

RAJA SUNKARA

Ph.D. Candidate in Computer Science

Missouri

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SUMMARY

Accomplished Ph.D. candidate with over 3 years of industry experience in machine learning and 6 years of academic research, specializing in developing innovative algorithms for machine learning, reinforcement learning, multi-armed bandits and black-box optimization. Passionate about leveraging cutting-edge techniques to solve complex AI challenges and enhance real-world applications.

EDUCATION

Missouri S&T

Rolla, USA

Ph.D. Candidate in Computer Science (GPA: 4.0/4.0)

Jan 2023 - Dec 2025

Research Areas: Reinforcement Learning, Multi-armed Bandits, Black-Box Optimization, LLMs

Missouri S&T

Rolla, USA

Master of Science (Thesis) in Computer Science (GPA: 4.0/4.0)

Aug 2021 - Dec 2022

Research Areas: Computer Vision, Object Detection

Indian Institute of Technology Madras

Chennai, India

Bachelor of Technology (BTech) in Aerospace Engineering (GPA: 7.98/10)

Aug 2013 - Jul 2017

TECHNICAL SKILLS

Languages: Python, C/C++, SQL, R, MATLAB, Scala

Frameworks/Libraries: PyTorch, MXNet, Numpy, OpenCV, Pandas, Scikit-Learn, MLOps (WandB)

Big Data tools: Hadoop, Spark, Hive, Mahout

RELEVANT COURSES

Mathematics and Statistics: Functional Analysis, High-dimensional Statistics, Mathematics of Medical Imaging, Probability, Statistics and Stochastic Process, Numerical Analysis, Applied Time-Series Analysis

Machine Learning and AI: Theory of Reinforcement Learning, Machine Learning in Computer Vision, Advanced Topics in AI, Convex Optimization

Algorithms and Optimization: Analysis of Algorithms, Process Optimization

RELEVANT PUBLICATIONS

- Adaptive Partitioning Schemes for Black-Box Optimization. **Raja Sunkara**, Ardhendu Tripathy. Under Review, International Conference on Artificial Intelligence and Statistics (AISTATS), 2025.
- Adaptive Partitioning Schemes for Black-Box Optimization. **Raja Sunkara**, Ardhendu Tripathy. Workshop on Optimization for Machine Learning, 38th Conference on Neural Information Processing Systems (NeurIPS), 2024.
- YOGA: Deep object detection in the wild with lightweight feature learning and multiscale attention. **Raja Sunkara**, Tie Luo. Pattern Recognition, vol. 139, pp. 109451, July 2023.
- No more strided convolutions or pooling: A new CNN building block for low-resolution images and small objects. **Raja Sunkara**, Tie Luo. European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD), 2022.
- Extraction of Key Features and Enhanced Prediction Framework of Breast Cancer Occurrence. Praveen Sahu, Pragatheiswar Giri, **Raja Sunkara**, Raji Sundararajan. International Conference on Trends in Electronics and Informatics (ICOEI), 2022.

RESEARCH EXPERIENCE

Statistical Machine Learning Lab, Prof. Ardhendu Tripathy

Missouri S&T: MO, USA

Graduate Research Assistant

Dec 2022 - Present

Summary: I am focused on developing advanced algorithms for sequential decision-making, particularly in the areas of multi-armed bandits and black-box optimization. My research integrates techniques from machine learning, optimization, and statistical analysis to enhance decision-making in complex environments.

- Spearheading cutting-edge research on **black-box optimization methods**, with dual applications in **neural networks** (hyper-parameter tuning, neural architecture search) and **engineering domains** (optimal designs through physical simulation experiments), demonstrating versatility in both theoretical and applied research.
- Developed innovative **adaptive partitioning schemes** for black-box optimization, proving improved **regret bounds** that surpass existing algorithms. This significant advancement led to a paper accepted at a **NeurIPS 2024 workshop**. An extended version of this work has been submitted to **AISTATS 2025**, incorporating additional theoretical insights and experimental results.
- Achieved **state-of-the-art performance in Large Language Model (LLM) quantization**, demonstrating reduced perplexity by innovatively framing the problem within a black-box optimization framework. This approach showcases the practical impact of theoretical advancements in real-world AI applications.
- Currently advancing research on **regret bounds for Multi-armed bandits** in the context of **subset selection of arms**, with anticipated submission to a top-tier conference by year-end. This work promises to extend the frontiers of decision-making algorithms in complex, multi-dimensional spaces.
- Demonstrated proficiency in **interdisciplinary research**, seamlessly integrating concepts from machine learning, optimization theory, and statistical analysis to solve complex problems at the intersection of AI and engineering.

Securing AI and IoT Lab, Prof. Tony Luo

Missouri S&T: Rolla, MO

Graduate Research Assistant

Aug 2021 - Dec 2022

- **Designed** and implemented a lightweight feature learning framework integrated with **multiscale attention mechanisms**, resulting in improved robustness and efficiency in object detection tasks across diverse environments, including urban and natural settings.
- **Received the Best Research Award** prize (\$1000) at SAINT LAB for outstanding contributions to research, recognizing my innovative approach and significant impact on ongoing projects.
- **Engineered** a multi-label latent diffusion model capable of generating high-quality chest X-ray images, leveraging **advanced generative techniques** to enhance **diagnostic processes**. This model facilitates improved **training datasets** for machine learning applications in medical imaging, enabling more accurate **disease detection** and analysis through realistic image synthesis.
- **Explored** cutting-edge techniques in **text-to-video generation** through **reinforcement learning** and **diffusion models**, contributing to advancements in **computer vision** that enable more dynamic content creation and interactive media applications. This research is positioned to influence future developments in **AI-driven video synthesis technologies**.

