Navin Chandak

Curriculum Vitae

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Applying for Master's in Computer Science

Interests

Primary Machine Learning, Information Retrieval, Deep Learning

Additional Natural Language Processing, Cryptography and Security, Systems

Academic and Professional Career

2015-Present **Software Engineer**, *Google London*, Rating: Exceeds Expectations.

2011–2015 **B.Tech in Computer Science and Engineering with Honours, and Minor in Applied Statistics and Informatics**, *Indian Institute of Technology Bombay*, GPA: 9.42/10.

2011 **Higher Secondary Examination**, *Delhi Public School*, Rourkela, 96.4%.

Publications

T. Schnabel, A. Swaminathan, A. Singh, N. Chandak, and T. Joachims, "Recommendations as treatments: Debiasing learning and evaluation," in Proceedings of the 33nd International Conference on Machine Learning, ICML 2016, New York City, NY, USA, June 19-24, 2016, pp. 1670–1679. Link here.

Industry and Research Experience

Oct 2015 - present **AdSense Payments**, *Software Engineer*, Google, London.
Tech Lead: Matthew Clark, Staff Software Engineer

AdSense lets users publish Google's advertisements on their webspaces. Our team aggregates and processes data to calculate the payments to be made to publishers, handles address verification of publishers, and handles all the AdSense interaction with the Billing team. Since large sums of money is involved, our team is very critical and we cannot afford bugs or breakages.

- Completed design of system to let publishers change their country/currency/entity-type by allowing multiple billing accounts per user, without losing access to previous payment and history
- Diagnosed and fixed an instance of wrong PIN mailers being received by publishers because of printing company erro which became a huge PR issue; took multiple remedial steps
- Periodically ran and monitored (fix if needed) the monthly process which pays out AdSense publishers
- Wrote database triggers, propagated using proprietary technology to detect billing state changes
- Brought multiple Google specific technologies to the team codebase
- Served as buildcop, ensuring code health and fighting breakages for entire AdSense team in London
- Took multiple internal courses, attended talks and followed internal product discussions

Summer 2015 **Debiasing Learning/Evaluation in Recommendation Systems**, *Intern*, Cornell University.
Advisor: Thorsten Joachims, Professor

- Recognize selection bias in evaluation and training recommender systems
- Providing a principled approach to handling selection biases, using casual inference
- Our approach leads to unbiased performance estimators despite biased data, and substantially improved prediction performance
- Theoretically and empirically characterize the robustness of approach

The paper was accepted in International Conference on Machine Learning (ICML) 2016. Link here.

2014-15 **Joint entity discovery and disambiguation**, *Undergraduate Thesis*, IIT Bombay.
Advisors: Soumen Chakrabarti, Professor and *Ganesh Ramakrishnan, Associate Professor*

- Worked on the use of hierarchical non-parametric topic models for entity linking
- Proposed a novel extension of existing methods to alleviate the issue of No Attachment phrases
- Proposed optimizations to existing Gibbs sampling techniques to scale to large corpora like Wikipedia
- Evaluated the proposed algorithm on corpora constructed from Wikipedia and Yago!

Thesis link here.

Summer 2014 **Topical Analysis of Twitter Data**, *IBM Research Lab*, Bangalore.
Advisor: Indrajit Bhattacharya, Research Scientist

- Coded, analyzed & compared parametric and non-parametric topic models for Twitter-based corpus
- Developed framework for topic-model algorithms, allowing single-machine code to be run on clusters
- Optimized Map-reduce Heirarchical Dirichlet Process by employing topic merging and document clustering techniques, leading to sharp drop in number of topics and improved perplexity measures

Summer 2014 **Implementation of Markov Models**, *Google Summer of Code*.
Guide: Ankur Ankan, Developer, PGMPY

- Worked on open-source probabilistic-graphical models library called PGMPY.
- Implemented architecture for Markov Networks, triangulation heuristics, message passing algorithm for MAP & conditional probabilities, and exact & heuristic inference and sampling algorithms
- Followed best practice; wrote documentation and tests; profiled and optimized functions

Winters 2012 **Diet Plan Recommendation System**, *HealthifyMe*, Bangalore.
Guide: Sachin Shenoy, Head of Engineering and co-founder, HealthifyMe

- Implemented a diet plan recommendation system using Django for HealthifyMe users.
- Considered factors like user's past diet, nutritional value of dishes, and target nutrition levels
- Ensured meaningful dish combinations, adequate quantity, and variety & taste using ranking functions

Honours and Awards

Academic

- **Represented India** at the ACM-Inter Collegiate Programming Contest (ACM-ICPC) World Finals 2015 at Marrakech, Morocco, securing **joint-highest rank for India**
- **Ranked $3^{\mathbf{rd}}$** out of 96 graduating students in the Dept. of CSE, IIT Bombay
- Completed the requirements for a minor degree in Applied Statistics and Informatics
- Secured $\mathbf{2^{nd}}$ **rank** at Kanpur onsite regional finals of ACM ICPC 2015
- All India $\mathbf{88^{th}}$ **rank** in IITJEE-2011, taken by about half-a-million students
- All India $\mathbf{41^{st}}$ **rank** and state $\mathbf{1^{st}}$ **rank** in AIEEE-2011 taken by about 1.2 million students
- **State Rank 1** in CBSE Higher Secondary Examinations, among approx 40k students

Olympiads and Scholarships

- **Gold Medal** in Indian National Chemistry Olympiad-2011 for being among top 35 students in India and attended Orientation-cum-Selection Camp at HBCSE, Mumbai
- Awarded Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship by Dept. of Science and Technology, India and attended science camps at IISER, Pune and IISc, Bangalore
- Offered INSPIRE scholarship by Govt. of India, for being in national top 1% in class 12 exam
- Among the **top 300** (top 1%) to appear for the Indian National Physics Olympiad-2011
- One of 8 graduating students to be awarded MVPM scholarship and prize money (50k INR)
- Secured All India **Rank 15** in National Science Olympiad (NSO) 2010 & All India Rank **94** in National Cyber Olympiad (NCO) 2008
- State **rank 1** in Uranium Talent Search Examination-2008, conducted by Govt of Odisha

Seminars/Talks

Fall 2014 **Learning the Kernel with Hyperkernels**.
Guide: Prof. Saketha Nath, IIT Bombay

We presented a research paper which introduced and formalized the idea of learning techniques for kernels used in classification tasks - it did so by proposing a hyperkernel which imposed a reproducing kernel hilbert space on the space of kernels under consideration.

