SAMPAD BHUSAN MOHANTY | sbmohant@usc.edu | +1-213-284-1347 | LOS ANGELES, CA | SAMPADBM.GITHUB.IO

EDUCATION

University of Southern California, Los Angeles | Aug 2019 - Dec 2026 (expected)
PhD Student in Computer Science | Current GPA - 3.59
Advisor: Bhaskar Krishnamachari (Autonomous Networks Research Group)

Selected Coursework:
MATH547 | MATH541A | MATH425A | MATH501 | MATH574 | MATH532 | MATH505A | MATH505B | MATH395

Mathematical Foundations of Statistical Learning Theory (**MATH547**) | Optimization for Information and Data Science (**EE588**) | Machine Learning II: Mathematical Foundations and Methods (**EE660**) | Mathematics of High Dimensional Data (**EE546**) | Convex Optimization (**CSCI675**) | Network Flows and Combinatorial Optimization (**ISE632**) | Linear Algebra for Engineering (**EE510**) | Advanced Analysis of Algorithms (**CSCI670**) | Selected Topics in Computational Physics (**PHY-760**) | Machine Learning (**CSCI567**)

National Institute of Technology Rourkela, India | Aug 2011 - July 2016
Bachelor and Master of Technology (Dual Degree)
Electrical Engineering with specialization in Control and Automation
GPA: 7.20/10 (B.Tech), 8.42/10 (M.Tech)

EXPERIENCE

INDUSTRY

Internship at General Motors (Summer 2021)

Machine Learning Research Intern | General Motors | June - August 2021

Developed tensor decomposition models (CP, Tucker) for urban traffic prediction across 5+ cities using Uber Movement and Beijing Taxi datasets, achieving 97% accuracy with 250x fewer parameters than SVD. Applied Latent Dirichlet Allocation to discover functional city regions from mobility patterns and implemented data imputation techniques for sparse spatiotemporal traffic data (~50% missing values and above).

Founding Member and Lead Developer | DATOMS and AURASSURE

- Founding member of two technology startups (Datoms , Aurassure) focused on IoT solutions for industrial monitoring and consumer applications
- Lead Embedded and Network Developer: Designed embedded systems architecture using ATMEL microcontrollers, developed firmware for sensor nodes with low-power operation.
- Built cloud infrastructure for data aggregation, real-time monitoring dashboards, and mobile application backends
- Led technical team in agile development from prototype to production-ready systems
- Successfully deployed pilot systems with industrial clients, gaining entrepreneurial experience in product development and customer requirements analysis
- Companies continue to operate in India's IoT ecosystem serving enterprise customers

RESEARCH

LEAP – Live Experiments for Active Pedagogy (2025)

Developed open-source framework enabling collaborative hands-on experimentation in live CS classrooms, allowing students to discover and call instructor-defined functions remotely. System logs all interactions with timestamps for real-time visualization of participation, solution strategies, and common errors. Supports courses in numerical analysis, optimization, ML, and algorithms with example labs including gradient descent visualization, Monte Carlo integration, genetic algorithms with leaderboards, and graph traversal. Features security controls, analytics dashboards, and standardized lab format for community sharing.

Status: Poster submitted to ACM SIGCSE 2026 (under review).

Tensor Methods for Traffic Data Analysis and Imputation (2022 - Present)

Developed novel low-rank tensor and matrix decomposition methods for spatio-temporal traffic data imputation addressing the critical challenge that 2-10% missing data causes 18-98% information loss. Introduced SATORIS (Singular vAlue and TensOR weIght regresSion), a unified framework exploiting temporal invariance of subspaces across proximate days—a property not previously leveraged in traffic imputation. Developed four complementary algorithms (KSV, KTF, USV, UTF) spanning known-factor and unknown-factor regimes using modified Alternating Least Squares. Extended framework to SATORIS-N using nuclear-norm minimization within SDP formulation with prior subspace injection. Extensive experiments on Beijing (56×56 grid) and Shanghai (40×40 grid) GPS datasets demonstrate significant outperformance over traditional baselines (mean/median imputation, k-NN) and competitive methods (SoftImpute, GAIN, Miracle), particularly at high occlusion levels (>70% missing data).

Status: SATORIS paper submitted to IEEE Access (under review); SATORIS-N manuscript in preparation (2025).

Heuristic Algorithms for Task Allocation (2020 - 2021)

Implemented multi-objective optimization algorithms for scheduling DAG tasks on heterogeneous compute nodes, optimizing compute cost, network transfer cost, and makespan. Developed and compared HEFT, MoHEFT, Binary Particle Swarm Optimization (BPSO), and genetic algorithms with tuned hyperparameters across varying DAG sizes and node configurations.

