



**Deep Tejas Karkhanis**  
**Computer Science & Engineering**  
**Indian Institute of Technology Bombay**

**160100024**  
**UG Third Year (B.Tech.)**  
**Male**  
**DOB: 05-Oct-1998**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2019	9.49
Intermediate/+2	HSC	PACE Junior Science College, Borivali	2016	93.85
Matriculation	ICSE	Gundecha Education Academy	2014	96.33

Pursuing **Honors** in Computer Science and **Minor** in **Applied Statistics** and Informatics

### SCHOLASTIC ACHIEVEMENTS

- Awarded Institute Academic Excellence Award for securing **INSTITUTE RANK 1** at the end of first year
- Only student in the batch (**1/950**) to have a **Perfect CPI of 10.00** in the first two semesters [2016-17]
- Secured **3 AP grades**: Linear Algebra (stood **2<sup>nd</sup>** out of **917** students), Biology (**3<sup>rd</sup>** out of **445** students) and Environmental Science and Engineering (in top **4** out of **269** students) [2016-17]
- Achieved **Branch Change** to CSE due to exceptional performance in 2017 (awarded to **11/910** students) [2017]
- Secured **All India Rank** of **725** in JEE Advanced 2016 (amongst **1.2 million** aspirants) [2016]
- Acquired a percentile of **99.67** in JEE Mains 2016 (amongst **1.2 million** candidates) [2016]

### EXPECTED PUBLICATION

- **Efficient Analysis and Applications of ME-MDPs** *Institute of Science and Technology Austria*  
 Guide: Prof. Krishnendu Chatterjee [Summer 2018]
  - Improved the **PAMCP** (Past-Aware POMCP) algorithm to safely navigate an imperfect robot in a **grid-maze**
  - Established **better Hallway and Rock-Sampling benchmarks** than conventional PBVI solving methods
  - Exploited the sparse transitions in MEMDPs to have **faster belief updates** [**O(n)** as opposed to **O(n<sup>2</sup>)**]
  - The improved solver was **50x** times faster and a **20x** times better environment detector
  - Expected to publish the results as **CO-AUTHOR** in the “**European Joint Conference (ETAPS) 2019**”

### PUBLICATIONS IN PREPARATION

- **Improved techniques for Rectification of Images** *Indian Institute of Technology Bombay*  
 Guide: Prof. Masaaki Nagahara [Autumn 2018-Present]
  - Improving upon methods used to solve standard inverse problems like inpainting, super-resolution, denoising
  - Incorporated the concept of total variation inpainting into deep image prior to get more refined results
  - Enhancing super-resolution by using weighted average of a 3 layer CNN with deep-image prior output
- **Faster Policy Iteration for POMDPs** *Indian Institute of Technology Bombay*  
 Guide: Prof. Shivaram Kalyanakrishnan [Autumn 2018-Present]
  - Developed a new policy iteration algorithm for solving POMDPs where finding the optimal policy is infeasible
  - Achieved finer policy improvements per iteration than state-of-the-art policy improvement algorithms
  - Produced better policies, compared to modern algorithms within the same amount of time

### KEY PROJECTS

- **Interactive Academics: Natural Language Processing** [Autumn 2017]  
 Guide: Prof. Kavi Arya
  - Designed a login based academic **Social-Networking website** for student-faculty interactions
  - Implemented a question-answer forum which uses **Bayesian Tagger** for automatically grouping questions
  - Added a **spell-checker** and **search option** (used NLP) for previously asked or similar questions
  - Developed features like **upvoting** answers, ratings, **user stats**, file/image upload and **points** for relevant answers

- **AI Based GO Player** [Spring 2018]  
*Guide: Prof. Amitabha Sanyal*
- Adopted **monte-carlo tree** search with **UCT** selection to choose the next move
  - Designed a DFS-based **graph algorithm** for **territory counting**.
  - The bot created was able to make simple **captures** and perform **counter-moves**
  - Used **foreign function interface** to import move validation functions from GNU-GO (C++) into scheme
- **Railway Signal Controller** [Spring 2018]  
*Guide: Prof. Supratik Chakraborty*
- Automated a real-life Railway network using **VHDL** based FPGA boards as Railway Signal Controllers
  - The controller supervised an **8-way** intersection using **track-data** from **central server** and **nearby controllers**
  - Used **FPGALink** library for **encrypted communication** with the server via **USB**
  - Implemented **UART** communication among adjacent controllers in the network
- **RSA Cryptography** [Autumn 2016]  
*Guide: Prof. Bernard Menezes*
- Developed a **C++** package to encrypt and decrypt messages using RSA Cryptography
  - Used **Baby Step-Giant Step** algorithm for finding Discrete Logarithms
  - Implemented Field operations in **Prime and Binary Fields**
  - Achieved modulo operations on **Big Integer** package like inverse and exponentiation

