

Nilesh Kulkarni

Curriculum Vitae

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Research Interests

Machine Learning, Artificial Intelligence, Natural Language Understanding, Computer Vision, Robotics.

Education

2011–2015 **Bachelors of Technology with Honors in Computer Science & Engineering and Minors in Electrical Engineering,**
Indian Institute of Technology (IIT), Bombay, CPI: **8.77/10.**

Industry Experience

Mar 2016 - ongoing **Natural Language Modelling, Smart Input Panel,**
Research Associate @ Artificial Intelligence Lab,
Software R&D Center, Samsung Electronics, South Korea.
I work on creating language models for English and Korean language using deep learning technologies majorly **recurrent neural nets(RNNs)**. I studied and applied dark knowledge and **transfer learning** to improve word perplexity. Then researched on applying model compression techniques such as **low-rank matrix factorization** and **node weight pruning** to create efficient models. The models are deployed on **mobile devices** which have memory limitations and inference time constraints. This improved on-device **keyboard predictions** and is currently bench-marked to be better than other solutions. The models were trained using **TensorFlow**.

Sept 2015 - Feb 2016 **Music Recommendation System, MILK Music,**
Research Associate @ Artificial Intelligence Lab,
Software R&D Center, Samsung Electronics, South Korea.
I worked on developing a music-genre prediction engine for music tracks. The **genre prediction engine complements collaborative filtering** to serve music recommendations. Extracted useful data from multiple non-standard music meta-data sources. Derived relationships and dependencies between the various music genres. Visualized structure of music genres and designed algorithms for **genre similarity and user customization & de-customization**.

May 2014 - June 2014 **Machine Learning on Big Data,**
Intern @ Big Data Solutions Lab,
Samsung Electronics, South Korea.
I worked on exploring the possibilities for distributed learning with decision trees and random forests. We successfully designed and implemented this algorithm on a Hadoop cluster.

Research Experience

July 2014 - May 2015 **Distributed Linear Programming Boost (LPBoost),**
Undergraduate Dissertation, IIT Bombay.
Mentor: *Prof. Ganesh Ramakrishnan*
My thesis involved developing a **parallel** version for the **LPBoost** algorithm. The method involves two independent paradigms, **data parallelization** and **hypothesis space parallelization**. The formulation for the distributed Master problem was done using **Alternating Direction Method of Multipliers (ADMM)**. This allowed us to dis-entangle various variables in the joint optimization problem. The solution has a single master - multiple slave architecture. The slaves are required to solve the local optimization on the hypothesis/data space independently. Achieved consensus at the master propagating necessary penalties to the slaves. It is implemented in Akka. [Report](#) | [Code](#)

- July 2014 - May 2015 **Kernel Principal Nested Sphere (KPNS)** ,
Undergraduate Research Project, IIT Bombay.
 Mentor: *Prof. Suyash Awate*
 Developed **KPNS** which is a kernel space statistical procedure. It is used to transform set of observations to independent un-correlated spaces called **Principal Spheres**. We achieve better performance on **Model compactness, Dimensionality reduction , Data Classification** [v.s standard methods]. The method derives its benefits from the unit norm kernel. The data lies on an unit hyper-sphere, implying a natural directional sense along the curved spherical surface. [Paper](#)
- May 2013 - June 2013 **Approximate algorithms for exploration using a swarm of robots,**
Algorithms group, Technische Universität, Braunschweig, Germany.
 Mentor: *Prof. Sandor Fekete*
 Researched on problems for unknown area exploration using a robot swarm. I worked on an Approximate algorithms and minimized overall error in navigation and localization with given minimum sensing capabilities of the robots.
- July 2012 - May 2015 **Matsya, Autonomous Underwater Vehicle(AUV),**
Research & Development Project, IIT Bombay.
 Mentor: *Prof. Leena Vachhani & Prof. Hemandra Arya*
 Worked as part of team for design and development of an AUV. The AUV, Matsya, is capable of navigating and performing pre-defined tasks based on the feedback from sensors. Matsya competes at the world's largest Underwater Robotics Competition – Robosub. Funded by **Naval Research Board(NRB), India**
- **Team Leader 2014:** Lead a 40 member team comprising of three divisions: Electronics, Software & Mechanical. Managed operations, logistics, recruitment and knowledge transfer
 - **Software Lead, 2013** Leading a sub-division of 5 members. Involved in development of full system stack to ensure **fail-proof mission execution**
- Semi-Finalist** at Robosub 2012, 2013 & 2014. Recipient of **Institute Technical Color** (9 of 7000), 2014 and **Institute Technical Special Mention** (15 of 7000), 2013 for exceptional technical contributions in field of Robotics. [Technical Paper](#)[Website](#)

