Bikash Kumar Badatya

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Research Interest

- Unsupervised Temporal video Segmentation
- Multi View & Multi Person Pose Estimation
- Sports Analytics
- Motion and Scene Understanding
- Generative AI/VLM
- Activity Recognition

Education

Indian Institute of Technology, Gandhinagar — Gujarat, India
M.Sc. in Physics (7.05/10) — July 2023 - May 2025

Berhampur University, Berhampur — Odisha, India
B.Sc. in Physics (8.2/10) — June 2019 - July 2022

Publications

1. **Bikash Kumar Badatya**, Kartike Tiwari, Jyotirmoy Amin and Ravi S. Hegde, "Throwing4: A Phase-Aligned Benchmark for Fine-Grained Throwing Analysis and Score Prediction" (Under Review)

1. Vipul Baghel, **Bikash Kumar Badatya**, and Ravi S. Hegde, "Label-Free Skeleton-based Temporal Action Localization through Spectral Analysis" (Submitted at SIGGRAPH -2026)

2. **Bikash Kumar Badatya**, Vipul Baghel, Jyotirmoy Amin and Ravi S. Hegde, "Biomechanical-phase based Temporal Segmentation in Sports Videos: a Demonstration on Javelin-Throw", (Published at IEEE STAR-2025)

3. **Bikash Kumar Badatya**, Vipul Baghel and Ravi S. Hegde, "UTAL-GNN: Unsupervised Temporal Action Localization using Graph Neural Networks", (Published at ICIP Satellite Workshop 2025)

4. Rahul Kumar, Vipul Baghel, Sudhanshu Singh, **Bikash Kumar Badatya**, Shivam Yadav, Babji Srinivasan, and Ravi S. Hegde, "BoxingVI: A Multi-Modal Benchmark for Boxing Action Recognition and Localization", (Accepted at the (ICSE 2025))

Research Experience

Major Projects

2. UMPIRE: Unsupervised Temporal Action Localization via Deep Clustering — **July 25 - Oct 25**

- Developed a fully label-free TAL framework that learns spatio-temporal graph embeddings from 3D skeleton sequences using ASTGCN and transformer-based temporal pooling, followed by DBSCAN clustering with adaptive -estimation.
- Achieved state-of-the-art performance on the BABEL dataset (51.53% mAP@IoU, 37.2 F1), surpassing prior unsupervised and weakly supervised methods.

3. Unsupervised Javelin Motion Phase Segmentation (SRIP-Internship'25) — **May 25 - July 25**

- Built an unsupervised ASTGCN + SOT framework to automatically detect biomechanical phase transitions in elite javelin throws, eliminating the need for manual labeling.
- Achieved state-of-the-art performance and released a dataset of 211 professionally annotated videos covering key motion phases.

4. Unsupervised Fine-Grained Action Localization in Sports Videos — **Aug 2024 - Jan 2025**

- Designed an unsupervised skeleton-based pipeline using ASTGCN pre-training and an Action Dynamics Metric (ADM) to detect fine-grained motion boundaries in untrimmed sports videos.
- Achieved 82.67% mAP on the DSV Diving dataset comparable to supervised methods—and demonstrated strong generalization to in-the-wild diving videos without labels.

Ongoing Projects

1. Semantic 3D Human Pose Dictionary (TIME@ARC Hub & Griffith University) — **Oct 25 - Present**

- Built a scalable pipeline to learn a unified 3D pose dictionary with semantic captions and compact embeddings.
- Normalized large-scale 3D skeleton data into a canonical representation and grouped poses using LSH-based clustering.

- Selected medoid poses as dictionary entries, enabling fast pose retrieval, action recognition, and motion understanding.

2. Defect Analysis Model for Device Quality Inspection (Walmart & IIT Madras) **Nov 2025 - Present**

- I am working on a collaborative Walmart–IIT Madras project to develop a deep-learning–based defect analysis system that compares paired factory images to automatically identify subtle visual flaws and distinguish good devices from defective ones.

Technical Skills

- **Technical Coding Skills** : Computer Vision & Image Processing, Video Coding, Machine Learning & Deep Learning.
- **Artifical Intelligence tools**: Tensorflow, Pytorch.
- **Programming Language**: Python, Linux, Supercomputing.
- **IDE Tools**: Jupyter, Spyder, MS Visual Studio Code.
- **Scientific Writing Tools** : MS-Office, Mendeley and Overleaf.

Courses

- Computer Vision
- Computational Physics
- Matrix Methods for Signal Processing, Data Science, and Machine Learning
- Deep Learning
- DSA Using Python
- Machine Learning

Achievements

- Qualified for the national-level entrance exam IIT-JAM (Physics), 2023 exam, out of 12,300+ candidates. (2.7% Acceptance Ratio).
- **Department Topper, Khemundi Degree College**-Ranked first in my department, demonstrating academic excellence and strong analytical skills.

Hackathon/Competition

- **HackOut'23 (DA-IICT)** **Aug-2023**
  Participated in HackOut'23, a hackathon at DA-IICT, collaborating on innovative solutions through problem-solving, coding, and teamwork.
- **SocioHack (IIT Gandhinagar)** **Feb-2024**
  Participated in SocioHack, a hackathon organized by Blithchron at IIT Gandhinagar, focusing on innovative, socially-driven solutions through collaborative coding, problem-solving, and rapid prototyping.

Mentor

- **Mentored two undergraduate students (BS-MS and B.Tech) in the creation and annotation of pose-based datasets for sports video analysis.** **Feb 2025 - Present**
  Provided guidance on key computer vision tasks such as pose estimation using AlphaPose and MMPose, and supported their understanding of action segmentation, annotation strategies, and dataset structuring.

Extracurricular Activities

- **Team Member, STEP UP Dance Club & Blithchron, IIT Gandhinagar** **Sep 2023 - March 2025**
  contributions in choreography, performances, and large-scale event coordination, ensuring smooth execution of cultural activities.
- **Coordinator, Inter IIT Sports Meet 2023, IIT Gandhinagar** **Dec 2023 - Jan 2024**
  Managed and coordinated various sports events, overseeing logistics, scheduling, and execution. Facilitated communication between IIT students, staff, and organizing teams to ensure smooth operations and successful event management.
- **Platoon Commander, NCC (National Cadet Corps)** **July 2015 - July 2017**
  Led and trained fellow cadets in discipline, drills, and leadership activities during school. Organized and participated in NCC events, fostering teamwork, physical fitness, and a sense of responsibility.

Referees

Dr. Ravi S. Hegde (Associate Professor) [Supervisor] *hegder@iitgn.ac.in*
Indian Institute of Technology Gandhinagar Gujarat, India

Dr. Anand Sengupta (Associate Professor) [Course Instructor] *asengupta@iitgn.ac.in*
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