Vaishnavi Gawale

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Portfolio - https://vaishnavi2231.github.io/profile/

RESEARCH INTEREST

I am interested in the intersection of artificial intelligence and neuroscience, with a particular focus on neuroprosthetics, brain–computer interfaces, and motor function restoration. My passion lies in developing methods to interpret neural signals and uncover the mechanisms underlying brain function. My goal is to design machine learning and neural coding models that can decode brain signals and predict intended actions. Ultimately, I aspire to contribute to translational neurotechnologies that connect theory with impactful real-world solutions.

EDUCATION

Master of Science in Artificial Intelligence **Aug 2024 – Jan 2026**

University at Buffalo - SUNY, Buffalo, New York, USA

- Courses : Introduction to Machine Learning, Basics of Artificial Intelligence, Numerical Mathematics, Analysis of Algorithm, Data Intensive Computing, Computer Vision, Reinforcement Learning and Pattern Recognition.

Master of Technology in Computer Engineering **Aug 2017 – Jul 2019**

University of Mumbai - VJTI, Mumbai, Maharashtra, India

- Courses: Data Structures and Algorithms, Research Methodologies, Advance Database Management Systems, Big Data Analytics, Computational Methods.
- Publication: **Vaishnavi Gawale**, Varshapriya J.N., "Firewall Algorithm Approach for Diminution of DDOS attack on Cloud" in *International Journal of Scientific and Research Development –IJSRD (July 2019)*.
- Graduate Teacher Assistantship **:** Python and C Programming for Fall 2017 and Spring 2018

Bachelor of Engineering in Computer Science & Engineering **Aug 2014 – Jul 2017**

BAMU University, *Aurangabad, Maharashtra, India*

RESEARCH EXPERIENCE

Research Scientist Intern | Clinical and Translational Research Center, Buffalo, NY, USA **Jan 2025 - Present**

Project - CEST MRI-Based Biomarker Development for Early Detection of Alzheimer's disease

- Designed and implemented an automated CEST MRI analysis pipeline for APT signal correction and regional quantification of amyloid-beta protein, advancing non-invasive biomarker development for early Alzheimer's diagnosis.
- Performed MRI & PET preprocessing (motion correction, co-registration, normalization, smoothing), followed by PET Centiloid quantification using the Python and Matlab tools with SUVR scaling, cerebellum normalization, and AAL3 atlas-based ROI extraction.
- Conducted ROI- and voxel-wise analysis across brain regions and executed statistical evaluations (Pearson correlation, Bland–Altman plots, and group-level comparisons) to assess agreement between CEST MRI and PET-derived biomarkers.
- Applied machine learning and deep learning models (CNNs, ROI-patch classification, segmentation networks) for regional biomarker prediction and validation against PET ground truth.

Tools & Software: Python (NumPy, Pandas, Matplotlib, Plotly, NiBabel, Nilearn), MATLAB (SPM12), ANTs, FSL, FreeSurfer, 3DSlicer, RadiAnt.

Graduate Research Assistant | University at Buffalo, Buffalo, NY, USA **Sept 2024 – Dec 2024**

Project - 3D Shape Reconstruction in Computer Vision using Deep Learning

- Researched methods for 3D object reconstruction from multi-view and single-view images, focusing on deep learning and CV approaches.
- Implemented point cloud and voxel-based representations, and experimented with neural architectures such as 3D CNNs, autoencoders, and transformer-based models for shape reconstruction.
- Conducted experiments on benchmark datasets (e.g., OmniObject3D, ShapeNet) to evaluate reconstruction accuracy and generalizability across object categories.

Tools & Software: Python, PyTorch, Open3D, NumPy, Matplotlib, CUDA, Git

SKILLS

Programming & Scripting: Python, C, C++, MATLAB, Bash/Shell scripting
Libraries and Frameworks: Pandas, NumPy, Scikit-learn, TensorFlow, PyTorch, Keras, OpenCV, NiBabel, Nilearn,
Machine Learning & AI: Predictive Modeling (Linear/Logistic Regression, Time Series, Forecasting), Bayesian Methods, Decision Trees, Random Forest, SVM, K-Means, KNN, Naive Bayes, XGBoost, CNN, RNN, LSTM, Reinforcement Learning, Transformers, LLMs (OpenAI, Hugging Face, LangChain), Model Interpretability (SHAP, LIME, XAI)
Neuroimaging & Computational Neuroscience: MNE-Python (EEG/MEG signal preprocessing),ANTs, FSL, SPM12, FreeSurfer
Statistical Modeling: Hypothesis Testing (T-test, Chi-Square, ANOVA), A/B Testing, Experimental Design, Bayesian Inference, Statistical Significance, Time Series Analysis, Regression Models.
Databases: MySQL, PostgreSQL, SQL Server, MongoDB
Data Visualization & Reporting: Matplotlib, Seaborn, Plotly, Power BI, Tableau
Reproducibility & Workflow Automation: Git, Docker, Conda environments, MLflow, FastAPI, Streamlit
Project Management & Methodologies: Agile/Scrum, JIRA, Stakeholder Communication, Cross-Project Management
Soft Skill: Strong research communication, Collaboration & Interdisciplinary Teamwork, Adaptability & Continuous Learning

