

Shikhar Jaiswal

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University of Toronto
Advisors: [Prof. Nick Koudas](#) & [Prof. Niv Dayan](#)

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EDUCATION

University of Toronto
Doctor of Philosophy, Department of Computer Science

August '23 - Present

Indian Institute of Technology Patna
Bachelor of Technology, Computer Science and Engineering

July '16 - May '20

RESEARCH INTERESTS

Primary: Machine Learning for Systems and Systems for Machine Learning
Others: Information Retrieval, Algorithms and Applied Mathematics

PUBLICATIONS

OOD-DiskANN: Efficient and Scalable Graph ANNS for Out-of-Distribution Queries
Shikhar Jaiswal, Ravishankar Krishnaswamy, Ankit Garg, Harsha Simhadri & Sheshansh Agrawal
Under Review at *Advances in Neural Information Processing Systems (NeurIPS)*, 2023. [\[🔗\]](#)

MinUn: Accurate ML Inference on Microcontrollers
Shikhar Jaiswal*, Rahul Kranti Kiran Goli*, Aayan Kumar, Vivek Seshadri & Rahul Sharma
In *Proceedings of the 24th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, 2023. [\[🔗\]](#)

Acting Engaged: Leveraging Play Persona Archetypes for Semi-Supervised Classification of Engagement
Benjamin D. Nye*, Mark G. Core*, **Shikhar Jaiswal***, Aviroop Ghosal & Daniel Auerbach
In *Proceedings of the 14th International Conference on Educational Data Mining (EDM)*, 2021. [\[🔗\]](#)
(*) Denotes equal contribution.

RESEARCH EXPERIENCE

Billion-Scale Graph ANNS for Out-of-Distribution Queries [\[🔗\]](#)
Advisors: [Dr. Ravishankar Krishnaswamy](#) & [Dr. Harsha Simhadri](#) Jan '21 - October '22, **Microsoft Research**

Developed RobustVamana, a graph-based Approximate Nearest Neighbor Search (ANNS) algorithm suitable for billion-scale text-to-image embedding retrieval, and Accurate PQ (APQ), a novel product quantization algorithm for fast and accurate distance computations. The resulting system, OOD-DiskANN, offers upto 40% latency improvement over the previous state-of-the-art at billion-scale. Parts of this work are deployed across various Microsoft Bing verticals.

► In submission to NeurIPS '23

Accurate ML Inference on Resource-Constrained Devices [\[🔗\]](#) [\[📄\]](#) [\[🔗\]](#)
Advisors: [Dr. Prateek Jain](#), [Dr. Harsha Simhadri](#) & [Dr. Rahul Sharma](#) June '20 - Nov '21, **Microsoft Research**

Developed an efficient bit-width demotion heuristic named Haunter, and co-designed the MinUn compiler around it. MinUn generates accurate ML models under a strict RAM budget, while being agnostic of the number representation (fixed-point/floating-point/posit). When used with posits, MinUn generates TinyML models with upto $5.1\times$ lower RAM consumption and negligible loss in accuracy/mAP scores, compared to 32-bit floating point models.

► Published as a full paper at LCTES '23

SMART-E: Service for Measurement and Adaptation to Real-Time Engagement [\[🔗\]](#) [\[📄\]](#)
Advisor: [Dr. Benjamin D. Nye](#) Summer '19, **USC - Institute for Creative Technologies**

Built an active-learning based algorithmic pipeline for detecting user engagement with interactive tutoring systems. Applied feature engineering to develop a set of generalizable engagement metrics, tackling cold start and automated annotation problems using easy-to-obtain play-persona data. Analysis demonstrates the utility of play-persona data gathered during professional or quality assurance testing for training useful data mining algorithms.

► Published as a full paper at EDM '21

THESIS

Passenger Demand Prediction using Graph Convolutional Networks



Advisor: Dr. Joydeep Chandra

Thesis Project, IIT Patna

Worked on improving the empirical performance of an the existing Grid-Embedding-based passenger demand prediction model by introducing architectural changes and spectral filtering techniques. Improved model showed marked decrease in RMSE scores on the New York GreenTaxi Trip dataset for 2014.

SOFTWARE

DiskANN: Fast Accurate Billion-point Nearest Neighbor Search



Devvrit, Philip Adams, Andrija Antonijevic, Deng Cai, Ningyuan Chen, Magdalen Dobson, Jerry Gao, **Shikhar Jaiswal**, Rohan Kadekodi, Ravishankar Krishnaswamy, Huisheng Liu, Jigao Luo, Dax Pryce, Harsha V. Simhadri and Suhas J. Subramanya ★ >250 P >80

EdgeML: Machine Learning for Resource-Constrained Edge Devices



Don K. Dennis, Yash Gaurkar, Sridhar Gopinath, Sachin Goyal, Chirag Gupta, Moksh Jain, **Shikhar Jaiswal**, Ashish Kumar, Aditya Kusupati, Chris Lovett, Shishir G. Patil, Oindrila Saha and Harsha V. Simhadri ★ >1,400 P >350

OPEN SOURCE CONTRIBUTIONS

Implementing Essential Deep Learning Modules



Mentor: Marcus Edel

Google Summer of Code 2018

Deployed implementations of Generative Adversarial Networks (GAN, Deep Convolutional GAN, Wasserstein GAN and Cycle GAN) and Restricted Boltzmann Machines (RBM and Spike and Slab RBM), achieving ~1.57x single core aggregate speeds over *Sklearn's* and *Tensorflow's* implementations. ★ >4,100 P >1,400

Improving SymEngine's Python Wrappers and SymPy-SymEngine Integration



Mentors: Isuru Fernando & Sumith Kulal

Google Summer of Code 2017

Improved the overall infrastructure of *SymEngine*, an efficient, standalone C++ Computer Algebra System (CAS), and refactored its Python wrapper *SymEngine.py*. Further introduced SymEngine as an optional core for *SymPy*, and *PyDy*, a multi-body dynamics tool-kit for speeding up their backend computations by the order of ~70x. ★ >900 P >250

INDUSTRIAL EXPERIENCE

Software Development Intern - HackerRank



Manager: Harishankaran Karunanidhi, Co-Founder and CTO

Summer '18, Bangalore

Open Mainframe Project Intern - The Linux Foundation



Mentor: Wolfgang Engel, SUSE Linux GmbH

Summer '18, Remote

HONOURS & ACHIEVEMENTS

- Achieved 98.71% percentile in JEE Advanced (previously IIT-JEE) 2016 among 200,000 candidates
- Achieved 99.54% percentile in JEE Main (previously AIEEE) 2016 among 1,200,000 candidates
- Achieved 99.13% percentile in National Entrance Screening Test (NEST) 2016 among 40,000 candidates
- Recipient of the Kishore Vaigyanik Protsahan Yojana Scholarship in 2016 (*top 1400* students out of 100,000)
- Recipient of CBSE Award for Community Service - Human Rights and Social Equality 2013

REFERENCES (AVAILABLE ON REQUEST)

Dr. Harsha Simhadri

Principal Researcher
Microsoft Research India

Prof. Ravishankar Krishnaswamy

Principal Researcher
Microsoft Research India

Dr. Rahul Sharma

Principal Researcher
Microsoft Research India

Dr. Prateek Jain

Senior Staff Research Scientist
Google Research India

Dr. Ankit Garg

Senior Researcher
Microsoft Research India