

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⁺

Bayesian Machine Learning

Learning Theory⁺

⁺ is excellent performance

Stochastic Processes

Introduction to Machine learning⁺

Probability and Statistics⁺

Computational Cognitive Science⁺

Database Systems

Computer Networks⁺

HONORS AND AWARDS

Fellowships	Opemined Fellow, 2020 National Talent Search Examination (NTSE), 2013 Young Scientist Promotion Fellowship (KVPY) scholar, 2014	Research and Applied AI Government of India Government of India
Awards	Selected in Top 15 teams worldwide , Hack against Hunger(2018) Most Innovative Student Activities (Depression therapy chatbot) Academic Excellence Award , 2015-2016 All-India Rank 40 amongst 1.5 million students All-India Rank 192 amongst 150k students Scholarship (Complete fee-waiver) 2013	United Nations IITK newsletter IIT Kanpur IIT-MAINS, 2015 IIT-JEE, 2015 DPS Bhopal

Publications

• A Generative Framework for Zero Shot Learning with Adversarial Domain Adaptation [🔗](#)

Varun Khare*, Divyat Mahajan*, Homanga Bharadwaj, Vinay Kumar Verma, Piyush Rai

Winter conference on Applications of Computer Vision (WACV), 2020

- 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** in Zero shot learning.
- 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).

WORK EXPERIENCE AND PROJECTS

• Research Intern (University of California, Berkeley, USA)

(Guide: Prof. Dawn Song, June'20 - present)

- **Objective** : Neural symbolic hybrids for image recognition
- Using **program synthesis** to sample programs for few shot image classification.
- Utilizes human defined **meta-grammar** to make predictions via **explainable concepts**.
- **Self-supervised pre-training** with **curriculum** training by dynamically sampling program and input.
- Reinforcement learning by **reinforce** for **few shot episodic training**.
- Draft coming out soon on arxiv

• Federated Learning Android lead, Core Developer (OpenMined.org)

- **Objective** : Open Source secure On-device Machine Learning platform
- Leading the development of **privacy preserving machine learning** on android devices
- This is the world's first **open source ecosystem** for **differentially private federated learning** across web, mobile and servers.
- The library supports **Peer-2-peer** communication for **secure aggregation** and **SMPC** protocols.
- Work funded by **PyTorch** and **RAAIS** foundation | Github [🔗](#): **PyGrid**, **KotlinSyft**

- **Visiting Research Scholar** (Max Planck Institute for Brain Research, Frankfurt, Germany)
(Guide: Prof. Moritz Helmstaedter, August'19 - March'20)
 - **Objective** : Myelin segmentation in 3D mSEM and connectomic analysis
 - multi **Scanning Electron Microscope** produces terabytes of data everyday making manual analysis impractical.
 - We trained **3D Unet with deeplab v3** on hand annotated mSEM data and performed inference on the entire raw data.
 - Responsible for setting up the entire data processing pipeline for axon segmentation.
 - The segmentation masks are then skeletonised into connected components for connectomic analysis
 - First work to deploy axon detection on **Peta-Byte** scale dataset
- **Visiting Research Scholar** (National University Singapore)
(Guide: Prof. Tat Seng Chua, May'18 - July'18)
 - **Objective** : Monocular 3D object instance recognition and Pose Estimation
 - Worked (alongside a graduate student) on 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.
 - 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**
- **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.
- **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 | **project report** [🔗](#)

TECHNICAL SKILLS

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

POSITION OF RESPONSIBILITY

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