




Aryan Das

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 arya-domain  in Aryan Das  Google Scholar

EDUCATION

VELLORE INSTITUTE OF TECHNOLOGY

BTECH. CS

2021 - 2025, Bhopal, India

GPA: 8.78 / 10

TECHNICAL SKILLS

PYTHON

- PyTorch • TensorFlow • Keras
- NLTK • Scikit-Learn • HF-Hub
- NumPy • Pandas • Diffusers
- OpenCV • Transformers

CLOUD PLATFORMS

- AWS • GCP

OPERATING SYSTEMS

- Linux • Windows • macOS

REFERENCES

DR. ARNAB BHATTACHARYA

Professor, IIT Kanpur

Email: arnabb@iitk.ac.in

DR. VINAY KUMAR VERMA

Senior Applied Scientist,

Amazon

Email: vkvermaa@amazon.com

DR. SWALPA KUMAR ROY

Associate Professor, Tezpur

University

Email: swalpa@tezu.ernet.in

RESEARCH PROJECTS

EXPERIENCE

BANGLA, IITK | PROJECT ASSOCIATE | APRIL. 2026 - ONGOING

- Working on Recursive Language Model.

SIR LAB, IISERB | RESEARCH SCIENTIST I | JAN. 2026 - FEB. 2026

- Working on Metacognition and Theory of Mind to develop an agentic, offline interface for human mental health.

MOON LAB, IISERB | PROJECT ASSOCIATE I | OCT. 2025 - DEC. 2025

- Developing a Model of Shortest Path Estimation for Drones using Satellite and Aerial Imagery.

HOUSE OF COUTON | DATA SCIENTIST | MAR. 2024 - SEPT. 2025

- Led a team of 5 in developing an Automated Hiring Tool (AI Hire Studio) using Micro and Macro Facial Expression Analysis (Contract-Based).

BHUSATYAM INDUSTRIES | AI ENGINEER | OCT. 2024 - MAY 2025

- Delivered an End-To-End Pipeline for Agricultural Lands Boundary Detection, incorporating a Novel Methodology with potential for IEEE Transactions publication (Contract-Based).

CDAC BENGALURU | AI/ML INTERN | NOV. 2023 - MAY 2024

- Collaborated with Scientist Mr. Raghu HV to design an HPC Power Saving Prototype using Machine Learning, achieving at least a 20% reduction in power consumption.

HOUSE OF COUTON | AI/ML INTERN | NOV. 2023 - FEB. 2024

- Completed 40+ coding tasks for Micro Projects and authored Research Reports.

IIT ROORKEE | RESEARCH INTERN | SEPT. 2023 - MAY 2024

- Worked under Prof. Pravendra Singh (IITR) on 6+ Research Projects focused on 2D and 3D Image Processing.

Published & Accepted Papers

CONFERENCES

EFFICIENT TEXT-GUIDED CONVOLUTIONAL ADAPTER FOR THE DIFFUSION MODEL | FIRST

AUTHOR | 2025

Published, WACV - 2026 [CORE A]

- Introduces Nexus Adapters, efficient and prompt-guided adapters for diffusion models, enhancing structure-preserving conditional generation.
- Contribution: Developed Nexus Prime and Slim adapters that integrate structural inputs and textual prompts through cross-attention mechanisms, improving semantic alignment and reducing computational overhead.

UNCERTAINTY-AWARE VISION-LANGUAGE SEGMENTATION FOR MEDICAL IMAGING | FIRST

AUTHOR | 2025

Published, WACV - 2026 [CORE A]

- Introduces a novel uncertainty-aware multimodal segmentation framework leveraging radiological images and clinical text for precise medical diagnosis.
- Contribution: Proposed the Modality Decoding Attention Block (MoDAB) with a lightweight State Space Mixer (SSMix) for efficient cross-modal fusion and long-range dependency modeling, and the Spectral-Entropic Uncertainty (SEU) Loss for improved model reliability under ambiguity.

LEVERAGING TASK-SPECIFIC KNOWLEDGE FROM LLM FOR SEMI-SUPERVISED 3D MEDICAL IMAGE SEGMENTATION | 2ND AUTHOR | 2024

Accepted, ICVGIP - 2025 [CORE B]

- Introduces LLM-SegNet for semi-supervised 3D medical image segmentation using task-specific knowledge from LLM.
- Contribution: Integrated the LLM into the co-training framework and conducted various evaluations.

OPTIMODNET: A UNET-TRANSFORMER HYBRID WITH GROUPED-QUERY AND CHANNEL ATTENTION FOR OPTIC DISC AND CUP SEGMENTATION | THIRD AUTHOR | 2024

Accepted, CVIP - 2025 [CORE B]

- Introduces OptiModNet, a novel lightweight UNet-Transformer hybrid integrating Grouped Query Attention, Channel Attention, and an Aggregated Pyramid Loss for efficient and accurate optic disc and cup segmentation.
- Contribution: Finalized the Mathematical Interpretation and proposed the Aggregated Pyramid Loss formulation, improving the paper's technical rigour and overall presentation quality.

