Devang Thakkar | IIT Bombay

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Research Interests

Computational and Network approaches to Biology, Evolutionary Dynamics and Game Theory

Education

- **Indian Institute of Technology (IIT) - Bombay, Mumbai** July 2013–Present
  Dual Degree – Bachelor and Master of Technology in Mechanical Engineering
  Minor in **Biosciences and Bioengineering**
  Cumulative Performance Index (CPI): **8.44/10** (Class Median: 7.25/10, Max: 9.1/10; Rank: 6/27)
- **CentraleSupélec, Paris** Fall 2016
  Échange Académique Ingénieur (Semester Exchange Program)
  Semester Performance Index (SPI): **9.75/10**

Key Academic Achievements

- Secured an All India Rank of **573** in the IIT Joint Entrance Examination among 130,000 applicants 2013
- Awarded the **KVPY** Scholarship by the Government of India (All India Rank 193) 2012
- Among the 300 students selected nationwide for the Indian National Chemistry Olympiad(INChO) 2012

Research Projects

- **Feature Selection for sample-specific Coexpression Networks** Dec 2016–Mar 2017
  Guide: Prof. Chloe-Agathe Azencott, Centre De Bioinformatique–MINES ParisTech
  - Studied existing algorithms for the construction of sample specific networks that incorporate gene expression data with a protein-protein interaction network.
  - Studied methods of transferring weights from nodes to edges - such as the Euclidean or Mahalanobis distance to identify those that were at least as expressive as the gene expression values themselves.
  - Reduced data dimensionality and identified relevant features using permutation importance in random forest based algorithms on the ACES gene expression data set using R/Python.

- **Multi Agent Reinforcement Learning for Logistics Networks** (Ongoing) Feb 2017–Present
  Guide: Prof. A. Subash Babu, Dept. of Mechanical Engineering, IIT Bombay
  (Master's thesis - Awarded a perfect score for Midterm Thesis Presentation)
  - Conducted a literature survey and studied existing industrial practices to identify potential areas of improvement of reverse logistics networks in the e-commerce sector.
  - Developed an agent based reverse logistics network utilizing mobile distribution centres in the form of a daughter - mother ship architecture as compared to the traditional fixed warehouse system.
  - Investigating the Nash equilibria for the multi agent system under the Q-learning algorithm.
  - Implementing Multi Agent Reinforcement Learning algorithms to introduce cooperation between agents and optimize the product collection schedule.

- **Identifying the Trend of Lysogeny under varying stresses** (Ongoing) Jun 2017–Present
  Guide: Prof. Supreet Saini, Dept. of Chemical Engineering, IIT Bombay
  - Studied the theoretical behavior of a temperate phage under ideal growth conditions.
  - Ran Gillespie simulations to discretize and analyze the reactions occurring in the system
  - Developed a model for estimating probability of lysogeny as a function of Multiplicity of Infection under different environmental stresses for bacterial growth.
  - Searching the 2-D space for the optimal curve that maximizes the probability of coexistence.
- **Exploring methods for understanding Pathway Perturbation** Apr 2017–Jul 2017
  Self undertaken project
  - Reviewed literature to understand the best algorithms for the construction of transcription factor (TF) networks from TCGA gene expression datasets.
  - Constructed a TF network by filtering interactions on the basis of mutual information
  - Evaluated the relative relevance of pathways in affected samples compared to the reference samples by quantifying the difference between a sample and a reference set created to represent the population.
- **Understanding the nanomechanical properties of amyloid fibrils** Jun 2014–Nov 2014
  Guide: Prof. Ranjith Padinhateeri, Dept. of Biosciences and Bioengineering, IIT Bombay
  - Reviewed literature on amyloids and their association with protein misfolding diseases.
  - Investigated the polymorphic configurations of folded amyloids and formulated mechanical models to represent the bending properties of their most common polymorphisms - twisted ribbons and nanotubes.

