Pavia Bera

+1 (813) 748-9525 | paviabera@usf.edu | linkedin.com/in/paviabera/ | github.com/paviabera

SUMMARY

PhD researcher in Machine Learning specializing in time-series anomaly detection, probabilistic deep learning, and hardware-aware AI systems. Developed neuromorphic streaming models with 7.55× efficiency gains and Bayesian neural network training methods improving predictive accuracy on real-world datasets. Research published in ACM, IEEE, and Elsevier venues.

SKILLS

- **Skills:** Deep Learning (CNNs, RNNs, LSTMs, Transformers), Generative AI, LLM Fine-tuning (BERT, GPT), Bayesian Neural Networks, Reinforcement Learning, Anomaly Detection, Recommendation Systems, Computer Vision (YOLO, VAE), Natural Language Processing (Tokenization, Sentiment Analysis), Prompt Engineering, Multi-Agent Systems, Scalable ML Pipelines
- **Programming & Data Science:** Python, PyTorch, TensorFlow, MATLAB, SQL, NumPy, Pandas, Scikit-learn, Experiment Design, Statistical Modeling, Data Mining, Optimization
- **Cloud & Deployment:** AWS SageMaker, Google Cloud Platform, Docker, Kubernetes, Cloud APIs, Distributed Training, Cloud Computing
- **Research & Tools:** Git, Jupyter, CUDA, LaTeX, Scientific Writing
- **Academic Exposure:** Deep Learning, Data Networks, Sys & Security, Mathematics, Random Process in Elec Engin, Robotics & AI, Advanced Data Analytics, Neuromorphic Computing, C/C++, Engin Apps for Vector Analysis, Statistical Design Models

EDUCATION

University of South Florida **Aug 2019 - Jul 2026**
PhD, Electrical Engineering *GPA: 3.7*

PROFESSIONAL EXPERIENCE

University of South Florida **Tampa, FL, USA**
Graduate Researcher *Aug 2019 - Present*

- Optimized Hierarchical Temporal Memory (HTM) algorithms for neuromorphic time-series modeling, achieving a 7.55× improvement in computational efficiency for streaming anomaly detection workloads.
- Improved Bayesian Neural Network accuracy by 5% using Boosting Variational Inference (BVI), enabling better posterior approximation with multimodal distributions for predictive modeling in financial datasets; contributed to open-source development of the BVI framework.
- Collaborated with University of Pittsburgh and academic labs to co-develop AI hardware simulators and explore generative AI applications for business innovation.
- Researched and prototyped multi-agent generative architectures for collaborative LLM problem-solving, supporting integration of multiple foundation models for complex tasks.
- Led cross-functional collaboration with engineers, academics, and business stakeholders to translate cutting-edge research into enterprise-ready AI systems.

University of South Florida **Tampa, FL, USA**
Instructor of Record *Jan 2023 - Present*

- Served as Instructor of Record for Digital Logic Lab (20–40 students); independently developed curriculum, lab materials, and assessments covering Verilog-based FPGA simulation and circuit design.

Cognizant **Kolkata, West Bengal, India**
Programmer Analyst *Nov 2015 - Jul 2017*

- Built customized banking solutions across Salesforce CRM, JavaScript, and SQL, delivering a $100K revenue impact and accelerating client project timelines by 20%.

Jadavpur University **Kolkata, WB, India**
Research Intern *Apr 2014 - Aug 2015*

- Conducted gait analysis using Microsoft Kinect to detect joint pain in elderly individuals, applying Differential Evolution to reduce noise and improve data quality, achieving 87.91% classification accuracy with SVM.

SELECT PUBLICATIONS

• **Bera, P., Moon, S. H., et al.** (2025). *Enhancing Biologically Inspired Hierarchical Temporal Memory with Hardware-Accelerated Reflex Memory.* **Neurocomputing**.
• **Bera, P., Cahoon, S., et al.** (2024). *SPIMulator: A Spintronic Processing-in-Memory Simulator for Racetrack Memory.* **ACM Transactions on Embedded Computing Systems**, 23(6).
• **Bera, P., et al.** (2026). *Near-Zero Multiplication Escape: A Framework for Sparse Deep Neural Networks Based on Racetrack Memory.* Accepted at **IEEE ISVLSI 2026**.
• **Bera, P., Kar, R., & Konar, A.** (2015). *Joint Pain Detection by Gait Analysis for Elderly Healthcare.* **IEEE ICRCICN**.
• **Bera, P., & Bhanja, S.** *Quantification of Uncertainties in Online Training of Probabilistic Deep Neural Networks using Boosted Variational Inference.* **arXiv preprint**.
• **Bera, P., Adorno, J., & Bhanja, S.** *Advancing Hierarchical Temporal Memory with Multi-Agent Reflex Memory.* **Manuscript in preparation for submission to Knowledge-Based Systems (Elsevier).**

RESEARCH IMPACT

- Developed **Boosted Variational Inference (BVI)** methods for Bayesian neural networks, improving predictive accuracy and uncertainty estimation on financial datasets.
- Designed **Hierarchical Temporal Memory optimizations** achieving **7.55× computational efficiency improvements** for anomaly detection in streaming time-series data.
- Built **SPIMulator**, a simulation framework for evaluating spintronic processing-in-memory architectures for AI workloads.

SELECTED MACHINE LEARNING PROJECTS

Transformer-Based NLP Pipeline with BERT — PyTorch, NLP May 2025 – Aug 2025
- Built a BERT-based NLP pipeline for sentiment classification on social media datasets.
- Deployed the model as a real-time inference API demonstrating end-to-end ML system deployment.
- GitHub: github.com/paviabera/nlp-sentiment-pipeline

Financial Fraud Detection via Anomaly Detection — Autoencoders, Isolation Forests May 2024 – Aug 2024
- Designed anomaly detection models for financial transaction monitoring using autoencoders and Isolation Forests.
- Reduced false positives in fraud detection pipelines through model calibration and threshold tuning.

Scalable Time-Series Forecasting with LSTMs — Distributed Training, AWS May 2023 – Jul 2023
- Built scalable LSTM pipelines for financial time-series forecasting on large historical datasets.
- Implemented distributed training workflows on AWS improving prediction accuracy by 25%.

Boosted Variational Inference for Bayesian Neural Networks — PyTorch, Probabilistic ML May 2022 – Aug 2022
- Developed a boosting-based variational inference method to improve posterior approximation in Bayesian neural networks.
- Demonstrated improved predictive accuracy and uncertainty estimation on financial datasets.
- GitHub: github.com/paviabera/Boosting-Bayesian-Neural-Network

Cloud-Based Image Compression with Variational Autoencoders — PyTorch, Cloud ML Aug 2020 – Dec 2020
- Developed a Variational Autoencoder (VAE) for efficient image compression and reconstruction.
- Optimized latent representations to reduce storage and bandwidth requirements while maintaining >90% reconstruction fidelity.
- Evaluated deployment feasibility on cloud infrastructure for scalable image processing pipelines.