

Nilesh Kulkarni

Curriculum Vitae

504, The O'vile Prime, Seochu-2(i)dong, Seochu-gu
Seoul

South Korea

+82 (10) 3338 4844

✉ nileshsatishkulkarni@gmail.com

📄 <http://nileshkulkarni.github.io/>

Interests

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

Education

2011–2015 **B.Tech in Computer Science and Engineering with Honors and Minors in Electrical Engineering**, *Indian Institute of Technology(IIT)*, Bombay, **8.68/10**.

Industry Experience - Software Engineer

March 2016–present **Natural Language Modelling, Smart Input Panel**,
Artificial Intelligence Lab,

Samsung Electronics, Software R&D Center, South Korea.

My work involves creating language models for English and Korean language using deep learning technologies majorly recurrent neural nets(RNNs). Firstly I researched on improving word perplexity by using dark knowledge and transfer learning. Then researched on applying model compression techniques such as low-rank matrix factorization and model pruning to create efficient models. The language models are deployed on mobile devices which have tight memory and inference time constraints. The language models improve on-device keyboard predictions and are currently bench-marked to be better than other solutions present in the market. The models were trained using TensorFlow.

September 2015– **Music Recommendation System, MILK Music**,
Artificial Intelligence Lab,

February Samsung Electronics, Software R&D Center, Seoul, South Korea.

2016 Worked on a genre prediction engine for music tracks. The genre prediction engine complements collaborative filtering while serving music recommendations. Worked on algorithmically joining various data sources into an accurate data source. Derived graph over genres depicting relationships between all genres. The graph was based on music meta-data and genre data collected from various sources on the Internet. It enabled neat visualization of music genres and helped in designing algorithms for genre similarity, specializing and de-specializing.

Research Experience

2014-2015 **Distributed Linear Programming Boost,**
Undergraduate Dissertation, IIT Bombay.

Guide: *Prof. Ganesh Ramakrishnan*

Developed a parallel version for the Linear Programming Boost(LPBoost) algorithm. The method involved two independent paradigms, data parallelization and hypothesis space parallelization. A mathematical formulation to the Master problem was developed using Alternating Direction Method of Multipliers (ADMM). ADMM allows us to dis-entangle various variables in the joint optimization problem, enabling a single master, multiple slave architecture, requiring slaves to solve the local optimization on the local hypothesis/data space independently. ADMM formulation helps to achieve consensus at the master across different slave nodes, propagating necessary penalties to the slaves. The method achieves faster convergences to the global problem. Report

2014-2015 **Kernel Principal Nested Sphere ,**
Undergraduate Research Project, IIT Bombay.

Guide: *Prof. Suyash Awate*

Kernel Principal Nested Spheres (KPNS) is a statistical procedure used to transform set of observations to independent un-correlated spaces called Principal Spheres. KPNS is a kernel method which transforms data using non-linear transformation into the Kernel space, finally finding principal spheres to represent the data. Our methods achieves better performance on Model compactness[v.s KPCA], Dimensionality reduction[v.s KPCA, Multi-Dimensional Scaling, Local Linear Embedding, Laplacian Eigenmaps], Classification[v.s KPCA]. The method derives its benefits from the kernels used which are unit norm and hence the data lie on an unit hyper-sphere(higher dimensional spheres), implying a natural directional sense in the data is along the sphere. KPNS solves a recursive optimization problem of fitting several spheres. Paper

Summer 2014 **Fast Machine Learning for Big Data, Samsung Electronics, South Korea.**

Guide: *Choonoh Lee, Senior Engineer*

Worked on a project on distributed machine learning. My task was to explore the possibilities for distributed learning with decision trees. We successfully designed and implemented the algorithm on a Hadoop cluster. Also, we improved Mahouts, a benchmark machine learning library, implementation of K-Means Clustering, and produced results with better execution time: speed up $6\times$ in Pre-processing and $2\times$ per Iteration.

Summer 2013 **On-line Triangulation and Navigation using a swarm of Simple Robots,**
Algorithms group, Technische Universitat, Braunschweig, Germany.

Guide: *Prof. Sandor Fekete*

Researched on problems for unknown area exploration with limited (K) number of robots namely called Maximum Area Triangulation with K Agents(Robots) & Minimum Robot Area Triangulation. These are approximate algorithms for packing and I contributed to practical aspects of real life problems involving minimizing overall error in navigation and localization with given minimum sensing capabilities of these robots.

2012-2015 **Matsya, Autonomous Underwater Vehicle(AUV),**

Research & Development Project, IIT Bombay.

Guide: *Prof. Leena Vachhani & Prof. Hemandra Arya*

AUV-IITB is an all student team working on the design and development of an AUV; An autonomous underwater vehicle capable of navigating and performing pre-defined tasks based on the feedback from **cameras, IMU (Inertial Measurement Unit), pressure sensor and Doppler Velocity Log (DVL)**. Matsya series of AUVs compete at the world's largest Underwater Robotics Competition – Robosub, conducted by the AUVSI Foundation in Association with US Office of Naval Research held annually in San Diego, California. The project is funded by **Naval Research Board(NRB)**, India

- **Team Leader & Software lead, 2014** Leading a 40 member team comprising of three divisions: Electronics, Software & Mechanical. Managing operations, logistics, recruitment and knowledge transfer in a four-tier cross functional team. Leading projects on DVL based AUV Localization for locating Underwater Acoustic Sources. Currently spent budget for the project is over \$10000.
- **Software Lead, 2013** Leading a sub-division of 5 members. Our system code consists of following modules hardware interfaces, sensor abstractions, simulator, robot navigation and localization, autonomous mission planning and execution; intensive run-time testing was done to ensure fail-proof mission execution, with several systems integrity checks and fall back systems.

