Room 2074, Academic Surge
UC Davis, California 95616
(530) 7613291
utkarsh2254@gmail.com
utkarshojha.github.io

Utkarsh Ojha

Research interests

Computer vision, Machine learning.

Education

2014–2018 **NIT Allahabad**.
B.Tech - Computer Science and Engineering
CGPA - 8.82/10

2014 **K.V. SAC Vastrapur**.
AISSCE - CBSE (XII) : 94.8

2012 **K.V. SAC Vastrapur**.
AISSCE - CBSE (X) : 10.0 CGPA

Research Experience

July 2018 – present **University of California, Davis**, *Prof. Yong Jae Lee*.
Working on unsupervised learning methods for representation learning and image synthesis.
- Proposed 'FineGAN': a method to generate images hierarchically by disentangling background, object shape and object appearance.
- Demonstrated its effectiveness on the challenging task of fine grained categorization images.
- Preprint version of the work is available online at this link

May 2017 – August 2017 **Indian Institute of Science, Bangalore**, *Prof. Venkatesh Babu*.
Worked on modeling universal adversarial perturbations for target classifiers
- Proposed 'NAG': a method which explores a subspace of adversarial perturbations in the image space, given a classifier.
- Demonstrated its strength by establishing a new benchmark for fooling existing convolutional network based architectures
- Work published in CVPR 2018 as a conference paper (link)

Worked on image reconstruction.
- Demonstrated effectiveness of generative adversarial networks to remove compression artifacts from images.

May – July 2016 **Indian Space Research Organization**, *Ankur Garg, Debajyoti Dhar*.
Worked in *Optical Data Processing Unit* on the image denoising problem.
- Developed deep learning models that learn to reconstruct the images from its noisy version.
- Used images captured by CARTOSAT-2, corrupted by Gaussian and Poisson noise as training data.
- Demonstrated its effectiveness in terms of significantly low inference time.

August 2016 – May 2018 **MNNIT Allahabad**, *Prof. Dushyant Singh*.
Worked on various extracurricular and final year projects related to computer vision and machine learning; like image recognition, real time object detection, visual question answering, integrating these modules peer to peer network etc.

Publications

Krishna Kumar Singh*, Utkarsh Ojha*, Yong Jae Lee. "FineGAN: Unsupervised Hierarchical Disentanglement for Fine-Grained Object Generation and Discovery". Arxiv 2018.

Konda Reddy Mopuri*, Utkarsh Ojha*, Utsav Garg, Venkatesh Babu. "NAG- Network for adversary generation". In proceedings of CVPR 2018.

Utkarsh Ojha, Ankur Garg. "Denoising high resolution multispectral images using deep learning". In proceedings of ICMLA 2016.

* denotes equal contribution

Projects

FineGAN.
We propose method hierarchically generate images belonging to fine grained object categories by disentangling background, object shape and object appearance. We further show state-of-the-art clustering performance on fine grained datasets using FineGAN's learned features

NAG.
Network for Adversary Generation. A generative model that learns a distribution of universal adversarial perturbations which deceive a target convolutional neural network into misclassifying perturbed images with high fooling rate.

Compression artifacts removal.
A framework which extends the idea of SRGAN, to remove compression artifacts from images using conditional generative adversarial networks.

Real time scene understanding.
We developed an application that detects and tracks objects in real time, lets the user query about a particular image frame by asking basic questions about the scene. We deploy this in a peer to peer network setting, so that the client can generate a live feed using its own web camera, and send it to the server in real time to obtain the similar service.

Denoising high resolution images.
An application of denoising stacked autoencoders to reconstruct very high resolution images from their noisy version. The inference time, i.e. the time required to obtain the reconstructed image from noisy version is significantly low compared to existing approaches, at the cost of a slight dip in reconstruction quality.

Automated system for Reversi game.
The project was about developing an artificial system that could take intelligent moves based on the current scenario of the board, in an attempt to maximize the future rewards. We used a combination of Minimax algorithm and dynamic programming approaches to develop the system.

Code compression techniques for low powered embedded systems.
This was a course project for *Embedded Systems*. In this work, we provide a detailed review of some of the recent techniques that have been used for code compression, which can lead to reduced memory access, and eventually can lead to lower power consumption. At the end, we propose our own idea of combining the idea of bit masking with a machine learning approach that can further help in reducing the number of bits required to represent some data.

Designing an automatic gate using data driven approach.
This was a course project for *Microprocessor and its applications* and outlines the development of an automatic gate with the help of a microprocessor using a machine learning approach; and how this approach can be used to overcome the shortcomings of traditional triggering methods, and improve the efficiency in detecting when to open or close gates automatically.

Technical proficiency

Operating systems.
Linux and Windows

Programming.
- **Languages:** Python, C, C++*, Java*
- **Software packages:** Pytorch, Tensorflow, Theano*, LaTeX, Git

* (basic)

Achievements

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- Awarded INAE travel grant for presenting 'NAG: Network for Adversary Generation' at CVPR 2018.
- 3^{rd} position in *Codewarriors* event held during *Aavishkar*, for developing an artificial agent to play Reversi. (>50 teams) : 2015
- Dean's list for academic excellence : 2015-2016
- Top 30 rank in Regional Mathematical Olympiad organized by National Board for Higher Academics (NBHM) : 2013-2014
- Scholarship for academic excellence from KVS: 2012, 2014

Extra curricular

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- Institute badminton captain: Represented the institute and won at different levels of tournaments.
- Event coordinator: *Aavishkar* (technical festival) and *Culrav* (cultural festival) in 2017-2018.
- Student guide: Mentor for incoming freshmen to help them adjust to campus life. Especially involved in anti-ragging events.
- Represented *Ahmedabad region* for badminton at Kendriya Vidyalaya Sangathan National Sports Meet in 2012.