

Akash Kumar

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Research Interests

(broadly) Statistical Machine Learning · Deep Learning (adversarial, robustness, uncertainty) · Interactive Machine Learning · Algorithms (Theory) · Optimization (convex, non-convex, distributed) · Unsupervised Learning

Education

University of California San Diego

Graduate Research Assistant, *Department of Computer Science and Engineering*

San Diego (CA), USA

Sept '21 - Now

- *Research Focus*: AI, ML, and Theory.
- *Advisor*: Prof. Sanjoy Dasgupta
- *Collaboration*: Prof. Misha Belkin (Data Science Institute, UCSD)

Aalto University

Graduate Research Assistant, *Department of Computer Science*

Espoo, Finland

Sept '18 - Aug '19

- *Coursework*: Special course in Adversarial Deep Learning (credited), Convex Optimization II (audited).

Chennai Mathematical Institute

M.Sc. in Computer Science

Chennai, India

Aug '16 - May '18

- *Advisor*: Dr. KV Subrahmanyam
- *Master's Thesis*: [Escaping Saddle Points and Tensor Decomposition](#)
- Completed one semester of coursework at IIT Madras (*Spring '17*).

B.Sc. Hons. in Mathematics and Computer Science

Aug '13 - April '16

- **Major**: Mathematics and Computer Science

Publications & Preprints

- Convergence of Nearest Neighbor Selective Classifier**
Akash Kumar, Sanjoy Dasgupta,
In submission.
- Robust Empirical Risk Minimization with Tolerance**
($\alpha - \beta$) Robi Bhattacharjee, Kamalika Chaudhuri, Max Hopkins, Akash Kumar, Hantao Yu,
In submission.
[\[arXiv preprint\]](#)
[A preliminary version appeared in AdvML Frontiers @ ICML'22](#)
- Teaching via Best-Case Counterexamples in the Learning-with-Equivalence-Queries Paradigm**
Akash Kumar, Yuxin Chen, and Adish Singla,
Accepted: The 35th Conference on Neural Information Processing Systems (NeurIPS'21), 2021.
[\[Proc\]](#)
- The Teaching Dimension of Kernel Perceptron**
Akash Kumar, Hanqi Zhang, Adish Singla, and Yuxin Chen,
Accepted: The 24th International Conference on Artificial Intelligence and Statistics (AISTATS'21), 2021.
[\[arXiv preprint\]](#), [\[Proc\]](#)

5. Average-case Complexity of Teaching Convex Polytopes via Halfspace Queries

Akash Kumar, Adish Singla, Yisong Yue, and Yuxin Chen,

Rejections: *NeurIPS'20*, *ICML'21*

[arXiv preprint]

6. Deletion to Induced Matching

Akash Kumar and Mithilesh Kumar

[arXiv preprint]

Relevant Coursework

- **Machine Learning:** Unsupervised Learning*, Machine Learning and Data Mining*, Deep Learning*, Reinforcement Learning*, Policy Gradient Reinforcement Learning*, Special Course in Adversarial Deep Learning*
- **Optimization:** Optimization*, Convex Optimization* II (audited), Bandit Optimization*
- **Probability and Statistics:** Probability Theory†, Measure Theoretic Probability*, Reading course in Statistics*
- **Computer Science:** Advanced Programming†, Design and Analysis of Algorithms†, Complexity theory* [I, II], Algorithmic Game Theory*, Algebra Computation and Algorithms*, Pseudorandomness*
- **Mathematics:** Linear Algebra†, Calculus† [I, II, III], Real Analysis†, Complex Analysis†, Topology†, Differential Equations†, Stochastic Processes*, Game theory*.