WORK EXPERIENCE

Research Assistant Professor | MGM University, Aurangabad, India **Jan 2024 - Jul 2024**

- Led research on plant disease prediction in agriculture using Convolutional Neural Networks (CNNs), developing image-based classification models to identify leaf diseases and improve early-stage crop diagnosis.
- Built and evaluated predictive models using Python, TensorFlow, and OpenCV, applying techniques such as image preprocessing, data augmentation, and transfer learning.
- Taught Data Structures, Programming Logic Design, and Python Programming to undergraduate students through lectures, labs, and assessments.
- Designed syllabi, assessments, and conducted final exam evaluations across three consecutive semesters.
- Launched a YouTube channel to share recorded Data Structures lectures, expanding learning access beyond the classroom [YouTube Link].

Senior Software Engineer| Vegayan Systems, Mumbai, India **Aug 2019 - Jan 2024**

- Developed and deployed machine learning models to forecast telecom network traffic, improving accuracy and operational efficiency by 25%, using scikit-learn and TensorFlow.
- Conducted exploratory data analysis (EDA) and applied feature engineering, hyperparameter tuning, and SMOTE to enhance model performance.
- Built and automated ETL pipelines using Python, SQL, and Linux Shell scripting, reducing data processing time by 20% and accelerating reporting by 40%.
- Designed RESTful APIs and backend components in Java to support dynamic web interfaces, improving system performance by 30%.
- Collaborated with cross-functional teams for requirement gathering, model integration, and stakeholder demos, ensuring smooth deployment and real-world impact.

PROJECTS

News Recommendation System using Reinforcement Learning

- Designed and implemented a real-time news recommendation system using DQN and A2C on the MIND dataset including ensemble tokenization, named entity recognition (NER), lemmatization, and POS tagging. Utilized vector embedding (TF-IDF, GloVe) and context- aware features for user-article representation, enabling accurate content personalization and long-term engagement prediction.
- Achieved up to 9% click-through rate (CTR) by optimizing article selection through reinforcement learning, significantly outperforming baseline recommender models.

Smart Parking Management System with Computer Vision

- Designed a real-time parking lot monitoring system that detects available parking spot from surveillance video, creating custom dataset of 2K+ cropped parking spot images from video feeds and applying preprocessing to enhance feature extraction.
- Trained and optimized an SVM classifier with GridSearchCV, achieving 90%+ accuracy in classifying parking spot status, and deployed results by overlaying predictions directly onto live video feeds for intuitive visualization of available spaces.

Credit Default Prediction and Risk Assessment

- Developed predictive models (XGBoost, ROC AUC: 0.779) to assess default risk across 30,000+ credit accounts, incorporating feature engineering, class imbalance handling (SMOTE), and cross-validation to improve model performance.
- Delivered actionable insights using SHAP values, ROC/AUC curves, and automated dashboards built with Plotly, enabling stakeholders to make data-driven decisions and proactively mitigate risk.

CERTIFICATION

- Computational Neuroscience | University of Washington – Coursera
- Computational Neuroscience course | Neuromatch Academy (Pursuing)
- Complete neural signal processing and analysis: Zero to hero | Udemy (Pursuing)
- Machine Learning Specialization | DeepLearning.AI – Coursera
- Deeplearning.ai Tensorflow Developer Specialization – Coursera
- Complete Generative AI Course with Langchain and Huggingface – Udemy
- Complete MLOps Bootcamp with End-to-End Machine Learning Projects – Udemy

ACHIEVEMENTS AND EXTRA-CURRICULARS

- Attended the Brain–Computer Interface Symposium 2025, New York, USA
- Secured 3rd place in Poster Presentation competition on "News Recommendation System using Reinforcement Learning" at the CSE Demo Day Spring 2025, University at Buffalo, NY
- Presented a poster on "Computer Vision: Facial Emotion Recognition using Deep Learning" at the CSE Demo Day Competition Spring 2025, University at Buffalo, NY
- Member of Women in Science and Engineering (WiSE)
- Awarded Most Valuable Employee of the Year 2023, Vegayan Systems Pvt. Ltd., Mumbai
- Secured 2nd place in "Codiac" Coding Competition at AGNITIO'15, JNEC, Aurangabad