

## Research Interests

, I am broadly interested in the field of machine learning, especially **Deep Learning**, **Probabilistic 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 **Undergraduate Thesis, 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, training on as few as a couple images of a scene.
- Produced **better** results than any existing method on real and artificial datasets.
- This work is presently **under review**. Hence a lack of detail.

May **Yodlee**, mentored by Dr Om Deshmukh, Bangalore.

2017–July Instance Selection in Big Data.

- 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.
- We have filed a **patent** for this work.

## Key Projects

January **Improving Variational Inference Models via Normalizing Flows**, Mentored by Prof. Piyush Rai.

2016–April **Code\*** | **Arxiv\***

- 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\***

- 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\***

- 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 pre-processing 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.

February **Sentimental Analysis and Handwriting Recognition**.

2016 - April **Code\*** | **Presentation\***

- 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

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

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<sup>A</sup>T<sub>E</sub>X • 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.