INDUSTRY EXPERIENCE

Alcon, Medical Data Science

May 2022 - Aug 2022

R&D Data Scientist Intern

Fort Worth, TX

- Engineered an advanced **image registration algorithm** leveraging **CNN architecture** and **semi-supervised learning** techniques. Successfully trained an **end-to-end model** achieving a **95% registration rate**, significantly enhancing image alignment accuracy.
- Optimized model performance through implementation of **FP32, FP16, and INT-8 quantization** for **TensorRT engines**. This strategic approach resulted in a **50% reduction in memory usage** and an impressive **77% improvement in inference time**, substantially boosting overall system efficiency.

Matdun Labs

Oct 2020 - Jul 2021

Research Engineer(AI/CV)

Hyderabad, India

- Engineered a **novel object detection model** for precise package localization in delivery images, leveraging an **ensemble approach** that significantly reduced the false positive rate to an impressive **4%**. This innovation enhanced the reliability of automated package tracking systems, contributing to improved logistics efficiency and customer satisfaction.

- Developed a cutting-edge **anti-spoofing model** utilizing **ResNet architecture** in conjunction with **IR dot projector hardware**. Successfully **deployed** the model on a **Jetson Nano edge device**, enabling real-time facial authentication with enhanced security against sophisticated spoofing attempts, thereby strengthening access control systems for sensitive applications. Engineered high-performance **TensorRT-optimized engines** for deployment on **Jetson Nano edge devices**, significantly enhancing deep learning model efficiency. Achieved a **20% reduction in RAM consumption** and a **16% improvement in inference speed**, allowing real-time processing capabilities for resource-constrained applications. Implemented advanced optimization techniques including **layer fusion**, **precision calibration**, and **dynamic tensor memory**, resulting in simplified model execution and improved overall system responsiveness.

Agrometrics

Jun 2018- Oct 2020

Data Scientist

Hyderabad, India

- Architected and implemented a comprehensive **relational database schema** for an integrated **Farm Management (FM) and Quality Assessment (QA) software**. Leveraged this schema to develop a sophisticated **Business Intelligence (BI) system**, identifying and optimizing crucial **Key Performance Indicators (KPIs)** across multiple domains, including sales / purchase, packing, farm operations, transportation, QA/QC, and shipping & receiving, resulting in an improvement **15% in operational efficiency**.
- Engineered an advanced **anomaly detection model** utilizing **Sentinel-2 and Landsat-8 multispectral satellite imagery**. Implemented **K-Means clustering** and **Gaussian Mixture Models (GMM)** to analyze remote sensing data, achieving a **92% accuracy** in identifying crop health anomalies and potential yield issues across diverse agricultural landscapes.
- Spearheaded the development of a **machine learning pipeline** for processing and analyzing **open-source satellite data**. Integrated **computer vision techniques** with **geospatial analysis** to extract actionable insights, enabling early detection of crop stress and optimizing resource allocation, which contributed to a **20% increase in crop yield** for client farms.

Enfrien Innovations

Aug 2017 - Jun 2018

Data Analyst

Bengaluru, India

- Engineered a sophisticated **CART (Classification and Regression Trees) model** for optimal solar power plant site selection, integrating multi-dimensional data collected across canal networks. The model successfully identified the most feasible areas while **minimizing environmental impact**, resulting in a **30% reduction in tree cutting** and a **25% improvement in inverter positioning efficiency**. This data-driven approach contributed to a **15% increase in overall plant efficiency** and significant cost savings in implementation.
- Developed an advanced **solar resource assessment model** utilizing historical and site-specific irradiance data to accurately estimate **Pxx (power output)**. Implemented a novel **mathematical optimization algorithm** to determine the optimal tilt angle and buoy length for floating solar power plants, resulting in a **20% increase in energy yield** compared to standard configurations. This innovation led to the successful deployment of a **5 MW floating solar project**, setting a new benchmark for renewable energy initiatives in the region.

EXTRACURRICULAR ACTIVITIES

- **National Service Scheme (NSS) Volunteer**: Mathematical courses were taught to underprivileged students for **100+ hours**, improving their academic performance by **20%**.
- **Alakananda Hostel Representative**: Participated in all **TechSoc** events, contributed to technical projects and promoting innovation among residents.
- **FIRE N ICE Competition**, IIT Madras: Led a **five-member team** to **fourth place** out of 20 in the inter-hostel event, showcasing rapid prototyping skills.
- **Cultural Secretary**, Alakananda Hostel: Managed **50,000 INR** budget, led **10 volunteers**, increased event participation by **30%**.

SERVICE

- Reviewer for International Conference on Artificial Intelligence and Statistics (AISTATS) (2024, 2025)
- Reviewer for Neural Information Processing Systems (NeurIPS 2024)
- Reviewer for International Conference on Learning Representations (ICLR 2025)
- Attended the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD) virtually in September 2022
- Selected to attend the Neural Information Processing Systems (NeurIPS) conference in December 2024