

# UJJWAL UPADHYAY

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## Research Interests

My research interest is at the intersection of **Computer Vision and Representation Learning**. My primary research focus is to build systems that offer true disentangled abstraction of human psychology and challenges human consciousness. I plan to pursue my vision for such systems by extending my approach to reinforcement learning and non-differentiable intelligence.

## Education

### Guru Gobind Singh Indraprastha University, India

CGPA: 8.52 / 10.0

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING | MENTOR: **DR. KIRTI GUPTA, DR. MANOJ SHARMA**

AUGUST 2016 - 2020

**Courses** Artificial Intelligence • Statistics • Advanced Probability • Database Management Systems • Data Structures • Algorithm Design & Analysis • Compiler Design • Operating Systems • Object Oriented Programming • Computer Graphics & Multimedia • Computer Networks

## Research Experience

### Qure.ai

India

AI RESEARCH INTERN

DECEMBER 2020 - PRESENT

- Initiated a study about applications and efficacy of deep learning models in detecting various morbidities from X-Ray and Brain CT Scans.
- Developing deep learning models to segment nodules and detect abnormalities in the scan.

### IBM Research

India

RESEARCHER (GRM) | MENTORS: **DR. ANUPAMA RAY, DR. RITU GARG AND DR. PRERANA MUKHERJEE**

FEBRUARY 2020 - MAY 2020

- Develop Fine-grained Aggressive Behaviour detection in videos using Deep Neural Networks on UCF-Crimes Dataset using self attention models with transformers and dynamic frame sampling neural network. Performed various ablation studies on UCF-Crimes dataset.
- Our Model ended up beating state of the art on the dataset by 1% with accuracy of 29.2%.

### Indian Institute of Technology Delhi

India

RESEARCH INTERN | MENTORS: **DR. AAKANKSHA CHOWDHERY AND DR. PRERANA MUKHERJEE**

JUNE 2019 - AUGUST 2019

- The project was developed under **The Marconi Society** and funded by **Google**.
- Developed neural network for voice stress detection. This work focused on providing model which is capable of working on edge devices.
- Both keyword spotting and emotion recognition models got accuracy of 92%. A speech dataset called EmoSpeech Command Dataset was also curated. [Link [↗](#)]. The project has received national media coverage for aiding socio-economic cause.

## Research Grants

### Research in Emotion Recognition

Intel Corp.

EARLY INNOVATION RESEARCH GRANT: \$5000 + HARDWARE SUPPORT

APRIL 2018

- Built a Neural Network that takes Face, Eye Movements, Speech and Heart rate into account to make prediction about emotion.
- A blend of stacked LSTM was developed that takes all these modalities as input.

### Research in Non-Invasive Techniques to Estimate Human Heart rate

Intel Corp.

OPENVINO EARLY INNOVATION RESEARCH GRANT: \$5000 + HARDWARE SUPPORT | MENTOR: **KARL FEZER, ARM**

AUGUST 2018

- Built a Neural Network that mimics the eulerian video magnification & magnifies change in colors and motion in certain frequency range.
- The change in color of forehead is used to predict heart rate over a period of time.
- The deep neural network was ported to Intel Neural Compute Stick which further pushes the scope of project to edge computing.

## Projects

### $\beta$ -VAE Adversarial Attack

MENTOR: **DR. PRERANA MUKHERJEE**

- Built a unsupervised adversarial attack mechanism on concept of meaningful representation of data in hidden space.
- The similar images is encoded using Disentangled Variational Autoencoder and changes are made to the hidden vector to generate a new image constrained to be similar to the original image. The attack beat PGD based defences by 70% on various datasets.

### M.A.V.

MAPPING AUDIO AND VIBRATION | PERSONAL PROJECT

- Built a system that map environment based on small movements using eulerian video magnification neural network model.
- This project is extended to area of audio generation based on small visual movements. It has a use in identifying where the sound came from in a certain image sequence.