Internships and Course Projects

- **Data Scientist Intern** | TransUnion India, Mumbai May 2016–Jul 2016
  - Developed a pipeline for automated report creation on a 550M large dataset with 50% time savings.
  - Performed dimensionality reduction and regression analysis using Apache Spark on a 'large p, small n' dataset to identify leading parameters affecting the rate of insolvency.
  - Optimized existing scripts and spearheaded the migration of the code base to Hadoop using Pig.
  - Designed and automated the creation of visualizations in Tableau to accompany the market insights.
- **Design of Micro-fabricated Neural Probes** Feb 2016–Apr 2016
  Course: Biomedical Microsystems, Prof. R. Srivastava, Department of Biosciences, IIT Bombay
  - Conducted a literature review of micro-fabricated probes, especially in the diagnosis of mental illnesses.
  - Designed an array of probes in order to measure neurotransmitter concentration in-vivo.
- **DNA Cloning using Plasmid Vectors** Mar 2014–Apr 2014
  Course: Genetic Engineering, Prof. A. Banerjee, Dept. of Biosciences, IIT Bombay
  - Amplified the gene of interest (a fucose inducible promoter) using PCR.
  - Extracted the cloning vector from E. coli and attached the gene onto the vector, followed by testing of the expression using a blue - white screen.
  - Learned to employ genetic techniques such as Plasmid Isolation, PCR Amplification in the lab.
- **Implementing Solutions to the Traveling Salesman Problem** Feb 2017–Apr 2017
  Course: Industrial Scheduling, Prof. P. Awate, Industrial Engg. and Operations Research, IIT Bombay
  - Conducted a literature review of the evolution of graph based algorithms developed to solve the traveling salesman problem using gradient descent.
  - Wrote code in C++ to implement a tree based iterative branch and bound algorithm.

Technical Skills

- **Data Analysis/Programming:** Python, R, Java, LaTeX
- **Hadoop Ecosystem:** Pig, Hive, Impala, Spark
- **Visualization and Design:** Tableau, Adobe Illustrator

Relevant Coursework

- **Biology**
  Introduction to Biology, Introduction to Molecular Cell Biology, Genetic Engineering, Molecular Biology, Biomedical Microsystems, Molecular Biophysics*
- **Computer Science**
  Computer Programming and Utilization, Object Oriented Software Design, Data Structures and Algorithms*, Machine Learning, Engineering Data Mining and Application#
- **Mathematics**
  Introduction to Calculus, Linear Algebra, Differential Equations, Introduction to Numerical Analysis, Decision Analysis and Game Theory, Data Analysis and Interpretation

- Expected Completion: Dec, 2017, * - Expected Completion: Apr, 2018

Standardized Test Scores

- **GRE (General):** 337/340 (Quantitative: 170, Verbal: 167, AWA: 4.5/6)
- **TOEFL:** 112/120 (Reading: 27, Listening: 30, Speaking: 26, Writing: 29)

Positions of Responsibility

- **Teaching Assistant** | **IIT Bombay** Jul 2017–Present
  Course: Manufacturing Planning and Control
  - Responsible for conducting problem solving sessions for students for a graduate level course.
  - Conducted help sessions, where I reviewed the coursework students have trouble understanding.
- **Institute Secretary for International Relations** | **IIT Bombay** Apr 2017–Present
  - Facilitating the flux of international exchange students and assisting with international university conferences, helping to improve the brand image of IIT Bombay among 100+ universities.
  - Responsible for the buddy program for international entrants and incoming student delegations.
- **Editor, Insight - IIT Bombay's official student media body** Apr 2016–Mar 2017
  - Regularly led teams of junior panelists and report on issues of importance to the campus community.
  - Led a team tasked with covering research activities and problems faced by graduate students.

Volunteer Experience

- **English Tutor** | Language Improvement Program, IIT Bombay May 2017–Present
- **Student Buddy** | International Student Programme, IIT Bombay Jan 2017–May 2017
- **Media Volunteer** | Pan IIT Global Leader's Conference, Santa Clara Apr 2015–Aug 2015

Extra-Curricular Activities

- I am an avid reader, occasional writer and amateur painter. Besides participating in writing competitions, I have contributed to campus magazines and newsletters, and convened Writing and Reading Club meets.
- I am also interested in linguistics and learning new languages - besides being fluent in English and four Indian languages, I'm also an intermediate French learner.

References

- Prof. Supreet Saini, IIT Bombay (saini[at]che.iitb.ac.in)
- Prof. A. Subash Babu, IIT Bombay (subash[at]iitb.ac.in)
- Prof. Chloe-Agathe Azencott, MINES ParisTech (chloe-agathe.azencott[at]mines-paristech.fr)