

Supun Nakandala

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Research Interests My research interest lies broadly in the intersection of Systems and Machine Learning, an emerging area which is increasingly referred to as *Machine Learning Systems*. In this space I operate as a data management researcher. My Ph.D. thesis work focuses on developing query optimization-inspired abstractions, algorithms, and systems to improve efficiency, scalability, and usability of deep learning workloads.

Education

University of California, San Diego Sept 2017 - (expected) March 2022
PhD, Computer Science.
Thesis Title: *Multi-Query Optimization for Deep Learning Systems*
Thesis Advisor: Arun Kumar
Committee Members: Arun Kumar (chair), Yannis Papakonstantinou, Geoffrey Voelker, Lawrence Saul, Loki Natarajan

University of California, San Diego Sept 2017 - June 2020
MSc, Computer Science. GPA: 3.97/4.00

University of Moratuwa, Sri Lanka Aug 2010 - April 2015
Bachelor of the Science of Engineering, Computer Science & Engineering.
GPA: 4.11/4.20.
Department Topper and Gold Medalist

Work Experience

Research Intern June 2021 - Sept 2021
Data Management, Exploration, and Mining Group – Microsoft Research
Mentor: Vivek Narasayya

Software Engineering Intern June 2020 - Sept 2020
Redshift – Amazon Web Services
Mentor: Yannis Papakonstantinou
Designed and implemented components of [Redshift ML](#), in-database ML feature of Redshift data warehouse, that went to public preview.

Research Intern June 2019 - Sept 2019
Gray Systems Lab – Microsoft
Mentors: Matteo Interlandi, Markus Weimer
Designed and implemented [Hummingbird](#) system, a compiler for translating classical machine learning pipelines into tensor computations for unified and faster scoring of machine learning models.

Research Software Developer Oct 2015 - Aug 2017
Science Gateways Research Center, Indiana University
Manager: Marlon Pierce
Contributed to the development of [Apache Airavata](#) system, which is a software framework to compose, manage, execute, and monitor computational applications and workflows on distributed computing resources such as local clusters, computational grids, and computing clouds.

Teaching Experience

Teaching Assistant - Systems for Scalable Analytics UCSD - Winter 2020
Teaching Assistant - Advanced Data Analytics Systems UCSD - Spring 2019

**Conference
Publications**

Cerebro: A Layered Data Platform for Scalable Deep Learning
Arun Kumar, **Supun Nakandala**, Yuhao Zhang, Side Li, Advitya Gemawat, and Kabir Nagrecha
CIDR 2021 (Vision paper)

Cerebro: A Data System for Optimized Deep Learning Model Selection
Supun Nakandala, Yuhao Zhang, and Arun Kumar
VLDB 2020

A Tensor Compiler for Unified Machine Learning Prediction Serving
Supun Nakandala, Karla Saur, Gyeong-In Yu, Konstantinos Karanasos, Carlo Curino, Markus Weimer, and Matteo Interlandi
OSDI 2020

Vista: Declarative Feature Transfer from Deep CNNs at Scale
Supun Nakandala and Arun Kumar
SIGMOD 2020

Extending Relational Query Processing with ML Inference
Konstantinos Karanasos, Matteo Interlandi, Doris Xin, Fotis Psallidas, Rathijit Sen, Kwanghyun Park, Ivan Popivanov, **Supun Nakandala**, Subru Krishnan, Markus Weimer, Yuan Yu, Raghu Ramakrishnan, Carlo Curino
CIDR 2020

Incremental and Approximate Inference for Faster Occlusion-based Deep CNN Explanations
Supun Nakandala, Arun Kumar, and Yannis Papakonstantinou
SIGMOD 2019
Honorable Mention for Best Paper Award
Invited to TODS 2020
Invited to SIGMOD Research Highlight 2020

Gendered Conversation in a Social Game-Streaming Platform
Supun Nakandala, Giovanni Cimpaglia, Norma Su, and Yong-Yeol Ahn
AAAI ICWSM 2017

Apache Airavata Security Manager: Authentication and Authorization Implementations for a Multi-Tenant eScience Framework
Supun Nakandala, Hasini Gunasinghe, Suresh Marru, and Marlon Pierce
IEEE e-Science 2016

**Journal
Publications**

Deep Learning Algorithms for Identifying Sedentary Behavior from Hip Worn Accelerometer Data
Supun Nakandala, Marta Jankowaska, Fatima Tuz-Zahra, John Bellettiere, Arun Kumar, and Loki Natarajan
Journal for the Measurement of Physical Behavior, 2021

