Aditya Kusupati

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RESEARCH INTERESTS
Resource Constrained Machine Learning
Applied Machine Learning: Search and Vision

CURRENT POSITION
Microsoft Research India *June 2017 - Present*
Research Fellow, MLO Group Advisor: Dr. Manik Varma

EDUCATION
Indian Institute of Technology Bombay *2013 - 2017*
Bachelor of Technology (Honours)
- Cumulative GPA: 8.63/10.0
- Major: Computer Science and Engineering
- Minor: Electrical Engineering

RESEARCH EXPERIENCE

Resource Constrained Machine Learning *June 2017 - Present*
Advisor: Dr. Manik Varma [Open Source]
Working on state-of-the art machine learning methods and trying to deploy them onto IoT devices with RAM as small as 2KB. Implemented Bonsai algorithm for Open Source Release and currently working on Federated Learning and Deep Neural Networks for IoT scenario.

Efficient Spatial representation for Entity-Typing *July 2016 - May 2017*
Undergraduate Thesis, IIT Bombay [Informal Report]
Advisor: Prof. Soumen Chakrabarti
Entity-Typing is a problem to be addressed in order to make keyword search effective. We worked on learning spatially bounded embeddings using type hierarchy from Knowledge Graph and context from the Corpus for better representation and understanding of entity-types in a multi-dimensional hyperspace thus using for Knowledge Base Completion and query answering.

Poisson Denoising with Dictionary Learning *June-Nov 2016*
R&D Project, IIT Bombay [Report]
Advisor: Prof. Suyash Awate
Denoising of images with low SNR is vital for the Medical Vision. We worked on a dictionary learning based denoising technique. Apart from the dictionary learning we have incorporated methods of sparse and non-negative encoding along with regularization constraints to obtain desirable dictionaries for image reconstruction. The results are promising and showed significant improvement over Gaussian prior model.

Enhancement of Gradient Boosting Machines for Big Data *May-July 2016*
Research Internship, American Express Big Data Labs, Bangalore [Slides]
Advisors: Madhan RA and Dr. Vishwa Vinay
Gradient Boosting Machines are a popular choice for classification problems. Given Big Data, we had to speed up the algorithm without significant decrease in accuracy. Various Binning strategies and Stochastic Sub-Sampling proved out to be outstanding methods for achieving the same along with an raise in accuracy. Finally we had a speed-up factor of 2 along with significant improvement in the performance metrics.

Polymorphic anisotropic metric for surfaces *May-July 2015*
Research Internship, TITANE team, Inria Sophia Antipolis [Report]
Advisor: Prof. Pierre Alliez
Mobile computing devices being the future(IoT) we needed a faster and approximate metrics to reconstruct the surface using meshing with a lower cost. We proposed a stochastic optimisation based technique for shape approximation. Final implementation resulted in anisotropic metrics for surface meshes based on largest inscribed canonical primitives. This resulted in speed up of about 10 times for the mesh generation using quadrilateral primitives.

DEVELOPMENT EXPERIENCE	**AutoPerf** - **Scalability and Stability Improvement**	*Jan-May 2016*

DEVELOPMENT EXPERIENCE

AutoPerf - **Scalability and Stability Improvement**   *Jan-May 2016*

R&D Project, IIT Bombay   [Slides]

Advisor: Prof. Varsha Apte

AutoPerf is a load-generator that requires minimal input and configuration from the user, and produces a comprehensive capacity analysis as well as server-side resource usage profile of a Web-based distributed system, in an automated fashion. We worked on the single-node and multi-node scalability along with the stablity and robustness of the server side profiler by contributing accurate measuring methods for various system resource usage in a distributed system.

SCHOLASTIC ACHIEVEMENTS

- All India Rank 44 in JEE Advanced 2013 among 150,000 candidates   *2013*
- Scored 99.99 percentile in JEE Main 2013 Paper I among 1.3 million candidates   *2013*
- Scored 100.0 percentile in JEE Main 2013 Paper II among half a million candidates   *2013*
- Among top 40 students who attended the OCSC for International Chemistry Olympiad and was awarded with Gold medal and Certificate of Merit   *2013*
- Prestigious KVPY Fellowship from Government of India - All India Rank 22   *2011*
- Prestigious NTSE Scholarship from Government of India   *2008*
- Represented India in the SAARC level of the IGNOU-UNESCO Science Olympiad   *2011*
- Among top 1% (300) students in India in Chemistry, Astronomy and Junior Science National Olympiads   *2009, 2011, 2012*

POSITIONS OF RESPONSIBILITY

- Undergraduate Teaching Assistantship
  - One of the only 2 students to be awarded TA of the month award twice during the period of 2015-2017
  - Digital Logic Design   *Spring 2017*
    * Lab supervision and evaluation for a batch of 120 students
    * TA of the month award (14 out of 480 TAships for academic year 2016-17) by CSE, IIT Bombay for the efforts   *Feb 2017*
  - Software Systems Lab   *Autumn 2016*
    * Design of Labs and guidance for a batch of 120 students including project evaluations
  - Digital Logic Design   *Spring 2016*
    * Lab supervision and evaluation for a batch of 100 students
    * TA of the month award (14 out of 480 TAships for academic year 2015-16) by CSE, IIT Bombay for the efforts   *Feb 2016*
  - Computer Programming and Utilisation   *Autumn 2015*
    * Lab supervision and logistics handling for 90 students
  - Computer Programming and Utilisation   *Spring 2015*
    * Design of questions papers & handouts for a batch of 500 students
- Department General Secretary, CSE, IIT Bombay   *2016-17*
  - Elected academic representative responsible for various activities and initiatives conducted for the students over the year
- Exchange Buddy, International Relations, IIT Bombay   *Autumn 2016*
  - Responsible for facilitating hassle-free stay of assigned foreign exchange student
- Internship Coordinator, Placement Cell, IIT Bombay   *2015-16*
  - Played a key role in career development of students though internships and handled the requests from companies along with logistics

