KARAN SINGH

CONTACT INFORMATION

8709 161st Avenue NE
Apt 343
Redmond, WA 98052

iamkaransingh@gmail.com
i-am-karan-singh.github.io
+1 (609) 516 5555

EDUCATION

Princeton University *November 2021*

PhD in Computer Science. GPA: 4.0/4
Adviser: Elad Hazan
Dissertation: The Nonstochastic Control Problem
Awarded the Jacobus Fellowship, Princeton University's top graduate student honor.

Indian Institute of Technology, Kanpur *June 2015*

Bachelor of Technology in Computer Science. GPA: 10.0/10
Received the *President's Gold Medal*, for the best academic performance in the outgoing class.

PROFESSIONAL AFFILIATIONS

Microsoft Research, Redmond *April 2021 –*

Postdoctoral Researcher, Reinforcement Learning Group Manager: Sham M. Kakade

Google AI, Princeton *2018-2020*

Student Researcher Host: Yoram Singer

FIELDS OF INTEREST

Provably efficient algorithms and fundamental limits for *feedback-driven* learning, spanning both *prediction* and *control*. Drawing from the algorithmic toolkits of *optimization* and *online learning*, together with techniques from *dynamical systems* and *control theory*, recent results have lead to the first instance-optimal control algorithm, and provably efficient learning in dynamical systems that exhibit long-term correlations.

SELECTED AWARDS, HONORS & ACHIEVEMENTS

2020	IBM Herman Goldstine Postdoctoral Fellowship in Mathematical Sciences (declined)
2019	Jacobus Fellowship, Princeton University's top graduate student honor (press, more)
2019	Best Paper Award, Optimization for RL workshop at NeurIPS 2019
2019	Best Reviewer (top 5%), NeurIPS 2019
2018-19	Selected twice for an Oral Presentation at NeurIPS – top 0.5% of the submissions
2018	SEAS Award for Excellence by the Graduate School at Princeton
2018	Spotlight Prize, New York Academy of Sciences' 12^{th} Annual ML Symposium
2015	President's Gold Medal for the best academic performance at IIT Kanpur (press)
	Ranked 1st (among 820 students) at IIT Kanpur
2012-2015	Academic Excellence Award for 3 years at IIT Kanpur
2011	All-India Rank 14 in AIEEE 2011 among 1,050,000 students
2011	All-India Rank 140 in IIT-JEE 2011 among 485,000 students
2011	Gold Medal, the top 35 (0.1%) students at Indian National Physics Olympiad 2011
2009	Kishore Vaigyanik Protsahan Yojana Fellowship, Government of India

PEER-REVIEWED PUBLICATIONS

All publications list authors in the alphabetical order, except those indicated with †.

Boosting for Online Convex Optimization
Elad Hazan, Karan Singh
International Conference on Machine Learning (ICML), 2021

A Regret Minimization Approach to Iterative Learning Control
Naman Agarwal, Elad Hazan, Anirudha Majumdar, Karan Singh
International Conference on Machine Learning (ICML), 2021

Improper Learning for Nonstochastic Control†
Max Simchowitz, Karan Singh, Elad Hazan
Conference on Learning Theory (COLT), 2020

No-Regret Prediction in Marginally Stable Systems
Udaya Ghai, Holden Lee, Karan Singh, Cyril Zhang, Yi Zhang
Conference on Learning Theory (COLT), 2020

The Nonstochastic Control Problem
Elad Hazan, Sham Kakade, Karan Singh
Algorithmic Learning Theory (ALT), 2020

Logarithmic Regret for Online Control
Naman Agarwal, Elad Hazan, Karan Singh
Neural Information Processing Systems (NeurIPS), 2019, **Oral Presentation** (<0.5% of submissions)
(Also, **Best Paper Award** at the OptRL workshop at NeurIPS 2019)

Online Control with Adversarial Disturbances
Naman Agarwal, Brian Bullins, Elad Hazan, Sham Kakade, Karan Singh
International Conference on Machine Learning (ICML), 2019

Provably Efficient Maximum Entropy Exploration
Elad Hazan, Sham Kakade, Karan Singh, Abby Van Soest
International Conference on Machine Learning (ICML), 2019

