Pradyot Prakash

Computer Science

Room 253, Hostel 3
IIT Bombay, Powai
Mumbai, India
+91 7208791160
pp2105@gmail.com
www.cse.iitb.ac.in/~pradyot

Education

2013 - 2017 **B.Tech (Honors) in Computer Science and Engineering and Minor in Applied Statistics and Informatics**, *Indian Institute of Technology, Bombay*,
CGPA: 9.22/10 *after 6 semesters;* ***Minor CGPA: 9.63/10***.

2013 **Higher Secondary Examination**, *Pace Junior Science College*, Navi Mumbai, ***93.83%***.

2011 **Matriculation**, *St. Thomas School*, Ranchi, ***96.14%***.

Interests

Image Processing and Vision, Computational Linguistics, Machine Learning, Cryptography and Security

Publications

Bak, Stanley, Sergiy Bogomolov, Thomas A. Henzinger, Taylor T. Johnson, and **Pradyot Prakash**. "Scalable Static Hybridization Methods for Analysis of Nonlinear Systems." In Proceedings of the 19th International Conference on Hybrid Systems: Computation and Control, pp. 155-164. ACM, 2016. Retrieve from `http://dl.acm.org/citation.cfm?doid=2883817.2883837`

Internships and Research Experience

Ongoing **Sparse Dictionary Learning on Riemannian Manifolds**.
Undergraduate Thesis, IIT Bombay
Prof. Suyash Awate

I am working towards my undergraduate thesis on the problem of sparse dictionary learning on Riemannian manifolds using hyperspheres, for applications in Image Processing. Dictionaries are linear bases which gives us succinct features which are specific to the image dataset. The learned dictionary can be used for tasks such as classification and denoising well. We have obtained good results for these tasks and the next phase of the project to explore the possibility of using dictionaries for more advanced applications, including on medical images is in the pipeline.

Ongoing **Effect of segmentation schemes on translation and transliteration**.
IIT Bombay
Prof. Pushpak Bhattacharyya

The statistical models of machine translation (SMT) had their feet entrenched in the community but recent progress using neural networks has started to uproot this trend. The area of Neural Machine Translation (NMT) has gained prominence recently. My project is in introductory endeavor to observe the effects of various encoding techniques on the task of transliteration. We have started with transliteration because the effect of phrase alignment is less pronounced here. Furthermore, the relatively smaller datasets for Indian languages presents challenges in learning the models well. We have obtained a mixture of positive and negative results and the analysis has shed light as to why some segmentation technique may or may not work for some language pairs. The next phase of the project will focus on tinkering with encoding schemes on the translation task.

Summer 2016 **Brand Personality Prediction**.
Adobe Advanced Technology Labs, Bangalore, India
Prof. Niloy Ganguly, IIT Kharagpur
Anandhavelu N., Senior Researcher, Adobe

Companies want to have a consistent tone and personality for their articles. We built a model for predicting Brands' Personality along 5 personality dimensions of competence, sophistication, excitement, sincerity and ruggedness using textual content of the articles published by brands. These traits, in the marketing literature, try to correlate the personality of a brand with human personality traits. We used linguistic features to build a ML model which calculates the scores for these five traits. Our model outperformed current state-of-the-art accuracies by 19% in the best case along one personality dimension and a minimum improvement of around 8% in the worst case. The overlying goal of this task was to build and automated textual suggestion system for brands' content creators to align brand personality as per their needs and specifications. Awarded **pre-placement offer** from Adobe for the good work done there. Also, the associated **patent** has been approved withing Adobe.

Summer 2015 **Hybridization Methods of Dynamical Systems**.
IST Austria
Prof. Thomas Henzinger

A hybrid automaton has two kinds of transitions: discrete and continuous. Discrete transitions come into picture when the automaton transitions from one mode to another. Within a particular state, the automaton evolves over time according to some differential equation. The differential equations can be extremely complex and numerical methods become insufficient to solve them. I simplified the state space into hypercubes and approximated them with affine dynamics which could be solved more efficiently. The obtained results were pretty close to the original system. In the default automaton, the transitions occur when the spatial boundary conditions of the state are violated. We explored the possibility of exiting a state when the time spent in a state exceeded a particular threshold. This time based investigation led to our work getting **accepted in HSCC 2016**.

Honours and Awards

Academic

- Awarded AP grade for **excellence** in Calculus and Differential Equations (top 8 out of 880 students) and AA in all other Math courses *2013 - 2014*
- Secured **All India Rank 55** in IIT JEE (Advanced), taken by 150,000 students, and **All India Rank 16** in IIT JEE (Main), taken by over 1.3 million students *2013*
- Awarded **Gold Medal** for being among the top 35 students in Indian National Physics Olympiad (INPhO) *2013*

Scholarships and Others

- Attended winter school on **Interplay Between Statistics and Cryptology** at ISI, Kolkata, India — one out of 3 undergraduate students selected for the workshop from around 50 participants *2014*
- Selected for the **INSPIRE scholarship**, Department of Science and Technology, Govt. of India (among the top 1% in India in Higher Secondary) *2013*
- Awarded the **KVPY Fellowship** by Department of Science and Technology, Government of India *2012 - 2013*
- Attended **Vijyoshi Camp** at Indian Institute of Science, Bangalore (IISc) *2012*