## OTHER PROJECTS / WORK EXPERIENCES

- **Remote Controlled Beyblade** Institute Technical Summer Project [Summer 2017]
- **Lead** a team of **4** to make an **Arduino** controlled **Beyblade**
  - Controlled the **movement and speed** of rotation of the Beyblade by an **IR Remote**
  - Optimally placed an IR receiver on the Beyblade to ensure control is maintained **even during rotation**
- **Innovation Cell (UMIC)** [Summer 2017]
- Initially made a Line Follower (Autonomous bot which detects and follows a marked-out line)
  - Implemented **IR LEDs** and **Photo-diodes** to differentiate black and white colours
  - Directly admitted to work with Innovation Cell, **without need of an interview**, on an ongoing or new project
- **IITB Racing** [Summer 2017]
- Cleared the induction test and interview stage to qualify for the IITB Racing Induction Program
  - Gained experience in **braking-mechanisms** and optimizing **Battery Cooling** while taking up **limited space**
  - Idealizing the **aerodynamic design** of the car to reduce drag while optimizing **downforce**

## INTERESTS

Machine learning (internships done in **Reinforcement Learning**), Computer **Networks**, Statistics and Data Analysis, **Predicate Logic**, **Probability Theory**, Algorithms and Complexity, Cryptography, **Quantum Physics**.

## TECHNICAL SKILLS

<b>Programming Languages</b>	: C++, Java, Python, Prolog, Answer Set Programming ( <b>Clingo</b> ), Scheme, VHDL
<b>Web Development</b>	: HTML-CSS, JavaScript, PHP, MySQL, Bootstrap, Django
<b>Software Skills</b>	: AutoCAD, SolidWorks, <b>Android Studio</b> , LaTeX, Matlab, <b>WireShark</b>

## POSITIONS OF RESPONSIBILITY

- **Institute Web Nominee, Academic Council IITB** [April 2018-Present]
- **Search Optimized** the UG-academics website and improved **visibility on the Google Search** Engine
  - Handled the **Project Allocation Portal** - used by **100+ professors** with **3000+** applications
  - Managed the portal for **TA allocation** for **1500+** applicants and all first-year theory courses.
  - Supervising websites for crucial academic tasks like **Tutorials**, Course Reviews, UG-Projects, Summer School
- **Web and Computer Secretary, Hostel 7 IITB** [2017-18]
- Designed an automated **Parcel Notification System** to inform the student on arrival of a package
  - Created a Mess Rebate portal using **PHP Mailer** to **automate the Mess-refund** procedure for students on leave

- Worked on an **Android App**, proposed as a **one-stop solution** to all hostel related information and updates
- Automated **Guest Room** allotments, Library operations and **Mess Menu updates**
- Repaired all **CCTV** cameras and reinstated the Hostel Computer room (with new PCs, printer)
- Organized **Gaming nights** to augment Hostel Culture

### EXTRA-CURRICULAR ACTIVITIES

- Awarded **Hostel Organizational Color** for exceptional work as Web Secretary of Hostel 7 *[2018]*
- Secured **1<sup>st</sup> position** in the Summer of Sports **Swimming Camp** *[Summer 2017]*
- NCC Annual Training Camp 410 *[Winter 2016]*
  - Secured **First Position in Rifle Shooting** (1/220 cadets) competition of .22 Calibre Rifle and **2<sup>nd</sup>** in cricket
  - Got **BULLSEYE** in all **15 shots** with a perfect score of **25/25** in all the **3** rounds
  - Attended lectures on Rifle firing mechanisms, **Minefield laying and retrievals**
  - Rigorous training led to all round development in fitness, sports, literary and cultural skills
- **Master Laureate: 2<sup>nd</sup>** runner up which is awarded for best overall performance (academics and extra-curriculars)
- Selected for **DSO and MSSA** cricket tournaments each time for **5 years** and made it to the **quarterfinal** in MSSA
- Participated in Freshizza 2k16 Group **Dance** and secured **2<sup>nd</sup> position** *[Autumn 2016]*