Harishwar Reddy K

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Research Background

My research focuses on developing scalable AI systems for **digital pathology**, with particular interests in **explainable foundation models**, **self-supervised learning**, and **multi-omics**.In addition, I also have research experience with **vision-language models** and **large language models** for multimodal biomedical AI and computer vision applications.

Education

University of Florida Aug 2023 – May 2027(Anticipated)
Ph.D. in Electrical and Computer Engineering, CGPA: 4/4 *Gainesville, Florida, USA*

Indian Institute of Science (IISc) Oct 2020 – June 2022
M.Tech in Artificial Intelligence, CGPA: 8.2/10 *Bangalore, Karnataka, India*

Research Experience

Graduate Research Assistant Aug 2023 – Present
University of Florida *Gainesville, FL, USA*

- Developed novel **foundation models**, **self-supervised learning**, and **multiple instance learning (MIL)** methods for computational pathology, including pretraining the **first kidney-specific multi-stain, multi-resolution histopathology foundation model** on approximately **30,000 whole-slide images (WSIs)**.
- Built scalable **representation learning** and **clinical prediction pipelines** for disease diagnosis, treatment response prediction, and biomarker discovery from gigapixel pathology images, translating machine learning research into clinically relevant tools through collaboration with pathologists and nephrologists.
- Developed an open-source **Python benchmarking framework** to systematically evaluate **11 SOTA histopathology foundation models** across **11 kidney pathology tasks**, and designed **explainable AI** methods linking learned embeddings with interpretable renal **pathomic biomarkers** for clinical decision support.
- Developed automated **segmentation**, **cell detection**, and **feature extraction** pipelines for glomeruli, glomerular tufts, arteries, tubules, and immune cells, enabling large-scale quantitative analysis of WSIs.

Research Intern April 2023 – July 2023
Siemens *Bangalore, India*

- Developed an **Explainable Active Learning (XAL)** framework for industrial computer vision by integrating **MLflow**, **Prefect**, and deep learning pipelines for scalable experimentation and workflow automation.
- Fine-tuned **deep neural networks** for **multi-class object classification** on Siemens' logistics dataset, enabling automated recognition of baggage categories in warehouse operations.
- Designed an **active learning** strategy with **model explainability** to prioritize high-value training samples, reducing annotation costs while improving classification accuracy and model transparency.

Junior Research Fellow July 2022 – March 2023
Indian Institute of Science *Bangalore, India*

- Conducted research in **computer vision**, **medical image analysis**, **image denoising**, and **explainable artificial intelligence (XAI)** for ophthalmic imaging applications.
- Developed and evaluated **Layer-CAM**, **Eigen-CAM**, and **HiResCAM** on the **Inception-ResNet-v2** architecture to improve explainability and abnormality detection in **Optical Coherence Tomography** images.
- First-authored research papers on **deep learning**, **medical image analysis**, and **explainable AI**, resulting in publications submitted to premier venues including **NeurIPS (Med-NeurIPS)** and **ISBI**.

Publications

Pathomic Analysis of 5-Year Surveillance Biopsies as Predictors of Kidney Allograft Loss. *American Journal of Transplantation*, 2026. **(Impact Factor: 8)**
P. Sarder, A. Denic, B. H. Smith, A. S. Paul, A. Gupta, H. R. Kasireddy, S. Devarasetty, S. P. Border, W. D. Park, M. D. Stegall.

A Scoping Review of Machine Learning Applications for Diagnosis, Classification, and Prognosis in Lupus Nephritis. *Kidney360*, 2026. **(Impact Factor: 3.6)**
H. R. Kasireddy, P. S. La Rosa, D. Demeke, J. B. Hodgin, P. Sarder.

Guardians of Digital Safety: Benchmarking Large Language Models in the Fight Against Online Toxicity. *Journal of Big Data*, 2026. **(Impact Factor: 10.8)**
N. AlDahoul, M. J. Tan, H. R. Kasireddy, Y. Zaki.

FaceScanPaliGemma: Multi-Agent Vision-Language Models for Facial Attribute Recognition. *Scientific Reports*, 2026. **(Impact Factor: 4.9)**
N. AlDahoul, M. J. T. Tan, H. R. Kasireddy, Y. Zaki.

Explainable Feature Embeddings from Histopathology Foundation Models: A Case Study for End-Stage Kidney Disease Risk Analysis in Diabetic Nephropathy Patients. *Proceedings of Medical Imaging 2025: Digital and Computational Pathology*, 2025.
H. R. Kasireddy, N. Lucarelli, D. Yun, K. C. Moon, P. S. La Rosa, *et al.*, A. Naglah, P. Sarder

Deep-Learning-Based Visualization and Volumetric Analysis of Fluid Regions in Optical Coherence Tomography Scans. *Diagnostics*, 13(16):2659, 2023. **(Impact Factor: 3.8)**
H. R. Kasireddy, U. R. Kallam, S. M. S. K., H. Kongara, A. Shivhare, *et al.*, R. Raman, C. S. Seelamantula.

Denoising Enhances Visualization of Optical Coherence Tomography Images. *Proceedings of the Sixth NeurIPS Workshop on Medical Imaging*, 2022.
H. R. Kasireddy, A. Shivhare, H. Kongara, J. Saita, R. Prasad, C. S. Seelamantula.

Manuscripts Under Review

A Comprehensive Benchmark of Histopathology Foundation Models for Kidney Digital Pathology Images. *Nature Communications* **(Under Review; Impact Factor: 18)**
H. R. Kasireddy, P. S. La Rosa, A. Gupta, A. S. Paul, *et al.*, A. Z. Rosenberg, M. T. Eadon, J. B. Hodgin, P. Sarder.

The Evolving Role of Machine Learning in Metabolomics for Precision Nutrition: A Systematic Review. *IEEE Journal of Biomedical and Health Informatics* **(Under Review; Impact Factor: 7.7)**
M. J. T. Tan, D. A. Lichlyter, M. M. Ebeid, M. W. Christopher, H. R. Kasireddy, *et al.*

Selected Research Projects

Kidney Histopathology Foundation Model (2025–Present)
- Developed the first kidney-specific multi-stain, multi-resolution histopathology foundation model using self-supervised learning on approximately 30,000 whole-slide images.
- Designed scalable pretraining and evaluation pipelines for gigapixel pathology images.

Histopathology Foundation Model Benchmark
- Developed an open-source Python framework benchmarking 11 state-of-the-art histopathology foundation models across 11 kidney pathology tasks.
- Includes reproducible evaluation for classification, regression, segmentation, and clinical prediction.

Lupus Nephritis Treatment Response Prediction
- Developed interpretable handcrafted pathomic feature extraction methods for predicting treatment response using various functional tissue unit-based features.

Technical Skills

Programming & Tools: Python, MATLAB, Git, Docker, Linux, Jupyter, MLflow, Prefect, SQL
Machine Learning & AI: PyTorch, Scikit-learn, Hugging Face, Pandas, NumPy, Self-Supervised Learning, Foundation Models, Multiple Instance Learning (MIL), Explainable AI (XAI), MLOps, CUDA, SLURM
Core Technical Expertise: Computer Vision, Digital Pathology, Biomedical AI, Prognosis, Advanced Image Processing, Optimization, Linear Algebra, Information Theory, Stochastic Modelling

Professional Service

Journals: Frontiers in Medicine, Nature Scientific Reports, Diagnostics, Kidney Medicine, International Journal of Medical Imaging, Abdominal Radiology, Diagnostic Pathology, Frontiers in Immunology, and Biodata Mining.
Conferences: Machine Learning in Computational Biology (MLCB)