

Ajay Rajendra Kumar

RESEARCH ASSISTANT · VISION-LANGUAGE MODELS

Boston, MA, USA

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“Towards Generalizable and Reliable Artificial Intelligence”

Summary

Computer science graduate conducting research in computer vision and multimodal learning using multimodal large language models (MLLMs). Focused on video understanding with vision-language models (VLMs), improving spatial and temporal reasoning. Working on visual grounding strategies using agentic architectures and expert tools to improve performance in visual question answering. Research assistant in Prof. Lorenzo Torresani's lab at Northeastern University; previously part of the Visual Intelligence Lab at Northeastern.

Highlights

- Co-authored a paper under review at IEEE IROS 2026, with a demo accepted at CVPR 2026 and a workshop paper accepted at ICRA 2026.
- Academic honors & awards:
 - Most Innovative Project among 40+ submissions, PhD-level Deep Learning Course, Northeastern University (Mar. 2025).
 - National 2nd Runner-Up, Daimler India Commercial Vehicles Hackathon (Aug. 2022).
 - 1st Runner-Up, Transfusion Medicine Hackathon (Apr. 2022).
 - Winner, Space Odyssey Web Development Hackathon (Jun. 2021).
 - Scholar's Scholarship Award, Manipal Academy of Higher Education (Jan. 2021).
- Research experience across computer vision, NLP, and robotics at Northeastern University (Prof. Lorenzo Torresani, Prof. Huaizu Jiang), IIT Kharagpur, Institute for Plasma Research, and Bhabha Atomic Research Centre.
- Industry experience as a Software Development Intern at Fidelity Investments; received a full-time return offer.

Field of Interest

MY RESEARCH INTERESTS INCLUDE, BUT ARE NOT CONFINED TO:

- Video understanding and spatiotemporal reasoning in vision-language models.
- Visual question answering and multimodal reasoning.
- Efficient deep learning for real-time perception.
- Dense visual SLAM and 3D scene reconstruction on edge devices.

Education

Northeastern University

Boston, USA

M.S. IN COMPUTER SCIENCE

Sep. 2024 - May 2026

- GPA: 4.0/4.0
- Dissertation: “Dense Visual SLAM on Edge Devices”
- Advised by Prof. Huaizu Jiang

Manipal Institute of Technology

Manipal, India

B.TECH. IN COMPUTER SCIENCE

Aug. 2020 - Jul. 2024

- GPA: 9.3/10.0
- Minor: Computational Intelligence
- Dissertation: “Evaluating Deep Learning Approaches for Fracture Segmentation in X-ray Images”
- Advised by Prof. Subhamoy Mandal

Work Experience

Research Assistant

Boston, USA

NORTHEASTERN UNIVERSITY, KHOURY COLLEGE OF COMPUTER SCIENCES

Nov. 2025 - Present

- Serving as a research assistant at Prof. Lorenzo Torresani's lab.
- Working on improving spatiotemporal reasoning in visual question answering tasks for vision-language models.

Research Assistant

Boston, USA

NORTHEASTERN UNIVERSITY, KHOURY COLLEGE OF COMPUTER SCIENCES

Apr. 2025 - Mar. 2026

- Served as a research assistant at Prof. Huaizu Jiang's lab.
- Worked on building dense visual-SLAM system capable of running real-time on edge devices.
- Submitted a paper to IEEE IROS 2026 (under review).
- Demo accepted at CVPR 2026; workshop paper accepted at ICRA S2S Workshop 2026.

Research Assistant

Boston, USA

NORTHEASTERN UNIVERSITY, D'AMORE-MCKIM SCHOOL OF BUSINESS

Feb. 2025 - May 2026

- Served as a graduate research assistant at Prof. Anna Lamin and Valentina Marano's lab.
- Contributed to projects to evaluate CSR initiatives driving social impact and sustainable development outcomes in India.
- Collaborated with Indian Institute of Management Bangalore on analyzing the impact of corporate growth in Bengaluru on housing.

Undergraduate Researcher (Bachelor's Thesis)

Kharagpur, India

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

Jan. 2024 - Jul. 2024

- Advised by Prof. Subhamoy Mandal.
- Worked on semantic segmentation of humerus bone from X-ray images.

Software Development Intern

Bengaluru, India

FIDELITY INVESTMENTS

Jun. 2023 - Aug. 2023

- Redesigned change ticket management system using Angular and Spring Boot.
- Obtained a full-time offer to join Fidelity.

Project Intern

Gandhinagar, India

INSTITUTE FOR PLASMA RESEARCH

Apr. 2023 - Dec. 2023

- Advised by Prof. Rajaraman Ganesh.
- Worked on simulation of turbulent fluid flows.
- Delivered experimental simulation software to the computing division of IPR.