Semi-Finalist at Robosub 2012, 2013 & 2014. Journal Paper

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.

Academic Achievements

- Secured **All India Rank 77** in IIT-JEE 2011, among 500,000 entrants
- Certified as among **Top 1%** (among 300 students across India), to appear for Indian National Chemistry Olympiad (INChO), 2011 and the Indian National Physics Olympiad (INPhO), 2011

Seminars

October 2014 **Generalization and Stability of Learning Algorithms**, Guide: *Prof. Saketh Nath J*, [\[Slides\]](#).

Gave a talk on a paper, "Generalization & Stability", by Olivier Bousquet & Andr Elisseeff. We discussed about stability of algorithms under Statistical Inference Learning, the key point of discussion being "How sensitive are your algorithms to the data sets?".

March 2014 **Applications of Kalman Filters in Robot Localization**, Guide: *Prof. Pushpak Bhattacharyya*, [\[Slides\]](#).

Introduced Kalman Filters and then discussed its application specifically in Robot Localization and Navigation

January 2014 **Design and Development of Matsya, a micro-AUV** , Guide: *Prof. Leena Vachhani*.

A talk on developing low cost AUVs and other underwater systems.

February 2014 **Introduction to ROS: Robot Operating System**, [\[Slides\]](#).

This was an introductory talk about Robot Operating System. The primary focus was to develop clean software for autonomous systems. This talk also discussed the current software architecture of Matsya 3.0

Projects

Autumn 2014 **Texture Classification.**

Guide: *Prof. Suyash Awate*

Designed and implemented image categorization and segmentation based on visual textures through a texon-based learning approach to model and represent visual textures. Supervised Learning performed using SVM's and Decision Tress to create model for the database

Spring 2014 **Virtual Memory for Experimental OS.**

Guide: *Prof. Dhananjay M. Dhamdhare*

We designed and implemented effective data structures and algorithms for handling process memory allocation, swap space management, with process swap in and out on Input Output Operations for Pranali, a virtual OS built on top of Linux.

Autumn 2013 **TeamFlow: Team Management Webapp .**

Guide: *Prof. Umesh Bellur*

Developed webapp to manage teams that supports calendar view of tasks, blogs & reminders. We conceptualized the ER model, normalized the 70+ relations and deployed the system on a Django framework after rigorous testing and optimization using additional indices.

Autumn 2013 **Sequence Alignment on GPU's.**

Guide: *Prof. Bernard Menezes*

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.**

Guide: *Prof. Varsha Apte*

Designed a simulation showing the interaction between different particles under the effect of intermolecular forces like gravity, electrostatic and nuclear. We used the famous Barnes-Hut Algorithm to optimize computation.

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, TensorFlow, Torch, Theano.

Teaching

2014 **Teaching Assistant**, *CS 210 Logic Design.*

2013 **Teaching Assistant.**

GPA -2104

- Among few undergraduates to be a TA for GPU Programming and Applications Workshop (GPA)-2014.
- Guided over 300 enthusiastic learners in a 3 day long hands-on workshop conducted by NVIDIA in association with CUDA Center of Excellence, IIT Bombay

Mentorship & Positions of Responsibility

2014-2015 **Department Academic Mentor.**

Department of Computer Science and Engineering, IIT Bombay

- Responsible for mentoring a group of 9 sophomores of Computer Science and Engineering department regarding their various academic as well as general concerns
- Helping academically struggling students, who are a part of the Academic Rehabilitation Programme, in coping with the curriculum

2012-2013 **Coordinator .**

Electronics Club, IIT Bombay

- Electronics Club is an institute club which caters to interest of students for hobby electronics across the institute.

2013-2014 **Technical Mentor.**

Institute Technical Summer Projects (ITSP)

- Guided and mentored over 4 teams (each with 3-4 students) for doing technical projects on campus aligned towards novel ideas.
- Guided on converting a prototype to product with intricacies and aesthetics involved in development

Professional References

- Prof. Ganesh Ramakrishnan
Associate Professor
IIT Bombay
ganesh@cse.iitb.ac.in

- Prof. Leena Vachhani
Associate Professor
IIT Bombay
leena.vachhani@iitb.ac.in

- Prof. Sándor P. Fekete
Professor
Technische Universität Braunschweig,
Germany
s.fekete@tu-bs.de

- Prof. Suyash Awate
Assistant Professor
IIT Bombay
suyash@cse.iitb.ac.in

- Jihie Kim
Vice President
Artificial Intelligence Lab, Samsung
Electronics, Software R&D Center,
South Korea
jihie.kim@samsung.com