Uddeshya Upadhyay

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Github: https://github.com/udion || Google Scholar

Education

Indian Institute of Technology, Bombay
(B.Tech + M.Tech) Computer Science and Engineering, 8.62/10 *2015–2020*

Kendriya Vidyalaya, Ambernath
All India Senior School Certificate Examination, 95.4% *2015*

Kendriya Vidyalaya, Ambernath
All India Secondary School Examination, 10/10 *2013*

Work Experience

AI Scientist **Bangalore**
Synapsica (Y Combinator-2020) *Nov, 2019–present*
- Working on ML based products for Spinal MRI and Digital Motion X-ray (DMX) analysis
- Building state-of-the-art Bayesian Deep Learning (DL) based models for mensuration analysis of Radiographs
- Developed domain-adaptation (DA) based techniques to train DL models with limited data

Global Alpha Researcher **Mumbai**
Trexquant Investments *Nov, 2017 – Mar, 2018 || July, 2019 – Nov, 2019*
- Developed machine-learning algorithms to filter and assign weights to thousands of proprietary return forecasts of stocks across various markets in USA, Canada (CN), Europe (EU), and Japan (JP) in Trexquant's database

Publications and Preprints

MICCAI, ISBI are among top 3 premier international conferences for medical image analysis
* represents equal contribution

- **Uncertainty-aware Robust Ultra Low-dose to Standard-dose PET Image Prediction using Physics-based Loss and MRI Information** [manuscript under-preparation]
  Viswanath. S*, **Uddeshya. U***, Gary F. Egan, Zhaolin. C, Suyash P. Awate
  IEEE Journal of Biomedical and Health Informatics ***(IEEE JBHI)***

- **GAN QUEST: Generative Adversarial Network with Quasi-norm based Uncertainty Estimation - Applications in Medical Imaging** [under review, *preprint available on request*]
  Uddeshya. U*, Viswanath. S*, Suyash P. Awate

- **QUEST for MEDISYN: Quasi-norm based Uncertainty ESTimation for MEDical Image SYNthesis** [paper]
  Uddeshya. U*, Viswanath. S*, Suyash P. Awate, *International Conference on Machine Learning - Workshop on Uncertainty and Robustness in Deep Learning* **(ICML-UDL), 2020**

- **Compact Representation Learning using Class Specific Convolution Coders - Application to Medical Image Classification** [paper]
  Uddeshya. U, Biplab. B, *IEEE International Symposium on Biomedical Imaging* ***(IEEE ISBI), 2020***
  (Accepted as full-length contribution), Iowa, USA, April-2020

- **A Mixed Supervision Multilevel GAN framework for Image Quality Enhancement** [paper]
  Uddeshya. U, Suyash. P. Awate, *Medical Image Computing and Computer Assisted Intervention* ***(MICCAI), 2019***
  ***MICCAI Undergraduate Student Travel Award*, Shenzhen, China, October-2019**

- **Spinal Stenosis Detection in MRI with Modular Coordinate Convolutional Attention Network** [paper]
  Uddeshya. U, Badrinath. S, Meenakshi. S, *IEEE International Joint Conf. on Neural Networks* ***(IEEE IJCNN), 2019***
  (Full oral presentation), Budapest, Hungary, July-2019

- **Robust Super-Resolution GAN, with Manifold-based and Perception Loss** [paper]
  Uddeshya. U, Suyash. P. Awate, *IEEE International Symposium on Biomedical Imaging* ***(IEEE ISBI), 2019***
  ***In top 10 papers eligible for Best Paper Award*, (Full oral presentation), Venice, Italy, April-2019**

- **Transformer Based Reinforcement Learning For Games**
  Uddeshya. U, Nikunj. S, Sucheta. R, Mayanka. M, ***arxiv.org/abs/1912.03918***

- **Removal of Batch Effects Using Generative Adversarial Networks**
  Uddeshya. U, Arjun. J, ***arxiv.org/abs/1901.06654***

Last updated on July 17, 2020

Selected Awards and Honors

- **"Best Paper Award"** finalist at IEEE Int. Symp. Biomedical Imaging (ISBI) conference, 2019
- Awarded **"MICCAI Undergraduate Student Travel Award"** for MICCAI, 2019
- Awarded **branch change to Department of Computer Science and Engineering** by IIT-Bombay for **exceptional academic performance**, 2015-16
- Received a certificate of merit and a letter of appreciation from the honorable **HRD Minister of India (Smt. Smriti Irani)** for **exceptional performance** in the **CBSE AISSCE**, 2015
- Received **Kishore Vaigyanik Protsahan Yojana (KVPY)** Scholarship, instituted by the Department of Science and Technology, Govt. of India, with **All India Rank 299** out of **60,000** Candidates, 2014

Teaching Assistant Experience

Teaching Assistant **IIT-Bombay**
Medical Image Computing *Spring-2019*
- Responsibilities include designing assignments, solving problems and doubts of students, conducting and grading exams

Teaching Assistant **IIT-Bombay**
Fundamentals of Digital Image Processing *Autumn-2019*
- Responsibilities include designing assignments, solving problems and doubts of students, conducting and grading exams

Teaching Assistant **IIT-Bombay**
Physics of Biological Systems: NPTEL *Autumn-2019*
- Responsibilities include helping video editor to develop content for online platform, setting assignments, solving problems and doubts in weekly tutorials, conducting and grading exams

