Jackson James Montour

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Objective

To obtain a Machine Learning Engineer role where my diverse interdisciplinary background will help strengthen my place of employment. Additionally, I aim to design innovative and impactful tools that push the boundaries of technology and make a meaningful difference in people's lives.

Education

University of Vermont, Burlington, VT..2021 to 2025
- ***B.S. Biomedical Engineering, Minor: Computer Science***   GPA: 3.43

Skills

- Self-motivated to innovate in the development, execution, and analysis of a project.
- Able to effectively communicate across diverse groups of collaborators spanning a wide variety of backgrounds and skills.

ETL: Pandas, PostgreSQL, R, Scikit-learn, Pytorch, torchvision, Dask, NumPy, FastAPI
Machine Learning: PyTorch, Docker, torchvision, prompt engineering, CNNs, Transformers, LLMs, XGBoost
Programming Languages: Python, R, SQL, Shell, Bash, Java, C++, JavaScript, HTML, CSS, Linux, Arduino
Engineering: Signal Processing, template matching, wavelet transform, biosignal processing, IMU, EMG, ECG, EEG

Experience

Undergraduate Researcher **Dr. Majumdar, ImmunoFoundry, Burlington, VT**..January 2025-Present
- Fine-tuning Meta's ESM protein language model on VirScan hit data to predict antibody-peptide binding affinities.
- Investigating immune system gaps by analyzing model saliency and comparing correctly identified non-binders.

BOOST Session Leader **UVM Department of Mathematics, Burlington, VT**..August 2023-Present
- Develops lesson plans and practice problems that align with all Calculus 1, 2, and 3 course schedules.
- Leads group tutoring sessions, ensuring an enriching experience for all tutees present by caring for the needs of all in an efficient, yet thoughtful manner.

Systems & Signals Teaching Assistant **Dr. Jangraw, UVM, Burlington, VT**..................................August 2024-December 2024
- Managed course file system to make sure students had access to current material; designed and presented interactive sandbox activities to supplement lectures and promote interactivity; communicated regularly with Dr. Jangraw.

Line Cook **Spot on the Dock, Burlington, VT**...May 2024-August 2024
- Prepped ingredients and assembled appetizers and entrées using flat-top grill and deep fryers, efficiently completing hundreds of tickets per day.
- Maintained exceptional workstation cleanliness, following all Vermont guidelines for food preparation and kitchen safety.

Personal Projects

DeepSwing - *LLM for Golf Swing Feedback*...March 2025-Present
- Developing a video-based golf swing feedback web app utilizing Ultralytics YOLO pose estimation and Gemma3 LLM.
- Engineering a back-end system using Docker Compose to integrate a pose estimation and FastAPI handling container with an LLM feedback container running Ollama, enabling seamless and efficient functionality.

BugBuster - *Transformer Based Antibiotic Resistance Prediction*...November 2024-March 2025
- Designed and implemented ESM fine-tuning classification pipeline to predict bacterial amino acid sequences as conferring antibiotic resistance or not. Comparing three different levels of ESM weight freezing during training.

EDUCATION

University of Vermont, CEMS, Burlington, VT   May 2025
Bachelor of Science, Biomedical Engineering; GPA: 3.5

Relevant Coursework: Human Cell Biology, Genetic Engineering, Applied Deep Learning in Biology, Medical Biostatistics & Epidemiology, Data Science, Algorithm Design & Analysis, Human Anatomy & Physiology (2 semesters), General Chemistry, Basic Statistical Methods

RESEARCH EXPERIENCE

UVM ImmunoFoundry (link)
January 2025 - Present
Advisor: Dr. Dev Majumdar
Leveraging VirScan datasets to develop an end-to-end deep learning pipeline for identifying structural patterns in viral immunity at the amino acid sequence level. Fine-tuning Meta Research's pretrained ESM-2 protein language model with a custom task-specific classification head to enable robust prediction of peptide-antibody binding affinity. Preprocessing VirScan data for biologically relevant fine-tuning of the ESM-2 pipeline.

PROJECTS

BugBuster - Transformer Based Antibiotic Resistance Prediction (link)
November 2024 - Present
Developing a Transformer-based model in PyTorch to classify bacterial amino acid sequences based on antibiotic resistance. The model leverages Meta Research's Evolutionary Scale Modeling (ESM) protein language model, exploring three fine-tuning strategies: fully frozen pretrained layers, fully unfrozen pretrained layers, and Low-Rank Adaptation (LoRA). Utilizing attention maps to identify biologically meaningful sequence motifs associated with antibiotic resistance. Achieved state-of-the-art performance, surpassing published accuracy and F1 scores by 3% and 4%, respectively.

