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EDUCATION

International Institute of Information Technology, Hyderabad (IIIT-H) *(August'21 - August'23)*
- **Master of Science in Computer Science Engineering (MS CSE)**

Institute of Technology Nirma University, Ahmedabad *(July'14 - May'18)*
- **Bachelor of Technology, Instrumentation and Control Engineering (Btech IC)**

PUBLICATIONS

- **Grounded Video Situation Recognition**
  Zeeshan Khan, CV Jawahar, Makarand Tapaswi
  Neural Information Processing Systems (NeurIPS 2022) [Paper and code coming soon]

- **More Parameters? No Thanks!**
  Zeeshan Khan, Sukruth Kartheek, Vinay Namboodiri, CV Jawahar
  Association for Computational Linguistics (ACL Findings 2021) : [Paper][Code]

- **Deep Weakly-Supervised High Speed High Dynamic Range Video Generation**
  Zeeshan Khan, Mukul Khanna, Parth Shettiwar, Shanmuganathan Raman.
  International Conference on Pattern Recognition (ICPR 2022) [Oral presentation][Paper] video]

- **Appearance Consistent Human Pose Transfer Transfer via Dynamic Feature selection**
  Ashish Tiwari, **Zeeshan Khan**, Shanmuganathan Raman.
  International Conference on Pattern Recognition (ICPR 2022) [Paper]

- **Exploring Pair-wise NMT for Indian Languages.**
  Sukruth Kartheek, Sreedhar Rajpurohit, Sai Himal Allu, Aman Singhal, **Zeeshan Khan**, Vinay Namboodiri, CV Jawahar
  International Conference on Natural Language Processing, (ICON 2020) : [Paper]

- **FHDR: HDR Image Reconstruction from a Single LDR Image using Feedback Network**
  Zeeshan Khan, Mukul Khanna, Shanmuganathan Raman.
  IEEE ***Global Conference in Signal and Information Processing****, 2019* : [Oral Presentation] [Paper] [Code]

RESEARCH EXPERIENCE

CVIT, IIIT Hyderabad *Research Fellow*
Mentors: Prof. C.V. Jawahar, Prof. Makarand Tapaswi, Prof Vinay Namboodiri *(July'20 - Present)*

- **Grounded Video Situation Recognition:**
  - Proposed a new framework that combines visual grounding with semantic role labelling for end to end situation recognition in videos. Achieved State-of-the-art results on a large scale movie dataset (VidSitu).
  - Designed a novel 3-stage Transformer model called *VideoWhisperer* that enables Action Recognition and Semantic role labelling to answer questions like (*Who did what, to whom, with what, where etc*), and also allows visual grounding that localises the agents/patients/tools taking part in the situation in the spatio-temporal domain without grounding annotations.
- **Multilingual Neural Machine Translation(MNMT):**
  - Studied the long standing problem of negative interference in MNMT, and proposed a novel training scheme to overcome it.
  - Proposed a space efficient adaptation approach through iterative pruning and retraining, and improved the MNMT performance on all the language pairs, with significant gains. Achieved State-of-the-art performance on TED talks dataset.
- **Exploring Pair-wise NMT for Indian Languages :**
  - Developed State-of-the-art NMTs for 11 low resource Indian Languages.
  - Proposed a back-translation filtering mechanism, to filter the noisy back-translated monolingual corpora and retain only the high quality training data to finetune an MNMT to a single language pair.

Computer Vision Lab, IIT, Gandhinagar *Research Assistant*
Mentor: Prof. Shanmuganathan Raman *(February'19 - June'20)*

- **Deep Weakly Supervised High FPS High Dynamic Range Video Generation from Off-The-Shelf Cameras**
  - Proposed a deep network to generate high FPS HDR video For the first time, from a sequence of low FPS alternating exposure LDR frames. Used video frame interpolation to generate multiple high and low exposure LDR frames recursively.
  - Proposed an HDR merge network that takes the generated high FPS, low and high exposure frames and generates high quality HDR videos at arbitrarily high frame rates.