### Chess Games Likelihood Engine

PERSONAL PROJECT

- Built a similar chess game finder based on autoencoder. The bottleneck layer of both the games was feed to a neural network which gives similarity score for the 2 games.
- Tried and Tested Disentangled Variational Autoencoder ( $\beta$ -VAE) for checking the effect of hidden vector on similarity of chess games.

## Honors & Awards

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- 2019 **Winner**, Paul Baran Young Scholars Celestini Prize India 2019, Awarded \$1500 by The Marconi Society.
- 2019 **Winner**, Smart India Hackathon-World's Largest Hackathon, Awarded ₹100,000 (\$1400) by Govt. of India.
- 2019 **Scholarship**, for studying Secure and Private AI, Awarded by Udacity.
- 2019 **Competitions Expert**, Kaggle: Ranked 2638 out of 125K, Awarded by Kaggle (Google).
- 2018 **Silver Medal**, Quora Insincere Questions Classification Challenge, Awarded by Kaggle (Google).
- 2018 **Bronze Medal**, Porto Seguro's Safe Driver Prediction, Awarded by Kaggle (Google).
- 2017 **Runner Up**, 3pillar Global Hackathon, Awarded by 3pillar Global.
- 2017 **Winner**, Annual Mathematics Competition, MATHELETICS, Awarded by Delhi University.
- 2017 **Winner**, HackData 2017, Awarded by Shiv Nadar University.
- 2017 **Winner**, ClashHacks 3.0, India's largest student run Hackathon.

## Publications

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### Latent Space Poisoning: Generating Out of Distribution Adversarial Attack

UJJWAL UPADHYAY, PRERANA MUKHERJEE (SUBMITTED TO IEEE SPL 2020)

AUGUST 2020

### Video-AggNet: Fine-grained aggressive activity recognition in the wild

UJJWAL UPADHYAY, PRERANA MUKHERJEE, ANUPAMA RAY, RITU GARG (SUBMITTED TO ICME 2021)

AUGUST 2020

### Indian EmoSpeech Command Dataset

SUBHAM BANGA\*, UJJWAL UPADHYAY\*, ANIKET SHARMA\*, PIYUSH AGGRAWAL\*, PRERANA MUKHERJEE (SUBMITTED TO COMPUTER SPEECH & LANGUAGE JOURNAL)

NOVEMBER 2019

### Heartrate Detection using Camera

UJJWAL UPADHYAY (PUBLISHED AT INTEL SOFTWARE INNOVATORS MEDIUM PUBLICATION)

JUNE 2019

### Knowledge Distillation using Keras

UJJWAL UPADHYAY (PUBLISHED AT INTEL DEVELOPER ZONE)

AUGUST 2018

## Technical Skills

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**Programming Languages** Python • Go • C • C++ • R • Javascript • Bash • Matlab • SQL • LATEX • Julia • Java • Coq  
**Software & Packages** Pytorch • Tensorflow • Keras • OpenVino • React.js • Scikit Learn • OpenCV

## Extracurricular

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### NeurIPS 2020

VOLUNTEER

Remote

NOVEMBER 2020

- Helping in organizing NeurIPS 2020 and managing individual online sessions for research papers, workshops & poster sessions.

### ICML 2020

VOLUNTEER

Remote

JULY 2020

- Helped in organizing ICML 2020 and manage individual online sessions for research papers, workshops & poster sessions.

### Intel AI Society

FOUNDER & PRESIDENT

New Delhi, India

MARCH 2018 - JULY 2020

- Founded the society focusing on Artificial Intelligence and building network on and off campus.

### HackTillEnd

HEAD EVENT-MANAGER

New Delhi, India

OCTOBER 2018

- Organized AI themed hackathon which saw participation of 1000+ students all across India.

## References

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**Dr. Aakanksha Chowdhery**, Software Engineer - ML

Google Brain, CA, USA

**Dr. Prerana Mukherjee**, Assistant Professor

JNU, India

**Dr. Anupama Ray**, Research Scientist

IBM Research, India

**Dr. Ritu Garg**, Computer Vision Engineer

Intel Corp., India

**Dr. Manoj Sharma**, Associate Professor

BVCOE, India