Deep Learning Human Activity Recognition (link)
September 2024 - November 2024
Developed CNN and hybrid CNN + LSTM deep learning models to classify activities in raw triaxial accelerometer data using HARTH dataset. Employed methods to account for dataset imbalance including a weighted loss function, weighted random sampler, and down sampling. Achieved an average accuracy of 98.3%, exceeding published metrics for all activity classes.

Using Explainable AI to Uncover Key Predictors of PGA Tour Success (link)
July 2024 - August 2024
Trained XGBoost regression models to predict money earned and amount of top 10 placements given season long performance statistics such as putts per round, fairway percentage, and various strokes gained metrics. Uncovered patterns relating specific skill areas (putting, driving, chipping, approach) to overall

season performance using SHapley Additive exPlanations (SHAP), validating commonly held beliefs among PGA tour golfers.

TEACHING & LEADERSHIP

BOOST Session Leader *August 2023 - Present*

Develops session plans and practice problems that align with all course schedules to prepare for any and all student needs. Leads group tutoring sessions, ensuring an enriching experience for all tutees present by caring for the needs of all in an efficient, yet thoughtful manner. Participates in professional development seminars to excel in situations with a variety of diverse learners and improve tutoring capabilities as a whole.

Systems & Signals Teaching Assistant *August 2024 - December 2024*

Attended weekly meetings to discuss plans moving forward, tasks that needed to be delegated among myself and the other TAs, any feedback from students, and additional support that Dr. Jangraw would like moving forward. Managed course file system, staying up to date with current material while ensuring students had access to all necessary material. Designed and presented interactive "Sandbox" activities, meant to break up the long class period while still providing meaningful and relevant instruction.

Pi Kappa Phi Executive Board and IFC Delegate *January 2022 - November 2024*

Met weekly with University representatives and fellow executive board members to make sure my fraternity was meeting and exceeding all expectations set forth by the University for chapter excellence. Communicated expectations set forth by the University to the rest of my chapter in order to establish transparent communication and clear guidelines. Maintained and updated chapter constitution to ensure an inclusive, productive, and studious chapter.

TECHNICAL SKILLS

Software & Frameworks: GitHub, Python, R, Java, C++, Ubuntu, Linux, Pytorch, BLAST, KEGG, XGBoost, SHAP, CNN, Transformer, RNN, EUGENe, AlphaFold, RoseTTAFold, RFdiffusion, BindCraft, NCBI Protein, NCBI Nucleotide, Microsoft Office Suite, Google Workspace, Arduino

Data Analysis: Pandas, Numpy, Scikit-learn, R, Matplotlib, seaborn, template matching, wavelet transform, signal filtering, EMG, IMU

<h1 align="center">Professional References</h1>

Dr. Dev Majumdar, Assistant Professor at The Robert Larner, M.D. College of Medicine
University of Vermont
Given Medical Bldg, E-126, 89 Beaumont Ave
Burlington, VT 05405
Dev.Majumdar@uvm.edu

I currently conduct research under Dr. Majumdar within his ImmunoFoundry lab. We meet weekly as an entire lab to discuss any findings or new data, providing and receiving constructive criticism from fellow lab members. Myself and Dr. Majumdar also have weekly one-on-one meetings in order to discuss specifics about my personal project, including new strategies from scientific journals and general guidance in order to maximize my success. I was introduced to Dr. Majumdar when I took his course, Applied Deep Learning.

Joan Rosebush, Director of Student Success
University of Vermont
Burlington, VT 05405
(802) 448-5184
jrosebus@uvm.edu

Joan has been a strong influence on the last two years of my journey at UVM, ever since I was a student in her Advanced Engineering Mathematics course. After we became more friendly, she recommended I take part in a math help program she was starting, called BOOST. She thought that I would be a great tutor, and a friendly personality that could bring some warmth to the sometimes scary world of learning calculus. Since that point, I have helped many students achieve their mathematical goals, and I am still going strong. Throughout this time, myself and Joan have built our professional relationship and I look to her as a mentor, finding no doubt that we will keep in touch long after my graduation.

Dr. David Jangraw, Assistant Professor, Department of Electrical and Biomedical Engineering
University of Vermont
Burlington, VT 05405
david.jangraw@uvm.edu

Dr. Jangraw chose me to be a teaching assistant for his Systems & Signals course due to my strong performance in the class a year prior. We met weekly to discuss plans moving forward, tasks that needed to be delegated among myself and the other TAs, any feedback from students, and additional support that Dr. Jangraw would like moving forward. These weekly meetings were supplemented with frequent Microsoft Teams messages to ensure that course goals were being met and students' needs were being appropriately responded to.