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Nilesh Kulkarni

Research Interests

Machine Learning, Natural Language Understanding,
Computer Vision, Robotics

Education

July 2011 - Aug 2015 **Bachelor of Technology** *Computer Science and Engineering*
Indian Institute of Technology, Bombay (IIT Bombay)
Honors in Computer Science Engineering
Minor in Electrical Engineering
GPA: 8.77/10

Publications

Dec 2016 **Robust Kernel Principal Nested Spheres**
Suyash P. Awate*, Manik Dhar*, Nilesh Kulkarni*
International Conference on Pattern Recognition (ICPR), Cancun, 2016 [link]
* Equal contribution

Industry Experience - Software R&D, Samsung Electronics, S. Korea

Mar 2016 - ongoing **Natural Language Modelling, Smart Input Panel**
Research Associate, Artificial Intelligence Lab
- Designed language models for English and Korean using Recurrent Neural Nets (RNNs)
- Optimized the model for memory and inference time constraints on mobile devices
- Obtained better on-device keyboard predictions benchmarks than existing solutions

Sept 2015 - Feb 2016 **Music Recommendation System, MILK Music**
Research Associate, Artificial Intelligence Lab
- Developed a genre prediction engine for music tracks to complement collaborative filtering
- Built an ontology linking the various music genres from various non-standard meta-data sources
- Designed algorithms for genre similarity to personalize user recommendations

May 2014 - June 2014 **Big Data Analytics for User data**
Intern, Big Data Solutions Lab
- Designed a distributed algorithm for decision trees and random forests
- Deployed algorithms on user data for gender profiling
- Achieved speed up over 6 times compared to existing solutions; deployed on a Hadoop cluster

Research Experience

July 2014 - May 2015 **Distributed Linear Programming Boost (LPBoost)**
Undergraduate Dissertation, IIT Bombay
Mentor: Prof. Ganesh Ramakrishnan
- Designed a distributed LP Boost (D-LPBoost) algorithm.
- Implemented the algorithm over two paradigms: data and hypothesis space parallelization
- Formulated a master-slave solution with each slave working on a subset of hypotheses
- Used Alternating Direction Method of Multipliers (ADMM) to untangle various variables in the joint optimization [report][code]

July 2014 - May 2015 **Kernel Principal Nested Sphere (KPNS)**
Undergraduate Research Project, IIT Bombay
Mentor: Prof. Suyash Awate
- Designed KPNS, a kernel space statistical procedure
- KPNS transforms data to independent un-corelated modes of variation called Principal Spheres
- The method leverages the fact that data lie on an unit sphere (unit-norm kernels)
- Achieved better results in the domains of Model Compactness, Dimensionality Reduction, Data Classification [paper]

May 2013 - June 2013 **Online Triangulation using a Swarm of simple Robots**
Algorithms group, Technische Universitat Braunschweig Germany
Mentor: Prof. Sándor P. Fekete
- Improved algorithms for exploring unkown areas using a swarm of simple robots
- Minimized overall error in navigation and localization, allowing for complicated maneuvers for exploration

July 2012 - May 2015 **Matsya, Autonomous Underwater Vehicle(AUV)**
IIT Bombay & Naval Research Board, India
Mentor: Prof. Leena Vachhani & Prof. Hemandra Arya
- Developed an Autonomous Underwater Vehicle to compete at International Robosub
- **Team Leader** - 2014:
  - Led a 40 member team comprising of three divisions: Electronics, Software & Mechanical
  - Managed operations, logistics, recruitment and knowledge transfer
- **Software Leader** - 2013:
  - Led a sub-division of 5 members
  - Involved in development of full system stack to ensure fail-proof mission execution
- 3 time Semifinalists at Robosub [technical paper][website]

Achievements

- Secured **All India Rank 77** in IIT-JEE 2011, among 500,000 entrants
- Certifed as among the **Top 1%** in India, in the Indian National Chemistry Olympiad and Indian National Physics Olympiad, in 2011
- Awarded the Institute Technical Color (7 among 9000), 2014
- Awarded the Institute Technical Special Mention (15 among 9000), 2013

Teaching

2014 **Teaching Assistant** CS 210 Logic Design

2013 **Teaching Assistant** Workshop on Parallel Programming 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 at IIT Bombay

Seminars

Oct 2014 Generalization and Stability of Learning Algorithms [slides]

Mar 2014 Applications of Kalman Filters in Robot Localization [slides]

Feb 2014 Introduction to Robot Operating System: Creating software for Robots

Jan 2014 Underwater Robotics: Developing AUVs

Academics

Advanced Courses Linear Optimization, Computer Vision, Image Processing, Medical Image Processing, Artificial Intelligence, Topics in Machine Learning

Skills C, C++, Java, Python, MATLAB, Scala, Javascript, PHP, HTML, LaTeX, Django, Bootstrap, Numpy-scipy, Hadoop, Cuda, TensorFlow, Torch, Theano

Course Projects

Spring 2015 **Image De-noising and Demosaicing using K-SVD**
Mentor: Prof. Suyash Awate [report][code]
Denoised and Demosaiced image using the dictionary based learning and Orthogonal Matching Pursuit for Optimization

Autumn 2014 **Texture Classification and Reconstruction**
Mentor: Prof. Suyash Awate [report][code]
Modelled visual textures using **texton dictionary** based learning approach (**The Leung-Malik (LM) Filter Bank**) to model and represent visual textures.

Spring 2014 **Virtual Memory for Experimental OS**
Mentor: Prof. Dhananjay M. Dhamdhere [report][code]
Design and implementated algorithms for effective processes handling; supports memory allocation, swap space management and process swapping for I/O 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 approaches 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.

References

- Jihie Kim
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- Prof. Suyash Awate
  Assistant Professor,
  Computer Science and Engineering,
  IIT Bombay
  suyash@cse.iitb.ac.in
- Prof. Leena Vachhani
  Associate Professor,
  Systems and Control Engineering,
  IIT Bombay
  leena.vachhani@iitb.ac.in
- Prof. Ganesh Ramakrishnan
  Associate Professor,
  Computer Science and Engineering,
  IIT Bombay
  ganesh@cse.iitb.ac.in
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  Computer Science Department,
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