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$^+$
Stochastic Processes
Introduction to Machine learning$^+$
Probability and Statistics$^+$
Computational Cognitive Science$^+$
Database Systems
Computer Networks$^+$

$^+$ is excellent performance

HONORS AND AWARDS

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

PUBLICATIONS AND TALKS

- **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).
- **Privacy Preserving On-Device Machine Learning with KotlinSyft**
  Varun Khare *(Core Developer, Federated Learning Team Lead)*
  OpenMined Privacy Conference (Pricon), 2020
  - We built 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 other **SMPC** protocols.
  - Work funded by **PyTorch and RAAIS** foundation | Github : ***PyGrid***, ***KotlinSyft***

RESEARCH EXPERIENCE

- **Research Intern** (University of California, Berkeley, USA)
  (Guide: Prof. Dawn Song, June'20 - present)
  - **Objective** : neural symbolic hybrids for few shot recognition
    - Using **program induction** to sample programs for **few shot image classification**.
    - Training procedure involves Supervised pre-training with **teacher-forcing** followed by reinforcement learning using **Hindsight Experience Replay**.
    - We use **memory augmented networks** with attention to allow multiple chains of execution.

- **Objective** : meta learning in SQL query synthesis
  - Divided the Spider dataset into 13 meta categories.
  - We use **transformers** to generate embeddings for natural language question tokens.
  - A **meta-training phase** for decoder to learn predicting the **structure** of SQL query
  - A **domain specific training** phase for token prediction using a separate multi head attention module.

- **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 segmenetation.
  - The segmentation masks are then skeletonised into connected components for connectomic analysis
  - First work to deploy axon detection on **Peta-Byte** scale dataset. We achieved over **97% accuracy** in volumetric segmentation

- **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 DNN**s. Another NN sub module uses **Faster R-CNN** style anchor boxes to predict the **6 DoF** poses in **continuous domain**

WORK EXPERIENCE

- **Federated Learning Capabilities Lead** (*OpenMined* ↗)
  (Jan'20 - present)
  - **Objective** : open-source secure Federated Learning ecosystem
  - Exploring and vetting research projects in federated learning for deployment into OpenMined stack.
  - The team explores ideas and decides the overall **vision for FL** at OpenMined.
  - Devising novel algorithms for **privacy preserving optimization** and **aggregation** in federated settings like gradient compression.
  - Designing architecture and training algorithms for **decentralized FL**
  - Leading a **multi-national team of 10** consisting of research scientists and engineers.

- **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.

TECHNICAL SKILLS

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

POSITION OF RESPONSIBILITY

Federated Learning Lead	*OpenMined*	*(Oct'20-present)*
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)*