR), 2010.
68. **A Neural Network based CBIR System using STI Features and Relevance Feedback***
K.G. Srinivasa, Karthik Sridharan, P. D. Shenoy, Venugopal K.R., L.M. Patnaik
International Journal on Intelligent Data Analysis, Volume 10, Number 2, 2006.

Theses :

69. **Learning From an Optimization Viewpoint**
Karthik Sridharan, Ph.D. Thesis
Advisor : Nathan Srebro
Committee : David McAllester, Arkadi Nemirovski, Alexander Razborov, Nati Srebro
Toyota Technological Institute, Chicago, 2011

- 70. Semantic Face Retrieval**
 Karthik Sridharan, Master's Thesis
 Advisor : Venu Govindaraju
 Computer Science, SUNY Buffalo, 2006

Books and Book Chapters:

- 71. Prediction of Sequences**
 Alexander Rakhlin, Karthik Sridharan
 Book, in Preparation.
- 72. On Martingale Extensions of Vapnik-Chervonenkis Theory with Applications to Online Learning**
 Alexander Rakhlin, Karthik Sridharan
 Chapter 15 in Measures of Complexity, Festschrift in honor of A. Chervonenkis.

Program Chair Algorithmic Learning Theory (ALT) 2018 along with Prof. Mehryar Mohri

Area chair or senior PC COLT 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020; ALT 2015, 2018; ICML 2016, 2017, 2018, 2019, 2020
 NIPS 2016, 2017, 2018, IJCAI 2019, AAAI 2018

Refereeing

Conference Refereeing : NIPS, ICML, COLT, AISTATS, ALT, IJCAI, AAAI, STOC, FOCS

Journal Refereeing : Journal of Machine Learning Research, Machine Learning, Pattern Recognition Letters, IEEE Transactions on Information Theory, Mathematical Programming SERIES A and B, Bernoulli Journal, Annals of Statistics, SIAM journal of Optimization, Mathematics of Operations Research

Selected Invited Talks

Keynote speaker for Mathematics in ML mini symposium at CDSE day in University at Buffalo April 2019

Center for Applied Mathematics, Colloquium, Fall, 2018

Information Theory and Applications, 2018

Information Theory and Applications, 2017

Wilks Statistics Seminar, Princeton, 2016

Workshop on Learning From Easy Data, Lorentz Center, Leiden, Amsterdam, 2016

Invited talk in Online Learning session at World Congress in Probability and Statistics, Toronto, 2016

Workshop on Optimization and Statistical Learning, Les Houches, France, 2016

Information Theory and Applications, 2016

Workshop on Online Algorithms and Learning, Lorentz Center, Leiden, Amsterdam, 2015

IMS Program on Stochastic Methods in Game Theory, Singapore, Nov, 2015

"Convexity and Optimization: Theory and Applications", Institute for Mathematics and its Applications, Minnesota, 2015

Workshop on Optimization and Statistical Learning, Les Houches, France, 2015

Information Theory and Applications, 2015

Mathematics of Machine Learning Program, April-July 2014, Barcelona, Spain, 2014

Information Theory and Applications, 2014

Meeting in Mathematical Statistics, CIRM, Marseille, France, 2014

Cornell Graduate Field Memberships

Computer Science
 Statistics
 Operations Research and Industrial Engineering
 Center for Applied Mathematics

**Cornell
Services**

PhD Admissions committee member for Computer Science Department in 2015, 2016, 2017 , 2019 and 2020

Served part-time on Faculty Recruitment committee for Computer Science Department 2018 (jointly with Prof. Weinberger)

PhD Admissions committee member for Center of Applied Maths in 2016

Faculty Recruitment committee for Statistics (DSS) 2019

Fall 2019 Colloquium Committee

Cornell University (CALs) Diversity Hosting Meet and Greet 2019