Obblivignes KanchanadeviVenkataraman

Raleigh, NC • obblivignes.kv@gmail.com • +1 (828) 455-5022 • linkedin.com/in/obblivignes-kv • https://vignes-12.github.io/

EDUCATION

North Carolina State University

Doctorate of Philosophy in Computer Science — August 2025 - Expected May 2029
GPA: 4.00/4

Master of Science in Computer Science — August 2023 - May 2025
GPA: 3.97/4

Bachelor of Science in Computer Engineering — August 2020 - May 2023
GPA: 4.00/4

SKILLS

Languages & Tools | Python, MATLAB, C, C++, Java, JavaScript, TypeScript, LaTeX, Git, Bash, SLURM
Libraries & Frameworks | PyTorch, Scikit-Learn, Pandas, Plotly, Numpy, Matplotlib, Keras, Scipy, Electron JS, React.JS
Machine Learning | **Classical** (Classification, Clustering, Tree-based methods), **Deep** (UNet, Diffusion, LiteLLM, GPT)
Data Science | Data Preprocessing, Data Visualization, Statistical Analysis, Monte Carlo Simulations, Predictive Modeling

WORK EXPERIENCE

Graduate Teaching Assistant - Automated Learning & Data Analysis | NC State University — January 2026 - Present
- Held office hours for **60 students** to understand material, complete assignments, and build a real-world machine learning project.
- Managed grading for all student coursework, including assignments, quizzes, and exams.

Graduate Teaching Assistant - Software Engineering | NC State University — August 2025 - December 2025
- Mentored **60 students collaborating across two lab sections** to complete assignments, and build a full-stack development application.
- Held office hours to help students with questions or concerns they have regarding course material and project issues.

CV/ML Graduate Research Assistant (GRA) | NC State University - MAP & GIS Lab [Link] — September 2024 - Present
- Designed end-to-end pipelines for super-resolution microscopy, integrating AI/ML workflows into biological and microscopy research to accelerate experimental innovation.
- Generated **500k+** physics-informed Monte Carlo simulations, boosting model accuracy by **25%** and training efficiency by **40%** with **feature engineering and custom normalization**.
- Migrated legacy MATLAB analysis tools to a high-performance PyTorch/Python version, achieving a **5x acceleration** in training and inference speeds for real-time biological analysis.
- Improved model generalization by **50%** across diverse datasets through various deep learning architectures (spatial attention, conditional diffusion), advanced statistical evaluation, and rigorous hyper-parameter tuning.
- **Research funded by several NC State grants**, including the NC State University Dean's COE Applied AI Research Accelerator Award and NC State Comparative Medical Institute Ideation Award.

Software Engineering AI GRA | NC State University - Dr. Bowen Xu's Lab [Link] — January 2024 - May 2024
- Presented, trained, and evaluated the performance of an existing deep **just-in-time SE code-comment consistency checker** technique among existing datasets such as Microsoft's CodeXGlue.
- Integrated the tool into SEEDGuard GitHub repository, providing video-guided tutorials and Docker images for easy deployment.

Distributed Systems RA | NC State University - Dr. Ruozhou Yu's Lab [Link] — January 2023 - August 2023
- Conducted **microservice-based distributed application benchmarking** by implementing a comprehensive Kubernetes cluster, utilizing Raspberry Pis, an Apache Cassandra database, Flask, Jaeger, and Opentelemetry.
- Trained several machine learning models and achieved a **96% R2-score** using Random Forest models
- Presented all findings using data visualization techniques in a comprehensive report.

PROJECTS

Multi-AI Agent System (SIMBA: Single-molecule Imaging with Multi-agent Bot Assistant**)** — June 2025 - Present
- Led a multi-agent desktop app to perform spectroscopic analyses, image denoising, single-molecule localization, and other tasks
- Utilized **Electron JS and React JS** for front-end integration and utilized **GPT-4o and LiteLLM** for backend integration
- Significantly improved scientific analysis workflow by seamlessly integrating microscopy tasks (denoising, localization, analysis)

Computer Vision (Advanced Deep Learning Framework for Spectroscopic SMLM) — September 2024 - Present
- Implemented advanced model complexity, evolving from baseline Spec-U-Net to **SA-SpecU-Net using spatial attention** for contextual feature extraction
- Further enhanced model architecture by deploying a **conditional diffusion (DDPM) model SpecDiffuse** to iteratively maximize denoising and reconstruction fidelity
- Significantly improved simulated and experimental image resolution by **~25%** and **~50%** from existing U-Net-based implementations with SA-SpecU-Net and SpecDiffuse models, respectively
- Transformed entire pipeline from MATLAB to Python (Monte Carlo Data Simulations, model training, model inference) for significantly greater efficiency and **5x acceleration speeds**

Computer Vision (Framework for Accurate SMLM Spectroscopic Analysis) [Link] — September 2024 - July 2025
- Improved image resolution by **~70%** from conventional denoising methods by developing a U-Net-based model in MATLAB (SpecU-Net) to denoise spectroscopic single-molecule localization images
- Increased prediction precision by **~70%** and accuracy by **~50%** through generating **100k+** physics-informed Monte Carlo simulation datasets and creating comprehensive evaluation metrics.

PUBLICATIONS

- *Mao, H., Liu, Y., **KanchanadeviVenkataraman O.**, Shahid, M. A., Laplante C., Xu, D., Song, K., Zhang, Y. (2025). Framework for Accurate Single-Molecule Spectroscopic Imaging Analyses Using Monte Carlo Simulation and Deep Learning. Analytical Chemistry, 97(30), 16250-16258.*