

# 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) December 2021  
*Ph.D.*, 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  
*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 - (Incoming) Research Intern** June 2021 - Sept 2021  
Team: Data Management, Exploration, and Mining (DMX) Group

**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, Mentors: Matteo Interlandi, Markus Weimer  
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  
Under Preparation

*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**, Giovani 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, and Mark A 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)  
(Under Revision) 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   <a href="#">Paper</a>
	<i>Query Optimization for Faster Deep CNN Explanations</i> <b>Supun Nakandala</b> , Arun Kumar, and Yannis Papakonstantinou SIGMOD Record 2020 ( <b>SIGMOD Research Highlight Award</b> )   <a href="#">Paper</a>
	<i>Incremental and Approximate Computations for Accelerating Deep CNN Inference</i> <b>Supun Nakandala</b> , Kabir Nagrecha, Arun Kumar, and Yannis Papakonstantinou TODS 2020 ( <b>Invited Paper</b> )   <a href="#">Paper</a>
<b>Workshop and Demo Publications</b>	<i>Intermittent Human-in-the-loop Model Selection using Cerebro: A Demonstration</i> Liangde Li, <b>Supun Nakandala</b> , and Arun Kumar Under Submission
	Compiling Classical ML Pipelines into Tensor Computations for One-size-fits-all Prediction Serving <b>Supun Nakandala</b> , Gyeong-In Yu, Matteo Interlandi, and Markus Weimer NeurIPS 2019 MLSys Workshop   <a href="#">Paper</a>
	<i>Cerebro: Efficient and Reproducible Model Selection on Deep Learning Systems</i> <b>Supun Nakandala</b> , Yuhao Zhang, and Arun Kumar SIGMOD 2019 DEEM Workshop   <a href="#">Paper</a>
	<i>Demonstration of Krypton: Optimized CNN Inference for Occlusion-based Deep CNN Explanations</i> Allen Ordookhanians, Xin Li, <b>Supun Nakandala</b> , and Arun Kumar VLDB 2019 Demo   MLSys 2019 Demo   <a href="#">Paper</a>
	<i>Materialization Trade-offs for Feature Transfer from Deep CNNs for Multimodal Data Analytics</i> <b>Supun Nakandala</b> , Arun Kumar MLSys 2018 Short paper   <a href="#">Paper</a>
<b>Research Impact</b>	<a href="#">CHAP models</a> are now the state-of-the-art method for identifying sedentary behavior from hip-worn accelerometer data for public health applications 2021 Microsoft open-sourced <a href="#">Hummingbird</a> system and uses it in ONNX ML Tools 2020 Ideas from project CEREbro integrated into <a href="#">MADlib/Greenplum</a> by VMWare 2019 CEREbro system is being used by behavioral science researchers at UCSD 2019 “ <i>Gendered Conversation in a Social Game-Streaming Platform</i> ” paper gains <a href="#">media attention</a> and creates awareness about the bleak issue of sexism in online gaming 2017 APACHE AIRAVATA science gateways middleware and the SEAGRID science gateway are <a href="#">widely used</a> by computational science researchers to execute and manage computational jobs on university clusters and national supercomputing infrastructure 2017
<b>Patents</b>	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
<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>	Teaching Assistant - <a href="#">Systems for Scalable Analytics</a>	UCSD - Winter 2020
	Teaching Assistant - <a href="#">Advanced Data Analytics Systems</a>	UCSD - Spring 2019
<b>Service</b>	<b>Program Committee:</b>	
	VLDB: 2022	
	<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	
<b>Technical Talks</b>	<i>Cerebro: A Data System for Optimized Deep Learning Model Selection</i>	
	VLDB 2020; Spark AI Summit 2020; UCSD CNS Research Review 2020; SIGMOD 2019	
	<i>A Tensor Compiler for Unified Machine Learning Prediction Serving</i>	
	OSDI 2020; Microsoft Gray Systems Lab 2019; Google Brain ML+Compiler Reading Group 2021 (Invited)	
	<i>Vista: Optimized System for Declarative Feature Transfer from Deep CNNs at Scale</i>	
	SIGMOD 2020; UCSD CNS Research Review 2018	
	<i>Incremental and Approximate Inference for Faster Occlusion-based Deep CNN Explanations</i>	
	SIGMOD 2019	
	<i>Gendered Conversation in a Social Game Streaming Platform</i>	
	AAAI ICWSM 2017; Indiana University Center for Complex Network and Systems Research 2017 (Invited)	
	<i>Apache Airavata Sharing Service: A Tool for Enabling User Collaboration in Science Gateways</i>	
	PEARC 2017	
	<i>Apache Airavata Security Manager: Authentication and Authorization Implementations for a Multi-tenant e-Science Framework</i>	
	IEEE e-Science 2016	
	<i>Anatomy of SEAGrid Science Gateway</i>	
	PEARC 2016	