

# Mandeep Singh

SENIOR UNDERGRADUATE · INDIAN INSTITUTE OF TECHNOLOGY KANPUR

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## Education

### Indian Institute of Technology Kanpur

BACHELORS OF TECHNOLOGY - MECHANICAL ENGINEERING | ELECTRICAL ENGINEERING

Cumulative Performance Index (CPI): 7.6/10.0

Kanpur, India

2014 - PRESENT

### Ch. Chhabil Dass Public School, Ghaziabad

CLASS XII, CBSE-AISSE PERCENTAGE: 96.4%

Ghaziabad, India

2014 & 2012

Class X, CBSE-AISSE Cumulative Grade Point Average (CGPA): 10.0/10.0

## Scholastic Achievements

2017	<b>Summer Research Internship</b> , Robotics Algorithms & Autonomous Systems (RAAS) Lab	Virginia Tech, USA
2016	<b>Honda-Young Engineer &amp; Scientist award</b> , Shortlisted for 2nd round out of 41 students	IIT Kanpur
2013-14	<b>All India Rank-208</b> , Kishore Vaigyanik Protsahan Yojana (KVPY) awardee	India
2014	<b>All India Rank-490</b> , Joint Entrance Examination, JEE (Main), 1.5 Million candidates	India
2013-14	<b>National Top 1% (Top 300)</b> , National Standard Examination in Astronomy (NSEA)	India
2014	<b>All India Rank-81</b> , Uttar Pradesh State Entrance Examination (UPSEE)	India
2014	<b>100% (top 0.1%) in Chemistry (Class XII)</b> , Appreciation letter from Smt Smriti Irani, HRD	India
2013,14	<b>AIR-64 (Class XI), AIR-144 (Class XII)</b> , National Science Talent Search Examination	India
2009-10	<b>National Talent Search Examination</b> , Qualified for National-level (pre-final) round	India

## Research Experience

### Blind Image Quality Assessment

IIT Kanpur

MENTOR: PROF. GAURAV PANDEY, DEPT. OF EE, IIT KANPUR

December'16 - January'17

- Objective: To calculate Image Quality score by learning a coupled dictionary
- Unsupervised learning of coupled dictionary** from the set of patches taken from pristine natural images and distorted images (BLUR, JPEG, JP2K, AWGN) (LIVE public-domain database).
- Using **regression algorithms** like lasso to optimize the training stage for deriving the dictionary pair, sparse coefficients, and the projection matrices of common feature space.
- Proposed an algorithm to calculate the **global quality score** from the energy of the projection matrices of the source domain and target domain sparse coefficients in the common feature space.
- Applied the coupled dictionary algorithm to synthesize **super resolution image** from low resolution image

### Animated image cloth segmentation

IIT Kanpur

MENTOR: PROF. TANAYA GUHA, DEPT. OF EE, IIT KANPUR

December'15 - October'16

- Objective: To segment the clothes from the animated images and recognise its constituent parts of clothing
- Used various algorithms for image segmentation like **edge detection, K-means clustering** and implemented in MATLAB with 60-75% accuracy at the end of Summer'16.
- Performed texture based segmentation using multi-channel **Gabor filters** to remove splitting of same texture region
- Proposed a novel probabilistic model for parsing animated image using an elegant algorithm, **Data Driven Markov Chain Monte Carlo (DDMCMC)**, and applying **split and merge method** to get its optimal solution.

## Selected Projects

### LiDAR Odometry And Mapping (LOAM) in Real Time

IIT Kanpur

TERM PROJECT (COURSE: EE698G), PROF. GAURAV PANDEY, DEPT. OF EE, IIT KANPUR

March'17 - April'17

- Objective: Deals with online simultaneous localization and mapping (SLAM) problem without taking any assistance from Global Positioning System (GPS) and Inertial Measurement Unit (IMU).
- Perform online odometry and mapping in real time using the data collected by a 2-axis LiDAR mounted on a robot at CMU.