Spring 2013 **Application of POMDPs in Robot Path Planning**.
Guide: Prof. Pushpak Bhattacharyya, IIT Bombay

We presented a seminar introducing Partially observable Markov decision process and then an application to robot path planning: that of modelling spaces as well as uncertainty in measurements using POMDPs.

Summer 2013 **Error-correcting codes**.

Guide: Prof. Rahul Jain, National University of Singapore

I read papers on bounds in ϵ-noisy channels and tree codes in adverserial channels. I also worked on non-negative rank of matrices. I analyzed provably near-optimal algorithms for the same, and the proof of NP-hardness of computing the non-negative rank. I presented these papers before an audience of professors and PhD students.

Key Projects

Fall 2014 **Automatic aggregation of product-reviews and summarization**.

Segregated the topics or aspects of a product, and provided a summary for all these aspects. For instance, battery, display and performance are aspects of a laptop. Aspect extraction was done using unsupervised topic models, LDA to be specific. We segregated sections of text which talked of different topics using these models, parsed text and applied sentiment analysis on descriptors (adjectives, adverbs) to present a summary of sentiment for each aspect of the product.

Fall 2013 **Finding the Best Merge Strategy for External Sort**.

Implemented external merge sort supporting generalized k way merge - as also multi pass merge with different merge ratios in each pass. We simulated external sort for extremely large fields. Further, we applied dynamic programming to find the best merge strategy for large files - the number of passes as well as the ratio of merge in each pass.

Fall 2013 **Jaccard and Contextual Similarity Using Map-Reduce**.

Implemented Jaccard Similarity computation of two documents using the min hash algorithm on hadoop to find similar documents in a corpus. We also implemented the code to find words which are contextually similar using cosine similarity of context vectors in O(N) time

Fall 2013 **CricQ : A Cricket Statistics Query Portal**.

Developed a statistics query portal for the sport of cricket. We conceptualized the ER model, normalized over 70 relations and deployed the system on a PostgreSQL back-end and with a JSP-based UI after rigorous testing. We analyzed the improvement in performance on adding indices and employed the same for efficiency.

Spring 2014 **Record Oriented File System with File Cache**.

Designed an implemented a record oriented file system with efficient data structures for an experimental OS (built and maintained by IIT Bombay). We implemented B+ trees for multi level indexing, developed file access system calls and an independent file cache.

Fall 2012 **Metaheuristcs v/s Conventional Methods on Image Compression**.

Implemented JPEG compression from scratch using Discrete Cosine Transform (DCT) and entropy encoding. We also implemented the vector quantization technique using Neural Networks, with hyperthreading, to deliver another image compression tool. We analyzed, and compared the two methods.

Spring 2012 **Artificial Intelligence Player for Chess**.

Built one player chess, in DrRacket (Lisp) with Xboard as GUI. We employed the Minimax algorithm with alpha-beta pruning and heuristcs to decide the best move. We were awarded highest credit in the batch for this project.

Summer 2012 **Physics Engine**.

Developed code for simulating rectangular rigid blocks in 2-dimensions in real time by implementing the maths and physics equations in Javascript. Demo here.

Courses in field of interest

- Practical ML with TensorFlow*
- Topics in Machine Learning
- Organization of Web Information
- Probabilistic Graphical Models
- Statistical Techniques in Data Mining
- Convex Optimization
- Statistical Thinking*
- Web Mining and Information Retrieval
- Advanced Machine Learning
- Probability Theory
- Organization of Web Information
- Matrix computations

* Google-internal courses

Positions of Responsibility

2014-2015 **Department General Secretarty, CSE**.

- Sole student representative to the Department Undergraduate Committee, the body responsible for instituting academic policies of the department
- Led a team of 12 council members in conducting various socio-cultural activities
- Conducting sessions and competitions, managing course slotting and feedback, addressing grievances

2014-2015 **Mentor, Institute Student Mentor Program**.

- Responsible for guiding 12 freshmen focusing on their academic and holistic development, providing them counsel and helping them adjust to campus life.

2013, 2014 **Problem setter, Techfest Coding Competition**.

- Responsible for setting the questions, test cases and solutions for Techfest International Coding Challenge-2014 and three zonal coding competitions in 2013

2013 **Mentor for Institute Technical Summer Project**.

- Mentored a team of sophmores in building an answer engine like Wolfram Alpha, which answers queries related to professors, students & courses at IIT Bombay. The project was given the 'Best Project' Award

Extra-curricular Achievements

- Developed a bidding portal for IIT Bombay at Yahoo HackU! using PHP, SQL & HTML
- Engineered a wall-following robot at Techfest 2012 and ranked among the top 32 teams
- Secured 2nd rank in the institute in Logic General Championship
- Represented the hostel in coding, squash, debate and tug of war inter-hostel championships
- Secured 1st position in IIT Bombay Freshers Debate Competition
- Awarded 2nd prize for Article-writing at Freshiezza, cultural fest for freshmen at IITB
- Completed a year-long Chinese language course at IITB