Publication

- 2016 **Robust Kernel Principal Nested Spheres.**
 Suyash P. Awate*, Manik Dhar*, **Nilesh Kulkarni***
 Published @ *International Conference on Pattern Recognition (ICPR)*, Cancun, 2016

Academic Achievements

- Secured **All India Rank 77** in IIT-JEE 2011, among 500,000 entrants
- Stood in **Top 1%** (in 30,000 students across India), to appear for Indian National Chemistry Olympiad, 2011 and the Indian National Physics Olympiad, 2011

Academics

- Advanced Courses Linear Optimization, Computer Vision, Image Processing, Medical Image Processing, Artificial Intelligence, Topics in Machine Learning..
- Programming Proficiency C, C++, Java, Python, MATLAB, Scala, Javascript, PHP, HTML, \LaTeX , Django, Bootstrap, Numpy-scipy, Hadoop, Cuda, TensorFlow, Torch, Theano.

Seminars

- Oct 2014 **Generalization and Stability of Learning Algorithms.**
 Mentor: *Prof. Saketh Nath J* [Slides](#)
 Discussed and presented the paper, "**Generalization & Stability**", by Olivier Bousquet & Andr Elisseeff. We discussed about stability of algorithms under Statistical Inference Learning .
- Mar 2014 **Applications of Kalman Filters in Robot Localization.**
 Mentor: *Prof. Pushpak Bhattacharyya* [Slides](#)
 Discussed **Kalman Filters** and their application in Robot Localization and Navigation
- Feb 2014 **Introduction to Robot Operating System: Creating software for Robots.**
- Jan 2014 **Underwater Robotics: Developing AUVs.**

Projects

- Autumn 2014 **Texture Classification and Reconstruction.**
Mentor: *Prof. Suyash Awate* [Report](#)[Code](#)
Worked on **texton dictionary** based learning approach (**The Leung-Malik (LM) Filter Bank**) to model and represent visual textures. Used similarity of texton histograms for texture classification
- Spring 2014 **Virtual Memory for Experimental OS.**
Mentor: *Prof. Dhananjay M. Dhamdhere* [Report](#)[Code](#)
Worked design and implementation for effective handling of Processes. **Memory allocation, Swap space management**, with **Process swap in and out** for input-output operations in a virtual OS.
- Autumn 2013 **Sequence Alignment on GPU's.**
Mentor: *Prof. Bernard Menezes* [Report](#)[Code](#)
Implemented a Sequence Alignment problem on GPU's with parallel version of Needleman-Wunsch algorithm. Investigated Parallel Prefix and Diagonal based approach to solve the problem. Achieved $O(n)$ complexity as compared to $O(n^2)$ in the Serial Version.
- Autumn 2012 **N Body Simulation.**
Mentor: *Prof. Varsha Apte* [Code](#)
Designed a simulation for interaction of particles under intermolecular forces viz., gravitation, electrostatic and nuclear. We used the **Barnes-Hut** Algorithm to optimize computation.

Teaching

- 2014 **Teaching Assistant**, *CS 210 Logic Design*.
- 2013 **Teaching Assistant**, Hands-on workshop conducted by NVIDIA in association with CUDA Center of Excellence, IIT Bombay.

Mentorship & Positions of Responsibility

- 2014-2015 **Department Academic Mentor**, mentored 9 sophomores.
- 2013-2014 **Technical Mentor**, mentored 4 teams on technical projects.
- 2012-2013 **Electronics Club Coordinator**, club catering to hobby electronics @ IIT.

Professional References

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| ○ Jihie Kim
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