

# Supun Nakandala

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**Research Interests** My research interest lies broadly in the intersection of Systems and Machine Learning. 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 the efficiency, scalability, and usability of ML-based analytic workloads.

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

Courses: Principles of Database Systems, Database System Implementation, Advanced Data Analytics Systems, Data Models in Big Data Era, Advanced Compiler Design, Machine Learning, Recommender Systems and Web Mining, Algorithm Design and Analysis, Programming Languages

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

**University of Moratuwa**, Sri Lanka Aug 2010 - April 2015  
*B.Sc.*, Computer Science. GPA: 4.11/4.20  
**Department Topper and Gold Medalist**

**Professional Experience** **Microsoft - Research Intern** June 2021 - Sept 2021  
Team: Microsoft Research Data Systems Group | Mentor: Vivek Narasayya  
Designed and evaluated resource management schemes for serverless databases.

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

**Microsoft - Research Intern** June 2019 - Sept 2019  
Team: Gray Systems Lab | Mentor: Matteo Interlandi  
Designed and implemented the [Hummingbird](#) system, a compiler for translating classical machine learning pipelines into tensor computations for optimized ML scoring.

**Indiana University - Research Software Developer** Oct 2015 - Aug 2017  
Team: Science Gateways Research Center | Manager: Marlon Pierce  
Contributed to the development of the [Apache Airavata](#) system, which is a software framework to execute and manage computational applications and workflows.

**Conference Publications** *Nautilus: An Optimized System for Deep Learning-based Active Transfer Learning*  
Supun Nakandala and Arun Kumar  
SIGMOD 2022 (To Appear) | [Paper](#)

*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) | [Paper](#)

*Cerebro: A Data System for Optimized Deep Learning Model Selection*

**Supun Nakandala**, Yuhao Zhang, and Arun Kumar

VLDB 2020 | [Paper](#)

*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 | [Paper](#)

*Vista: Declarative Feature Transfer from Deep CNNs at Scale*

**Supun Nakandala** and Arun Kumar

SIGMOD 2020 | [Paper](#)

*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 | [Paper](#)

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

**Supun Nakandala**, Arun Kumar, and Yannis Papakonstantinou

SIGMOD 2019 | [Paper](#)

**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 | [Paper](#)

*Apache Airavata Sharing Service: A Tool for Enabling User Collaboration in Science Gateways*

**Supun Nakandala**, Suresh Marru, Marlon Piece, Sudhakar Pamidighantam, Kenneth Yoshimoto, Terri Schwartz, Subhashini Sivagnanam, Amit Majumdar, Mark Miller

PEARC 2017 | [Paper](#)

*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 | [Paper](#)

*Anatomy of the SEAGrid Science Gateway*

**Supun Nakandala**, Sudhakar Pamidigantam, Suresh Marru, Marlon Pierce

PEARC 2016 | [Paper](#)

## Journal Publications

*The CNN Hip Accelerometer Posture (CHAP) Method for Classifying Sitting Patterns from Hip Accelerometers: A Validation Study in Older Adults*

**Supun Nakandala\***, Mikael Anne\*, 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 (\* Co-first author)

Medicine & Science in Sports & Exercise, 2021

*Application of Convolutional Neural Network Algorithms for Advancing Sedentary and Activity Bout Classification*

**Supun Nakandala**, Marta Jankowska, Fatima Tuz-Zahra, John Bellettiere, Jordan Carlson, Andrea LaCroix, Sheri Hartman, Dori Rosenberg, Jingjing Zou, Arun Kumar, and Loki Natarajan  
Journal for the Measurement of Physical Behavior, 2021 | [Paper](#)

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

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

**Vision, Workshop, and Demo Publications** *Tensors: An Abstraction for General Data Processing*  
Dimitrios Koutsoukos, **Supun Nakandala**, Karla Saur, Konstantinos Karanasos, Gustavo Alonso, and Matteo Interlandi  
VLDB 2021

*Intermittent Human-in-the-loop Model Selection using Cerebro: A Demonstration*  
Liangde Li, **Supun Nakandala**, and Arun Kumar  
VLDB 2021 | [Paper](#)

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 | [Paper](#)

*Cerebro: Efficient and Reproducible Model Selection on Deep Learning Systems*  
**Supun Nakandala**, Yuhao Zhang, and Arun Kumar  
SIGMOD 2019 DEEM Workshop | [Paper](#)

*Demonstration of Krypton: Optimized CNN Inference for Occlusion-based Deep CNN Explanations*  
Allen Ordoookhanians, Xin Li, **Supun Nakandala**, and Arun Kumar  
VLDB 2019 Demo | MLSys 2019 Demo | [Paper](#)

*Materialization Trade-offs for Feature Transfer from Deep CNNs for Multimodal Data Analytics*  
**Supun Nakandala**, Arun Kumar  
MLSys 2018 Short paper | [Paper](#)

**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 2020  
[CHAP models](#) are now the state-of-the-art method for identifying sedentary behavior from hip-worn accelerometer data for public health applications 2020  
CEREbro system is being used by behavioral science researchers at UCSD 2019  
“*Gendered Conversation in a Social Game-Streaming Platform*” paper gains [media attention](#) and creates awareness about the bleak issue of sexism in online gaming 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: *Query Optimization for Deep Convolutional Neural Network Inferences*  
Arun Kumar and Supun Nakandala

Pending US Patent Application: *Accelerating Inference of Traditional ML Pipelines with Neural Network Frameworks*

Matteo Interlandi, Markus Weimer, Saeed Amizadeh, Konstantinos Karanasos, Supun Nakandala, Karla J. Saur, Carlo Aldo Curino and Gyeongin Yu

<b>Scholarships and Awards</b>	SIGMOD research highlight award	SIGMOD - 2020
	Student grant to attend OSDI 2020	USENIX - 2020
	SIGMOD best paper honorable mention award	SIGMOD - 2019
	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	NUS Singapore - 2014
	Mahapola higher education merit scholarship	Govt. of Sri Lanka - 2010

<b>Teaching Experience</b>	<a href="#">Systems for Scalable Analytics-UCSD Winter 2020</a> : TA for the inaugural offering of the course. Contributed to the design and implementation of the programming assignments of the course.
	<a href="#">Advanced Data Analytics Systems-UCSD Spring 2019</a> : Mentored graduate student research projects and conducted research paper discussions.

<b>Service</b>	<b>Program Committee:</b>
	VLDB: 2022
	DBAI@NeurIPS: 2021
	<b>External Reviewer:</b>
	VLDB: 2019
	<b>Mentoring Student Research Projects:</b>
	Liangde Li, MS UCSD 2021
	Allen Ordookhanians, MS UCSD 2019
	Xin Li, MS UCSD 2019
	Advitya Gemawat, BS UCSD 2021
Kabir Nagrecha, BS UCSD 2021	