* = Graduate course; † = Undergraduate course

Relevant Work Experience

Max Planck Institute for Software Systems - Research Fellow

Advisor: *Dr. Adish Singla*

Machine Teaching Group

Saarbrücken, Germany

Sept '19 - May '21

IBM India Research Lab - Research Intern

Advisor: *Dr. Karthik Sankaranarayanan*

Project - Tabular Data Summarization

Bengaluru, India

May '17 - July '17

Scholarships and Awards

- **Jacobs School of Engineering Fellowship** Fall '21
Accepted to the PhD program in Computer Science at the University of California San Diego and awarded the departmental fellowship for the first year of doctoral studies.
- **Crerar Fellowship at the University of Chicago** Fall '21
Accepted to the PhD program in Computer Science at the University of Chicago and awarded the Crerar Fellowship for being one of the strongest students of the incoming cohort.
- **Max Planck Institute Fellowship** Sept '19 - May '21
Selected as a research intern at Max Planck Institute for Software Systems with a monthly stipend.
- **Chennai Mathematical Institute Graduate Scholarship** Aug '16 - April '18
Joined Chennai Mathematical Institute's National Graduate Program in Computer Science in 2016 with a full tuition fee waiver and a merit-based monthly stipend.
- **Chennai Mathematical Institute Undergraduate Scholarship** Aug '13 - April '16
Joined Chennai Mathematical Institute's National Undergraduate Program in Mathematics and Computer Science in 2013 with a full tuition fee waiver and a merit-based monthly stipend.
- **Poster Competition: 2nd Prize, Among 30 candidates** Feb '18
Poster Competition sponsored by Tata Development Research and Design Center, Pune. Presented the research work conducted during an internship at IBM Research Lab.

- **TCS Summer School with Full Scholarship*** 2016
Selected for summer program in CS group of Institute of Mathematical Sciences under Dr. Meena Mahajan.
(*did not continue due to personal issues)
- **ACM Regionalist, Onsite Round** Dec' 13
ACM-ICPC at Amrita Vishwa Vidyapeetham.
- **B.MATH Programme, Ranked in Top 90 candidates selected from India** 2013
Qualified for interview for B.Math program at Indian Statistical Institute, Bangalore.
- **Regional Mathematics Olympiad Winner** '11 - '12
Awarded Merit Certificate and a gold medal for qualifying for Indian National Mathematics Olympiad (INMO) sponsored by National Board For Higher Mathematics, Department of Atomic Energy, Govt. Of India.
- **Zonal Informatics Olympiad Winner** '11 - '12
Qualified for Indian National Olympiad in Informatics (INOI) conducted by Indian Association for Research in Computing Science (IARCS) for Indian Computing Olympiad (ICO).
- **Special Merit Certificate** 2010
Honoured by CBSE Board, India for outstanding performance in the CBSE Examinations for scoring CGPA 10.

Selected Talks

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| Teaching via Best-case Counterexamples | UCSD, La Jolla |
| <i>UCSD AI Seminar talk on the research article accepted to NeurIPS'21.</i> | <i>Nov '21</i> |
| The Teaching Dimension of Kernel Perceptron | Virtually |
| <i>Short talk and poster presentation given as part of the research article accepted to AISTATS'21.</i> | <i>April '21</i> |
| Evaluating the Robustness of Neural Networks | Aalto University, Finland |
| <i>Presentation given as part of the seminar course on Adversarial Deep Learning.</i> | <i>Nov '18</i> |
| Manifold Learning and Tensor Decomposition | CMI |
| <i>Presentation given as part of the defense of the Master's thesis at CMI.</i> | <i>May '18</i> |
| Tabular Data Summarization | IBM, CMI |
| <i>Presentation given as part of the internship at IBM Research and in a poster competition.</i> | <i>July '17, Feb '18</i> |
| The sum of d small-bias generators fools polynomials of degree d | IIT Madras |
| <i>Presentation given as part of the course Pseudorandomness based on work of E Viola et al.</i> | <i>April '17</i> |
| Hierarchical Optimistic Optimization (HOO) | CMI |
| <i>Presentation given as part of the seminar course Advanced Machine Learning. It covers the techniques from the paper \mathcal{X}-armed bandits by Bubeck et al.</i> | <i>Nov '17</i> |

Teaching & Services

- **Teaching Assistant** at Chennai Mathematical Institute (Chennai) *Spring Semester, 2016*
Course: Discrete Mathematics (Instructor: Dr. Sourav Chakraborty)
- **Teaching Assistant** at Chennai Mathematical Institute (Chennai) *Fall Semester, 2017*
Course: Machine Learning and Data Mining (Instructor: Dr. Madhavan Mukund)
- **Reviewer**, *International Conference on Artificial Intelligence and Statistics (AISTATS) '21.*

Workshops/Conferences and Summer Schools

- **ALT'21, AISTATS'21, COLT'21, ICML'21** 2021
- **NeurIPS'20** 2020

Skills

- **Programming:** Python, C, C++, Haskell, Java
- **Libraries/Tools:** Scikit-learn, Pandas, PyTorch, Tensorflow, Git, Numpy, Scipy