Lafith Mattara

lafith.net | lafithmattara@gmail.com | linkedin.com/in/lafith | github.com/lafith | +91-7749049583

Education

National Institute of Technology Rourkela Odisha, India

Bachelor of Technology in Biomedical Engineering *2021*

- Graduated with First class.
- **Relevent Courses:** Biomedical signal processing, Medical imaging & image processing, Statistics for Bioengineers, Rehabilitation engineering & Robotics, Artificial intelligence & machine learning.
- Led simulator development for Autonomous Underwater Vehicle development team - Tiburon.
- Contributed original creative work to the college magazine, showcasing writing skills and creativity.

Experience

Senior Deep Learning Engineer Feb 2024 – Now

Image-Guided Robotics, Healthcare Technology Innovation Centre, IIT Madras *Tamil Nadu, India*

- **Led a 3-member team** in developing **AI-driven computer vision modules** for an autonomous antenatal ultrasound robotic system, serving as the principal developer and integrating **deep learning** for real-time fetal standard plane detection, segmentation, and biometry estimation.
- Adapted the **Segment Anything (SAM) foundation model** to be self-prompting for fetal ultrasound, achieving **96% specificity**, with an inference time of **12 ms per image**.
- Successfully deployed the model in a robotic prototype, reducing manual scanning time from **30–45 minutes to just 4 minutes**, achieving an **85%+ efficiency improvement** and enabling high-throughput prenatal screening.
- Showcased the system at the **XVIII Clinical Ultrasonography in Practice (CUSP) conference**, garnering significant interest from clinicians for its potential to enable large-scale automated prenatal screening.
- Coordinating a 4-member interdisciplinary team to build a comprehensive data pipeline, covering data acquisition, model training, and deployment for real-time clinical use.

Visiting Research Scientist Dec 2022 – Dec 2023

Cancer Biology Lab, University of Alabama at Birmingham (UAB) *Alabama, USA*

- Developed convolutional and graph neural networks to analyze whole slide images from breast cancer patients, improving diagnostic insights through automated image interpretation.
- Investigated the association between neighborhood deprivation, tumor microenvironment, and race, presented preliminary findings at the ATTIS 2023 Symposium.
- Coordinated collaborations between the Biomedical Imaging Informatics Lab at Georgia State University and the Cancer Biology Lab at UAB, facilitating joint research efforts and data sharing.
- Developed a **multi-stage deep learning model** for patch-level annotation of WSIs, acheiving **F1 score of 0.95** across **24 classes**.
- Mentored three undergraduate students at the Biomedical Imaging Informatics Lab, guiding them in whole slide image analysis techniques and supporting their research skill development.

Project Engineer Nov 2021 – Oct 2022

Endoscopy Design and Development group, Healthcare Technology Innovation Centre, IIT Madras *Tamil Nadu, India*

- **Designed and developed a VR application for stereo-endoscope visualization** from start to completion, integrating video capture, image processing, and 3D rendering. Delivered a fully functional system before transitioning from the company.
- Utilized frameworks and tools such as Unreal Engine, Unity, PyTorch, OpenCV, Python, and C++ to build and optimize the system.
- Enabled the team to showcase the Stereo Endoscope VR system at **MEDICA 2024** after **competitive selection**, demonstrating its impact on **medical imaging** and **real-time visualization**.
- Demonstrated strong dedication, rapid learning, and adaptability throughout the project, contributing significantly to the success of the software development.

Project Intern Jun 2021 – July 2021

Center for Computational Imaging, IIT Palakkad *Kerala, India*

- Tackled the challenge of contrast limitations in industrial CT by implementing MUSICA (Multi-Scale Image Contrast Amplification) techniques. This approach sharpened internal features within scanned materials, making subtle structural variations immediately clear for inspection and analysis.

- Collaborated closely with Visiconsult,Germany to ensure the enhancements met industry standards, enabling immediate application to nondestructive testing processes.

Undergraduate Research Internship Dec 2020 – Feb 2021

Center for Computational Imaging, IIT Palakkad *Kerala, India*

- Created a Fractal Dimension-based denoising algorithm with wavelet transform to enhance ultrasound image quality, improving sharpness, noise reduction, and contrast.
- Validated the algorithm across ultrasound images, achieving marked diagnostic improvements.
- Utilized imaging methods like blind deconvolution and fractal dimension analysis, demonstrating technical proficiency in computational imaging.