JOURNALS

HYPERCAP: A HYPERSPECTRAL IMAGING DATASET WITH PIXEL-LEVEL CAPTIONS AND BENCHMARKING | FIRST AUTHOR | 2025

Published, IEEE GRSM - 2026 [Q1]

- Presents HyperCap, a hyperspectral captioning dataset enhancing interpretability and performance in remote sensing.
- Contribution: Proposed and designed the dataset and conducted evaluations using State-of-the-Art encoders on various fusion techniques.

SM-HAD: SPECTRUM MAMBA FOR HYPERSPECTRAL ANOMALY DETECTION | FIRST AUTHOR | 2026

Published, IEEE Transaction - 2026 [Q1]

- Proposed SM-HAD, a novel hybrid encoder-decoder framework integrating Fourier-based spectral modeling, masked spatial attention, and state-space Mamba blocks for hyperspectral anomaly detection.
- Contribution: Worked on the mathematical formulation of the proposed modules, and contributed to experiments demonstrating superior performance over 18 SoTAs across 6 benchmarks with improved accuracy-efficiency trade-offs.

A GENERATIVE FRAMEWORK FOR DETECTION AND CLASSIFICATION OF PLANT LEAF DISEASE USING DIFFUSION NETWORK | FIRST AUTHOR | 2025

Published, Elsevier - 2025 [Q1]

- Presents LeafDisDiff, a diffusion-based model for classifying plant leaf diseases.
- Contribution: Developed the U-Net based Diffusion Classification architecture and conducted performance evaluations.

NOVEL CUCKOO SEARCH-BASED METAHEURISTIC APPROACH FOR DEEP LEARNING PREDICTION OF DEPRESSION | 3RD AUTHOR | 2022

Published, MDPI Applied Science - 2023 [Q2]

- Proposes the particle swarm-cuckoo search (PS-CS) optimization algorithm for training deep neural networks to predict depression.
- Contribution: Evaluated the performance of the PS-CS algorithm against various classification models.

MODIFIED GENETIC ALGORITHM WITH DEEP LEARNING FOR FRAUD TRANSACTIONS OF ETHEREUM SMART CONTRACT | 4TH AUTHOR | 2022

Published, MDPI Applied Science - 2023 [Q2]

- Develops a deep learning model using a metaheuristic optimization strategy, Optimized Genetic Algorithm-Cuckoo Search (GA-CS), to detect fraudulent Ethereum transactions.
- Contribution: Conducted comprehensive experiments to evaluate the efficiency and performance of the proposed strategies.

CO-WOA: NOVEL OPTIMIZATION APPROACH FOR DEEP LEARNING CLASSIFICATION OF FISH IMAGE | 3RD AUTHOR | 2022 [Q4]

Published, Wiley Chemistry and Biodiversity - 2023 [Q3]

- Utilizes the Chaotic Oppositional Based Whale Optimization Algorithm (CO-WOA) for fish image classification.
- Contribution: Conducted performance comparisons with leading models and data mining techniques.

Submitted Papers

CONFERENCES

RAD: RELATIVE ADVANTAGE DIFFUSION | FIRST AUTHOR | 2026

Submitted, NeurIPS - 2027

- Introduces RAD, a unified adaptive diffusion training framework leveraging relative difficulty estimation across samples, timesteps, and spectral frequencies through AGD, TAM, and SAD modules for improved quality and learning efficiency.
- Contribution: Developed the core formulation and implementation of the RAD, including the adaptive advantage strategy (AGD), temporal memory (TAM), and spectral decomposition (SAD) for dynamic gradient allocation in diffusion training.

FUZZY RADIAL SETS FOR OPERATOR ROUTING IN TEXT-GUIDED CHEST INFECTION SEGMENTATION | EQUAL CONTRIBUTOR | 2026

Submitted, ACM MM - 2026

- Introduces MemberNet, a multimodal text-guided segmentation framework leveraging fuzzy reasoning, Deep State Space Token Mixing, and Fuzzy Radial Routing Attention for uncertainty-aware chest infection segmentation.
- Contribution: Formulation of the fuzzy radial membership routing mechanism and contributed to the multimodal fusion strategy for adaptive cross-modal feature interaction and uncertainty-aware segmentation.

