

# Alok Bhattarai

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## Experience

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### Graduate Research Assistant

University of South Florida, Tampa, FL (Jan 2019 - May 2025)

- Conducted **neuroscience research** using **biophysical modeling and machine learning**, leveraging advanced **data analysis** and **simulation techniques** to analyze neuronal behavior, while **developing an automated cell segmentation tool** that improved analysis throughput by **over 50%**, bridging experimental observations with theoretical models.

### Machine Learning Intern

icardio.ai, Los Angeles, CA (Jun 2024 - Aug 2024)

- **Evaluated** and **optimized** a research collaborator's **PyTorch ML model for Left Ventricle (LV) segmentation** using an in-house echocardiography dataset, facilitating integration into the in-house **MLOps prediction pipeline**.

### Junior ML Engineer Volunteer

Omdena INC., CA (Nov 2023 - Jan 2024)

- Led and collaborated with multidisciplinary teams on **deep learning** projects for **healthcare** and **environmental applications**, including **brain scan analysis for Alzheimer's detection (99% accuracy)** and **microorganism detection in water (92% accuracy)**.
- Managed **data cleaning**, **exploratory data analysis**, and **model development** processes using approximately **5,000 imaging samples** from initial research to **deployment**, demonstrating expertise in **Computer Vision** techniques and effective communication through technical presentations.
- Co-led the microorganism detection project team of **30 members**, overseeing workflows and ensuring timely delivery of project milestones within **40–50 days**.

### Graduate Teaching Assistant

WESTERN ILLINOIS UNIVERSITY (Aug 2016 - May 2018) & UNIVERSITY OF SOUTH FLORIDA (Jan 2019 - May 2025)

- **Taught** undergraduate Physics labs at two institutions, **led** large student groups while instructing on **fundamental physics concepts** and guiding students in **data collection, analysis, and interpretation** for scientific inquiry.

## Education

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**UNIVERSITY OF SOUTH FLORIDA:** Ph.D. in Computational Biophysics/Neuroscience (Jan 2019 - May 2025)

**WESTERN ILLINOIS UNIVERSITY:** M.S. in Physics (Aug 2016 - May 2018)

## Skills

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- **Computational Modeling:** Neuron/Astrocyte Modeling, Euler Method, RK4 Method, Monte-Carlo Simulation
- **Programming Languages:** Python, MATLAB, C
- **Data Analysis and Visualization:** MS Office, SQL, Power BI, Tableau, Pandas, Numpy, Scipy, Matplotlib, Seaborn, Plotly, Streamlit
- **Image Processing:** OpenCV, Scikit-image, PILLOW, ImageJ
- **Machine Learning & Deep Learning:** Python (Scikit-learn, TensorFlow, Keras, PyTorch), Statistical Modeling, Supervised & Unsupervised Learning, Dimensionality Reduction (PCA), Neural Networks (ANN, CNN)
- **Advanced ML/NLP:** Transformers, LangChain, RAG, MCP, n8n
- **MLOps & Cloud:** FastAPI, Flask, Docker, Git, DVC, GitHub Actions (CI/CD), AWS (SageMaker, EC2, S3), Apache Airflow, MLflow, ClearML
- **Other Skills:** Rapid Adaptation to New Technologies, Team Collaboration, Data-Driven Decision Making

## Recent Projects

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- Developed an **MCP-based system to automate and batch-execute the published DL-SCAN microscopy pipeline**, allowing analysis workflows to be **triggered via natural-language prompts using an LLM (Claude)**, with a focus on **scalable and reproducible high-content image analysis**.
- **Built an end-to-end loan approval ML pipeline with feature engineering, preprocessing, and AWS SageMaker deployment with GitHub Actions CI/CD**, enabling **scalable, automated, and real-time loan decisioning**.
- **Built an end-to-end ML pipeline using Apache Airflow (Astro) and Docker** for automated preprocessing, training, and **MLflow** experiment tracking; forecasts via **Streamlit** with **MinIO** for data and artifact storage.

## Publications

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- Bhattarai, A.; Meyer, J.; Petersilie, L.; Shah, S.I.; Neu, L.A.; Rose, C.R.; Ullah, G. **Deep-Learning-Based Segmentation of Cells and Analysis (DL-SCAN)**. *Biomolecules* 2024, 14, 1348. <https://doi.org/10.3390/biom14111348>
- Meyer, J.; Eitelmann, S.; Bhattarai, A.; Bornemann, V.; Unichenko, P.; Durry, S.; Kafitz, K.W.; Henneberger, C.; Ullah, G.; Rose, C.R. **Local Differences in Baseline Sodium Shape Astrocytic Potassium Uptake by the NKA**. *bioRxiv* 2025. <https://doi.org/10.1101/2025.11.18.687951> (*Preprint; accepted for publication at Nature Communications*).