Project Associate | Robert Bosch Center for Cyber Physical Systems
Indian Institute of Science Bangalore, India | Jul 2017 - Jul 2019
Advisor: Dr. Rajesh Sundaresan
Project: Unintrusive Monitoring for Energy Optimization in SMT-PCB Assembly Line

- Developed IoT-driven Digital Twin system for energy optimization in an automated Surface Mount Technology (SMT) Printed Circuit Board assembly line at Bosch manufacturing facility with legacy machines
- Instrumented production line with multiple sensors measuring machine-wise activity and energy consumption across Line Loader, Screen Printer, Pick-and-Place machines, and Reflow Oven
- Built complete software platform for data aggregation using open-source tools (Elasticsearch/Kibana, InfluxDB/Grafana) with 3 months of continuous data collection
- Created discrete-event simulation digital twin for "what-if" analysis of process configurations and throughput bottleneck identification
- Proposed buffering-based solution to improve energy efficiency by reducing idle power consumption in Reflow Oven (most energy-intensive component)
- Analyzed trade-offs between per-PCB energy consumption and system throughput using parametric simulation studies
- Published work at IEEE IOTAIS 2018 and COMSNETS 2020, demonstrating practical industrial applications of IoT and digital twin technology
- Conducted Industrial IoT tutorials at IISc Bengaluru (June 2019) and Professional Development Programme at NIT Rourkela (June 2022)

Project Associate | Codes & Signal Design Lab
Indian Institute of Science Bangalore, India | Jul 2016 - Jun 2017
Advisor: Dr. P. Vijay Kumar
Project: Low Power Intrusion Detection Platform for Outdoor Environment

- Designed and built reduced-complexity, reduced-power (<5W) intrusion detection and classification system for outdoor forest monitoring using embedded computing (Raspberry Pi), PIR sensor arrays, and low-power camera modules
- Developed novel chirplet-based signal processing algorithms for PIR sensor data analysis, comparing performance with alternate feature extraction approaches for human vs. animal classification
- Implemented CNN-based computer vision pipeline for direction and gender classification from side-view images captured on monitored trails
- Created hybrid LITE (Light-based Intrusion deTEction systEm) combining optical-camera and PIR sensor array as complementary sensing modalities for robust 24/7 outdoor intrusion detection
- Achieved significant power reduction compared to commercial systems while maintaining high classification accuracy in challenging outdoor conditions (variable lighting, weather, terrain)
- Won Best Paper Award at ICACCI 2017 (VisionNet) for reduced-power camera system work
- Won Best Paper Award at ICIIP 2017 for CNN-based direction and gender classification
- Published 5 peer-reviewed papers at ICACCI 2017, LCN Workshops 2017, ICIIP 2017, and SenseApp 2017 demonstrating system performance in real outdoor environments
- Presented demo at IEEE Conference of Local Computer Networks 2017

- Work motivated by wildlife conservation and forest ranger safety applications in collaboration with forest department

Project Assistant | Electronics and Communication Engineering
National Institute of Technology Rourkela, India | Jun - Jul 2016

- Developed embedded system for vehicle monitoring in open cast mines where GPS signal is available but cellular network is unavailable/unreliable
- Implemented ZigBee wireless sensor network bridged to Single Board Computer (SBC) with internet connectivity, enabling real-time vehicle tracking in network-constrained mining environments
- Published work at ICMOCE 2015 demonstrating robust solution for industrial monitoring in remote locations

Undergraduate Summer Research Project | Satellite Lab
National Institute of Technology Rourkela, India | May 2014 - June 2015
Project: Balloon Satellite for Weather and Pollution Monitoring

- Designed and built high-altitude balloon platform (stratospheric payload) for atmospheric data collection reaching altitudes up to 20km
- Integrated sensor suite including temperature, pressure, humidity, GPS positioning, and particulate matter (PM2.5/PM10) sensors for comprehensive environmental profiling
- Developed telemetry system with wireless communication for real-time data transmission during flight phases
- Implemented embedded software for sensor data acquisition, on-board storage, and transmission protocols
- Designed thermal protection and structural housing for extreme atmospheric conditions (temperature range -60°C to +50°C, low-pressure environment)
- Conducted successful test launches with payload recovery, collecting atmospheric profile data from surface to 2km above surface
- Contributed to environmental research by measuring pollution gradients across atmospheric layers over industrial regions
- Presented technical findings at NIT Rourkela symposium, demonstrating low-cost alternative to conventional atmospheric monitoring methods

