KARTIKAEYA KUMAR

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RESEARCH INTERESTS

3D Computer Vision • Deep Learning • Augmented & Virtual Reality • Game Development

EDUCATION

MSc **Applied Computing (MScAC), University of Toronto** 2022-2024
Courses: • Computational Imaging • Computer Vision • Topics in Interactive Computing • Neural Networks & Deep Learning

B. Tech **Indian Institute of Technology (IIT), Guwahati** 2018-2022
Electronics and Electrical Engineering with Minor in Computer Science and Engineering GPA: 8.74 / 10.00

RESEARCH EXPERIENCE

Faculty of Information, University of Toronto
Dec 2022 - Present
Research Assistant in HCI and Computer Vision

- Ongoing applied research on Neural Radiance Fields (NERF) for remote collaboration and visual media creation tasks.

RICELab, University of Toronto
May 2021 – Jan 2022
MITACS Research Intern in HCI

- Using Photogrammetry & visual SLAM applied to 360 videos, developed a novel method of multi-user 360 video consumption in Unity.
- Set up a client-server architecture for multiplayer support, using Unity's MLAPI networking library.
- A 22% increase in shared cognition & 13% increase in shared presence was observed with the new interface in a 34 participant study.
- This research was published in two of the top HCI venues, ACM CHI and ACM CSCW 2022.

VIGIL Lab, IIT Hyderabad
Apr 2020 - July 2020
Deep Learning Research Intern

- Proposed a novel lightweight CNN architecture based on the U-Net & Stacked Hourglass Network for 2D Human Pose Estimation.
- Built the complete pipeline (Data pre-processing/Augmentation, model creation, training and inference) in PyTorch.
- Trained the model on the COCO Dataset and achieved faster inference times, albeit with lower precision.

SELECTED PROJECTS

Image Deconvolution using ADMM with Diffusion Denoising Prior
Nov 2022
Applied ADMM optimization with DDPM based diffusion prior for image deblurring in the presence of noise. (poster, report, code)

Depth Estimation from Stereo Vision
April 2022
Implemented a simple triangulation algorithm to estimate depth of an object based on disparity from stereo video feed in OpenCV.

CrossDroneVR: FPV drone simulator for mobile VR
Oct 2021
Coded physics simulation for a First Person View (FPV) Drone simulator for mobile VR, implemented with a dual device control scheme, where one device is used for VR display and the other smartphone is used to control the game. Set up low-level packet transmission for low latency.(demo)

Basic Hand Tracking & Gesture Recognition
Mar 2020
Used Image processing techniques (thresholding, contouring & convex-hull detection) in OpenCV to build a hand gesture recognition system. Also explored RGBD (Depth) & deep learning-based methods. (demo)

PUBLICATIONS

[1] Kartikaeya Kumar, Lev Poretski, Jiannan Li, and Anthony Tang. 2022. Tourgether360: Collaborative Exploration of 360° Videos using Pseudo-Spatial Navigation. Proc. ACM Hum.-Comput. Interact. 6, CSCW2, Article 546 (November 2022), 27 pages. https://doi.org/10.1145/3555604 doi , paper , video , talk

[2] Kartikaeya Kumar, Lev Poretski, Jiannan Li, and Anthony Tang. 2022. Tourgether360: Exploring 360° Tour Videos with Others. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI EA '22). Association for Computing Machinery, New York, NY, USA, Article 224, 1–7. doi , paper, video

SKILLS

Languages: C/C++ • C# • Python • HTML • CSS • JavaScript

Tools/Frameworks: OpenCV • Numpy • node.js • PyTorch • Keras • ARCore

Software: Unity • Blender • Adobe Premiere Pro