Barathi Subramanian

Contact Details

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Research Interests

- Image Classification
- Object Detection and Segmentation
- Anomaly Detection
- Gesture Recognition
- Vision Language Modelling

Research Domain

- Computer vision
- Healthcare

Top Research Publications

- MICCAI 2026
- CVPR 2026
- NeurIPS 2025

Professional Memberships

- IEEE
- ACM

Technical Skills

Computer Vision

◇ Classification: Vision Transformers (ViT), Transfer Learning, Fine-tuning
◇ Object Detection: YOLO and DETR (Detection Transformer)
◇ Image Segmentation: U-Net, SegFormer, and Segment Anything Model (SAM)
◇ QuPath and Roboflow for Object Annotation

Generative AI

◇ Architectures: Transformers (LLM), Attention Mechanisms, Multi-Modal (VLM)
◇ Optimization: Knowledge Distillation

MLOps & Engineering

◇ Lifecycle: MLflow, Experiment Tracking, Model Versioning
◇ Inference & Deployment: Streamlit (Prototyping), Docker Containerization
◇ Infrastructure: Multi-GPU Handling, Distributed Training

DevOps

◇ Platforms: AWS, Google Cloud Platform (GCP), Docker
◇ CI/CD: GitHub Actions, Version Control (Git)

Hands-on Experience

- Built end-to-end digital pathology pipelines for WSI/tile classification & segmentation with rigorous preprocessing (artifact filtering, tile extraction, quality control, color standardization).
- Trained and deployed multimodal pathology foundation models (image + text) for analysis and reporting.
- Created tumor annotations in QuPath and established high-quality ground truth and QA workflows; curated a large tile-level tissue dataset for benchmarking/reproducibility.
- Executed Groovy scripts in QuPath to integrate custom user-defined modules for advanced visualization workflows and automated detection model execution.
- Extended PyTorch by overriding core modules to customize training behavior.
- Delivered production systems: spectral clustering for fabric-defect detection, YOLOv5 for small objects, and transfer-learning for anomaly localization.
- Built gesture-recognition pipelines with MediaPipe (face/hand landmarks) and real-time inference.
- Developed a CNN–BiLSTM OCR system for generating historical Korean handwriting to modern text.
- Segmented malignant patterns in dermatology images; adapted similar CV methods to autonomous-driving perception tasks.
- Improved robustness via targeted augmentation/sampling/regularization and diagnostic visualization (t-SNE, PCA).
- Led projects as coordinator, developer, and team lead, driving collaboration, planning, and on-time execution.

Employment History

Post-doc Scholar **07/2024 – Present**
◇ Stanford University, California, USA.

Education

Ph.D. in Computer Vision **2020 – 2024**
◇ Kyungpook National University, Daegu, South Korea.

Achievements

◇ Charles B. Carrington Memorial Award for Outstanding Poster Presentation (2026), Stanford University.
◇ Best Thesis Award (2024), Kyungpook National University.
◇ Best Paper Awards (2021–2022) across multiple conferences.
◇ Volunteer (2015): collaborated with NASA scientists at a science exhibition hosted by Bharathiar University, India.

Research Projects Involved

◇ Multi-modal analysis in digital pathology **2024 – Present**
◇ Abnormal image detection and Localization of fabric products **2022 – 2024**
◇ Gesture recognition **2022 – 2023**
◇ Lightweight model for Disabled Sign Detection **2021 – 2021**
◇ Korean handwritten text recognition **2021 – 2022**
◇ Real-Time Emotion Recognition System **2021 – 2022**

Research Publications

Current Submissions (5)

1. Rathinaraja Jeyaraj, Barathi Subramanian, et al., "MUFASA: An Information Utility-Aware Preprocessing Framework for Reliable Model Reasoning in Computational Pathology," for submission to Nature Biomedical Engineering.
2. Rathinaraja Jeyaraj, Barathi Subramanian, et al., "HMS: Bounded Harmonic Mean Perturbations for Stabilizing SGD-Based Regression Optimization," in preparation for submission to AAAI 2027.
3. X.Wu, H.Tan, Barathi Subramanian, H.Chen, M.Peterson, T.Guo, A.Kiani, S.Noh, X.Qi, J.Shen, "MedVES: Visual Evidence Scaling at Test Time for VLMs in Medical VQA," under review at ACMMM 2026.
4. Barathi Subramanian, Rathinaraja Jeyaraj, et al., "APALU: A Trainable, Adaptive Activation Function for Deep Learning Networks," in preparation for submission to Neurocomputing.

Patent

1. Barathi Subramanian, Anand Paul, and Jeonghong Kim, "Digital Twin-Based Emotion Recognition System for Personalized Healthcare: Enhancing Emotional Well-Being Through Real-Time Monitoring and Treatment Strategies," Indian Patent in Bio-medical Engineering, **2023**.

Journal Articles (top list)

1. C.Qiu, S.Miller, B. Subramanian, A.Ryu, et al., "A Deep Learning-Based Automated Pipeline for Colorectal Cancer Detection in Contrast-Enhanced CT Images," Computerized Medical Imaging and Graphics, vol 128, **2026**.
2. K. Gangadharan, A. Purandaran, K. Malathi, B. Subramanian, R. Jeyaraj and S. K. Jung, "From Data to Decisions: The Power of Machine Learning in Business Recommendations," in IEEE Access, vol. 13, pp. 17354-17397, **2025**.
3. Rakhmonov Akhrorjon Akhmadjon Ugli, Barathi Subramanian, et al., "Extensive knowledge distillation model: An end-to-end effective anomaly detection model for real-time industrial applications," IEEE Access, **2023**.
4. Bekhzod Olimov, Barathi Subramanian, Rakhmonov Akhrorjon Akhmadjon Ugli, Jea-Soo Kim, Jeonghong Kim, "Consecutive Multi-scale Feature Learning-based Image Classification Model," Scientific Reports, **2023**.
5. Barathi Subramanian, Jeonghong Kim, Mohammed Maray, Anand Paul, "Digital Twin Model: A Real-Time Emotion Recognition System for Personalized Healthcare," IEEE Access, vol. 10, pp. 81155-81165, **2022**.
6. Barathi Subramanian, Bekhzod Olimov, Shraddha M Naik, Sangchul Kim, et al., "An integrated MediaPipe-optimized GRU model for Indian sign language recognition," Scientific Reports, vol. 12, pp. 1-16, **2022**.

Conference proceedings (top list)

1. Barathi Subramanian, Rathinaraja Jeyaraj, Jeanne Shen, et. al., "TRIAGE-MIL: Multi-Axis Instance Selection and Semantic Hypergraph Modeling for Survival Prediction from Whole-Slide Images," accepted at MICCAI **2026**.
2. Rathinaraja Jeyaraj, Barathi Subramanian, et al., "Gesture2Music: A Low-Latency Real-Time Framework for Continuous Gesture-Driven Music Generation," 1st International Workshop on Interactive Physical AI (IPA), CVPR **2026**.
3. Barathi Subramanian, et al., "Contrast-Enhanced Gating in GRUs for Robust Low-Data Sequence Learning," Workshop on Women in Computer Vision Proceedings Track, CVPR **2026**.
4. Barathi Subramanian*, Rathinaraja Jeyaraj*, et al., "STARC-9: A Large-scale Dataset for Multi-Class Tissue Classification for CRC Histopathology," (NeurIPS) **2025**. *Equally contributed