Efficient Full-Matrix Adaptive Regularization
Naman Agarwal, Brian Bullins, Xinyi Chen, Elad Hazan, Karan Singh, Cyril Zhang, Yi Zhang
International Conference on Machine Learning (ICML), 2019

Spectral Filtering for General Linear Dynamical Systems
Elad Hazan, Holden Lee, Karan Singh, Cyril Zhang, Yi Zhang
Neural Information Processing Systems (NeurIPS), 2018, **Oral Presentation** (<0.5% of submissions)

Learning Linear Dynamical Systems via Spectral Filtering
Elad Hazan, Karan Singh, Cyril Zhang
Neural Information Processing Systems (NeurIPS), 2017, **Spotlight** (<5% of submissions)
(Also, **Spotlight Prize** at New York Academy of Sciences' ML Symposium 2018)

The Price of Differential Privacy for Online Learning
Naman Agarwal, Karan Singh
International Conference on Machine Learning (ICML), 2017

Efficient Regret Minimization in Non-Convex Games
Elad Hazan, Karan Singh, Cyril Zhang
International Conference on Machine Learning (ICML), 2017

PREPRINTS, PATENTS AND TECHNICAL REPORTS

All publications list authors in the alphabetical order, except those indicated with †.

A Boosting Approach to Reinforcement Learning
Nataly Brukhim, Elad Hazan, Karan Singh
Preliminary version at ICML Workshop on RL Theory, 2021

Dynamic Learning System
Elad Hazan, Karan Singh, Cyril Zhang
US Patent 11,138,513 B2, approved Oct 2021

Machine Learning for Mechanical Ventilation Control†
Daniel Suo, Cyril Zhang, Paula Gradu, Udaya Ghai, Xinyi Chen, Edgar Minasyan, Naman Agarwal, Karan Singh, Julienne LaChance, Tom Zajdel, Manuel Schottdorf, Daniel Cohen, Elad Hazan
Machine Learning for Health (ML4H), 2021 Workshop Track
Featured in Princeton Engineering news

Deluca – A Differentiable Control Library: Environments, Methods, and Benchmarking†
Paula Gradu, John Hallman, Daniel Suo, Alex Yu, Naman Agarwal, Udaya Ghai, Karan Singh, Cyril Zhang, Anirudha Majumdar, Elad Hazan
NeurIPS Workshop on Differentiable Computer Vision & Physics, 2020 Oral Presentation

Towards Provable Control for Unknown Linear Dynamical Systems
Sanjeev Arora, Elad Hazan, Holden Lee, Karan Singh, Cyril Zhang, Yi Zhang
International Conference on Learning Representations (ICLR), Workshop Track, 2018

Dynamic Task Allocation for Crowdsourcing†
Angela Zhou, Irineo Cabreros, Karan Singh
ICML Workshop on Data Efficient Machine Learning, 2016

INTERNSHIPS

Microsoft Research, Redmond — *Summer 2014*
Undergrad Research Intern — Host: Sumit Gulwani

TEACHING

Economics and Computation (COS 445) — *Fall 2017*
Princeton University — Assistant Instructor

Artificial Intelligence and Machine Learning (COS 402) — *Spring 2016*
Princeton University — Assistant Instructor

Introduction to Machine Learning (COS 324) *Fall 2016*
Princeton University Assistant Instructor

Data Structure & Algorithms (ESO 207) *Fall 2014*
IIT Kanpur Teaching Assistant

SERVICE

Program Committee

Conference on Learning Theory (COLT) 2021, 2022
Algorithmic Learning Theory (ALT) 2021, 2022
AAAI Conference on Artificial Intelligence (AAAI), 2020

Reviewer

Conference on Learning Theory (COLT) 2017, 2018, 2020
International Conference on Machine Learning (ICML) 2018, 2019, 2020, 2021
Neural Information Processing Systems (NeurIPS) 2018, 2019, 2020, 2021
International Conference on Learning Representations (ICLR) 2020, 2021
Journal of Machine Learning Research
Mathematical Programming
OptRL Workshop, NeurIPS 2019

Graduate Students Admissions Committee *2018-2020*

Computer Science, Princeton University

Organizer *2017-2019*

Alg-ML Reading Group, Princeton University

Webmaster *2017-2019*

ML Theory Website, Princeton University

November 19, 2021