ABHAY BHANDARKAR

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OBJECTIVE

Dynamic fourth year undergraduate researcher deeply engaged in **Multimodal AI, Computer Vision, and Applied Machine Learning**. I focus on problems requiring advanced **Perception and Interpretation**, with proven experience in driving innovative, cross-domain applied research projects from concepts to robust solutions. Seeking PhD positions in the fields of Machine Learning and Computer Vision.

EDUCATION

Ramaiah Institute of Technology | Bachelor of Engineering in Computer Science and Engineering | 2022 - Expected June 2026

PUBLICATIONS

Patents

1. **Abhay Bhandarkar**, " **JAM Algorithm for Probabilistic String Search**"
2. **Abhay Bhandarkar**, "**SIMHA: Sustainable Integrated Microbial and Hydrogen fuel cell Architecture**"
3. **Abhay Bhandarkar**, Vineeth N Balasubramanian, **Patent being filed at Microsoft Research India**

Accepted Conference/Workshop Papers

1. **Abhay Bhandarkar**, et al. **Causal Quantification of the Sensitivity-Reliability Trade-Off in Semantic XAI: Comparing Object-Aware (SAM) and Texture-Aware (SLIC) Segmentation**. *AAAI AI4Science Workshop 2026 (Accepted, To Appear)*.
2. **Abhay Bhandarkar**, Vishwachetan D, Geetha B (2025). **Augmenting URL-BERT based Phishing Detection with Favicon Metadata**. International Conference on Computational Technologies for Research in Data Analytics: ICCTRDA 2025.
3. **Abhay Bhandarkar**, Vishwachetan D (2023). **Unmasking the AI Hand: A Machine Learning Approach to Deciphering Authorship**. IEEE INOCON 2024.
4. **Abhay Bhandarkar**, Riddhi Rai, Sushma Bylaiah. **Advancements in Defense Surveillance: Integrating Deep Learning and Enhanced Materials in CubeSAT Systems**. IEEE SPACE 2024.
5. Manjula R Chougala, Sushma Bylaiah, **Abhay Bhandarkar**, Akshata S Bhayyar, P N Pavitra (2024). **TotCareBot: A Comprehensive Approach towards Enhancing Early Childhood Education through Robotics**. In *I4C 2024*.
6. SA Kumar**, Abhay Bhandarkar**, Dr. Nagaraju Kottam et al. **SIMHA: Sustainable Integrated Microbial and Hydrogen fuel cell Architecture**. IEEE SPACE 2025.
7. **Abhay Bhandarkar**, Dr. Nagaraju Kottam, Vishwachetan D (2023). **Minds and Materials in Flight: The Dynamic Duo of Smart Materials and Machine Learning in Aerospace Evolution**. International Conference for Advanced Materials in Engineering Sciences (ICAMES).

Under Review

1. **Abhay Bhandarkar,** Vineeth N Balasubramanian**, "LEGO: Learning Expert-Guided Orchestration for Infographic Decomposition",** *Under Review at CVPR 2026.*
2. **Abhay Bhandarkar**, **The Anatomy of a Resilient Phishing Detector: An In Depth Analysis of a Transformer's Interpretability, Causality and Robustness**. *Under Review in IEEE Access journal*.
3. **Abhay Bhandarkar**, Amogh Kalasapura, Jamuna S Murthy "**CAMMEL-ViT Net: Context Aware Memory Modules with Efficient Lightweight Vision Transformers for Lightweight Efficient Image Segmentation**"
4. Nikhil YN, **Abhay Bhandarkar**, "**Helios: A Co-Designed Landscape-Aware Optimization System Bridging Serial Intelligence and GPU Parallelism**" *Under Review at EvoStar Applications 2026*.

Pre-prints & In Writing

1. **Abhay Bhandarkar**, Khushi, Gaurav Mishra et al. **Topic Modelling with BERTopic: Understanding the likings of humans across various LLMs via thorough analysis of LMSYS dataset**.
2. **Abhay Bhandarkar**, et al. **MITRA: Model In The Rear Approach to Safeguarding LLMs for low cost and scalable solutions**.

AWARDS & ACHIEVEMENTS

- Selected as an ACM Summer Uplink Intern for year 2025 among **16 people out of 600+ applicants** in India.
- Received **$50,000** from IBM in Compute Resources among all department students at RIT to carry out research in space sustainability.
- Secured **1st place** in CNS Hackathon as solo participant against entire CS department with MITRA AI Safety Framework.
- Won **2nd prize** in ACM Hackathon for **CAMM-EL ViT Ne**t medical imaging solution.
- Achieved **2nd place** among 800+ participants in Whackiest'24 by CodeRIT.
- Qualified for Regionals in the Solving For India Hackathon by GFGXGoogleCloud.

EXPERIENCE

ACM Summer Uplink Intern, Business Guest | **ACM IKDD (under Dr. Vineeth N Balasubramanian), Microsoft Research India**| *April 2025 - Present*

- Conducting foundational research in generative modeling, focusing on the theoretical underpinnings and practical applications of Diffusion Models.
- Implemented and experimented with state-of-the-art diffusion architectures for image synthesis and editing tasks.
- Appointed as a Business Guest at Microsoft Research Bangalore to contribute to Microsoft Tools.