- **Appearance Consistent Human Pose Transfer via Dynamic Feature Selection:**
  - Proposed a Novel 3-way GAN consisting of image, pose, and appearance pathways. Which progressively transforms a human image from source to target pose. Used deformable convolutions, local attentions, and adaptive instance normalisation for appearance transfer. Achieved State-of-the-art results on Fashion dataset.
- **FHDR: HDR Image Reconstruction from A Single Exposure LDR Image using Feedback Network**
  - Proposed a novel Feedback CNN, for HDR image generation from a single exposure LDR image. Achieved State-of-the-art performance, with significant improvement over prior methods.
  - Designed a novel Dense Feedback Block using hidden states of RNN, to transfer the high-level information to the low-level features. LDR to HDR representations are learned in multiple iterations via feedback loops.

Raxter @ https://raxter.io, Gandhinagar *Research Assistant*
Mentor: Prof. Sourish Dasgupta~ CEO at Raxter (Asst. Professor @ DAIICT) *(Jan'18 - Jan'19)*

- **RAxBot: Reinforcement Learning(Q-learning) based Scholarly Article Recommendation Engine:** [Pre-print]
  - Designed and implemented RAxBot: The core Personalised Scholarly Article Recommendation Engine behind **raxter.io**, providing scalable content delivery and adaptive recommendations.
  - Proposed a novel Q-learning based framework that exploits the user selection pattern history and takes action to predict the user behaviour. Based on the prediction a query is generated and sent to the Elasticsearch server, for content retrieval.
- **Scholarly Article Recommendation Engine using a Query Augmentation Framework:**
  - Implemented a novel personalised Recommendation Engine using Content Based Filtering and a Query Augmentation technique. Achieved **A+** grade (10/10) in the final semester.
  - Designed a complex 3-level Elasticsearch query. i) Topic-level using LDA topic models ii) Word Embedding level using Word2vec model, and iii) Noun Phrase level. Performed extensive experimentation to determine the query weights.

CONSULTANCY PROJECTS

Azure Knowledge Corporation, Ahmedabad *Technical Consultant*
Project Coordinator : Abhilash Mankad ~ COO at Azure *(Jul'20 - Aug'20)*

- **Automatic Advertisement and Signboard Detection in Mobility**
  - Designed and developed a deep learning based tool to automate the filtering of advertisements and signboards on streets in the wild. Trained a YOLO-V3 object detection algorithm for the given task.
  - Further developed it as a re-trainable tool using transfer learning, which allows it to adapt to new datasets and classes.

Honeywell International India Pvt. Ltd., Bangalore *Research Consultant, representative from IITGN*
Project Coordinator : Manjuprakash Rama Rao ~Director, Architecture and Innovation *(Oct'19 - Mar'20)*

- **Synthetic Data Generation for Person Intrusion Detection Using Human Pose Transfer** [Architecture-diagram] **[Code]**
  - Proposed a 2-way GAN for Human Pose Transfer, for foreground and background image generation. FG path deals with pose transfer. BG path inpaints the background for generating consistent target FG and BG images.
  - Extended the Progressive Attention Transfer Network(PATN)(CVPR-2019) by proposing active FG and BG losses for unsupervised generation of target FG and BG masks, and separately dealing with the FG and the BG paths.

INTERNSHIPS

Google Summer of Code with Sugarlabs (GSoC'17) *Intern*
Mentor: Walter Bender ~ Founder Sugarlabs, ex-Executive Director of The MIT Media Lab *(May'17- July'17)*

- **Say No To GTK2: Graphical User Interface Refactoring :** [Blog with Code]
  - Completed the Google Summer of Code program'17 and was rewarded a sum of **2400$.**
  - Refactored the GUI and migrated 9 major applications of Sugarlabs from GTK2 to GTK3 toolkit in Python, enabeling further growth and development of the applications. Also, Ported from GST 0.10 to GST 1.0.

INDEPENDENT STARTUP

Nebuleon *(April'20- Aug'20)*

- **Cloud Kitchen Hygiene Monitoring system** [Code]
  - Lead a team of 3, and developed various hygiene monitoring systems, including 1) Hand wash detection, 2) Face-Recognition and 3) Mask, Headcap, Gloves and, apron Detection.
  - Mentored the interns in general Computer Vision data pre-processing and Object detection training algorithms.