Siddhartha Saxena

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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 2016–August 2017 **Undergraduate Thesis, IIT Kanpur**, *mentored by Prof Vinay Namboodiri*, Kanpur.

Generating multiple depth maps from monocular images

- Proposed a **novel** technique to produce multiple depth maps, training on as few as a couple images of a scene.
- Used a Sequential Adversarial Network to learn a translation in Depth Space, transforming one depth map to another plausible depth map. Producing **better** results than any existing method on the vkitti dataset.
- Created an artificial dataset consisting images specifically produced for this problem to benchmark the model.

May 2017–July 2017 **Yodlee**, *mentored by Dr Om Deshmukh*, Bangalore.

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

September 2017–Present **Person recognition via Mixture of SVM classifier**, Mentored by Prof. Piyush Rai.

- Formulated a novel probabilistic mixture of SVM experts (MoSVME) model that can classify non-linear data without Kernels in an end-to-end fashion.
- Working on a model for person recognition that can use the aforementioned MoSVME to classify people learned features of body parts using ConvNets.

January 2016–April 2017 **Improving Variational Inference Models via Normalizing Flows**, Mentored by Prof. Piyush Rai.

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 - November 2016 **Interactive Bayesian Document Clustering**, Mentored by Prof. Piyush Rai.

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-weighing rejected clusters and vice-versa for accepted ones.
- Implemented it to cluster documents according to the topics contained in them, extracted through LDA.

December 2015 - December 2016 **AUV-IITK (Autonomous Underwater Vehicle)**, *Computer Vision Lead*.

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 2016 - April 2016 **Sentimental Analysis and Handwriting Recognition**.
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 **Producing Depth Maps from Images** *Machine Learning Research Day IITK* | *Presentation**

October 2016 **Hidden Markov Models for Speech Recognition** *IIT Kanpur* | *Presentation**

March 2016 **Computer Vision for Robotics** *Google Dev Group IITK* | *Presentation**

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 • LaTeX • R • HTML/CSS • C++ • Python • MIPS • Solidworks • Autocad

Extra-Curricular Activities

March 2017 - Present **Editor, VOX POPULI**, *Journalism body of IIT Kanpur*, **website**.
- Fulfilled my goal of bringing Vox closer to people by publishing content voicing opinions of campus community.
- Led articles on pressing issues like problems of Ph.D. students, effect of coaching on IIT undergrads, and more.
- Brought Vox to a larger scale by authoring article that got published on **Business Insider** and **Times of India**.

2016 - 2017 **Secretary , Robotics Club**.
- Active member of the club with numerous contributions towards the day to day functioning of the club.
- Prepared a voice recognition Robot for SnT day 2016 that actuates its motors through voice navigation.
- 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**.
- Took the initiative to reduce **child labor** as present in hall canteens and resolved contractor-worker conflicts.