

# NIKHILESWARA RAO SULAKE

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## Education

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**Rajiv Gandhi University of Knowledge and Technologies, Nuzvid IIIT**

Nuzvid, Eluru

Pre University Course, **CGPA-9.88**

December 2021 - August 2023

**Rajiv Gandhi University of Knowledge and Technologies, Nuzvid IIIT**

Nuzvid, Eluru

Bachelor of Technology in Computer Science, **CGPA-8.92**

August 2023 - May 2027

## Course Work

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**DRDO and DIAT, Pune - AI/ML Professional Certification Course**

Online

Course Guide: Dr. Upasana Singh, **Grade-9.2**

June 2023 - November 2023

## Experience

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**Neural Nurture**

Remote (Aug 2025 - Nov 2025 )

Research Intern - LLM

Indore, India

- Worked on Project Lens to analyze and mitigate privacy and PII leakage risks in large language models under white-box and black-box threat settings through systematic experimentation.

**Stanford Medicine Department of Radiology**

Remote (June 2025 - Aug 2025)

Fellowship in Molecular Biology

California, USA

- Conducted research on AI applications in medical imaging with a focus on Alzheimer's disease, including analysis of brain imaging data and presentation of findings during the fellowship.

**School of Medical Science and Technology (SMST) at IIT Kharagpur**

Hybrid (May 2025 - Aug 2025)

Summer Research Intern

Kolkata, India

- Developed TARU-Net, a unified framework combining U-Net-based CT lung segmentation with topology-aware 3D reconstruction using marching cubes, and applied it to patient data; the work is submitted to *IEEE Transactions on Radiation and Plasma Medical Sciences*.

**Core AI**

Remote (January 2025 - March 2025)

AI Researcher

Vijayawada, India

- Developed new model configurations on **Joint Autoregressive and Hierarchical Priors** for Learned **Image Compression** for image compression to work on **OCT** grayscale images.
- Developed a new methodology for efficient classification of **Alzheimer disease** on **3D Brain MRI** with visualizing the gradients using **Guided Smooth GradCam ++**.

## Projects

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**HuMAR - Multimodal Human-Centric Understanding**

- Developed an ultra-lightweight multimodal vision-language framework for text-conditioned human detection, instance segmentation, and 17-keypoint pose estimation with end-to-end training.
- Designed a pose-centric hierarchical decoder with depthwise separable convolutions and iterative reference-point refinement, enabling accurate keypoint localization and instance-level reasoning.
- Curated a large-scale human-only dataset with over 120,000 images using a human-in-the-loop annotation pipeline and automated label completion with a fine-tuned ViT-Pose model.

**CIPS-Net - Instruction-Conditioned Pathology Segmentation**

- Proposed a vision-language segmentation framework enabling compositional, instruction-driven segmentation of overlapping pathology classes in histopathology images.
- Introduced a compositional graph reasoning module to explicitly model pathology interactions and inject instruction-aware guidance into dense segmentation decoding.
- Achieved a macro Dice score of 0.795 on an instruction-conditioned histopathology benchmark, substantially outperforming fixed-label U-Net baselines.

**TARU-Net - Topology-Aware 3D Lung Segmentation and Reconstruction**

- Developed a unified pipeline combining 2D CT lung segmentation with topology-aware 3D reconstruction to generate anatomically faithful lung models.
- Integrated marching cubes, radial basis function interpolation, and ball pivoting to eliminate voxel artifacts and preserve smooth lung surface topology.
- Achieved a Dice score of 0.8887 on lung cancer CT segmentation with efficient inference time per scan, demonstrating a balance between accuracy and computational efficiency.

## CardioLens - Automated Segmentation of Left Ventricle and Ejection Fraction Calculation

- Developed an AI-powered echocardiogram analysis system using the Stanford's **EchoNet Dynamic** dataset to automate left ventricle segmentation and ejection fraction calculation and give out detailed health report for patients.
- Worked on Intel DPT Large and ResNet-101 models for segmentation, achieving Dice coefficients of 0.78 and 0.90, respectively and R2plus1D Model for Ejection Fraction calculation.
- Developed an algorithm to generate electrocardiogram (ECG) waveforms by analyzing heart contractions and expansions using systole and diastole boundaries.

## Multi Modal Chest X-Ray Classification

- Tackled a multimodal classification challenge in **MAIC** by extracting embeddings from images (Chest X-rays) and text using the **OpenAI's CLIP model**.
- Designed a cross-attention fusion mechanism and a custom neural network, achieving a **macro-averaged F1 score of 0.35**, placing us at Top 22, showcasing expertise in multimodal deep learning

## Multi backbone Integration for YOLOv8

- Developed a modular framework to integrate multiple backbones into the YOLOv8 model, replacing the **vanilla Dark-FPN** with **convolutional, Vision Mamba, transformer-based**, and **ViT-based** architectures.
- Implemented and analyzed these variations from scratch, leveraging model-building expertise to enhance detection performance on the Mini-COCO dataset.

## Technical Skills

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- **Programming Languages:** Python, C, Java
- **Technologies:** Medical Image Analysis, Computer Vision, Deep Learning, Machine Learning, Generative AI, LLMs, VLMs
- **Frameworks:** PyTorch, Tensorflow, CUDA, OpenCV, Hugging Face
- **Tools:** VS Code, Git, TensorBoard, Wandb, Kaggle, Draw.io
- **Environments:** Anaconda, NVIDIA Jetson Nano, NVIDIA AI Workbench, Raspberry PI

## Achievements

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- **IEEE EMBS BHI 2025 Data Competition Finalist** – Developed MINDER, a machine learning framework for BDI depression score prediction and analysis 2025
- **SNU Multi-Modal AI 4 TB Top 22** – Led sole Indian team in chest X-ray + text analysis at Seoul National University competition 2024
- **Intel AI 2024 Hackathon – 2nd Runner-Up** – Developed AI-driven echocardiography analysis tools presented at IIT Kharagpur in IEEE Indicon 2024 2024
- **AI 4 Andhra Police Hackathon Winners** – Build a product for digitising the handwritten multi-lingual document with a user-admin website for interactions. 2025
- **Intel/Awiros CV Appathon Semi-Finalist** – Created hand-sign detection system for accessibility communication 2023
- **GDSC AI/ML Lead** – Directed educational sessions introducing AI concepts to 100+ students 2023-2024
- **YOLOv11 Architecture Researcher** – Published article on YOLOv11 architecture with novel diagram contribution at Analytics Vidhya Blogathon 49 (Winner) 2024