# SAJAL GOYAL

Third Year Undergraduate
Dept. of Chemical Engineering, IIT Kanpur

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## Education

2022 **Bachelor of Technology**, *Indian Institute of Technology*, Kanpur, ***CGPA- 8.2/10***

2018 **Grade XII**, *Kautilya Sr. Sec. School*, Kota, ***Result: 89.8%***

2016 **Grade X**, *St. Peter's College*, Agra, ***Result: 95.3%***

## Scholastic Achievements

2020 Secured **1st** position in **Stock the Stock** competition by Entrepreneurship Cell, IIT Kanpur with **200**+ participants

2018 Secured **All India Rank 1981** in JEE Advanced 2018 amongst 160,000 candidates

2016 Awarded **Merit Certificate** for exceptional performance, Class X

## Key Projects

May'20–Jul'20 **Tweet Sentiment Extraction**

*Science and Technology Council, IIT Kanpur*

- Built **NLP model** which takes Tweet and Sentiment as input and outputs Part of Tweet which represents that Sentiment
- Performed **Exploratory Data Analysis** to discover patterns and gain insight into the data
- Stacked dropout and 1D Convolution layer on top of **RoBERTa** to increase robustness of the model and used pre-trained **Tokenizer** for the embedding of the Tweet
- Applied **StratifiedKFold cross validation** to reduce overfitting and post-processed the output to increase accuracy

May'19–present **Autonomous Underwater Vehicle**

*Mentor: Prof. Mangal Kothari, IIT Kanpur*

- Implemented **Detection** and **Tracking** Algorithm to detect complex objects and their centre under water using **OpenCV**
- Created **multi-class labelled underwater dataset** for training the **YOLOv3** model
- Tweaked the vision layer to perform image processing tasks while improving its robustness
- Created a **Disparity map** of simulated environment on Gazebo using simulated **Stereo camera**
- Deployed online Inventory for **Tracking** and **Management** of new and existing products using MERN stack

Jan'20–present **Self-Driving Vehicle Simulation**

*Mentor: Prof. Venkatesan Kanagaraj, IIT Kanpur*

- Pre-processed **Point cloud** data collected by Velodyne's Puck(VLP-16) in MATLAB to remove invalid points
- Implemented code to **cluster** and differentiate ground points from the object clusters while getting bounding boxes with labels of different objects by **DBSCAN** algorithm
- Implemented robust tracking using Kalman filter which optimally estimates the current state of the surrounding objects
- Computed state estimate error **covariance matrix** for each track with JPDA tracker

May'20–Jul'20 **Playing Atari with Reinforcement Learning**

*Science and Technology Council, IIT Kanpur*

- Implemented **Reinforcement Learning** algorithm with CNN model as function estimator for **Markov Decision Process** where raw pixels of current state are input
- Incorporated **Experience replay** to reduce overfitting thereby smoothing out and speeding up the training process
- Trained the **Deep Q-network** model for **10+ hours** which reached Human level accuracy on an average
- Implemented **model free** network does not take internal features of emulator and outputs optimal action for each state

## Research Experience

May'20–Jun'20 **Changing the Game: The Rise of Sports Analytics**

*Mentor: Prof. Faiz Hamid, IIT Kanpur*

*Research paper going to be published in* ***Journal of Sports Sciences***

- Reviewed the literature on **Data Analytic** techniques in Football to **Predict Match Outcome** and critically analysed **16** papers published in reputed Journals and Conferences
- Explored various **State Of The Art** techniques and analysed their trends over years with **Stacked Histogram**
- Classified papers based on their Objectives and examined the popular and most **relevant variables** for predicting results

## Technical skills

**Data Science:** SQL, Tensorflow, Keras, Pandas, Scikit-learn, Numpy, Matplotlib

**Languages:** Python, C, C++

**Robotics:** ROS, OpenCV, Arduino

**Development:** MongoDB, Express, React, Node.js, Javascript, HTML5

**Utilities:** Git, LaTeX, MATLAB, Excel, Fusion 360

## Relevant Coursework

**Data Science:** Convolutional Neural Network*(o)*, Sequence Models*(o)*, Introduction to SQL*(o)*

**Mathematics:** Applied Probability and Statistics, Computational Methods in Engineering, Probability Theory Statistics and Exploratory Data Analysis*(o)*, Linear Algebra and Ordinary Differential Equation, Real Analysis & Multivariate Calculus

**Algorithms:** Algorithms Specialization*(o)* , Fundamentals of Programming

**Finance:** Stock Market Basics*(o)* , Financial Risk Analytics*(o)*

*(o): Online Certified*

## Positions of Responsibility

Apr'20–present **Software Team Lead**, *AUV Team*, IIT Kanpur

- Spearheading a group of **7 people** working on Autonomous Vehicle's software, planning and implementing technical changes
- Maintaining **software stack** of Autonomous Vehicle, developed using ROS, OpenCV and UnderWater SIMulator, on **Git**
- Performing administrative and managerial tasks for the team
- Representing the team at various exhibitions to share our experience with others

## Miscellaneous

Jul'20 **JPMorgan Chase & Co Virtual Experience Program**

*Virtual Internship*

- Set up the system for data analysis with **Perspective tool** to correctly output stock information on trader's dashboard
- Fixed the client-side web application to generate **Live graphs** of **stock prices** and created Patch files for various tasks assigned
- Deployed code to **alert Trader** whenever **trading opportunity** is available due to temporary weakening of a correlation between any two stock prices

Aug'20–Nov'20 **Autonomous Wrapping Machine**

*Course Project TA202 – Prof. Mohit Law*

A group project involving the making of autonomous machine from scratch which is capable of wrapping cartons and pushing it to conveyor belt where the machine was designed with Fusion360 and the motors were controlled with Arduino Uno board