Teaching Assistant **IIT-Bombay**
Quantum Physics and Applications *Autumn-2016*
- Responsibilities included solving problems and doubts in weekly tutorials, conducting and grading exams

Research and Internship Experience

Research Intern **Tokyo, Japan**
***Honda Research Institute**, Supervisor: Dr. Eric Nichols* *Summer-2018*
- Worked on deep learning models for sequential tagging problems in NLP and unsupervised language models
- Developed experimental model to extract character level features using capsule network for NER
- Proposed residual connection based algorithms for NLP, inspired by computer vision tasks achieving competitive results on POS tagging, but faster than RNN based methods

Research Intern **Singapore**
***NTU-Singapore**, Supervisor: Prof. Anupam Chattopadhyay* *Summer-2017*
- Designed and implemented a library capable of performing various side channel attacks such as Correlation Power Analysis, Template Attacks, Differential Power Attack, Mutual Information Attack on block ciphers
- Performed template attacks from power traces with templates obtained by modeling traces as Multivariate Gaussians

Research Intern **Bangalore**
Synapsica *Winter-2018*
- Developed a novel multi-stage deep learning solution leveraging *coordinate convolutions* to detect spinal stenosis using axial MRI scans of spinal cord (***research work accepted at IEEE IJCNN-2019***)
- Implemented unsupervised method based on template matching to locate lumbar disks in sagittal spinal MRI
- Developed a user friendly web interface using Django, HTML, CSS to host the trained model for inference in real time

Deep Learning Intern **Mumbai**
Fractal Analytics *Winter-2017*
- Implemented real time face detection and recognition module in python using deep learning model FaceNet
- Used Multi-task Cascaded Conv-Nets (MTCNN) as face detection module to extract faces in real time
- Implemented ensemble of Xgboost, SVM and feed forward networks to achieve 93.7% classification accuracy for 150+ people

R&D Thesis-1 **ViGIL, IIT-Bombay**
Supervisor: Prof. Arjun Jain *Spring-2017*
- Implemented a novel architecture to recognize actions of humans in video using 3D and 2D pose estimates by processing 2D projections of pose in stacked Bi-LSTM network
- Trained model to achieve action recognition accuracy of 82.57% on video dataset of 17 different actions

Key Projects

Transformer-RL **IIT-Bombay**
Using Transformers in Deep Reinforcement Learning, [code] *Autumn-2019*
- Proposed a deep reinforcement learning framework (Transformer-RL) leveraging transformers instead of RNN (LSTM)
- Implemented Transformer-RL in PyTorch and performed benchmarking on Partially Observed Markov Decision Process (POMDP)

XTBTorch **IIT-Bombay**
Tuberculosis detection in X-ray scans using deep learning, [code] *Autumn-2018*
- Implemented a deep residual network to detect tuberculosis from a public repository of X-ray scans

Neurapse **IIT-Bombay**
Neuromorphic Engineering, [code] *Autumn-2018*
- Developed open source library Neurpase for Simulating spiking neural networks
- Implemented neuronal models such as LIF, AEF, Hodgkin-Huxley, Izhikevich
- Implemented Spiking Neural Network models with different STDP rules, complex models like Dynamic Random Networks

Texture Optimization Synthesis **IIT-Bombay**
Digital Image Processing, [code] *Autumn-2017*
- Implemented a classic texture synthesis algorithm based on energy optimization of samples
- Implemented EM optimization technique to optimize energy equation at every step in multi-level synthesis
- Improved proposed algorithm by processing the **YCbCr** channel to cut running time by one-third while preserving quality

Zypher **NTU-Singapore**
Research Internship, [code] *Summer-2017*
- Developed an open source library in JULIA to perform side channel attacks on block cyphers
- Implemented attacks such *correlation power attacks*, *template attacks* on the power traces from cyphers

Zick: Messenger Chatbot **IIT-Bombay**
Hack U, Yahoo Japan, [code] *Spring-2017*
- Designed chatbot for facebook's messenger application which can recommend movies, songs and articles to users
- Implemented back-end in python and hosted it on heroku server as heroku app

Technical Skills

- **Programming Languages:** C, C++, Python, Matlab, Julia, Octave, TeX
- **Web & APIs:** HTML, CSS, Javascript, Django
- **Tools & Libraries:** Tensorflow, Pytorch, Keras, FluxML, git

Course Works

Some of the relevant course works completed as part of my studies at IIT Bombay
- **Maths:** Linear Algebra, Multivariate Calculus and Differential Equations, Probability and Statistics
- **Machine Learning/ Deep Learning:** Data Analysis and Interpretation, Fundamentals of Machine Learning, Artificial Intelligence, Digital Image Processing, Medical Image Computing, Computer Vision, Machine Learning for Remote Sensing
- **Physics:** Introduction to Quantum Mechanics and Applications, Introduction to Thermal and Statistical Physics, Physics of Biological Systems, Classical Mechanics, Fundamentals of Quantum Mechanics

References

- Prof. Suyash Awate, IIT-Bombay (*Available on request*)
- Prof. Biplab Banerjee, IIT-Bombay (*Available on request*)
- Prof. Anupam Chattopadhyay, NTU-Singapore (*Available on request*)
- Dr. Eric Nichols, Honda Research Institute-Japan (*Available on request*)