

Research Interests

, I am broadly interested in the field of machine learning, especially Deep Learning, Bayesian Machine Learning and their applications in Computer Vision and Natural Language Processing.

Education

2015(Ongoing) **IIT Kanpur, India**, *B.Tech - Computer Science*, City, 9.23/10.

2013–2015 **Vijay Verghiya Bal Vidyalaya, AISSCE (CBSE)**, 93.8%.

2013–2015 **DPS Rewari, AISSE (CBSE)**, 10.0/10.0.

Research Experience

- December **IIT Kanpur**, mentored by *Prof Vinay Namboodiri*, Kanpur.
- 2016–Present Generating multiple depth maps from a monocular images
- Proposed a novel technique to produce multiple depth maps of a scene from training on just a couple of images.
 - Created an artificial dataset from scratch on Unreal Engine 4 and extracted Depth Maps, comprising 4 scenes.
 - Produced excellent qualitative results on KITTI dataset, showing the technique's ability to work on real datasets.
 - This work is presently under review.
- May **Yodlee**, mentored by *Dr Om Deshmukh*, Bangalore.
- 2017–July Instance Selection in Big Data.
- 2017
- Developed an Instance Selection method that will enhance generalizability of company's other M.L. models.
 - Used a novel on-line clustering technique with growing number of clusters to tackle the problem of Big Data, making it lightweight in terms of computation power and memory.
 - Scaled the model at Industry Standards with spark for parallelization and Amazon Web Services.

Key Projects

- January **Improving Variational Inference Models via Normalizing Flows**, Mentored by Prof. Piyush Rai.
- 2016–April **Code*** | **Arxiv***
- 2017
- Generated richer latent representations in Variational Auto-encoders suited to data from different classes.
 - Implemented Variational Auto-encoders with Normalizing Flows for generating MNIST handwritten digits.
 - Surveyed Various other Techniques for Variational Inference, overcoming the mean field assumption.
- August 2016 - **Interactive Bayesian Document Clustering**, Mentored by Prof. Piyush Rai.
- November **Code*** | **Report***
- 2016
- Built a clustering model invoking user feedback through a cycle of rejection, acceptance or ignoring the clusters.
 - Employed a prior over Gaussian likelihood, down-weighting rejected clusters and vice-versa for accepted ones.
 - Implemented it to cluster documents according to the topics contained in them, extracted through LDA.
- December **AUV-IITK (Autonomous Underwater Vehicle)**, *Computer Vision Lead*.
- 2015 - **Code*** | **Report*** | **Website***
- December
- The aim of the project is to build Institute's first AUV. The vehicle is capable of following distinctly-colored lines, shoot torpedoes and drop markers autonomously using sensor data and computer vision, which has been integrated using Robot Operating System (ROS), used for the first time by a team in IIT Kanpur.
 - Constructed the whole Computer Vision Package for AUV-IITK from preprocessing to object detection.
 - Integrated shape based Pose Detection algorithms i.e. SIFT and SURF, on top of color based outline detectors.
 - Leveraged the power of Intel i7 NUC, by using Convolutional Neural Nets implemented using Tensorflow.
- 2016
- February **Sentimental Analysis and Handwriting Recognition**.
- 2016 - April **Code*** | **Presentation***
- 2016
- Classified movie reviews dataset part of NLTK corpus using Naive Bayes Algorithm with 79% Accuracy .
 - Implemented face recog. using Eigen Faces on 'Labeled faces in the wild' with PCA dimensionality reduction.
 - Performed Handwriting Recognition on MNIST dataset via feed-forward neural net, achieving 96% accuracy.
 - Experimented with quadratic, cross entropy and softmax loss functions to improve classification accuracy.

Seminars and Talks

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|--------------|--|---|
| August 2017 | Producing Depth Maps from Images | <i>Machine Learning Research Day IITK Presentation*</i> |
| October 2016 | Hidden Markov Models for Speech Recognition | <i>IIT Kanpur Presentation*</i> |
| March 2016 | Computer Vision for Robotics | <i>Google Dev Group IITK Presentation*</i> |

Awards and Fellowships

- 2017 **Academic Excellence Award IIT Kanpur.**
Award given to top 5% academic performers in the department
- 2016 **First runner-up at SAVE-NIOT**, Debut Attempt of Team AUV-IITK.
National Level Autonomous Underwater Vehicle Competition held at NIOT Chennai
- 2016 **Goldman Sachs Quantify**, Secured a rank of 74.
National level Competition organized by GS with real-world Machine Learning problems
- 2015 **JEE Advanced**, Secured AIR 190 out of 150k students qualified through JEE Mains..
- 2015 **JEE Mains**, Scored 305/360 (99.99 percentile).
- 2015 **KVPY Fellowship.**
KVPY fellowship given to only **400** students in science stream from all over India by Indian Institute of Science.
- 2015 **AISSCE (CBSE)**, *Received Merit Certificate in Mathematics.*
Award given to top .1% students in class XII examinations nationwide.
- 2013 **AISSE (CBSE)**, *Received Merit Certificate in Class X CBSE Board.*
Award given to top .1% students in class XII examinations nationwide.

Relevant Courses

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| Bayesian Machine Learning | Linear Algebra | Data Structures and Algorithm |
| Machine Learning Techniques | Differential Equations | Logic in Computer Science |
| Introduction To Computing | Computer Organization | Probability and Statistics |

Programming Skills

Torch • Tensorflow • Spark • Amazon Web Services • Unreal Engine • MATLAB/Octave • CUDA • Shell Scripting • ROS • OpenCV • Github • Arduino IDE • L^AT_EX • R • HTML/CSS • C++ • Python • MIPS • Solidworks • Autocad

Extra-Curricular Activities

- March 2017 - **Editor, VOX POPULI**, *Journalism body of IIT Kanpur, website.*
Present
 - o Fulfilled my goal of bringing Vox closer to people by publishing content voicing opinions of campus community.
 - o Led articles on pressing issues like problems of PhD students, effect of coaching on IIT undergrads, and more.
 - o Brought Vox to a larger scale by authoring article that got published on **Business Insider** and **Times of India**.
- 2016 - 2017 **Secretary , Robotics Club.**
 - o Active member of the club with numerous contributions towards the day to day functioning of the club.
 - o Prepared a voice recognition Robot for SnT day 2016 that actuates its motors through voice navigation.
 - o Presented AUV-IITK to reporters and professionals at Techkriti 2015, the annual Technical fest of IIT Kanpur.
- 2016 - 2017 **President's Nominee Minimum Wage Monitoring Committee.**
 - o Took the initiative to reduce **child labor** as present in hall canteens and resolved contractor-worker conflicts.