RELEVANT ELECTIVES

- Computer Graphics
- Algorithms for Medical Image Processing
- Fundamentals of Digital Image Processing
- Special topics in Network Algorithms [Ranked 1st out of 10]
- Information Retrieval and Web Mining [Ranked 5th out of 40]

- Organization of Web Information [Ranked 1st out of 20 in theory]
- Computer Vision
- Digital Geometry Processing
- Information Theory & Coding

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<tr><td>SELECTED
ACADEMIC
PROJECTS</td><td>

Gloss: A Continuous Contextual Shape Descriptor *Spring 2017*
Digital Geometry Processing, Prof. Siddhartha Chaudhuri [Report]
We tried to get the power of word embeddings using context into the scene analysis so as to help predict various properties of a 3D scene with multiple objects and there by help in various tasks like decorative suggestions, auto completion of scenes etc.,

Classification in Social Networks based on Activity in Politics *Spring 2017*
Organization of Web Information, Prof. Soumen Chakrabarti [Report]
We tried to predict the political alignment of each person in the social network based on their activity and social circle along with the influences they might have on them. We were able to show certain clear cut demarcations in the alignment so as to do targeted campaigning and advertising.

Camera Calibration using Vanishing Points *Spring 2017*
Computer Vision, Prof. Ajit Rajwade [Report]
We attempt to implement the camera calibration algorithm specified by : Camera calibration from vanishing points in images of architectural scenes authored by R. Cipolla, T. Drummond, D. Robertson. This paper presents a unique method to calibrate a camera given two images taken by it at two different viewpoints and angles

Performance Comparison of Open Virtual Switch with 4x4 switch *Autumn 2016*
Special Topics in Network Algorithms, Prof. Ashwin Gumaste [Report]
Deployed and compared OVS based performance with a normal 4x4 switch implemented on DPDK. Ran the experiments for various traffic patterns and other parameters like lookups, MTU. Studied various limitations and reported the latency for both over various experimental parameters.

Language Assistant using predictive POS tags *Autumn 2016*
Web Search and Mining, Prof. Soumen Chakrabarti [Report]
A predictive POS tagging based technique implemented using the ideas of Language models using RNN(LSTM). POS prediction signal tones down the obscure recommendations which might pop up in a typical language model as the corpus is not expansive enough. Extended language modeling to corpus of POS tags were able to make futuristic prediction.

Restricted C compiler *Spring 2016*
Implementation of Programming Languages, Prof. Amitabha Sanyal
Developed a compiler using Lex and Bison. The input language included most of the basic C features. The output machine language was a limited form of MIPS assembly, with a minimal instruction set and fewer registers. Final implementation included optimizations like short-circuit evaluation, and efficient register allocation using Sethi-Ullman algorithm.

Animation of Star Wars Droids *Autumn 2015*
Computer Graphics, Prof. Parag Chaudhuri [Video]
Using all the principles of Modeling-Viewing pipeline along with hierarchical modeling, created an entire scene based on a story between 3D models of two star war droids(R2D2 and Enemy droid). Implemented camera movement along user specified Bezier curves and used keyboard control to generate keyframed animation.

Mortality Prediction using Neural Networks *Autumn 2015*
Artificial Intelligence, Prof. Siva Kumar [Slides]
Given a dataset of patients' vitals and labels in ICU, we made online prediction of mortality when admitted to ICUs. We used Stochastic Gradient Descent(SGD) on neural network to make a 95% accurate prediction using scikit-learn, NumPy and theanets in Python.

Internal Algorithms in Database Systems *Autumn 2015*
Database Systems, Prof. N.L.Sarda [Report]
Implemented external merge sort algorithm on ToyDB platform. Made statistical comparison of various metrics between B+ tree based algorithms and external merge sort.Built a CLI platform to allow the user make an informed choice based on various constraints involved.

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Modern Pandit *Autumn 2015*

Database Systems, Prof. N.L.Sarda [Report]

We have built an interactive team formation app for events based on common interests. Along with major functionality, we have implemented many standard social-media features.

UART Design *Spring 2015*

Digital Logic Design, Prof. Ashutosh Trivedi [Slides]

Designed and simulated universal asynchronous receiver / transmitter circuit in Xilinx ISE using VHDL. Designed and implemented Finite State Machines for transmission and retrieval of binary data with sampling.

Relation Prediction in a Corpus *Autumn 2014*

Data Analysis and Interpretation, Prof. Ganesh Ramakrishnan

Made use of an existing knowledge base and special indicators to identify the relation between any country and number present in a given sentence from a corpus using regression analysis. Processed the given sentence to assign a confidence score to the country-number pair using statistical methods like confidence intervals, hypothesis testing and distributions.

Seat Allocation *Autumn 2014*

Software Systems, Prof. Sharat Chandran [Slides]

Implemented modified Gale Shapley algorithm for college admissions in Java and developed a web application using Django framework with multiple features such as authentication, prediction, preference selection, password reset using SMTP.

EXTRA-CURRICULAR

- Secured 1st position in Survive the Rubble competition by Capital One in IIT Bombay *2016*
- Stood 17th in National Finals of Build the Shield competition conducted by Microsoft *2016*
- Ranked 5th in Logic General Championship, IIT Bombay *2015*
- Won 1st prize in Math quiz conducted by Maths & Physics Club, IIT Bombay *2013*
- Won Andhra Pradesh Under-12 Singles and Doubles Lawn Tennis Championship *2008*

REFERENCES Available On Request