TEACHING

Teaching Assistant CS567 - Machine Learning
University of Southern California
Fall 2022 | Prof. Vatsal Sharan | Summer 2023 | Prof. Victor Adamchik | Spring 2024 | Prof. Vatsal Sharan | Summer 2024 | Prof. Victor Adamchik | Summer 2025 | Prof. Victor Adamchik | Fall 2025 | Prof. Victor Adamchik

- Designed homework assignments and practice exams covering supervised/unsupervised learning, neural networks, and optimization
- Conducted weekly discussion sessions and office hours for 150+ students per semester
- Graded assignments and exams, providing detailed feedback on machine learning implementations
- Led tutorials/projects on Python/PyTorch for ML model development and evaluation

Teaching Assistant CS570 - Analysis of Algorithms
University of Southern California
Summer 2022 | Prof. Shahriar Shamsian | Spring 2023 | Prof. Victor Adamchik | Fall 2024 | Prof. Victor Adamchik

- Created problem sets on algorithm design, complexity analysis, and optimization techniques
- Held discussion sessions covering dynamic programming, graph algorithms, and NP-completeness
- Designed and graded practice exams preparing students for rigorous theoretical assessments

Teaching Assistant, CS360 - Intro to Artificial Intelligence
University of Southern California | Spring 2025
Prof. Ruishan Liu

- Designed homework problems on search algorithms, constraint satisfaction, Logic-based AI systems, probabilistic reasoning and machine learning fundamentals.

Teaching Assistant, EE250 - Distributed Systems and Internet of Things
University of Southern California | Fall 2020 | Spring 2021 | Fall 2021 | Spring 2022
Prof. Bhaskar Krishnamachari, Prof. Mark Redekkop, Prof. Shahin Nazarian

- Designed and developed new machine learning lab module integrating ML concepts into IoT curriculum
- Created hands-on lab tutorials on embedded systems, networking protocols, and distributed computing
- Graded lab reports and projects on Raspberry Pi-based IoT implementations
- Held discussion sessions on system design, MQTT protocols, and edge computing architectures

Volunteer Teaching Assistant, **MATH499 - Special Topics (Consulting with Data through Python)** | USC | Fall 2020
University of Southern California
Instructor: Prof. Neelesh Tiruviluamala

- Provided tutoring support for inaugural undergraduate course in python (later MATH446: Datascience with Python)
- Conducted tutorials on Jupyter notebooks, HPC access, PyTorch
- Mentored student projects and held office hours on demand.

MENTORING

- **Technical Mentor , Advisor and Judge for Engineering Design & Development Class Projects, California Academy of Math & Science (2025 Jan - Present)**

  - Mentored high school engineering students on advanced robotics and aerospace design projects
  - Evaluated student mission design presentations for complex autonomous systems

- **One on One mentored two bright high school students from California Academy of Mathematics and Sciences leading to research poster/presentation.**

- **USC Summer Highschool Intensive in next Generation Engineering (SHINE) mentor (2022)**

  Mentored two high school students in research on non-linear dimensionality reduction techniques like TSNE, UMAP, PACMAP, KPCA at USC leading to a poster presentation.

- **Viterbi Summer Institute Mentor (2022)**

  Mentored two freshmen undergraduate students at USC in evolutionary algorithms for solving RL problems in the Gymnasium environment.

PATENTS

Indian Patent Application No.: 202241033679 (pending)

PUBLICATIONS

S. Mohanty*, S. Krajagi*, and B. Krishnamachari, "LEAP – Live Experiments for Active Pedagogy," to appear in ACM SIGCSE TS 2026 *Equal contribution

S. Mohanty and B. Krishnamachari, "SATORIS-N: Spectral Analysis based Traffic Observation Recovery via Informed Subspaces and Nuclear-norm minimization," under review IEEE Intelligent Vehicles Symposium, 2025.

S. Mohanty, M. Kiamari, F. Bai, and B. Krishnamachari, "SATORIS: A Unified Framework for Singular vAlue and TensOR weIght regresSion to Perform Imputation on Spatio-Temporal Traffic Data," submitted to IEEE Access, under review, 2025.

L. Clark, **S. Mohanty**, and B. Krishnamachari, "SMILE: Robust Network Localization via Sparse and Low-Rank Matrix Decomposition," ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), 2023.

G. Bhandari, A. Joglekar, A. Kulkarni, D. Kulkarni, C. Mahadeva, **S. Mohanty**, D. Raghunath, M. B. Raju, R. Shorey, and R. Sundaresan, "An Implementation of an Industrial Internet of Things on an SMT Assembly Line," COMSNETS, 2020.

N. Karanjkar, A. Joglekar, **S. Mohanty**, V. Prabhu, D. Raghunath, and R. Sundaresan, "Digital Twin for Energy Optimization in an SMT-PCB Assembly Line," IEEE IOTAIS, 2018.