Project Intern

Visakhapatnam, India

BHABHA ATOMIC RESEARCH CENTRE

Dec. 2022 - Jan. 2023

- Advised by Dr. Manoj Warriar.
- Contributed to early-stage research on modeling spectral neighbor analysis potentials for zirconium using machine learning techniques.

Selected Projects

Pose Graph Sparsification by Maximizing Algebraic Connectivity

Northeastern University, Boston,

USA

MOBILE ROBOTICS

Mar. 2025

- Formulated and implemented an iterative variant of the algebraic connectivity maximization algorithm for pose graph sparsification.
- Evaluated on benchmark pose graphs using GTSAM and SE-Sync, achieving sparser graphs with minimal performance loss.
- Keywords: Pose Graph Optimization, Graph Sparsification, SLAM, GTSAM, SE-Sync

Hallucination Detection in Large Language Models

Northeastern University, Boston,

USA

NATURAL LANGUAGE PROCESSING

Mar. 2025

- Evaluated hallucination detection methods from "Joint Evaluation of Answer and Reasoning Consistency for Hallucination Detection in Large Reasoning Models" (AAAI 2026) across multiple open-source LLMs.
- Identified limited generalization of the proposed methods beyond the original evaluated models through thorough experiments.
- Keywords: Hallucination Detection, Large Language Models, PyTorch, Python

Improving Text-Driven Human Motion Generation through Equivariance

Northeastern University, Boston,

USA

DEEP LEARNING

Mar. 2025

- Integrated equivariant neural networks into motion diffusion models for human motion generation.
- Improved matching accuracy and achieved competitive FID scores against existing baselines.
- Keywords: Human Motion Generation, Diffusion Models, Equivariant Neural Networks, Motion Diffusion, PyTorch

Rethinking Depth for Object Detection with YOLOv3

Northeastern University, Boston,

USA

COMPUTER VISION

Dec. 2024

- Implemented YOLOv3 and RGB-D variants to study the impact of depth cues on object detection.
- Observed limited performance gains, indicating need for improved depth fusion architectures.
- Keywords: Object Detection, RGB-D Vision, Depth Fusion, YOLOv3, Multimodal Perception, OpenCV, Python

Addressing Vaccine Misinformation on Social Media

Manipal Institute of Technology,

Manipal, India

RESEARCH ASSISTANT (BACHELOR'S)

Mar. 2024

- Fine-tuned transformer models for misinformation classification on social media data.
- Developed similarity-based method for anomalous user detection, achieving strong classification performance.
- Keywords: Misinformation Detection, Social Media Analysis, Deep Learning, PyTorch

Publications

Underline denotes co-first authors or co-corresponding authors

INTERNATIONAL CONFERENCE

1. Aniket Gupta, Tianye Ding, **Ajay Rajendra Kumar**, Dennis Giaya, Pia Bideau, Charles Saunders, Qu Cao, Aruni RoyChowdhury, Hanumant Singh, and Huaizu Jiang, “NeuSLAM: Dense Visual SLAM on Edge Devices,” under review at *IROS*, 2026; accepted to *ICRA 2026 Workshop on From Sea to Space: Advancing Perception in Harsh Domains*; accepted to *CVPR 2026 Demo Track*.
2. C. Rao, G. M. Prabhu, **Ajay Rajendra Kumar**, S. Gupta, and N. P. Shetty, “Addressing Vaccine Misinformation on Social Media by Leveraging Transformers and User Association Dynamics,” in *Int. Conf. Mach. Learn. Data Eng. (ICMLDE)*, 2023.

Teaching Experience

Object-Oriented Design (CS2163)

UNDERGRADUATE TEACHING ASSISTANT (INSTRUCTOR: PROF. ANUP BHAT)

*Manipal Institute of Technology,
Manipal, India*

Aug. 2023 - Dec. 2023

Problem Solving Using Computers (CS1081)

UNDERGRADUATE TEACHING ASSISTANT (INSTRUCTOR: PROF. T. SUJITHRA)

*Manipal Institute of Technology,
Manipal, India*

Aug. 2023 - Dec. 2023

Honors & Awards

Mar. 2025 **Most Innovative Project (among 40+ submissions)**, PhD-level Deep Learning Course (CS7150), Northeastern University

Boston, USA

Oct. 2023 **Undergraduate Sponsorship Grant**, Manipal Academy of Higher Education (MAHE)

Dehradun, India

Aug. 2022 **National 2nd Runner-Up**, Daimler India Commercial Vehicles Hackathon

India

Apr. 2022 **1st Runner-Up**, Transfusion Medicine Hackathon

Manipal, India

Jun. 2021 **Winner**, Space Odyssey Web Development Hackathon

Manipal, India

Jan. 2021 **Scholar's Scholarship Award**, Manipal Academy of Higher Education (MAHE)

Manipal, India