

Machine Learning Engineer | Computer Vision | Medical AI

Computer Science & Pre-Med sophomore at the University of Southern Mississippi (GPA 3.8) with hands-on experience building end-to-end deep learning pipelines, computer vision systems, and ML research.

EDUCATION

University of Southern Mississippi Hattiesburg, MS
B.S. Computer Science / Pre-Med | Sophomore | GPA: 3.8 / 4.0 *Expected Dec 2028*
– **Relevant Coursework:** Data Structures & Algorithms, Software Development Foundations, Deep Learning, Machine Learning, Calculus, Linear Algebra

Trinity International College Kathmandu, Nepal
+2 Science (Biology, Physics, Chemistry, Math) | GPA: 3.8 / 4.0 *Graduated 2023*

PROJECTS

Pneumonia Detection & Localization System *Summer 2025*

Deep Learning | PyTorch, YOLOv8 (Ultralytics), OpenCV, Albumentations, Pydicom

- Built an end-to-end ML pipeline on the RSNA Pneumonia Detection dataset (~30k chest X-rays in DICOM format): data ingestion via Kaggle API, EDA, preprocessing, augmentation, model training, and inference
- Addressed a 3.4:1 class imbalance by applying 3 targeted augmentation transforms (horizontal flip, brightness/contrast shift, Gaussian blur + noise) to pneumonia-positive cases, growing positive training samples from 4,810 to 19,240
- Converted DICOM pixel arrays to JPEG, normalized bounding box coordinates to YOLO format (**x_center**, **y_center**, **w**, **h**) and built stratified train/val splits (80/20) stratified by both class label and X-ray view (PA vs. AP)
- Fine-tuned YOLOv8m on 35,777 training images (1024×1024) using AdamW optimizer, early stopping (patience=20), and custom YAML dataset config; achieved mAP@50 of 0.25 on held-out validation set
- Generated a confidence-weighted bounding box heatmap overlay post-inference to visualize where the model localizes pneumonia across the lung field

YOLOv1 Object Detection - Implemented from Scratch *March 2025 - May 2025*

Computer Vision | PyTorch, NumPy

- Fully recreated the YOLOv1 architecture from the original paper: backbone feature extractor, detection head with S×S grid, B bounding box predictors per cell, and C class probability outputs
- Implemented the complete multi-part loss function from scratch - localization loss (MSE on box coords), objectness confidence loss, and classification loss - with separate weighting for object vs. no-object grid cells
- Implemented IoU (Intersection over Union) calculation and evaluated detection quality using mean Average Precision (mAP); exercise provided deep, low-level understanding of single-shot detection internals

Unsupervised Feature Learning with Autoencoders & VAEs *2024*

Deep Learning | PyTorch, Scikit-learn, Matplotlib

- Benchmarked unsupervised clustering approaches on MNIST: raw K-Means (AMI = 0.50), t-SNE + K-Means (AMI = 0.79), and t-SNE + GMM (AMI = 0.78) - quantifying the value of dimensionality reduction before clustering
- Built a Linear Autoencoder (784→128→64→12→2 bottleneck) and a CNN Autoencoder (Conv2d stride-2 layers → 128-dim bottleneck) to compress images into 2D latent representations; visualized learned latent space via scatter plots colored by digit class
- Trained with MSE reconstruction loss and StepLR scheduler; confirmed CNN AE produced tighter, more separable latent clusters than the linear variant

Food Image Classification with CNNs *2024*

Machine Learning | PyTorch, NumPy

- Benchmarked linear classifiers vs. CNNs across food image datasets, MNIST, and Fashion-MNIST; documented accuracy and training time tradeoffs across architectures
- Experimented with architecture depth, dropout regularization, and learning rate schedules to characterize generalization vs. overfitting behavior

Camp Crunch - Personalized Student Nutrition App *2025 - Present*

Mobile App | React Native, Firebase, Appwrite

- Developing a mobile app that ingests real-time campus dining menu data and generates personalized meal plans based on individual dietary preferences and fitness goals
- Built a custom hybrid recommendation algorithm combining content-based filtering (nutritional macro profiles) with user preference modeling

RESEARCH EXPERIENCE

Research Assistant - Dr. Rijal's Lab

March 2026 - Present

University of Southern Mississippi

Hattiesburg, MS

- Proposed and developing research: “*Computational Design and Identification of Peptide Inhibitors Targeting Secreted Virulence Proteins of Mycobacterium tuberculosis*”
- Applying computational biology and ML techniques to screen and rank candidate peptide sequences against TB virulence factor structures

Undergraduate Research Symposium - 2nd Place, \$300 Award

April 2026

University of Southern Mississippi

Hattiesburg, MS

- Presented: “*Benchmarking Supervised Machine Learning Algorithms using PyCaret for Network Anomaly Detection (Binary and Multiclass Classification)*” - evaluated 15+ classifiers on network traffic datasets; placed 2nd among all undergraduate presenters

TECHNICAL SKILLS

Languages : Python, JavaScript, SQL, C++

ML/DL Frameworks: PyTorch, Scikit-learn, Ultralytics YOLOv8

Libraries : NumPy, Pandas, OpenCV, Albumentations, Matplotlib, Seaborn, Pydicom

Mobile & Web : React Native, Firebase, Appwrite

Developer Tools : Git, GitHub, Jupyter Notebook, VS Code, Google Colab

Databases / Cloud : MySQL, Appwrite, Firebase

Areas of Interest : Computer Vision, Medical Imaging, Deep Learning, Data Analysis, Automated Systems, Recommendation Systems