AAYUSH JUNG RANA

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Work Experience

- **Senior Engineer** - Qualcomm Technologies Inc.   *(05/2023 - current)*
- **Research Assistant** - Center for Research in Computer Vision (CRCV)   *(08/2017 - 08/2023)*
  University of Central Florida (UCF)
- **Research Intern** - Qualcomm Technologies Inc.   *(05/2022 - 08/2022)*
- **Research Intern** - Center for Vision Technologies (CVT)   *(05/2020 - 08/2020)*
  Stanford Research Institute (SRI) International
- **Research Assistant** - Vision and Graphics Lab   *(06/2015 - 07/2017)*
  CSIM, Asian Institute of Technology (AIT)

Education

- **Doctor of Philosophy (PhD) in Computer Science**   *08/2023*
  Center for Research in Computer Vision (CRCV), University of Central Florida
- **MS in Computer Science**   *05/2023*
  University of Central Florida
- **B.S.E. in Information and Communication Technology**   *05/2015*
  Asian Institute of Technology

Projects and Research Experience

- **Multi-sensor fusion based real-time video effects** *(Qualcomm)*
  End-to-end system to combine time-of-flight based active depth sensor and RGB sensor to provide real-time consistent video solutions with accurate depth for low-light video Bokeh, cinematic effect, 3D room scan and XR devices. Worked on system integration, testing, evaluation, and optimization of pre and post-processing algorithms to improve quality and runtime for videos.

- **Video semantic segmentation with temporal consistency** *(Qualcomm Internship)*
  Improve low latency video semantic segmentation with temporally consistent predictions using deep learning techniques with lower inference overhead, enabling real-time video segmentation.

- **Generative model for human action synthesis** *(CRCV, UCF)*
  GAN based generative approach to synthesize temporally cohesive human action videos with consistent appearance and motion dynamics. Jointly generates text embedding-based motion vectors which are then integrated with content embeddings to make realistic action videos for real and synthetic datasets.

- **Low cost annotation for video action detection** *(CRCV, UCF)*
  Developed multiple deep active learning approaches to annotate high utility samples for high precision video action detection. Addressed issues with sparse annotation based deep learning (cold start, pseudo-label accuracy) and large dataset annotation (data redundancy) for training on videos.

- **Video activity localization and classification** *(CRCV, UCF)*
  Deep learning based real-time end-to-end action localization and classification method. Perform localization and classification of actors and action from an untrimmed video sequence on a

multi-label and multi-class dataset. Developed under IARPA funded program with 1st place in ActEV SDL 2020 challenge and 2nd place in TRECVid 2019 challenge.

- **Large scale object detection using LiDAR** *(SRI International)*
  Use LiDAR data from high altitude aerial vehicles to perform 3D object detection over large areas using deep learning. Developed models to run fast inference over large areas with higher precision.

- **Sugarcane leaf disease and insect detection** *(VGL, AIT)*
  Image processing (superpixel segmentation, edge detection), machine learning, and mathematical modeling based system development to localize and classify different insects and leaf diseases.

- **Driver monitoring system with real-time feed** *(AIT Thesis)*
  IR camera based lane detection, analysis, and database management frontend and backend system implemented with real-time server interaction using OpenCV (C++) and Ruby on Rails.

Publications

- Ayush Singh, **Aayush Jung Rana**, Akash Kumar, Shruti Vyas, Yogesh Singh Rawat; *Semi-supervised Active Learning for Video Action Detection*; Accepted for publication in The 38th Annual AAAI Conference on Artificial Intelligence (**AAAI**) 2024

- **Aayush Jung Rana**, Yogesh Singh Rawat; *Hybrid Active Learning via Deep Clustering for Video Action Detection*; IEEE/CVF Computer Vision and Pattern Recognition Conference (**CVPR**) 2023

- **Aayush Jung Rana**, Yogesh Singh Rawat; *Are all Frames Equal? Active Sparse Learning for Video Action Detection*; Advances in Neural Information Processing Systems (**NeurIPS**) 2022

- Naman Biyani, **Aayush Jung Rana**, Shruti Vyas, Yogesh Singh Rawat; *LARNet: Latent Action Representation for Human Action Synthesis*; British Machine Vision Conference (**BMVC**) 2021

- **Aayush Jung Rana**, Yogesh Singh Rawat; *We don't Need Thousand Proposals: Single Shot Actor-Action Detection in Videos*; IEEE/CVF Winter Conference on Applications of Computer Vision (**WACV**) 2021

- Mamshad Rizve, Ugur Demir, Praveen Tirupattur, **Aayush Jung Rana**, Kevin Duarte, Ishan Dave, Yogesh Singh Rawat, and Mubarak Shah; *Gabriella: An Online System for Real-Time Activity Detection in Untrimmed Security Videos*; IEEE International Conference on Pattern Recognition (**ICPR**) 2020 *(**Best Paper Award**)*

- **Aayush Jung Rana**, Yogesh Singh Rawat; *SSA2D: Single Shot Actor-Action Detection in Videos*; Student Abstract at the Thirty-Fifth Annual **AAAI** Conference on Artificial Intelligence, 2021

- Rajat Modi, **Aayush Jung Rana**, Akash Kumar, Praveen Tirupattur, Shruti Vyas, Yogesh Singh Rawat, Mubarak Shah; *Video Action Detection: Analysing Limitations and Challenges*; IEEE/CVF Computer Vision and Pattern Recognition Workshop (**CVPR workshop**) 2023

Patents

- Yogesh Singh Rawat, Mubarak Shah, **Aayush Jung Bahadur Rana**, Praveen Tirupattur, Mamshad Nayeem Rizve; *Methods of Real-Time Spatio-Temporal Activity Detection and Categorization from Untrimmed Video Segments*; **United States Patent No**. 11468676 B2

- Yogesh Singh Rawat, **Aayush Jung Bahadur Rana**; *Active Sparse Labeling System and Method*; United States Patent Application No. 63/514,482 (**Filed**)

Skills

- *Programming*: Python, C++, C, Matlab

- *Libraries*: Deep learning (Pytorch, Tensorflow, Keras), OpenCV, ROS

- *Embedded systems*: ARM Cortex, Raspberry Pi, Arduino, Udoo