Niranda Perera *January 10, 1990*

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Research Interests

High Performance Computing, Data Engineering, *Dataframes*, Distributed Computing, Distributed Deep Learning

Experience

Voltron Data Inc.
Remote - Fishers, Indiana

Software Engineer *Oct 2022 – Present*

Building a multi-silicon language-agnostic distributed data engineering solution with a C++ backend

- Developing communication routines for distributed data engineering operators using **TCP** & **UCX**
- Developing distributed computing kernels for relational operators
- Developed a distributed unit-testing framework based on CMake CTest
- Contributing to **Apache Arrow** core and its **Acero** project

Digital Science Center, Indiana University
Bloomington, USA

Research Assistant *Aug 2018 – Oct 2022*

Working on high-performance computing, data engineering, and AI/ML

- Lead developer of **Cylon**, a **distributed high performance data engineering framework** based on **Apache Arrow**, with a **C++** backend & a **Python** frontend using **Cython**
- Developing Cylon communication backend using **MPI**, **UCX & UCC**, & **Gloo**
- Developing *Cylon-Flow* execution environment that integrates Cylon with **Dask**, **Ray**, **Parsl**, & **Radical Pilot**
- Working on parallel DNN training in **PyTorch** (ex:**Pipedream**, **GPipe**)
- Developing **Twister2**, a **Java** based composable Big Data toolkit for cloud and high-performance computing infrastructure

Teaching Assistant *Aug 2019 – Apr 2020*

Engineering Cloud Computing (E516)

- Assisted students with their Cloudmesh projects
- Technologies covered: Cloud infrastructure (**Azure**, **AWS**, **GCP**, **OpenStack**), Container management (**Docker**, **Kubernetes**), **REST APIs**

Voltron Data Inc. (*FKA* Ursa Computing Inc.)
Remote - Greenwood, Indiana

Software Engineering Intern *May 2021 – Aug 2021*

Working on **Apache Arrow C++ Compute API** development

- Developed to compute kernels, bug fixes, and compute utilities in C++ and Python
- Extensively worked on **Template Metaprogramming (TMP) & Object Oriented Programming (OOP) in C++**. Major contributions - *Hash Semi-Join Node*, *If-else Kernel*, *Bitmap Word Visitor API*
- Apache Arrow JIRAs worked on can be accessed here.
- Apache Arrow Github Pull Requests can be accessed here.

Department of Computer Science and Engineering, University of Moratuwa
Moratuwa, Sri Lanka

Research Assistant *Jan 2017 – Jun 2018*

Developing a Cloud Based, Real-Time Weather Modeling and Forecasting Framework for Center for Flood Control and Water Management, Sri Lanka.

- Worked on statistical and numerical weather prediction models (WRF, SHER, and HEC-HMS)
- Developed a **Python**-based distributed execution framework to run models in production using **Apache Airflow**, **Google Cloud Platform**, & **Docker**

WSO2 Inc
Colombo, Sri Lanka

Senior Software Engineer *Apr 2016 – Dec 2016*

Open source middleware stack using OSGi spec. Member of WSO2 Data Analytics Server (DAS), an enterprise platform for batch, streaming, & predictive data analytics.

- Integrated **Apache Spark** into DAS
- Developed analytics solutions for WSO2 Enterprise Service Bus, API Manager, & Identity Server
- Experienced in OSGI architecture, Open Source Software development practices, and providing enterprise production & support

Software Engineer *Mar 2014 – Apr 2016*

Education

Indiana University
Bloomington, USA

Doctor of Philosophy, *Intelligent Systems Engineering* *2018 – 2022*

PhD Candidate advised by Prof. Geoffrey Fox with a **GPA of 3.991**
Major: **Computer Engineering** Minor: **Cyber-Physical Systems**
Dissertation topic: **Towards Scalable High Performance Data Engineering Systems**

- Proposed a scalable computation model & operator patterns for distributed data engineering
- Developed *Cylon*, a high-performance dataframe system based on the said model
- Developed *CylonFlow*, a ubiquitous data engineering environment that supports multiple execution paradigms

Master of Science, *Intelligent Systems Engineering* *2018 – 2022*
GPA of 3.97 in **Computer Engineering** track (Completed. Graduation May, 2022)

University of Moratuwa (UoM) Katubedda, Sri Lanka
B. Sc. Eng. (Hons), Electronic and Telecommunication Engineering *2009 – 2014*
First Class with a GPA of 3.76. With the Undergraduate Final Year Project, *Air travel planning and search optimization using GPUs*, developed using **Nvidia CUDA**.

Publications

[1] K. Shan, N. Perera, D. Lenadora, T. Zhong, A. Sarker, S. Kamburugamuve, T. A. Kanewela, C. Widanage, and G. Fox, "Hybrid cloud and hpc approach to high-performance dataframes," *arXiv preprint arXiv:2212.13732*, 2022.

[2] N. Perera, S. Kamburugamuve, C. Widanage, V. Abeykoon, A. Uyar, K. Shan, H. Maithree, D. Lenadora, T. A. Kanewala, and G. Fox, "High performance dataframes from parallel processing patterns," *arXiv preprint arXiv:2209.06146*, 2022.

