

Yashaswi Karnati

Curriculum Vitae

Department of CISE
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Education

- 2019–present **PhD, Computer Science**, *University of Florida*, Gainesville, GPA : 3.8/4.
Advised by Dr. Sanjay Ranka and Dr. Anand Rangarajan
- 2018–2020 : **Master of Science, Computer Science**, *University of Florida*, Gainesville, GPA : 3.8/4.
- 2014–2018 : **Bachelor of Technology, Electrical Engineering** , *Indian Institute of Technology*, Dhanbad.
- 2016–2018 : **Minors, Computer Science**, *Indian Institute of Technology (Indian School of Mines)*, Dhanbad.

I am a machine learning researcher with diverse experience working on different domains including intelligent transportation, climate science, data compression and health care. My research has spanned topics including predictive modeling, anomaly detection, deep learning based digital twins, traffic signal control, traffic flow modelling, tensor decompositions, machine learning based data compression. Hands on experience with large scale distributed frameworks for data generation, processing, model development and also deriving key insights, delivering to end stakeholders. I am excited about developing machine learning systems that has practical impact

Research Experience

University of Florida, MALT Lab

Jan, 2019 – present **Artificial Intelligence for Smart City Transportation.**

- **Unsupervised Summarization and Descriptive Modelling of City Traffic Data:**
Developed machine learning algorithms focused on modelling spatio-temporal dynamics in traffic flow. Different use cases for these predictive/descriptive models include detecting unusual time periods, summarizing mobility patterns, change detection, ranking intersection behaviour, signal timing optimization etc.
- **Real-time System for Traffic Incident/Interruption Detection:**
Developed a real time system to detect traffic interruptions (anomaly) in using ground sensor data. Developed ML pipeline with non linear dimensionality reduction followed by deep learning based classifier to achieve an accuracy of 90% outperforming several other existing methods.
- **Deep Learning based Digital Twin for City Traffic Network:**
InterTwin: Developed a deep learning based framework that can emulate physics based microscopic simulations of a traffic network. Developed novel architectures using graph convolutions, attention heads, recurrent layers. The proposed models are 5 orders of magnitude faster (compared to microscopic simulations) and is used for extensive parameter exploration for signal timing optimization of a city network.
- **BigSUMO: End-to-End Parallel Deep Learning System for Traffic Simulation Applications**
Developed an end-end framework (data generation - model training - hyperparameter optimization). Leverages distributed computing to generate, process terabyte-scale heterogeneous traffic simulation data. Equipped with SOTA open source libraries - OpenMPI (parallelizing), HDF5 (storage), PyTorch(distributed training), MLFLOW (experiment tracking), Optuna (hyper-parameter optimization). Tested running on more than 5000 cores on UF's supercomputer.
- **Deep Reinforcement Learning for Adaptive Traffic Signal Control:**
Currently working on developing multi agent deep reinforcement learning framework for controlling signal timing at each intersection considering local and global state of traffic network.

Aug,2021 – **Hybrid Learning Techniques for Scientific Data Compression.**

present

- Data compression pipelines for exascale scientific applications that produce extremely large amounts of data. Currently developing hybrid learning-based compression techniques that combines ideas from tensor decompositions, auto encoders, generative modelling, product quantizers, and entropy coding.
- Developed models with error guarantees on primary data as well as derived quantities of interest. Tested on petabyte scale atmospheric reanalysis data and has shown guarantees on cyclone detection and tracking.

UF Institute on Aging, Data Science and Applied Technologies Core

Jan,2019 – **Smart wearable's for Real time mobility monitoring.**

present

- Software engineering lead for ROAMM, a customizable framework for real time online assessment and mobility monitoring. Supports real time data collection, capturing health events with secure wearable technology. Highly scalable cloud based framework, supports customization for different research needs. Currently used by more than 10 different research groups for their clinical studies.
- Developing ML models using sensor data for different use cases like activity recognition, research on behaviors, health and mobility patterns of the individuals.

Publications

Journal Articles

- 2021 **Y. Karnati**, R.Sengupta, A.Rangarajan, S. Ranka , Subcycle Waveform Modeling of Traffic Intersections Using Recurrent Attention Networks, In *IEEE Transactions on Intelligent Transportation Systems, special issue on AI 10.1109/TITS.2021.3121250* .
- 2021 **Y. Karnati**, R.Sengupta, S. Ranka , Inter-Twin: Deep Learning Approaches for computing Measures of Effectiveness for Traffic Intersections, In *Applied Sciences* <https://doi.org/10.3390/app112411637> .