SLAM: SEQUENTIAL LINEAR ADAPTER MODULES FOR EFFICIENT TEXT-TO-IMAGE FINETUNING OF DIFFUSION TRANSFORMERS | FIRST AUTHOR | 2026

Submitted, ECCV - 2026

- Introduces SLAM, a plug-and-play sequential adapter framework for Diffusion Transformers that leverages the Gated Delta Rule for memory-aware, linear-complexity feature refinement and proposes Progressive Guidance Loss to reduce inference steps by up to 40%.
- Contribution: Designed the Sequential Linear Adapter Module with periodic insertion strategy, integrated GDR-based key-value updates into DiT blocks, and developed PGL for progressive supervision enabling superior performance over LoRA and full fine-tuning with significantly fewer parameters.

UNITY: BRIDGING UNIVERSAL AND SPECIALIZED CONDITIONING VIA ATTENTION FLOW NETWORKS FOR ADAPTIVE DIFFUSION UNETS | FIRST AUTHOR | 2026

Submitted, ECCV - 2026

- Introduces UNITY, a universal-to-specialized adapter framework for composite conditioning in diffusion UNets using a Morphable Attention Flow Network for spatially adaptive, channel-aware feature alignment with constant complexity.
- Contribution: Designed the two-stage Universal-to-Specialization training paradigm and developed the MAF with Morph Wrapper modules for flow-based geometric alignment, enabling memory-efficient multi-modal conditioning without separate adapters or parallel denoising.

U-RED: UNCERTAINTY-AWARE REWARD-DRIVEN DIFFUSION FOR MULTIMODAL MEDICAL IMAGE SEGMENTATION | FIRST AUTHOR | 2026

Submitted, ECCV - 2026

- Introduces a novel reward-modeling-based Vision-Language framework for Medical Image Segmentation, leveraging diffusion transformers with hierarchical visual-text conditioning.
- Contribution: Designed a three-stage pipeline integrating latent mask learning, flow-matching diffusion, and reinforcement learning (PPO) with aleatoric uncertainty calibration for clinically reliable segmentation.

JOURNALS

GEOVQA: GLOBAL AND LOCAL EFFICIENT ATTENTION MECHANISM FOR REMOTE SENSING VISUAL QUESTION ANSWERING | FIRST AUTHOR | 2025

Submitted, IEEE Transaction - 2025

- Introduces GeoVQA, a framework combining Mamba SSM for visual features and a BERT-Based Text Encoder for vision-language understanding.
- Contribution: Developed and integrated the proposed methodology with the Proposed Method for Global Sum Attention, incorporating Mamba for remote sensing.

DMN: DUAL-PATH MIXING NETWORK FOR VARIABILITY-AWARE HYPERSPECTRAL IMAGE CLASSIFICATION | FIRST AUTHOR | 2025

Submitted, IEEE GRSS - 2025

- Proposed a novel Dual-Path Mixing Network (DMN) for hyperspectral image classification that jointly models spectral and spatial features through complementary Unmixing and Path Mixing networks, integrating Spectral Learning Modules (SLM) and Deep Mamba Blocks (DMB) to handle spectral variability and capture long-range dependencies.
- Contribution: Formulated the core idea and designed the DMN architecture, including the dual-path framework with proposed modules, enabling effective spectral-spatial feature learning for HSI classification.

MMC-NET: MEDICAL MAMBA UNCERTAINTY-AWARE IMAGE SEGMENTATION | FIRST AUTHOR | 2025

Submitted, Elsevier - 2025

- A novel uncertainty-aware medical image segmentation framework introducing Resonant Mamba Attention and Upsampling Graph Convolution with Evidential Dice Loss for efficient and precise boundary-aware segmentation.
- Contribution: Development of the Resonant Mamba Attention and Upsampling Graphical Convolution with Evidential Dice Loss.

MEDIBLRSAM: ALIGNING FOR ZERO-SHOT SEGMENTATION | FIRST AUTHOR | 2025

Submitted, Elsevier - 2025

- Explores zero-shot segmentation using Bootstrapping Language-Image Pre-training (BLIP) and Segment Anything Model (SAM) for medical image segmentation.
- Contribution: Development of the Proposed MediBLRSAM model with proposed Coordinate Estimator Algorithm for SAM.

TRANSFUSE-MAMBA: ADVANCING CROSS-MODAL INTEGRATION FOR ENHANCED MEDICAL IMAGE ANALYSIS | EQUAL CONTRIBUTOR | 2025

Submitted, Elsevier - 2025

- Combines Transformers and CNNs with Mamba modules for improved medical image segmentation.
- Contribution: Developed the BiFusion module and conducted performance evaluations.

VISION EXTENDED XLSTM: AN INNOVATIVE APPROACH FOR PLANT LEAF DISEASE IDENTIFICATION WITH LIMITED TRAINING SAMPLES | FIRST AUTHOR | 2025

Submitted, Springer - 2025

- Proposes Vision Extended xLSTM for plant leaf disease identification using multiscale feature fusion.
- Contribution: Developed the hybrid classification model with High Frequency feature extraction and conducted experiments.