# NILAKSH AGARWAL

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## Academic Details

| Year | Degree | Institute | CGPA/Percentage |
|---|---|---|---|
| 2019-2020 | M.Tech in Computer Science | Indian Institute of Technology, Delhi | 8.4/10 |
| 2015-2019 | B.Tech in Engineering Physics | Indian Institute of Technology, Delhi | 8.8/10 |
| 2015 | Class XII, CBSE | Magnolia Maaruti Public School, Bangalore | 96.4% |
| 2013 | Class X, CBSE | National Public School, Bangalore | 10/10 |

## Relevant Courses

AI for Robot Intelligence, Algorithmic Game Theory, Artificial Intelligence, Convolution Neural Networks, Database Management, Deep Learning, Extreme Classification, Graph Neural Networks, Machine Learning, Natural Language Processing, OSS Development with Linux and Git, Reinforcement Learning, Sequence Models, Tensorflow in Practice

## Scholastic Achievements And Recognitions

- **Department Rank of 4** in the batch of Engineering Phyics on basis of academic performance (across 8 semesters)
- **Teaching Assistant** for UG courses on Machine Learning & Database Management (150+ students each) (2019)
- **IITD Semester Merit Award** Conferred for having CGPA in the top 7% among all students of IIT Delhi (2015)
- **National Standard Examination** Top 1% in Karnataka in Physics (NSEP) and Astronomy (NSEA) (2014, 2015)
- **Runner Up, HP CodeWars (India)** A competitive coding national level competition with over 100 teams (2014)
- **KVPY Fellowship** Received scholarship to pursue research from Dept. of Science and Technology by G.o.I. (2014)
- **NTSE Scholarship** Awarded after 2-tier evaluation: National Council for Educational Research & Training (2011)
- **ICAS, by Macmillian & UNSW Global** International Rank 1 in Science for two consecutive years (2009, 2010)
- **Winner, Indian Robotics Olympiad** Represented India at the World Robotics Olympiad held at Japan (2008)

## Major Projects

**Summer Internship** - WorldQuant Research — May 2019 - July 2019

Developed investment strategies and trading signals for inter-day and intra-day trades.
Devised utility operation for intraday ( 5 min) strategies to control behavior, reduce risk and regulate market impact.
Augmented trading strategies with technical indicators to maintain Sharpe & turnover and reduce correlation.
Created operator for multi-factor based exposure based trade strategies using conic optimization with MOSEK.
Found cointegrated stocks (Johansen Test) and used mean reversion for trade position calculation

**3D Human Pose Estimation** (Keras [Python]) — Prof Rahul Garg, January 2019 - Jan 2020

Developed a novel multi-modal Deep model for 3D Tracking which outperforms state of the art (1.3% better)
Improvement on natural (Human3.6M) & synthetic (SURREAL) datasets; using Coord Conv. and Seq. Models
Successfully tracked Yoga (own dataset) with occlusions and unnatural body extensions not possible with SotA

**Finite Element Analysis** (Python) — Prof Anurag Sharma, June 2018 - November 2018

Implemented a finite element solver for electromagnetic partial differential equations to compute stationary field waveguide solutions in photonics for different geometrical configurations and refractive index distributions.
Incorporated self-adjusting mesh sizing for denser approximation at the boundaries for more accurate modelling

## Technical Skills

**Programming:** C, C++, Java, Python, Go, MATLAB, PostgreSQL, Bash, Git, HTML/CSS, Javascript
**Libraries:** Keras, Tensorflow, Pytorch, Matplotlib, OpenCV, NLTK, MOSEK

## Course Projects & Independent Projects

**Early Detection of Carcinoma in Liver** (MATLAB) Prof Amit Mehndiratta, September 2017 - May 2018

Developing novel algorithms for liver segmentation from MRI scan using layer based region growing across the stack
Applied this algorithm, and analysis including histogram, skewness, kurtosis to develop a toolbox for cancer detection
Clinical prospects in early diagnosis and therapeutic monitoring of patients prone towards Hepatocellular Carcinoma
*Abstract titled Automated Segmentation of Lesions in Liver Using T1 MR Imaging presented at ISMRM, 2018*

**Fast Abstractive Summarization** (Pytorch [Python]) Prof Mausam, April 2019

Developed a multi sentence selection and rewriting tool, to generate abstractive summaries of short datasets using an encoder-abstractor-decoder Reinforced Learning based network. Improved abstractiveness score (5% more novel n-grams) on CNN/Dailymail Dataset, using multi-sentence input to abstractor

**Convolution Neural Networks** (Tensorflow [Python]) deeplearning.ai, January 2019

Used YOLOv2 algorithm to build a multiple car detector, using bounding boxes and non-max suppression
Implemented the Neural Style Transfer algorithm, using a pretrained VGG-19 mode to generate style images
Created a face-recognition, using FaceNet algorithm and modelling a triplet loss for encoding face image

**Sequence Models** (Tensorflow + Keras [Python]) deeplearning.ai, January 2019

Machine Translation, from Human-readable dates to Machine-readable, using Attention Sequence to Sequence model
Modelled a trigger word detector using speech data, to detect "activate". Used synthesis, creating a larger dataset.

**WebAssembly Analysis and Tracing** (WebAssembly / JavaScript) Prof Smruti Ranjan Sarangi, Nov 2019

Analysed the performance of WebAssembly vs Native code (Polybench suite compiled with emscripten)
Analysis using Wasabi Toolkit (execution time, instruction mix & count and hot code indentification)
Experimented with modern browsers (Chrome, Firefox, Safari) as well as multiple Optimization Levels
Generated the dynamic instruction trace of WebAssembly and translated it to it's equivalent x86 format

**Xv6 extension & functionality** (C) Prof Smruti Ranjan Sarangi, March 2019

Extended functionality of Xv6 to include IPCs (unicast & multicast) and created a distributed algorithm
Implemented Maekawa's algorithm for mutual exclusion; Jacobi's algorithm for steady heat distribution
Virtualization using a container with process, memory & file system isolation & a virtual process scheduler

## Extra Curricular Activities

**Team Lead, The Indian Economist** December, 2016 - August, 2017

- Managed a 30+ team of associates, responsible for editing & publishing over 500+ news articles per month
- Single-handedly managed allocation and sequencing of articles, including social media and SEO parameters
- Received 4 promotions in 9 month period, awarded a letter of recommendation for contributions

**House Representative, Board for Student Welfare (BSW)** April, 2016 - April, 2017

- Managed and inducted 1500+ freshman students, to ease their transition to a new college life at IIT Delhi
- Organized 12 workshops, 6 seminars and 9 camps for the development of 12,000+ students in various fields
- Awarded Outstanding Contribution in Hostel Management for exemplary performance by Udaigiri House