Shravan Venkatraman

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Research Interests

I am interested in addressing challenges in computer vision, neural rendering, and deep learning applications for image reconstruction, geometric understanding, and generative modeling in multi-disciplinary domains.

Education

Vellore Institute of Technology, Chennai — **2021 - Present**
B.Tech Computer Science & Engineering — *GPA - **9.19/10***

Research Experience

Ongoing

** indicates equal contribution, † denotes my role as mentor*

- Sunil, M.*, Shravya, V.*, **Venkatraman, S.†**, Dhanith, J. P. R. (2025). *"Rethinking Knowledge Retrieval for Generation: A Survey on RAG Architectures and Applications."*
- **Venkatraman, S.***, Kumar, P. S.*, Jayasankar, K. S.*, Sunil, M.*, Ajith, G.*, Malarvannan, S.*, Dhanith, J. P. R. (2025). *"A Lightweight Continual Learning Approach via Retrieval-Augmented Generation for Personalized AI Assistants."*
- **Venkatraman, S.***, Jaskaran Singh Walia*, Karthik Desingu, Lekshmi K. (2025). *"Histopathological Cancer Stage Transition Modeling With Nucleus-Pair Spatial Attention & Multi-Stage Variational Autoencoders."*
- **Venkatraman, S.***, Kumar, P. S.*, Jayasankar, K. S.*, Renuka, S., Pravin, S. C. (2025). *"CerviLens: Deep Learning and Computational Imaging for Cervical Cancer Assessment and Therapy Recommendations."*
- **Venkatraman, S.***, Kumar, P. S.*, Ramachandran, V., Elias, S. (2025). *"EndoBuddy: AI-Assisted Real-Time Landmark Detection for Upper Gastrointestinal Endoscopy."*

Published/Under Review

- **Venkatraman, S.**, Kumar, P. S., Pandiyaraju, V., Abeshek, A., Aravintakshan, S. A., Kannan, A. (2025). *"SPROUT: Symptom-centric Prototypical Representation Optimization and Uncertainty-aware Training for Few-Shot Precision Agriculture."* **Computers and Electronics in Agriculture**. (Under review).
- **Venkatraman, S.**, Pandiyaraju, V., Abeshek, A., Kumar, P. S., Aravintakshan, S. A., Kannan, A (2025). *"Bayesian Uncertainty Propagation for Bone Fracture Diagnosis via Region-Aware Adaptive Label Refinement."* **Computers in Biology and Medicine**. (Under review).
- Jaskaran Singh Walia*, **Venkatraman, S.***, & Pavithra, L. K. (2025). *"Fusion: Frequency-Guided Underwater Spatial Image RecOnstructioN."* **CVPR 2025 Workshop – New Trends in Image Restoration and Enhancement (NTIRE)**. (Accepted).
- **Venkatraman, S.**, & Pandiyaraju, V. (2025). *"Making NeRF See Structure, Not Just Light: Enforcing PDE-Based Surface Constraints for 3D Consistency."* **ACM Transactions on Graphics**. (Under review).
- **Venkatraman, S.**, Walia, J. S., & Dhanith, J. P. R. (2025). *"SAG-ViT: A Scale-Aware, High-Fidelity Patching Approach With Graph Attention for Vision Transformers."* **arXiv**. (Under review at **Complex and Intelligent Systems**).
- **Venkatraman, S.**, Dhanith, J. P. R., & Kavitha, M. S. (2025). *"A Hierarchical MRI-Based Feature Profiling Approach for Identifying Neurodegenerative Disease-Specific Biomarkers."* **IEEE Transactions on Neural Systems and Rehabilitation Engineering**. (Under review).

