Nupur Kumari

Senior Member of Technical Staff
Media and Data Science Research
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Education

Indian Institute of Technology Delhi (I.I.T Delhi), India 2012 - 2017
Integrated M. Tech in Mathematics and Computing - 9.15/10.0 Department Rank : 5

CBSE
Senior Secondary Exam 12^{th} grade - 92.7% 2010 - 2012
Higher Secondary Exam 10^{th} CGPA - 10.0/10.0 2010

Publications

- Nupur Kumari*, Puneet Mangla*, Mayank Singh*, Abhishek Sinha*, Balaji Krishnamurthy, V N Balasubramanian. **Charting the Right Manifold: Manifold Mixup for Few-shot Learning**. **WACV** 2020 (paper link)
  - Analyzed the role of self-supervision and generalization boosting techniques while training deep neural networks for down-stream task of few-shot learning.
  - Proposed a new training methodology for feature extraction combining manifold-mixup and rotation self-supervision which achieved the **state-of-the art** accuracy on standard datasets for few-shot tasks.

- Nupur Kumari*, Mayank Singh*, Abhishek Sinha*, Harshitha Machiraju, Balaji Krishnamurthy, V N Balasubramanian. **Harnessing the Vulnerability of Latent Layers in Adversarially Trained Models**. **IJCAI**. 2019. (paper link)
  - Analyzed the latent layers of adversarially trained models and observed its vulnerability to adversarial attacks.
  - Proposed a new adversarial training methodology to increase the robustness of latent layers which achieved **state-of-the-art** adversarial accuracy against strong adversarial attacks.

- Nupur Kumari*, Mayank Singh*, Abhishek Sinha, Puneet Mangla, Balaji Krishnamurthy, V N Balasubramanian. **On the Benefits of Attributional Robusntess**. arxiv preprint (paper link)
  - Proposed a robust attribution training methodology that maximizes the alignment between the input and its attribution map. It achieves **state-of-the-art** attributional robustness on various saliency methods.
  - Showed that the proposed training methodology also induces adversarial robustness and achieves state-of-the-art in weakly supervised object localization on CUB dataset.

- Nupur Kumari*, Mayank Singh*, Abhishek Sinha*, Balaji Krishnamurthy. **Understanding Adversarial Space through the lens of Attribution**. *Nemesis* - **ECML** workshop. 2018. (paper link).
  - Used the attribution map of images to train a classification model for detecting adversarial examples of a deep learning model.

- Bishal Deb, Ankita Sarkar, **Nupur Kumari**, Akash Rupela, Piyush Gupta, Balaji Krishnamurthy. **MultiMapper: Data Density Sensitive Topological Visualization**. **ICDM** workshop. 2018. (paper link).
  - Proposed an improvement over Mapper, a topological data visualization algorithm, that reduces the obscuration of topological information by facilitating the cover selection in data density sensitive manner.

(* denotes equal contribution)

Work Experience

- **Adobe Systems, Noida, India** Jun 2017-Present
  - **Topological Data Visualization**
    Working on a scalable data visualization approach which aims at preserving the shape/topological properties of the data. A **patent** application(Adobe P8569-US) has been filed for a part of the approach.
  - **Adaptive Customer Journey**
    Working on a reinforcement learning based approach to arrive at personalized user journeys for marketing campaigns. A **patent** application(Adobe P7958-US) has been filed for the proposed methodology.
  - **Adversarial Robustness**
    We proposed a regularization loss while training of neural network to promote disentangled feature learning at deeper layers of neural network which further helped in adversarial robustness. A **patent** application(Adobe P8327-US) has been filed for the proposed methodology.

Internships

- **Adobe Systems, Noida, India** May-July 2016
  Topological Data Analysis

  Unsupervised user segmentation leveraging techniques from topological data analysis and deep learning. Trained a seq2seq neural network model on time-series data of users to get a low dimensional vector representation. Afterwards, calculated the persistent homology features of the point cloud of each user for segmentation.
- **Curofy, Gurgaon, India** May-July 2015
  Application Development

  Implemented a personalized notification system for the application based on past behavioural data of users. The algorithm ranked the recommended content for each user using a tf-idf based approach.

Other Projects

- **Sim2Real in Reinforcement Learning** July-Sept 2019
  Worked on the problem of learning policies which are robust to changes in the environment. Current work in domain randomization aims at achieving this goal by training the agent on a distribution of simulation environments. We guided the sampling distribution of environment using an adversarial loss for finding the worst environment within small perturbations and observed improvement in the total reward.
- **Natural Language Processing** Jan-April 2016
  Implemented a sentiment classifier for predicting sentiments expressed in the tweet specific to a personality. Used domain adaptation techniques to exploit large amount of labelled tweet data on general sentiment and few domain specific labels. Experimented with attention based hierarchical seq2seq model for abstractive summarization of movie reviews.

Scholastic Achievements

- Qualified for **INMO (Indian National Mathematics Olympiad)** 2012 organized by HBSCE by securing second position in the region and 19 overall in India in JMO (Junior Mathematics Olympiad).
- Recipient of highest CGPA in semester award for two semesters at IIT Delhi. 2016-2017

Positions of responsibility

- **Mentor of internship projects** May-July 2018-19
  - **Topological features for Deep Learning** The project aimed at exploring the use of persistent homology based features of data for predicting network architecture.
  - **Adversarial Attacks** In this project, we developed a fast data independent technique of computing class-wise universal adversarial perturbation for classification neural networks. (project link)
- **Teaching Assistantship** Jan-May 2017
  - **Discrete Mathematics, Data Mining, and Linear Algebra** Responsible for assignment evaluation and conducting tutorial sessions for the courses.
  - **Machine Learning course on classification and deep learning** Worked as a teaching instructor for a Machine Learning course that was offered to employees at Adobe.
- **Electrical coordinator at Robotics Club IIT Delhi** 2014-2015
  - Responsible for guiding a team of 10 students in building the drive and circuit of a remote controlled robot that can play badminton. We participated in Abu-Robocon India 2015 competition and qualified till the quarter-finals round among more than 50 participating teams.

Languages and Libraries

Proficient: Python, Tensorflow, Pytorch **Familiar:** C++, Java