[3] V. Abeykoon, S. Kamburugamuve, C. Widanage, N. Perera, A. Uyar, T. A. Kanewala, G. von Laszewski, and G. Fox, "Hptmt parallel operators for high performance data science & data engineering," *arXiv preprint arXiv:2108.06001*, 2021.

[4] S. Kamburugamuve, C. Widanage, N. Perera, V. Abeykoon, A. Uyar, T. A. Kanewala, G. Von Laszewski, and G. Fox, "Hptmt: Operator-based architecture for scalable high-performance data-intensive frameworks," in *2021 IEEE 14th International Conference on Cloud Computing (CLOUD)*, IEEE, 2021, pp. 228–239.

[5] N. Perera, V. Abeykoon, C. Widanage, S. Kamburugamuve, T. A. Kanewala, P. Wickramasinghe, A. Uyar, H. Maithree, D. Lenadora, and G. Fox, "A fast, scalable, universal approach for distributed data reductions," *arXiv preprint arXiv:2010.14596*, 2020.

[6] V. Abeykoon, N. Perera, C. Widanage, S. Kamburugamuve, T. A. Kanewala, H. Maithree, P. Wickramasinghe, A. Uyar, and G. Fox, "Data engineering for hpc with python," in *2020 IEEE/ACM 9th Workshop on Python for High-Performance and Scientific Computing (PyHPC)*, IEEE, 2020, pp. 13–21.

[7] C. Widanage, N. Perera, V. Abeykoon, S. Kamburugamuve, T. A. Kanewala, H. Maithree, P. Wickramasinghe, A. Uyar, G. Gunduz, and G. Fox, "High performance data engineering everywhere," in *2020 IEEE International Conference on Smart Data Services (SMDS)*, IEEE, 2020, pp. 122–132.

[8] P. Wickramasinghe, N. Perera, S. Kamburugamuve, K. Govindarajan, V. Abeykoon, C. Widanage, A. Uyar, G. Gunduz, S. Akkas, and G. Fox, "High-performance iterative dataflow abstractions in twister2: Tset," *Concurrency and Computation: Practice and Experience*, e5998, 2020.

[9] P. Wickramasinghe, S. Kamburugamuve, K. Govindarajan, V. Abeykoon, C. Widanage, N. Perera, A. Uyar, G. Gunduz, S. Akkas, and G. Fox, "Twister2: Tset high-performance iterative dataflow," in *2019 International Conference on High Performance Big Data and Intelligent Systems (HPBD&IS)*, IEEE, 2019, pp. 55–60.

[10] A. Uyar, G. Gunduz, S. Kamburugamuve, P. Wickramasinghe, C. Widanage, K. Govindarajan, N. Perera, V. Abeykoon, S. Akkas, and G. Fox, "Twister2 cross-platform resource scheduler for big data,"

Presentations

IEEE BigData 2020 - IWBDR Workshop: Presenting *A Fast, Scalable, Universal Approach For Distributed Data Aggregations* (Video Link), Dec 2020

ApacheCon @Home 2020 Conference: Presenting **Cylon** to Apache Community (Video Link), Sep 2020

Skills (Experience in years, '+' indicates currently using)

Programming: C/C++ (3+), Python (4+), Java (4), Cython (1+)

Data Engineering: SQL (3+), Apache Spark (3), Apache Hadoop (1), NumPy (3+), Pandas (3+), CuDF (2+)

Technologies: OpenMPI (4+), UCX (1+), UCC(.5+), Gloo (.5+), Ray (.5+), Parsl (1+), Dask (1), Docker (2), Kubernetes (2), Apache Airflow (1), REST (1)

Deep Learning: PyTorch (1.5), Tensorflow (1)

Hardware Languages: x86 Assembly with AVX/2/512 (1), Verilog (moderate fluency)

Professional Qualifications

Chartered Institute of Management Accountants (CIMA) — UK
Passed Finalist — *2009 – 2012*

Honors, Awards, and Achievements

Hiking and travel: Achieved a height of 16,200ft (4950m) on foot in Junarghali Pass, Roopkund Trek, Uttarkund, India in June, 2016.

Basketball, WSO2: *Captained* the team which emerged *champions* at the Mercantile Services Basketball Association League Tournament 2016 - Division E.

Dean's List, Faculty of Engineering, UoM: During the Semesters 1 and 8

Basketball, UoM: *Colorsman* during the years 2010, 2011, 2013. Emerged *champions* at the Inter University Basketball Championship 2011.

G.C.E. Advanced Level Examination, Sri Lanka: *Ranked Island 21st, Colombo District 9th* with a Z-Score of 2.9127 from Physical Science

Nalanda College, Colombo: Awards for the ***Most Outstanding Student of the Year***, *Best Result – Science Section*, *Best Result – Physical Science* & *Best Student in General Knowledge* in the year 2008

Dept. Electronic & Telecommunication, UoM: *Student Representative* of the 2009 Batch for the year 2010/11

Electronic Club, UoM: *Treasurer* for the year 2013 & Chief Organizer, Sri Lanka Robotics Challenge 2012

English Literary Association, UoM: *Vice President* for the year 2011/2012

English Debating Team, UoM: *Captained* the Team B in 2012

IEEE XTREME Programming Competition: Participant in 2011, 2012 & 2013

CIMA Global Business Challenge: *Country Runner-Up*, Team Unorthodox in 2012