YONGCHENG MU

CS PH.D. CANDIDATE

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EDUCATION

- **Old Dominion University** *Ph.D. in Computer Science*

  Norfolk, VA — Expected Graduation: [Month, Year]

  – **Selected Courses:** Machine Learning, Deep Learning, Computer Vision, Data Science, Algorithms

RESEARCH & TEACHING EXPERIENCE

- **Graduate Research Assistant** *Jan 2021 - Present*

  Old Dominion University, Norfolk, VA

  – **Project 1: Nutritional Analysis using Large Multi-modal Models**

  * Developed **DonateAndLearn**, a Swift-based iPhone application for collecting real-world, multi-modal food datasets, including images, depth maps, and camera sensor data, with future integration for glucose monitoring.
  * Benchmarked state-of-the-art Large Multi-modal Models on the collected dataset to evaluate their zero-shot capabilities for nutritional analysis.
  * Evaluated and compared LMM performance against a baseline deep learning model trained on the Nutrition5k dataset, providing insights into the practical application of foundation models on specialized, real-world data.

  – **Project 2: Deep Learning for Cryo-EM Map Segmentation**

  * Spearheaded the development of **DeepSSETracer**, a novel deep learning tool for segmenting 3D cryo-EM density maps, achieving a significant improvement in segmentation accuracy over baseline models.
  * Designed and implemented custom loss functions (Combined Focal and Dice Loss) to significantly improve segmentation performance of protein secondary structures.
  * Developed a robust Pytorch-based framework for training CNNs on large-scale scientific image data, utilizing HPC clusters (Slurm) and GPUs to accelerate model training.
  * Reviewed papers for top-tier machine learning and bioinformatics conferences (e.g., NeurIPS, BIBM).

  – **Project 3: Technician & Research Assistant**

  * As part of the ODU Research Foundation (Dept. of Bio-electrics, Oct 2019 - Jan 2021), designed and fabricated programmable electronic equipment for bio-electrics research experiments.

CORE COMPETENCIES & TECHNICAL SKILLS

ML Techniques:	Deep Learning, Computer Vision, Image Segmentation, Large Multi-modal Models (LMMs), Model Benchmarking, Data Analysis
Architectures:	Transformers, CNNs, U-Nets, ResNet
Languages & Packages:	**Python:** PyTorch, TensorFlow, Keras, Scikit-learn **Other:** Swift, C++, Jupyter
Tools & Platforms:	Git, Unix/Linux, Mobile App Development, HPC Clusters (Slurm), CUDA

SELECTED PUBLICATIONS

- **The Combined Focal Loss and Dice Loss Function Improves the Segmentation of Beta-sheets in Medium-Resolution Cryo-Electron-Microscopy Density Maps**

  Authors: Yongcheng Mu, Thu Nguyen, Bryan Hawickhorst, Willy Wriggers, Jiangwen Sun, Jing He

  Published in: *Bioinformatics Advances*, 2024

- **A Tool for Segmentation of Secondary Structures in 3D Cryo-EM Density Map Components Using Deep Convolutional Neural Networks**

  Authors: Yongcheng Mu, Salim Sazzed, Maytha Alshammari, Jiangwen Sun, Jing He

  Published in: *Frontiers in Bioinformatics*, 2021