

Pranav Mantini

Contact

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Interests

Computer Vision, Image Processing, Image Quality, Machine Learning, Video Analytics.

Person Re-Identification, Semantic Segmentation, Face Recognition, Anomaly Detection, Human Motion Analysis and Prediction, Automated Video Surveillance, Software Development.

Education

Ph.D., Computer Science, 2015

University Of Houston, Houston, TX, USA.

Dissertation Topic: "Context Based Human Trajectory Forecasting and its Applications".

M.S., Computer Science, 2009

University of Houston - Clear lake, Houston, TX, USA.

Capstone: "Using CUDA for Solar Thermal Plant Computation".

B. Tech., Information Technology, 2007

St. Joseph's College of Engineering, Chennai, TN, India.

Project: "Virtual Defense Machine in JAVA uses 1024 bit key".

Research Experience

Sr. Researcher

Apr. 2022 - Present

Department of Computer Science
University of Houston, Houston, TX, USA

Robust Long-Term Person Re-Identification: Currently focusing on advanced **Person Re-ID** research, addressing long-term challenges like cloth-changing, occlusion, and viewpoint variation (e.g., aerial imaging), resulting in multiple recent publications in top-tier conferences (e.g., CVPR, WACV, ICIP).

Model Stability in Semantic Segmentation (Catastrophic Forgetting): Conducted core research defining data quality with respect to model performance, utilizing Image Quality Assessment (IQA) metrics to filter data and mitigate catastrophic forgetting during model fine-tuning. This work ensures long-term performance reliability in critical systems (e.g., medical diagnostics, autonomous systems).

Convolutional Quadratic Neural Network (CQNN): Advanced independent work on the Convolutional Quadratic Neural Network (CQNN) architecture, focusing on feature robustness and computational optimization, informing the NSF Future Computing Research proposal.

Research Associate 2

Nov. 2017 - Mar. 2022

Department of Computer Science
University of Houston, Houston, TX, USA

Public Safety Innovation Accelerator Program (PSIAP) Grant Success: Authored key research components for the Public Safety Innovation Accelerator Program (PSIAP) grant, which

secured \$1.57 million in funding for research on multi-tiered video analytics, demonstrating a proven ability to successfully pursue public grants.

Developed Novel Video Anomaly Detection Methods: Initiated and led research in camera tamper detection, proposing a residual-based deep-learning method that achieved high accuracy and was recognized with the Best Paper Award at VISAPP '19.

Published High-Impact Datasets: Introduced two large-scale, real-world datasets for complex video anomaly detection and camera tampering detection (288 hours of video, 700+ abnormal event annotations), published at ACCV '20 and AVSS '19.

Quantified Image Quality for CV Algorithms: Conducted foundational analysis correlating video compression and image quality with the performance degradation of computer vision algorithms, resulting in a high-impact publication with over 50 citations.

Developed Patented Deployment Framework: Designed and implemented a deployable Video-Analytics-as-a-Service (VaaS) platform to allow public safety users to customize video analytic pipelines. This modular framework led to U.S. Patent 11,532,158 ("Methods and systems for customized image and video analysis").

Post Doctoral Fellow

Jan. 2016 - Nov. 2016

Department of Computer Science
University of Houston, Houston, TX, USA

Non-functionality and Operational Degradation Detection in Video Surveillance Systems: Surveillance Cameras become non-functional for a variety of reasons, from getting simply unplugged to getting struck by lightning. Designed a cloud-based camera fault detection tool to automatically identify such non-functionality and alert the user through an intuitive user interface.

Research Assistant

Feb. 2010 - Dec. 2015

Department of Computer Science
University of Houston, Houston, TX, USA

3D Models for Video Surveillance: Designed a complete 3D environment model for simulating video surveillance through networked cameras.

Human Trajectory Forecasting: Developed algorithms for predicting human motion in indoor environments, incorporating surrounding geometry and social norms.

Geometry-Constrained Person Re-Identification: Implemented an algorithm to improve Re-ID by integrating a human motion prediction model to complement appearance features with spatio-temporal context.

Camera Placement Optimization: Developed an algorithm to locate optimal security camera positions based on human behavior and 3D geometry for effective surveillance.

Grant/Funding Activities

NIST — Technical & Business Assistance Program

Jan. 2022 - Dec. 2022

Title: Customizable Video Analytics & Houston Public Safety Video – A Demonstration Project

Co-authored core research methodologies for a successful NIST grant proposal, securing funding for public safety innovation.

Orchestrated a demonstration project in Houston to validate real-world applications of customizable video analytics.

NIST — Public Safety Innovation Accelerator Program

Nov. 2017 - Dec. 2021

Title: Multi-tiered Video Analytics for Abnormality Detection and Alerting to Improve Response Time for First Responder Communications and Operations

Developed key technical frameworks for the grant proposal, focusing on first responder communication and operational efficiency.
Successfully delivered advanced video analytics solutions designed to reduce response times for emergency personnel.

Teaching Experience

Lecturer

Department of Computer Science
University of Houston, Houston, TX, USA

January, 2017 - Present

CS Specialization Course: Taught **Digital Image Processing** (COSC 4393/6380) for more than **18 semesters** since Fall '17.

CS Core Course: Taught **Computer Organization and Architecture** (COSC 2425) for more than **7 semesters** since Fall '22.

CS Specialization Course: Taught **Computer Vision** (COSC 6373) in Spring of '17 and '18.

Teaching Effectiveness

Overall Teaching Effectiveness Score: 4.50

Department Average: 3.90

Publications

Peer-Reviewed Conference and Journal Publications.

1. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Occlusion-aware appearance and shape learning for occluded cloth-changing person re-identification. (Pattern Analysis and Applications '25)
2. Samiha Mirza, Apurva Gala, Pandu Devarakota, Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Recall-Based Knowledge Distillation for Data Distribution Based Catastrophic Forgetting in Semantic Segmentation. (ICPR '25)
3. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. ACML: Attention-Based Cross-Modality Learning For Cloth-Changing and Occluded Person Re-Identification. (ICIP '24)
4. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Occlusion-aware cross-attention fusion for video-based occluded cloth-changing person re-identification. (IJCB '24)
5. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Occluded cloth-changing person re-identification via occlusion-aware appearance and shape reasoning. (AVSS '24)
6. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Cross-Modality Complementary Learning for Video-Based Cloth-Changing Person Re-identification. (ACCV '24)
7. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Crossvit-reid: cross-attention vision transformer for occluded cloth-changing person re-identification. (ACCV '24)
8. Vuong D Nguyen, Samiha Mirza, Abdollah Zakeri, Ayush Gupta, Khadija Khaldi, Rahma Aloui, **Pranav Mantini**, Shishir K Shah, Fatima Merchant. **Tackling Domain Shifts in Person Re-Identification: A Survey and Analysis**. (CVPR '24 workshop)
9. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Contrastive Clothing and Pose Generation for Cloth-Changing Person Re-Identification. (CVPR '24 workshop)
10. Vuong D Nguyen, Khadija Khaldi, Dung Nguyen, **Pranav Mantini**, Shishir Shah. **Contrastive viewpoint-aware shape learning for long-term person re-identification**. (WACV '24)
11. Khadija Khaldi, Vuong D Nguyen, **Pranav Mantini**, Shishir Shah. Unsupervised person re-identification in aerial imagery. (WACV '24)
12. Vuong D Nguyen, **Pranav Mantini**, Shishir K Shah. Temporal 3d shape modeling for video-based cloth-changing person re-identification. (WACV '24)

13. P. Beniwal, **P. Mantini**, and S.K. Shah. Image Quality Assessment for Object Detection Performance in Surveillance Videos. (VISAPP '23)
14. P. Beniwal, **P. Mantini**, and S.K. Shah. Image Quality Assessment using Deep Features for Object Detection. (VISAPP '22)
15. K. Khaldi, **P. Mantini**, S.K. Shah, Unsupervised Person Re-identification Based on Skeleton Joints Using Graph Convolutional Networks (ICIAP '22)
16. **P. Mantini**, S.K. Shah. **CQNN: Convolutional Quadratic Neural Networks** (ICPR '20)
17. **P. Mantini**, Z. Li, S.K. Shah. **A Day on Campus - Video Anomaly Detection Dataset** (ACCV '20)
18. **P. Mantini**, S.K. Shah. UHCTD: A Large Scale Dataset for Camera Tampering Detection. (AVSS '19)
19. P. Beniwal, **P. Mantini** and S.K. Shah. Assessing the Impact of Video Compression on Background Subtraction. (ACPR '19)
20. **P. Mantini**, S.K. Shah. Camera Tampering Detection using Generative Reference Model and Deep Learned Features. (VISAPP '19)
21. M. Aqqa, **P. Mantini**, S.K. Shah. **Understanding How Video Quality Affects Object Detection Algorithms.** (VISAPP '19)
22. **P. Mantini**, S.K. Shah. A Signal Detection Theory Approach for Camera Tamper Detection. (AVSS '17)
23. **P. Mantini**, S.K. Shah. Camera Placement Optimization Conditioned on Human Behavior and 3D Geometry. (VISAPP '16)
24. **P. Mantini**, S.K. Shah. Multiple People Tracking using Contextual Trajectory Forecasting. (IEEE HST '16)
25. **P. Mantini**, S.K. Shah. Person re-identification using geometry constrained human trajectory modeling. (IEEE HST '15)
26. **P. Mantini**, S.K. Shah. Human Trajectory Forecasting In Indoor Environments Using Geometric Context. (ICVGIP '14)

Professional Service

Actively review papers for conferences: BMVC, CVPR, WACV, IEEE CAI, ICCV, ECCV, ACCV, AAAI (Program Committee), etc.
Actively review papers for journals: Pattern Recognition, Image and Vision Computing, Electronics, DSP, etc.

Honors and Awards

Best Paper Award, received the best paper award for the paper "Camera Tampering Detection using Generative Reference Model and Deep Learned Features" at the 14th International Conference on Computer Vision Theory and Applications (VISAPP '19).

Patents

Methods And Systems For Customized Image And Video Analysis, **Granted** 2020.

Skills

Research and Deep Learning Tools

Deep Learning Frameworks: TensorFlow, Keras, PyTorch.

Core Programming: Python (Expert), C/C++.

Imaging Libraries: OpenCV, Pillow.

Cloud, Platforms, and Systems

Cloud Computing: Google Cloud Platform (SDK), AWS.

Operating Systems: Unix/Linux (Expert), Windows.

Technical and Professional Tools

Documentation and Publishing: LaTeX.

Development Tools: Pycharm, Eclipse, Visual Studio.

Version Control and Integration: Git/GitHub, Jenkins.

Service and Leadership

NSF I-Corps Entrepreneurship Course, Entrepreneurial Lead January, 2016 - February, 2016

Lead a three-person team of computer scientists and software engineers to interview one hundred customers in five weeks to create a viable business model for a computer vision startup.

Pratham@UH, President August, 2012 - May, 2014

Lead a non-profit organization consisting of 20 members. Conducted various fundraising and awareness events to support the education of underprivileged children in India.