### Automatic Cleaning Machine

IIT Kanpur

COURSE PROJECT, PROF. NIRAJ SINHA, DEPT. OF ME, IIT KANPUR

January'16 - April'16

- Objective: To automate the cleaning process using the mechanical energy generated from the human input
- Using a gear assembly of 4 gears, which gets input from the wheels of the machine, the garbage picker is rotated through the **offset slider crank mechanism** and machining techniques used are milling, lathing, cutting, drilling

### Celestron Autofocuser

IIT Kanpur

SUMMER PROJECT, OBSERVATORY FOR AMATEUR ASTRONOMICAL RESEARCH (OAR)

May'15 - June'15

- Objective: To automate the focusing of 14 inch **Schmidt Cassegrain telescope** of IITK Observatory of Astronomy Club
- Extracted images from the telescope, processed and compared two consecutive images using OpenCV library
- Used **Arduino** (Processing) language and established serial communication for sending instruction to Arduino to control the stepper motor which is linked to the focusing knob of the telescope.

## Relevant Courses

Data Structures & Algorithms\*  
Probabilistic Mobile Robotics  
Microelectronics  
Vibration & Control

Digital Electronics\*  
Robot Motion Planning  
Dynamics  
Theory of Mechanism & Machines

Signals, Systems & Networks\*  
Programming & Numerical Analysis  
Fundamentals of Computing  
Linear Algebra

\*: Ongoing

## Technical Skills

**Programming:** C/C++ | Python | HTML/CSS | MySQL

**Softwares & Utilities :** ROS | MATLAB | OpenCV | Adobe Photoshop | Autodesk Inventor |  $\LaTeX$  | Gazebo | Git

**Operating Systems:** Ubuntu | Windows

## Positions of Responsibility

### Coordinator, Astronomy Club

IIT Kanpur

CORE TEAM MEMBER, SCIENCE AND TECHNOLOGY COUNCIL; (ADVISOR: PROF. PANKAJ JAIN)

March'16 - March'17

- Organised the SNT Summer camp for the Y15 batch and assisted the teams of 5 Y15 batch students for their summer projects- **Observatory Automation for Photometry** and **Automated Star Pointer**
- Hosted the **observation session** at OAAR (Observatory) for students of **classes I to IX** during Summers'16.
- Initiated **1st Inter College Astronomy Meet**, Mandakini'16, with 5 participating institutes & 20k expenditure
- Administered the **budget of 45k** and maintain the inventory of the club and OAAR.
- Coordinated the live streaming of the **Mercury transit** from OAAR on May 9, 2016.
- Successfully organised **Inter-IIT Tech Meet'17** and **Takneek'16**, inter-hall technical competition

### Coordinator, Creative Cell

IIT Kanpur

ANTARAGNI'15

June'15 - November'15

- Led a team of 6 members and planned about the décor (theme 'Dastan-e-sultanate') of the events ground which was the new location behind the New SAC and quite challenging with a **budget of 10k**.
- Implemented the idea of making an iron throne covered with cardboard daggers and swords which was the centre of attraction to take photographs by the participants and campus community.

### Secretary, Fine Arts Club

IIT Kanpur

CULTURAL COUNCIL

May'15 - March'16

- Led 20 Y15 batch students and assisted them to make 'Superheroes' wall painting of 15ft X 20ft at OAT.
- Organised and contributed in the Antaragni FAC exhibition by painting abstract scenery on the wall in a team of 5.
- Led 20 Y15 batch students in Galaxy'16, inter-hall cultural competition, and bagged overall 1st position

## Extra Curricular Activities

2015	<b>1st prize</b> , Astrophotography competition of Takneek'15 (Sci. & Tech. championship)	IIT Kanpur
2015-16	<b>1st position</b> , Fine Arts competition of Galaxy (Cultural championship) in both years	IIT Kanpur
2015	<b>Junior Design Executive, Sci. &amp; Tech. council</b> , Designed the logo of Takneek'15	IIT Kanpur
2015	<b>Secretary, Association of ME (AME)</b> , Conducted the Freshers night of Y15 (ME dept.)	IIT Kanpur
2015	<b>Secretary, Show Management in Antaragni'15</b> , Managed the events like opening nights	IIT Kanpur
2015	<b>Executive, Public Relations, Udghosh'15</b> , Contacted the sports personalities and famous dignitaries & organised their travel plans, accomodation	IIT Kanpur
2014	<b>Volunteer, Hospitality cell, Antaragni &amp; Udghosh</b> , lead 16 students team of DU	IIT Kanpur