Query Optimization for Faster Deep CNN Explanations
Supun Nakandala, Arun Kumar, and Yannis Papakonstantinou
SIGMOD Record 2020 (**SIGMOD Research Highlight Award**)

Incremental and Approximate Computations for Accelerating Deep CNN Inference
Supun Nakandala, Kabir Nagrecha, Arun Kumar, and Yannis Papakonstantinou
TODS 2020 (**Invited Paper**)

Workshop and Demo Publications	Compiling Classical ML Pipelines into Tensor Computations for One-size-fits-all Prediction Serving Supun Nakandala , Gyeong-In Yu, Matteo Interlandi, and Markus Weimer NeurIPS 2019 MLSys Workshop
	<i>Cerebro: Efficient and Reproducible Model Selection on Deep Learning Systems</i> Supun Nakandala , Yuhao Zhang, and Arun Kumar SIGMOD 2019 DEEM Workshop
	<i>Demonstration of Krypton: Optimized CNN Inference for Occlusion-based Deep CNN Explanations</i> Allen Ordoookhanians, Xin Li, Supun Nakandala , and Arun Kumar VLDB 2019 Demo MLSys 2019 Demo
	<i>Materialization Trade-offs for Feature Transfer from Deep CNNs for Multimodal Data Analytics</i> Supun Nakandala , Arun Kumar MLSys 2018 Short paper
	<i>Anatomy of the SEAGrid Science Gateway</i> Supun Nakandala , Sudhakar Pamidigantam, Suresh Marru, Marlon Pierce NSF XSEDE 2016
Pre-Prints	<i>Nautilus: An Optimized System Deep Learning-based Active Transfer Learning</i> Supun Nakandala and Arun Kumar Under Preparation
	<i>The CNN Hip Accelerometer Posture (CHAP) Method for Classifying Sitting Patterns from Hip Accelerometers: A Validation Study in Older Adults</i> Mikael Anne*, Supun Nakandala* , Marta M. Jankowska, Dori Rosenberg, Fatima Tuz-Zahra, John Bellettiere, Jordan Carlson, Paul R. Hibbing, Jingjing Zou, Andrea Z. LaCroix, Arun Kumar, and Loki Natarajan Under Submission (* Co-First Author)
Research Impact	Microsoft open-sourced Hummingbird system and uses it in ONNX ML Tools 2020 Ideas from project CEREBRO integrated into MADlib/Greenplum by VMWare 2019 CEREBRO system is being used by behavioral science researchers at UCSD 2019 “Gendered Conversation in a Social Game-Streaming Platform” paper gains lot of media attention and creates awareness about the bleak issue of sexism in online game streaming platforms 2017 APACHE AIRAVATA science gateways middleware and the SEAGRID science gateway are widely used by computational science researchers to execute and manage computational jobs on university clusters and national supercomputing infrastructure 2017
Patents	Pending US Patent Application: <i>Query Optimization for Deep Convolutional Neural Network Inferences</i> Arun Kumar and Supun Nakandala
	Pending US Patent Application: <i>Accelerating Inference of Traditional ML Pipelines with Neural Network Frameworks</i> Matteo Interlandi, Markus Weimer, Saeed Amizadeh, Konstantinos Karanasos, Supun Nakandala, Karla J. Saur, Carlo Aldo Curino and Gyeongin Yu

Service**Program Committee:**

VLDB: 2022

External Reviewer:

VLDB: 2019

Scholarships and Awards

Student grant to attend OSDI 2020 USENIX - 2020
NSF travel award to attend SIGMOD 2019 NSF - 2019
Gold Medal for the Best Academic Performance University of Moratuwa - 2015
Travel award to attend South Asia Workshop on Research
Frontiers in Computing National University of Singapore - 2014
Mahapola Higher Education Merit Scholarship Govt. of Sri Lanka - 2010

Technical Talks

Cerebro: A Data System for Optimized Deep Learning Model Selection

VLDB 2020; UCSD CNS Research Review 2020; SIGMOD 2019

Vista: Optimized System for Declarative Feature Transfer from Deep CNNs at Scale

SIGMOD 2020; UCSD CNS Research Review 2018

Incremental and Approximate Inference for Faster Occlusion-based Deep CNN Explanations

SIGMOD 2019

A Tensor Compiler for Unified Machine Learning Prediction Serving

OSDI 2020; Microsoft Gray Systems Lab 2019; Google Brain ML+Compiler Reading Group 2021 (Invited)