T. Choubisa, **S. Mohanty**, K. Chaitanya, M. Kashyap, Sridhar A, A. Singh, and P. Vijay Kumar, "A Reduced-Complexity, Reduced-Power Camera System for Intrusion Classification in an Outdoor Setting," VisionNet - ICACCI, 2017. [BEST PAPER]

T. Choubisa, M. Kashyap, R. N. Rithesh, and **S. Mohanty**, "Direction and Gender Classification using Convolutional Neural Network for Side-View Images Captured from a Monitored Trail," IEEE ICIIP, 2017. [BEST PAPER]

T. Choubisa, **S. Mohanty**, M. Kashyap, K. K. Chaitanya, Sridhar A, and P. Vijay Kumar, "LITE: Light-based Intrusion deTEction systEm Using an Optical-Camera and a Single Board Computer," IEEE LCN (Demos), 2017.

T. Choubisa, M. Kashyap, **S. Mohanty**, and P. Vijay Kumar, "Comparing Chirplet-based Classification with Alternate Feature-Extraction Approaches for Outdoor Intrusion Detection using a PIR Sensor Platform," ICACCI, 2017.

T. Choubisa, **S. Mohanty**, M. Kashyap, S. Gambhir, K. K. Chaitanya, A. Sridhar, and P. Vijay Kumar, "An Optical-Camera Complement to a PIR Sensor Array for Intrusion Detection and Classification in an Outdoor Environment," SenseApp, 2017.

H. S. Pradhan, **S. Mohanty**, S. M. Yerme, P. G. Kale, and D. P. Acharya, "Embedded System for Mine Process Monitoring in a Network Constrained Environment using Wireless Communication Bridge," ICMOCE, 2015.

TALKS/PRESENTATIONS/DEMOS

- "Matrix and Tensor Factorization and Approximations for Understanding Spatiotemporal Data", STEM Bytes Seminar,, Women In Science and Engineering (WiSE), University of Southern California, September 24, 2025
- "Industrial IoT and Digital Twin", Professional Development Programme on IoT and Machine Intelligence for Industry 4.0, National Institute of Technology Rourkela, June 6th, 2022
- Invited Expert, "Hands on IoT Application Machine Learning," ISEA Project-II Sponsored Short Term Training Program, Graduate School of Engineering and Technology, Gujarat Technological University, December 29, 2021.
- "Industrial Internet of Things Tutorial", Robert Bosch Center for Cyber Physical Systems, IISc Bengaluru, June 25th, 2019
- "Low Power Camera based Intrusion Monitoring for early warning system for forest safety" , IOT Workshop, National Institute of Technology Rourkela, August 19th, 2017

PROFESSIONAL SERVICE

- Reviewer for IEEE Transactions on Vehicular Technology (2022)
- Reviewer, Machine Learning for Data Science (ML4DS) Workshop, NeurIPS, 2025

HONORS & AWARDS

Best Paper Award, VisionNet - ICACCI Conference | 2017
Camera system for intrusion classification in outdoor settings

Best Paper Award, IEEE International Conference on Image Information Processing | 2017
Direction and gender classification using convolutional neural networks

Top 10 Finalist, Intel Innovate for Digital India Challenge | 2015
Smart city solutions product "Aurassure"

Certificate of Appreciation for Excellence in Undergraduate Research | 2015
Awarded by Director, NIT Rourkela for Balloon Satellite project

Qualified for Interview, Tata Institute of Fundamental Research (TIFR) | 2017
Graduate Studies in Systems Sciences (48 candidates selected nationwide)

Medhabruti Scholarship, Department of Higher Education, Odisha | 2012-2014
Merit-based scholarship for academically excellent students from economically disadvantaged backgrounds..

All India Rank 95, National Entrance Screening Test | 2011
Top 0.1% among ~100,000 test takers

TECHNICAL

- Programming Languages - **Julia**, Python, C/C++, Javascript, Ruby, Matlab, **SAGEMATH**
- Libraries and Frameworks -
    - Data and ML : Pandas, Sklearn, Scipy,PyTorch, Tensorflow, OpenCV, Tensorly, JAX
    - Web: VueJS, Flask/web.py/CherryPy, Sinatra, Websockets
    - Databases: SQL, Elasticsearch/Kibana, InfluxDB/Grafana
    - Systems: Containers(Docker)/Kubernetes, Vagrant, ROS

LEADERSHIP & COMMUNITY

USC Makers | Member | 2019-2022

- Conducted signal processing tutorials for maker community
- Organized workshops on embedded systems and IoT

ImprovSC | Member | 2024 - Present

- Help in coordinating weekly improv sessions