

# Varun Khare

Graduate Computer Science

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## ACADEMIC DETAILS

Examination	Institute	Year	CPI/%
Computer Science and Engineering	IIT Kanpur	2015-2019	8.8*
Class XII	Delhi Public School, Bhopal	2015	93.8*
Class X	Delhi Public School, Bhopal	2013	10.0*

\* represents **distinction**

### Relevant Courses:

Computer Vision	Stochastic Processes	Computational Cognitive Science
Bayesian Machine Learning	Introduction to Machine learning	Database Systems
Learning Theory	Probability and Statistics	Computer Networks

## HONORS AND AWARDS

Fellowships	National Talent Search Examination ( <b>NTSE</b> ), 2013 Young Scientist Promotion Fellowship ( <b>KVPY</b> ) scholar, 2014	Government of India Government of India
Awards	Selected in <b>Top 15 teams worldwide</b> , Hack against Hunger(2018) Most Innovative Student Activities (Depression therapy chatbot) <b>Academic Excellence Award</b> , 2015-2016 All-India Rank <b>40</b> amongst 1.5 million students All-India Rank <b>192</b> amongst 150k students Scholarship (Complete fee-waiver) 2013	United Nations IITK newsletter IIT Kanpur IIT-MAINS, 2015 IIT-JEE, 2015 DPS Bhopal

## FIELDS OF INTEREST

- Augmented reality, Computer Vision, Natural Language Understanding, Probabilistic modelling
- Neuroscience, Cognitive Science, language and vision


## WORK EXPERIENCE

- **Visiting Research Scholar** (National University Singapore)  
(Guide: Prof. Tat Seng Chua, May'18 - July'18)
  - **Objective** : Monocular 3D object instance recognition and Pose Estimation
  - Proposed (alongside a graduate student) a novel end-to-end architecture consisting of two modules for robust pose prediction and instance recognition via extracting **Marr's 2.5 D sketches** from images.
  - The **learned embedding** explicitly **disentangles** a shape vector and a pose vector, which alleviates both pose bias for 3D shape retrieval and categorical bias for pose estimation
  - One sub module learns to **reconstruct 3D model**, from the 2.5D sketches, in its canonical viewpoint via **multi-task learning DNNs**. Another NN sub module uses **Faster R-CNN** style anchor boxes to predict the **6 DoF** poses in **continuous domain**.
  - The method achieves state of the art **10.3 median error** for pose estimation and **0.592 top-1-accuracy** for **category agnostic 3D object retrieval** on the **Pascal3D+** dataset.
- **Software Lead** (New York Office, IIT Kanpur)  
(Guide: Prof. Manindra Agarwal, May'16 - May'18)
  - **Objective** : Industrial grade deployment of ML backend and android application for NYO
  - **ML systems**: **Collaborative Filtering** for Recommendation engine; Automated response collection on scanned MCQ survey response sheets; **NLU chatbot** using **RASA** pipeline with **NER**, **Relationship extraction** and quantity association
  - **Android app**: REST APIs, SSE notifications, app-caching, Continuous integration with Jenkins, **data and property binding** and app designing
  - Lead a team of 16 people at NYO.

## MAJOR PROJECTS


- **Zero-Shot Learning Framework** (Under Graduate Project)

(Guide: Prof. Piyush Rai, Jan'18 - present)

- Proposed a generative model for ZSL using **class conditional distributions** parametrized by non-linear functions of class attributes.
- First work of its kind to propose an **adversarial domain adaptation** for minimizing the **domain shift** between the seen and unseen class distributions.
- The generative model was trained using neural nets to model the class distributions resulting in **extensive hyper parameter stability**
- The method achieved **state of the art accuracies** on benchmark datasets (AWA2, CUB and SUN). **First author submission** currently under review at **WACV 2020** | [preprint](#) 



- **Adversarial Corruption in deep Neural Networks**

(Guide: Prof. Purushottam Kar, Jan'18 - April'18)

- **Objective** : Provide a adversarial corruption factor for robustly training neural networks
- Proposed an **alternating optimization** algorithm for the single layer Relu activated neural network. Converted the optimization problem to a **difference of convex functions** for robust optimization.
- Practically compared the training procedure to SGD as a proof of concept.
- Literature survey included robust statistics, convergence analysis of two layer network and various convergence proof techniques amongst others.
- **Project Report:** 


- **Concept-Graph based Word Problem solver** (Under Graduate Project)

(Guide: Prof. Arnab Bhattacharya & Prof. Amay Karkare, July'17 - Dec'17)

- **Objective** : Creating a solver for elementary speed, distance and time maths word problems
- Generated **world concept graph** depicting **object-quantity** (like subject and distance) owner-ships, **value-quantity** associations (like 20kmph-speed) and relationships between subjects. Used **DFS** to traverse the graph and evaluate the answer for query.
- Implemented the model using word2vec, **co-reference resolution**, **syntactic parsing** and **dependency parsing**
- **Github** : [github.com/varunkhare1234/word\\_problem\\_solver](https://github.com/varunkhare1234/word_problem_solver) | **project report** 

- **Augmented Reality Navigation** (Programming Club Project)

(Guide: Self, May'16 - June'16)

- Created **Android** navigation app using Google Directions API and **unity3d game engine**.
- Relayed unity graphics on camera feed according to accelerometer and gyroscope readings. GPS and magnetic compass was used to detect roads.
- Awarded **best club project** | : [varunkhare1234/augmented-reality-app](https://github.com/varunkhare1234/augmented-reality-app)

## TECHNICAL SKILLS

Languages	<b>Proficient:</b> Kotlin,C,C++, Java, Matlab/Octave, Bash, python, MySQL, $\LaTeX$ <b>Experienced:</b> R, Verilog, Assembly, C#, HTML
Softwares	<b>OS:</b> ARCH linux, Ubuntu, Windows <b>Libraries and Softwares:</b> Tensorflow, Pytorch, Android Studio, blender, Unity game engine

## POSITION OF RESPONSIBILITY

<b>Course Project Mentor</b>	Introduction To Machine Learning(CS771), IITK	(June'18-Nov'18)
<b>Coordinator</b>	Programming Club, IIT Kanpur	(May'17-March'18)
<b>Coordinator</b>	Google Developers Group	(May'16-April'17)
<b>Manager</b>	Software Corner, Techkriti 2017 (Annual Tech Fest)	(May'16-April'17)
<b>Student Guide</b>	Counselling service, IIT Kanpur	(June'16-April'17)
<b>Academic Mentor</b>	Counselling service, IIT Kanpur	(June'16-April'17)
<b>Senior Web Executive</b>	Antaragni 2016 (Annual Cult Fest)	(May'16-Nov'16)
<b>Senior Executive</b>	Entrepreneurship Cell, IIT Kanpur	(June'16-April'17)
<b>Secretary</b>	Programming Club, IIT Kanpur	(June'16-April'17)