Undergraduate Research Project Dec 2018 – Nov 2019

Software Tissue Biomechanics Lab, NIT Rourkela *Odisha, India*

- Conducted uniaxial tensile experiments on goat skin specimens at varying strain rates to analyze biomechanical properties.
- Performed nonlinear regression analysis to determine the best-fitting hyperelastic model, achieving a coefficient of determination (R^2) between 0.97–0.99 using the Ogden model.
- Contributed to findings that demonstrated nonlinear, anisotropic stress-strain behavior and collagen fiber alignment during deformation, with potential applications in tissue engineering.
- Results presented at Asian-Pacific Conference on Biomechanics 2019 Conference.

Forthcoming Publications

Mattara, L., Bhargava, M., Saini, G., Seth, G., Kong, J., & Aneja, R. A deep learning-based analysis of the association between neighborhood deprivation and the tumor microenvironment in Black and White women with breast cancer.*(under-preparation)*

Conferences

XVIII Clinical Ultrasonography in Practice (CUSP) conference Sep 2024

Chennai Trade Centre *Tamil Nadu, India*

- Presented a prototype of a Robotic Antenatal Ultrasound System, showcasing capabilities for automatic scanning and real-time detection of 20+2 standard fetal planes, advancing precision in prenatal imaging.

Research Retreat, O'Neal Comprehensive Cancer Center, Oct 2023

O'Neal Comprehensive Cancer Center, University of Alabama at Birmingham

- Presented a poster titled- A deep learning-based analysis of the association between neighborhood deprivation and the breast tumor microenvironment in Black and White women.

Annual Translational and Transformative Informatics Symposium April 2023

University of Alabama at Birmingham

- Presented a poster titled- A Machine learning model to evaluate the association between the tumor microenvironment and neighborhood deprivation in Black and White women with Triple Negative Breast Cancer.

Asian-Pacific Conference on Biomechanics Nov 2019

Taipei, Taiwan

- Project titled 'Investigation of the Biomechanical Properties of Goat Skin,' presented by Dr. Anju R. Babu.

Projects

AUV Simulator Apr 2018 – Dec 2020

Team Tiburon, NIT Rourkela *Odisha, India*

- Developed a 3D simulator for testing software stacks of an Autonomous Underwater Vehicle (AUV).
- Built using Unity3D (C#) for the simulation environment, with obstacle modeling in Blender.
- Integrated the simulator with ROS through ROSBridgeLib, enabling real-time communication with a control algorithm.
- Transmitted camera images to the control algorithm every frame, optimizing communication by encoding images for efficient data transfer.

Awards

Winner, 6th National Competition on Student Autonomous Underwater Vehicle (SAVe) 2019
National Institute of Ocean Technology (NIOT), in association with IEEE-OES, Marine Technology Society (MTS), and Ocean Society of India (OSI)

- Led the development of a 3D Autonomous Underwater Vehicle (AUV) simulator as part of Team Tiburon, representing National Institute of Technology (NIT) Rourkela.
- The team won 1st place at the 6th National SAVe Competition, held at IIT Madras, competing against top engineering institutes across India.
- The win earned the team the opportunity to participate in the international ROBOSUB Competition in San Diego, USA.

Technical Skills

Artificial Intelligence & Machine Learning (AI/ML): Deep Learning, CNN, GNN, Transformers, Generative models, Large Language Models (LLM), Foundation models, Distributed training.
Languages: Python, C/C++, Rust, C#, R
Frameworks: PyTorch, Tensorflow, OpenCV, ROS
Libraries: Scikit-learn, Kornia, Pandas, NumPy, Matplotlib
Other: Unreal Engine 5, Unity, Blender

Open Source Contributions

Laplacian Pyramid Transform for Tensor Images
Kornia Library *(PR 1816)*

- Developed and implemented a Laplacian Pyramid transform for tensor images within Kornia, a differentiable computer vision library for PyTorch.
- Enhanced Kornia's functionality by adding a scalable, multi-resolution image representation technique, useful for applications in image analysis, feature detection, and deep learning.

3D Model of Marked Bin for Robotics Testing
Gazebo Model Repository *(PR 53)*

- Developed and contributed a 3D model of a marked bin to facilitate testing of autonomous robots' object-dropping capabilities in simulation environments.
- Model accepted into the official Gazebo model repository, providing an open-source tool for robotics researchers and developers.