Darrin Bright

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Research Interests

Medical Image Analysis | 3D Vision | Multimodal Learning

Education

Vellore Institute of Technology (VIT) Vellore, India
Integrated Master of Technology in Software Engineering *2022 – 2027 (Expected)*

CGPA: 8.79/10.0
Relevant Coursework: Artificial Intelligence, Machine Learning, Natural Language Processing, Data Mining, Database Management Systems, Python Programming

Publications

[1] **D. Bright**, R. Raj, K. Keisham. "PortionNet: Distilling 3D Geometric Knowledge for Food Nutrition Estimation." *Accepted at Conference on Vision and Intelligent Systems (CVIS)*, 2025. [arXiv][Code]

[2] **D. Bright**, P. Kumar. "Explainable Transfer Learning Ensemble with Dynamic Weighting for Kidney Disease Classification in CT Images." *Under review at Cogent Engineering.* [Code]

Research Experience

Indian Institute of Technology, Hyderabad Hyderabad, India
Research Intern | Advisor: Dr. C. Krishna Mohan *January 2026 – Present*

- Developing federated continual learning methods for vision-language models in medical image classification, addressing catastrophic forgetting across distributed clinical datasets.

Simon Fraser University Vancouver, Canada
Research Intern | Advisor: Dr. Ghassan Hamarneh *December 2025 – May 2026 (Expected)*

Automated Detection of Mitochondria-ER Contact Sites in 3D STED Microscopy

- Developing a 3D U-Net pipeline for automated detection of mitochondria-endoplasmic reticulum contact sites from 3D STED volumes.
- Leveraging pySTED simulator to generate synthetic training data, augmenting limited annotations and enabling controlled experiments on imaging parameters.

Vellore Institute of Technology Vellore, India
Undergraduate Researcher *July 2025 – November 2025*

PortionNet: Distilling 3D Geometric Knowledge for Food Nutrition Estimation

Advisor: Dr. Kanchan Keisham

- Developed PortionNet, a cross-modal knowledge distillation framework enabling RGB models to learn 3D geometric features from point clouds during training, eliminating depth sensor requirements at inference.
- Designed a dual-mode training strategy with a lightweight RGB-to-Geometry Adapter that learns to generate pseudo-3D features for accurate geometric reasoning from a standard RGB image.
- Achieved state-of-the-art performance on MetaFood3D and SimpleFood45 datasets, demonstrating effective generalization.

Explainable AI Framework for Kidney Pathology Classification from CT Scans

Advisor: Dr. Praveen Kumar Reddy

- Designed a dynamic weighted ensemble combining MobileNetV2, ResNet-50, and EfficientNet-B1 for multi-class kidney disease classification on 12,446 CT images across four diagnostic categories.
- Implemented explainability framework using Grad-CAM and LIME with domain-specific augmentations to provide interpretable predictions for clinical decision support.

Indian Institute of Technology, Jodhpur Jodhpur, India
Research Intern | Advisor: Dr. Deepak Mishra *May 2025 – July 2025*

Self-Supervised Medical Image Segmentation with Vector Quantization

- Developed a hierarchical vector quantization framework that addresses limited labeled data in medical imaging by learning discrete representations from 2,594 unlabeled ISIC 2018 images and using them as structured regularizers during segmentation fine-tuning on the PH2 dataset.
- Designed three-stage training pipeline integrating VQ-VAE, SimCLR contrastive learning and segmentation fine-tuning, with multi-layer quantization capturing features across semantic scales.
- Achieved 79.76% Dice score with +1.38% consistent improvement over baseline without VQ across multiple runs, demonstrating the effectiveness of discrete representations as regularizers for medical imaging with limited labeled data.

Ablation Study: Vector Quantization Integration in Transformer-based Segmentation

- Conducted 13-experiment ablation study on Pascal VOC 2012 dataset investigating vector quantization integration with Swin Transformer encoders, testing codebook configurations, fusion mechanisms and initialization strategies.
- Achieved 74.61% Dice score with optimized vector quantization configuration, demonstrating +7.34% improvement over baseline CNN and +3.91% over vanilla Swin Transformer, validating VQ effectiveness for semantic segmentation.

Technical Skills

Programming: Python, SQL
ML/DL Frameworks: PyTorch, TensorFlow, MONAI
Computer Vision: OpenCV, PointNet, Albumentations, Torchvision
Libraries & Tools: NumPy, Pandas, Matplotlib, SciPy, Scikit-learn

Honors & Awards

- **Runner-up**, Startup Demo Day, Vellore Institute of Technology, 2025
- **Second Runner-up**, HackWar Hackathon, Vellore Institute of Technology, 2025
- **Winner**, Project 2039 Hackathon, Vellore Institute of Technology, 2024
- **Winner**, Alphaforge Ideathon, Vellore Institute of Technology, 2024
- **Runner-up**, Biomimicry Innovation Challenge, Vellore Institute of Technology, 2024

Professional Experience

Astute Vellore, India
Technical Lead – Intern *July 2024 – April 2025*

- Architected SEO AgentFlow, a custom multi-agent AI framework with 6 specialized autonomous agents (ICP, Keyword Extractor, On-Page, Off-Page, Technical SEO, Website Analyzer) implementing agent orchestration and inter-agent communication protocols using Gemini LLM.
- Engineered data-driven keyword research pipeline integrating SERP API, Google Trends, and DataforSEO API with multi-dimensional ranking algorithms for competitive analysis.
- Designed RAG-based content generation system with web scraping and structured data extraction to synthesize SEO-optimized content, automating on-page optimization and technical auditing.

Service & Leadership

IEEE Robotics and Automation Society, VIT Vellore, India
Chairperson *December 2024 – December 2025*

- Lead a 500+ member student chapter, organizing technical workshops, hackathons, and research talks, while mentoring junior students through hands-on sessions on ML fundamentals and Generative AI frameworks (LLMs, LangChain).

National Service Scheme Vellore, India
Volunteer *January 2023 – January 2024*

- Conducted career guidance sessions for government school students on educational pathways and professional opportunities.