- **Venkatraman, S.**, Pandiyaraju, V., Abeshek, A., Kumar, S. P., & Aravintakshan, S. A. (2025). *"Leveraging Bi-Focal Perspectives and Granular Feature Integration for Accurate, Reliable Early Alzheimer's Detection."* **IEEE Access, 13**, 28678-28692.
- **Venkatraman, S.**, & Pandiyaraju, V. (2024). *"Statistical and Multivariate Feature Selection With Dynamic Graph Learning and Domain-Informed Fusion for Histopathological Image Classification."* **Biomedical Signal Processing and Control**. (Under review).
- Dhanith, J. P. R., **Venkatraman, S.**, Sharma, V., Malarvannan, S., & Narendra, M. (2024). *"Multimodal Emotion Recognition Using Audio-Video Transformer Fusion With Cross Attention."* **arXiv**. (Under review at **IEEE Transactions on Affective Computing**).
- **Venkatraman, S.**, Pandiyaraju, V., Abeshek, A., Aravintakshan, S. A., Kumar, P. S., & Madhan, S. (2024). *"Targeted Neural Architectures in Multi-Objective Frameworks for Complete Glioma Characterization From Multimodal MRI."* **arXiv**. (Under review at **Applied Soft Computing**).
- Pandiyaraju, V., **Venkatraman, S.**, Kumar, P. S., Malarvannan, S., & Kannan, A. (2024). *"Exploiting Precision Mapping and Component-Specific Feature Enhancement for Breast Cancer Segmentation and Identification."* **arXiv**. (Under review at **Ain Shams Engineering Journal**).
- Dhanith, J. P. R., **Venkatraman, S.**, Raj, R. S. P., Abeshek, A., Malarvannan, S., Ramkumar, J., & Anumalasetty, S. (2024). *"Enhancing Traffic Sign Classification in Autonomous Vehicular Technology Using Weather-Conditioned Synthetic Data and Xception-Enhanced Vision Transformers."* (Under review **IEEE Transactions on Intelligent Transportation Systems**).
- **Venkatraman, S.**, Abeshek, A., Malarvannan, S., Shriyans, A., Jashwanth, R., & Joe Dhanith, P. R. (2024). *"Traffic Sign Classification Using Attention-Fused Deep Convolutional Neural Network."* **2024 8th International Conference on Robotics and Automation Sciences (ICRAS)**, 90–94.
- Pandiyaraju, V., Senthil Kumar, A. M., Praveen, J. I. R., **Venkatraman, S.**, Kumar, S. P., Aravintakshan, S. A., Abeshek, A., & Kannan, A. (2024). *"Improved Tomato Leaf Disease Classification Through Adaptive Ensemble Models With Exponential Moving Average Fusion and Enhanced Weighted Gradient Optimization."* **Frontiers in Plant Science, 15**.
- Pandiyaraju, V., Anusha, B., Senthil Kumar, A. M., Jaspin, K., **Venkatraman, S.**, & Kannan, A. (2023). *"Spatial Attention-Based Hybrid VGG-SVM and VGG-RF Frameworks for Improved Cotton Leaf Disease Detection."* **Neural Computing and Applications**.

Internships and Work Experience

Nagasaki University – Pattern Recognition and Machine Learning Lab *Mar 2025 - Present*
Research Intern | Advisor: Dr. Muthu Subash Kavitha *Remote*

- Researching denoising diffusion probabilistic models for anatomically consistent medical image translation, incorporating explicit edge-preserving morphological priors.
- Developing a patch-level intensity alignment algorithm to ensure local consistency between translated modalities and typical tissue density distributions.

Zestral *Oct 2024 - Present*
CEO & Co-Founder *Chennai, India*

- **AI-COP (Kauvery Group of Hospitals, Chennai)**
  * Devised a voice-driven report generator for cardiac surgery that reduced post-operative documentation time by 60%, saving approximately 12 hours per week per surgeon.
  * Leveraged LLMs to automatically generate tailored post-operative reports from transcriptions, reducing manual editing time by 8 hours weekly and improving report accuracy by 40%.
- **CerviLens (Meenakshi Medical College, Kanchipuram)**
  * Engineered an AI-powered solution for colposcopy that improved cancer grade classification accuracy by 25%, leveraging deep graph neural networks (GNNs) for precise analysis of cervical imagery.

