Kabir Nagrecha

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Education

2021-	PhD in Machine Learning Systems, University of California San Diego

- Jacobs School of Engineering Fellowship
- Halicioglu Data Science Institute Fellowship

2019-2021	B.Sc. in Computer Science, University of California San Diego (Transfer) GPA: 4.0
2017-2019	B.Sc. in Computer Science, California State University Los Angeles GPA: 3.99

Began undergraduate degree at age 13, started PhD at age 17.

Industry

2021 — Siri Understanding Intern (Apple)

- Redesigned Siri False-Trigger-Mitigation model development pipeline to enable faster iteration and deployment. Internship ongoing.

2020 — Siri Understanding Intern (Apple)

- Primary contributor on the Apple Watch "Raise-to-Speak" model overhaul. Developed prototype system that reduced false-reject-rate of Siri invocation on Apple Watches by more than 64%. False-accept-rate was decreased by 67%, and model power draw reduced by 50%. System was deployed to production, and is used more than 30 million times a week.
- Developed a full redesign to leverage intra-device information across the Apple ecosystem to produce a prototype Siri model with 84% lower invocation error rates.
- One of 5 finalists in Apple's internal product proposal and development contest.

2019 — Machine Learning Intern (Unilever)

- Developed a facial-analysis system capable of identifying blemishes and other skin conditions. Coupled with a product recommendation algorithm, the system streamlines the user experience and allows customers to understand which Unilever products are best for them.
- Utilized RPA technologies to improve internal communication and management.

2018 — Software Development Intern (Unilever)

- Developed an RPA system for price scraping to monitor price changes in competitor's products, and to analyze optimal price points relative to market alternatives.
- Built a sentiment analysis system to automatically detect negative mentions of the company on social media, and to analyze internal surveys.

2017 — Machine Learning Intern (Aerospace Corp.)

- Developed an autonomous vehicle to explore and map unknown terrain.
- Used in the Aerospace Corp.'s eventual satellite launches.

Publications

2022 — Hydra: A Scalable and Optimized Data System for Large Multi-Model Deep Learning (Preprint)

- A new platform for model parallelism leveraging multi-model execution and mixed memory hierarchies to improve scalability and parallelism.
- Enables training of multi-billion parameter Transformer models on a single 8GB GPU.
- Speeds up training by >7.5X with 8 GPUs, and demonstrates up to 50% speedups versus pipeline parallelism.

2021 — Model Parallel Model Selection for Deep Learning Systems (ACM SIGMOD '21)

- **ACM UG Student Research Competition Winner**
- Competition abstract proposing a platform for model parallelism leveraging novel ideas from RDBMSs to redesign machine learning training.

2021 — Gradient-based Algorithms for Machine Teaching (CVPR '21)

- A technique for dataset pruning and selection allows a machine learning algorithm to determine most useful samples of a dataset for use in teacher-student training or human education.
- Demonstrates up to 47% increase in human student accuracy and a 140% improvement on simulated workers.

2020 — Cerebro: A Layered Data Platform for Scalable Deep Learning (CIDR '21)

- A platform for model selection using new forms of mixed task-data parallel training that enables practitioners to evaluate hyperparameters and architecture for their task quickly.
- Currently being used by medical researchers and economists.

2020 — Satellite Image Atmospheric Air Pollution Prediction through Meteorological Graph Convolutional Network with Deep Convolutional LSTM (CSCI '20)

- A deep learning model leveraging the latest advances in graph neural network design to predict air pollution levels across the L.A. area. Demonstrates less than 10% prediction error.
- Adopted by NASA and L.A. City government, presented to high-ranking government officials including the mayor.

2020 — Sensor-Based Air Pollution Prediction Using Deep CNN-LSTM (CSCI '20)

- Air pollution prediction system using inexpensive ground-sensor data.
- Demonstrates less than 18% error, applicable to any region of the world.

2019 — Incremental and Approximate Computations for Accelerating Deep CNN Inference (ACM TODS '20)

- A platform for efficient convolutional inference with multi-query optimization techniques.
- Speeds up video analytics tasks by up to 8X, and prediction explanation tasks by up to 32X.

2018 — As-Encountered Prediction of Tunnel Boring Machine Performance Parameters using Recurrent Neural Networks (Transportation Research Record '18)

- Novel technique applying deep learning techniques to predict tunnel excavation performance with a margin of 18% error.

Awards and Fellowships

2022	ACM Undergraduate Student Research Competition Grand Finalist (Competition Ongoing)
2021	ACM SIGMOD Undergraduate Student Research Competition Winner
2021	UCSD CSE Excellence in Research Award
2021	UCSD Jacobs School of Engineering Fellowship
2021	UCSD Halicoglu Data Science Institute Fellowship
2021	CRA Outstanding Undergraduate Researcher Honorable Mention
2020	UCSD Outstanding Undergraduate Researcher Honorable Mention
2020	Earl Warren College Engineering Society Member
2019	Eta Kappa Nu Honors Engineering Society Invitee
2018	Tau Beta Pi Honors Engineering Society Invitee

Talks

2021   Hydra: Model Parallel Model Selection for Deep Learning Systems (ACM SIGMOD SRC)

- Won the ACM SIGMOD Student Research Competition

2021   Machine Teaching for Dataset Production (CVPR)

- Demonstrated an accurate way of generating high-accuracy labels in expert domains using inexpensive techniques.

2020   Data Management and Model Parallelism (UC San Diego DB Lab)

- Seminar talk at the UCSD Jacobs School of Engineering.

2020   Machine Learning for Tunnel Excavation (University of Colorado, Boulder)

- Demonstrated a new way for tunnel excavators to use machine learning to minimize costs and time.

Teaching

2020	Teaching Assistant with Prof. Gary Gillespie at University of California, San Diego
2018	Teaching Assistant with Prof. Russ Abbott at California State University Los Angeles