KUNAL PRATAP SINGH

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RESEARCH INTERESTS

Perception for Robotics; Efficient Neural Networks; Active Visual Learning; Lifelong Learning

EDUCATION

Indian Institute of Technology, Roorkee **2016-2020**
Bachelor of Technology, Department of Electrical Engineering
Advisor: Prof. G.N. Pillai

PUBLICATIONS

MOCA: A Modular Object-Centric Approach for Interactive Instruction Following. [pdf][code]
Kunal Pratap Singh*, Suvaansh Bhambri*, Byeonghwi Kim*, Roozbeh Mottaghi, Jonghyun Choi
arxiv preprint, 2020

Learning Architectures for Binary Networks. [pdf][code]
Kunal Pratap Singh*, Dahyun Kim*, Jonghyun Choi
European Conference on Computer Vision (ECCV), 2020
Extended version under submission in IEEE T-PAMI

Improving Mask Prediction for Long Horizon Instruction Following. [pdf]
Kunal Pratap Singh*, Suvaansh Bhambri*, Byeonghwi Kim*, Jonghyun Choi
Embodied Vision, Actions & Language (EVAL) Workshop
European Conference on Computer Vision (ECCV), 2020

A Fast, Scalable and Reliable Deghosting Method for Extreme Exposure Fusion. [pdf][code]
K. Ram Prabhakar*, Rajat Arora*, Adhitya Swaminathan, **Kunal Pratap Singh**, and R. Venkatesh Babu
International Conference on Computational Photography (ICCP), 2019

RESEARCH EXPERIENCE

GIST Computer Vision Lab **Gwangju Institute of Science and Technology, South Korea**
Research Assistant *May 2020-Present*
Advisors: **Dr. Jonghyun Choi**, **Dr. Roozbeh Mottaghi** (Research Manager, Allen Institute for AI)

- Worked on the task of embodied instruction following on the ALFRED benchmark.
- Proposed a modular agent that decouples the policy and perception aspects of the problem.
  - Proposed an object-centric mask prediction mechanism for accurate object interaction.
  - Leveraged language based dynamic filters for cross-modal reasoning and generalization.
  - Proposed an obstacle avoidance mechanism to facilitate smooth navigation through the environment.
- Our proposed approach achieves the best performance (till date) on the test leaderboard here.
- Work under review at **CVPR 2021**. Runners up on the ALFRED challenge in **ECCV 2020** workshop with latent version of this work.

GIST Computer Vision Lab **Gwangju Institute of Science and Technology, South Korea**
Research Intern *May 2019-Nov 2019*
Advisor: **Dr. Jonghyun Choi**

- Led a collaborative effort to develop the first architecture search method for binary neural networks.
- Developed a gradient based architecture search approach to search architectures with binary parameters constraints.
  - Proposed a new cell template and search space to accomplish this.
  - Added a diversity-based objective to ensure exploration in early stages of the search.
  - Redefined the utility of zeroise layer for searching sparser architectures.
- Our method (BNAS) led to superior performing backbone architectures for binary networks.
- Work published in **ECCV 2020**, extended version under review in T-PAMI.

Video Analytics Lab, Department of CDS **Indian Institute of Science, India**
Research Intern *Nov 2018 to Jan 2019*
Advisor: **Dr. R. Venkatesh Babu**

- Worked on developing a fast and scalable method for artifact free exposure fusion that can any number of images as input.
- Additionally, prepared a dataset of 582 varying exposure images with corresponding deghosted HDR images to train our model
- Developed method achieved a speed-up of around 54× over existing state-of-the-art HDR fusion methods.
- Project led to publication in **ICCP 2019**.

Infosys Centre for Artificial Intelligence — **Indraprastha Institute of Information Technology, India**
Research Intern — *May 2018 to July 2018*
Advisor: **Dr. Saket Anand**

- Worked on the visual perception module of an autonomous vehicle as a part of the Mahindra Autonomous Vehicle Challenge.
- Used real time collected data to design lane detection and speed bump detection systems using OpenCV.
- Implemented a self-similarity model using a fixed template for identifying speed bumps and zebra crossing in the path.

TALKS

- Embodied Vision, Actions and Language Workshop (EVAL), ECCV 2020.
- Invited talk on How to get started in Research. Organized by Student Mentorship Program, IIT Roorkee. [slides]

AWARDS

- Bronze Prize, Samsung Humantech Awards,2020 (for ECCV work on binary neural networks).
- Awarded the National Talent Search Examination (NTSE) Scholarship for high school and undergraduate studies.
- Awarded the Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship, which included a fully-funded opportunity to pursue a basic sciences degree from the Indian Institute of Science (IISc), Bangalore, India.

TECHNICAL SKILLS

- Languages and Toolkits: Python, Pytorch, Tensorflow, C++, Docker, Git

REFERENCES

Jonghyun Choi
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GIST (Gwangju Institute of Science and Technology)
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Research Manager
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