Samsung PRISM Elite Intern | **Samsung PRISM, India** | *Bengaluru, India* | *Jan 2025 - Present*

- Engaged in advanced research and development on a proprietary Distributed LoRA system for defence applications.
- All work performed is confidential and protected under a Non-Disclosure Agreement (NDA).

AI Research Fellow | **Pradhi AI Solutions, India** | *Remote* | *March 2025 - August 2025*

- Conducting advanced research into scalable AI architectures and novel machine learning models in voice intelligence.
- Collaborating with a team of senior developers and writing production grade code with meticulous testing.

Data Science Intern | **Altqube, India (Product Team)** | *Jan 2024 - April 2024*

- Developed a **YOLOv8** model for detection of Lumpy Skin Disease in cattle with **96% accuracy**.
- Devised a pipeline for Oriented Bounding Box format to analyze rice grain quality in an industrial setting.
- Implemented a pipeline for training medical images with Nomic AI Vision Embedding model.
- Annotated **600+ images** with multi-label bounding boxes on Roboflow to facilitate robust YOLOv8 training.

Project Intern | **Indian Space Research Organization (ISRO) LEOS (Laboratory for Electro-Optics Systems)** | *March 2023 - August 2023*

- Contributed to **LiDAR point cloud analysis** for an autonomous docking project (classified).
- Applied **computer vision** algorithms for spatial mapping and object recognition in spacecraft systems.
- Implemented optimizations for real-time processing of sensor data in resource-constrained environments.

Machine Learning Intern | **Crisant Technologies (Karnataka Government Transliteration Project)** | *2023-2024*

- Assisted with transliteration from English to Kannada for streamlined documentation for the Karnataka government.
- Fine-tuned **Google-MT5 base model** for improved transliteration via transformer-based approaches and achieved **74% accuracy**.
- Developed evaluation metrics for assessing translation quality and measuring improvements.

RESEARCH PROJECTS

CAMM-EL ViT Net: Lightweight Vision Transformers for Medical Image Segmentation
Python, PyTorch, Transformers, U-Net, Streamlit

- Proposed and developed a novel deep learning architecture combining a U-Net backbone with lightweight vision transformers and context-aware memory modules.
- Achieved high performance on the BraTS2020 validation set with Dice scores of **0.920** (Enhancing Tumor), **0.949** (Necrotic Core), and **0.999** (Whole Tumor).
- Engineered a highly efficient model (260.65 MB) with a fast average inference time of **~127ms**, trained in only 29 epochs.
- Developed a local deployment using Streamlit to provide a practical tool for assisting radiologists in brain tumor segmentation.

MITRA: A Guardrail System for Large Language Model Safety
Python, Flask, Hugging Face Transformers, LangChain, Ollama

- Designed and implemented a novel LLM guardrail system (MITRA) that uses a cascade of smaller, specialized language models to protect a primary LLM from malicious inputs.
- Engineered a multi-stage safety pipeline for real-time threat analysis, utilizing a **RoBERTa-based** toxicity classifier and a dedicated jailbreak detection model.
- Integrated a core LLM (Qwen2.5) via LangChain and Ollama, building a full-stack, responsive chat interface with Flask for demonstration and testing.

Trinayana: A Triple-Pipeline RAG System for Space Sustainability
Python, IBM Watson (Granite), LangChain, PyTorch, RAG

- Architected a novel, three-pipeline Retrieval-Augmented Generation (RAG) system to support space-tech initiatives, supported by a **$50,000 IBM cloud compute grant**.
- **Vision Pipeline:** Implemented a computer vision model for automated detection and bounding-box annotation of space debris from orbital imagery.
- **Document Analysis Pipeline:** Developed a RAG system using e5-large-v2 embeddings to analyze government space policies and assess the regulatory feasibility of mission proposals.
- **Conversational Q&A Pipeline:** Built an interactive interface using IBM's Granite LLM to provide precise, referenced answers to complex queries on space law and policy.

LEADERSHIP EXPERIENCE

Chair, IEEE Computer Society - RIT | *Bangalore, India* | *2024 - Present*

- Organized technical events and hackathons to bolster student engagement in computer science.
- Facilitated workshops on emerging technologies with industry professionals.
- Managed a committee of 10+ students to coordinate technical activities.

Founder, IEEE Student Team for Research & Innovation (ISTRI) | *RIT, Bangalore, India* | *2024 - Present*

- Spearheaded a platform for real-world problem-solving research collaborations with IEEE-RIT.
- Organized student-led conferences to promote innovation and practical engineering.
- Created mentorship pathways connecting senior researchers with junior students.

Project Manager, S.T.A.R.D.U.ST – RIT | *Bangalore, India* | *2023 - August 2023*
Contributed to flight computer design for Spaceport America Cup 2025.

- Led technical coordination between software and hardware teams.
- Implemented project documentation standards and version control systems.
- Guiding juniors to publish impactful research at IEEE Conferences such as **IEEE SPACE**