In Conference Proceedings

- 2021 **Karnati, Yashaswi**, Ruben Zapata, Matthew J McConnell, Parisa Rashidi, Michael Marsiske, Thomas M. Gill, Todd M. Manini, and Sanjay Ranka. Roamm: A customizable and interactive smartwatch platform for patient-generated health data. In *2021 Thirteenth International Conference on Contemporary Computing (IC3-2021)*, IC3 '21, page 150–158, New York, NY, USA, 2021. Association for Computing Machinery.
- 2021 **Karnati, Yashaswi**, Rahul Sengupta, Anand Rangarajan, and Sanjay Ranka. Subcycle-based neural network algorithms for turning movement count prediction. In *VEHITS*, pages 735–744, 2021.
- 2021 Rahul Sengupta, **Karnati, Yashaswi**, Anand Rangarajan, and Sanjay Ranka. Tqam: Temporal attention for cycle-wise queue length estimation using high-resolution loop detector data. In *2021 IEEE International Intelligent Transportation Systems Conference (ITSC)*, pages 3313–3320, 2021.
- 2021 Dhruv Mahajan, **Karnati, Yashaswi**, Jeremy Dilmore, Anand Rangarajan, and Sanjay Ranka. An automated framework for deriving intersection coordination plans. In *2021 IEEE International Intelligent Transportation Systems Conference (ITSC)*, pages 1322–1327, 2021.
- 2020 **Yashaswi Karnati**, Dhruv Mahajan, Anand Rangarajan, and Sanjay Ranka. Data mining algorithms for traffic interruption detection. In *Proceedings of the 6th International Conference on Vehicle Technology and Intelligent Transport Systems - Volume 1: VEHITS*,, pages 106–114. INSTICC, SciTePress, 2020.

- 2020 **Y. Karnati**, D. Mahajan, A. Rangarajan, and S. Ranka. Machine learning algorithms for traffic interruption detection. In *2020 Fifth International Conference on Fog and Mobile Edge Computing (FMEC)*, pages 231–236, 2020.
- 2020 Dhruv Mahajan, Tania Banerjee, **Yashaswi Karnati**, Anand Rangarajan, and Sanjay Ranka. A data driven approach to derive traffic intersection geography using high resolution controller logs. In *Proceedings of the 6th International Conference on Vehicle Technology and Intelligent Transport Systems - Volume 1: VEHITS*,, pages 203–210. INSTICC, SciTePress, 2020.
- 2020 D. Mahajan, **Y. Karnati**, T. Banerjee, V. R. Regalla, R. Reddy, A. Rangarajan, and S. Ranka. A scalable data analytics and visualization system for city-wide traffic signal data-sets. In *2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC)*, pages 1–6, 2020.
- 2020 D. Mahajan, **Y. Karnati**, A. Rangarajan, and S. Ranka. Unsupervised summarization and change detection in high-resolution signalized intersection datasets. In *2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC)*, pages 1–6, 2020.
- 2020 **Y. Karnati**, M. Mardini, P.Rashidi, T. Manini, S. Ranka , Smart Wearables in the Lens of Aging: Results from ROAMM Study, In *The Gerontological Society of America (GSA) 2020 Annual Scientific Meeting*.
- 2021 D.Mahajan **Y. Karnati**, A.Rangarajan, S. Ranka , Multiple Instance Learning Approach for Mining Detector Channel to Phase Mappings for Signalized Intersections, In *Transportation Research Board (TRB) Annual Meeting 2022*.

Fellowships & Awards

- 2021 **Gartner Group Graduate Fellowship** Department of CISE, UF, Outstanding Ph.D Student, awarded \$1000.
- 2018-2020 Receipt of **Academic Achievement Award** at University of Florida, awarded \$4500 towards tuition expenses.
- 2014 –2018 **Merit cum means scholarship** Department of Higher Education, Government of India, to cover 100% of my tuition expenses.

Achievements & Recognitions

- 2021 **Winner of CoMotion Miami Mobility Challenge**.The challenge is aimed at how smart cities can improve mobility and safety using emerging technologies and their associated data. Invited to collobarate with Miami-Dade County and City of Gainesville for pilot implementation.
- 2014 Figured among the **top 1%** students out of 150,000 students appearing for Joint Entrance Examination - 2014 with All India Rank - 5595

Technical skills

Programming	Python, PyTorch, PyTorch Lightning, Keras, Tensorflow, Elixir
Web	HTML 5, CSS, JSX, Javascript, React
Database	MySQL, DynamoDB, Postgres, S3 Athena, Timescale DB
Cloud	AWS, Google Cloud Platform
Data Viz	Tableau, Plotly

Professional Activities

- 2020 - Reviewer, *Transportation Research Records (TRR)*.
present
- 2019 - Reviewer, *International Conference on Machine Learning and Data Science (ICMLDS)*.
present

- 2016–2018 Executive member of IEEE Student Chapter, Indian Institute of Technology, Dhanbad.
- 2015 Coordinator, Embedded Systems/Atmel AVR workshop, held under Concetto '15, annual Techno-Management Fest of IIT Dhanbad..

Referees

Dr. Sanjay Ranka

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