* Integrated multiscale lenses on a Jetson Nano, increasing imaging resolution by 30%, which enhanced the detection of early-stage cancer lesions during colposcopy procedures.

- **MediScan (Anderson Diagnostics & Labs, Chennai)**
  * Developed software that automated clinical report generation and documentation, reducing manual data entry tasks by 70% and improving overall workflow efficiency by 60%.
  * Successfully implemented a pilot study at Anderson Diagnostics & Labs, Chennai; product nationwide rollout is planned for November '25.

MedxAI Innovations *May 2024 - Jul 2024*
AI Intern (Medical Imaging/Diagnostics) *Chennai, India*

- Established an innovative solution for supporting gastroenterologists in Upper GI Endoscopy using AI, improving assistance and quality of procedures by over 50% by providing real-time visualization.
- Significantly decreased report generation delays at MGM Hospitals, India, by over 80% via smart automation.

Innovative Implements Private Ltd (State Government-Funded) *Oct 2023 - Dec 2023*
AI and IoT Solutions Architect *Chennai, India*

- Developed a high-speed IoT framework using Raspberry Pi and TensorFlow for gesture-based automation to enhance teaching assistance in rural schools across Tamil Nadu.
- Optimized efficiency to achieve a minimal response time $<$ 33ms per frame while utilizing limited memory to prevent overheating in the absence of a heat-sink.

Virtusa *Aug 2023 - Nov 2023*
Computer Vision Intern *Chennai, India*

- Engineered FaceLog, a Django-based web app integrating PyTorch-powered facial recognition AI for automated attendance management at VIT Chennai hostels.
- Presented a Proof of Concept (POC) to VITc management, showcasing support for 10,000+ users and handling 1,000+ requests per second with 99.9% uptime.

Technical Skills

Programming	Python, C++, C, Java, MATLAB, R, Bash scripting, SQL
Frameworks	PyTorch, TensorFlow, Keras, Scikit-Learn, OpenCV, HuggingFace, Django
Developer Tools	Git, HTML, CSS, JavaScript, React.js, Django, Blender, AWS, GCP, VS Code

Achievements and Honors

Awards, Honors, and Accomplishments

- *Sir C.V. Raman Research Award* – 2× recipient, VIT Chennai (Oct 2024, Feb 2025).
- *Finalist*, AMD Pervasive AI Developer Contest; received full funding to attend the *AMD Advancing AI Conference* in San Francisco; awarded exclusive access to AMD Radeon Instinct GPUs with ROCm 6.1.2, worth $24,000.
- Maintained a **9+ cumulative GPA** since the first semester of undergraduate studies.
- Awarded a *Category-1 scholarship* at VITC for academic merit, ranking within the **top 2,100 out of 200,000** candidates in the VIT Engineering Entrance Examination (VITEEE).

Teaching Experience and Mentoring

- **Teaching Assistant**: BCSE332P - Deep Learning Lab (Fall 2024), VIT University, Chennai.
- *Author* for *Python in Plain English* on Medium, a publication with 3.5M+ monthly readers.
- Creator of *PyNeura*, an open-source Python library for low-code deep learning model development.
- *Mentor* at Topmate, guiding juniors and peers in research, projects, and internships.

Research Presentations, Conferences, and Grants

- **International Conference Presentations**: ICRAS '24, IDCAS '24, and ICERCS '24.
- *Poster Presentation* - TriVision'25: VIT-RIT-Industry AI and Data Science Summit, VIT Chennai, India.
- *Research papers published* in Q1-ranked journals.
- *Team Lead*: State-funded R&D (VIT Chennai), Kauvery Hospitals R&D, Smart India Hackathon 2024 (internal qualifier), Apollo Hospitals key research project.