Key Academic Projects

Autumn 2016 **MNIST classification using dictionaries**.
Prof. Suyash Awate, Prof. Ajit Rajwade

- Implemented dictionary learning using Non-Negative Sparse Coding for the classification of MNIST digits

Spring 2016 **Cryptographic Secrecy**.
Prof. Bernard Menezes

- Demonstrated Zero Knowledge Proofs (ZKP) via a web interface for Sudoku
- Did a parallel implementation of the Verifier and the Prover using HTML and JS

Spring 2016 **C-like Compiler**.
Prof. Amitabha Sanyal

- Created a compiler for a subset of C for MIPS32 using flexc++ and bisonc++ using stack for storing results

Spring 2016 **Shell and File Server**.
Prof. Mythili Vutukuru

- Coded up a multi-threaded FTP server with a bash-like shell with basic Linux commands
- Added features like pipe, I/O redirection, signal handling, foreground and background processes

Autumn 2015 **Text Summarizer**.
Prof. Sivakumar G.

- Developed a graph based implementation of the Text Rank Algorithm to extract the most valuable sentences

Autumn 2015 **Buy and Sell Application**.
Prof. Nandlal L. Sarda

- Implemented a database system for a buy and sell portal on PostGreSQL using Java Servlets and JSP Modules with a chat feature between the buyer and seller

Autumn 2014 **Country-Feature Assignment using Supervised Learning** .
Prof. Ganesh Ramakrishnan

- Statistically analyzed English sentences to recognize the relation being described
- Trained a model used for predicting confidence scores for each country-relation assignment

Hackathons and Other Projects

- **Coded an AI for Planet Wars**, for the Google AI challenge 2010
- Built a **snooze alarm Rube Goldberg contraption** using Box2D to wake up a sleeping person
- Implemented the **Gale Shapley algorithm for college admissions** based on multiple merit lists
- Made a **chess solving engine using MiniMax and $\alpha - \beta$ pruning** methods
- Developed a version of the famous **Tetris game in C++** using the FLTK library
- **Designed the UART protocol** using VHDL

Mentorship and Teaching

2016 - 2017 **Institute Student Mentor**.
IIT Bombay

- Responsible for **guiding 12 freshmen** focusing on their academic and holistic development, providing counsel
- Team of 82, selected out of 368 applicants based on peer review and all round performance

2016 - 2017 **Head, Department Academic Mentorship Program**.
Department of Computer Science and Engineering, IIT Bombay

- **Leading a team of 17 motivated mentors** to cater towards the academically weaker students of the department
- **Member of the undergraduate rule making committee** of the department as a student representative

2015 - 2016 **Department Academic Mentor**.
Department of Computer Science and Engineering, IIT Bombay

- **Responsible for mentoring a group of 7 sophomores** of the department with their various academic as well as general concerns
- Helping academically struggling students, who are part of the Academic Rehabilitation Program, in coping with the curriculum

2014 - Present **Teaching Assistant**.
Software Systems Lab, Calculus, Differential Equations at IIT Bombay

- Created questions and evaluated students on assignments, exams and projects

2016 **Teaching Assistant**.
Data Structures, Algorithms, Intro to Computer Programming on edX and IITBombayX

- Assisting with creating questions and tests for the participants of the courses
- Answering doubts and queries on the online forum for the courses

Leadership Skills

2015 - 2016 **Head, Web and Coding Club**.
IIT Bombay

- **Lead a team of 8 students**, working to boost coding culture across the institute
- Organized periodic workshops, and hackathons sponsored by Lenovo India and Kandy.IO
- **Led group discussions** on Cryptography and Web Security, **gave a talk on Ciphers** and breaking them using frequency analysis and on Game Making using MIT Scratch

2014 - 2015 **Convener, Electronics Club**.
IIT Bombay

- Held sessions and gave talks at the institute level for club events and competitions

Extracurricular Activities

Technical

- Recipient of **Hostel Technical Special Mention** for contributing to the technical activities in the hostel *2016*
- Awarded the 2^{nd} **spot in the code.fun.do hackathon** conducted by Microsoft *2016*
- **Led hostel to** 1^{st} **and** 2^{nd} **positions** in Logic General Championship conducted across 16 hostels, IIT Bombay *2014, 2016*
- **Won** 2^{nd} **place for Game Development event** at IIT Bombay *2013*
- **Built a line following robot** for an intra-college competition *2013*

Others

- Bagged the 1^{st} **position in Advertisement Making Competition** in the Freshman Cultural Event at IIT Bombay *2013*
- Won the 2^{nd} **place in Environmental Debate** conducted by Government of Jharkhand, India *2010*
- Passionate about quizzing

References

- Pushpak Bhattacharya
  Professor, IIT Bombay
  pb@cse.iitb.ac.in
- Suyash Awate
  Associate Professor, IIT Bombay
  suyash@cse.iitb.ac.in
- Thomas Henzinger
  Professor, IST Austria
  tah@ist.ac.at
- Niloy Ganguly
  Professor, IIT Kharagpur
  niloy@cse.iitkgp.ernet.in