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Aishwarya Gupta

Research Interests

Computer Vision, Machine Learning and Deep Learning.

Publications

SemEval 2021 **Humor@IITK at SemEval-2021 Task 7: Large Language Models for Quantifying Humor and Offensiveness** [pdf]
- A Gupta*, A Pal*, B Khurana*, L Tyagi*, A Modi

WiML 2019 **Light-Weight Single-Shot Refined Neural Network for Object Detection**
- A Gupta*, H Desai*, M Kolla*

IAAI 2019 **VPDS: An AI-based Automated Vehicle Occupancy and Violation Detection System** [pdf]
- A Kumar*, A Gupta*, B Santra*, L Srinivasan*, M Kolla*, M Gupta* and R Singh*

UAI 2017 **A Probabilistic Framework for Zero-shot Multi-label Learning** [pdf]
- A Gaure, A Gupta, V Verma and P Rai

Patents

2020 **Building Light-Weight Single-Shot Refined Neural Network for Vehicle Passenger Detection System**
- H Desai, A Gupta, M Kolla, US Patent (*under review*)

Education

2020 – 2025 **Ph.D**, *Computer Science and Engineering*, **IIT Kanpur**, 9.5/10.0.

2015 – 2017 **Master**, *Computer Science and Engineering*, **IIT Kanpur**, 8.0/10.0.

2011 – 2015 **Bachelor**, *Computer Science and Engineering*, **HBTU Kanpur**, 82.52%.

Work Experience

Aug 2017 – July 2019 **Conduent Labs India/Xerox Research Centre India**, Bangalore, India.
Research Engineer, Computer Vision and Media Analytics Group

Research Projects

Sep 2020 – **PhD Thesis: Explainable and Reliable Autonomous Driving Systems**
Advisor: *Prof Indranil Saha and Prof Piyush Rai*, IIT Kanpur.
- Working on developing an explainable and reliable end-to-end deep neural network based controller for autonomous vehicles by focusing on the critical objects influencing model's decisions (a.k.a action-inducing objects).
- We aim to improvise the model performance and explainability using the past, present and most probable future events of the action-inducing objects present in the driving scenario.

Sept 2020 – Feb 2021 **SemEval-2021 Task 7: HaHackathon: Detecting and Rating Humor and Offense**
Advisor: *Prof Ashutosh Modi*, IIT Kanpur.
- Explored the efficacy of Large Language models (LLMs) for the subjective understanding of the underlying humor and/or offence in the short text inputs.
- Proposed a novel multi-task model jointly trained in an end-to-end fashion on all the challenge subtasks i.e. humor classification, offence-rating, humor-rating and humor-controversy. Explored both single and multi-task models as well as their ensembles using different LLMs as backbones.
- Achieved 3^{rd} **rank in subtask 1b** i.e. humor-rating and consistently ranked among the **top 33% of the valid submissions** on the leaderboard for the remaining subtasks.

*Equal Contributions

May 2020 – March 2021 **Detecting the outbreak of any infectious respiratory diseases**
Advisor: *Prof Tolga Tasdizen*, University of Utah.
- Worked on developing a machine learning and statistics based algorithm to early detect the outbreak of an infectious respiratory disease using Chest X-ray images.
- We showed the efficacy of our proposed work by collecting a significant number of COVID positive and negative Chest X-ray images.
- The work is under review in MICCAI 2021.

Aug 2019 – Jan 2020 **Learning Deep Networks Robust to Adversarial Attacks**
Advisor: *Prof Tolga Tasdizen*, University of Utah.
- Worked on improving the adversarial robustness of Deep Convolutional Neural Networks (DCNN) by penalising the noisy gradients.
- Explored the importance of local-learning over end-to-end learning for enhancing the adversarial robustness of the model.
- Experimented with Locally Linear Embeddings (LLEs) to learn models robust to adversarial attacks.

Aug 2018 – July 2019 **Light-Weight Network for Object Detection**
Advisor: *Dr Manasa Kolla*, Conduent Labs.
- Trained RefineDet object-detection model and identified highly-correlated filter pairs. Further increased their correlation using log-based loss.
- Iteratively identified and pruned highly correlated filter pairs, followed by the pruned model training from scratch.
- Successfully pruned almost **40%** of the model with a maximum accuracy drop of **3-4%**.

Aug 2017 – July 2018 **Vehicle Passenger Detection System**
Advisor: *Dr Manasa Kolla*, Conduent Labs.
- Detected HOV3+ violators (having occupancy count less than 3) using deep convolutional neural networks (DCNNs).
- Achieved an accuracy of **95%** in passenger counting by training the CNN with **oversampling and softmax**; even outperforming Siamese and focal loss in class-imbalanced scenario.

Jan 2016 – June 2017 **Probabilistic Models for Multi-label Learning**
Advisor: *Prof Piyush Rai*, Dept of CSE, IIT Kanpur.
- Proposed **MT-LCS**, a probabilistic framework for multi-label learning problem in zero-shot setting by the joint modeling of the label co-occurence matrix and label matrix.
- Also learned a probabilistic model by **factorizing the similarity graph** constructed using the label matrix of the training instances and learned a regression model to predict their low-dimensional embeddings.

Other Research Projects

Jan 2018 – June 2018 **Vehicle Re-identification in Surveillance Videos**
Advisor: *Rohit Gupta*, Conduent Labs.
- Re-identified vehicles present in multiple surveillance videos captured from multiple cameras at different locations and with different viewpoints.
- Detected and tracked vehicles in a frame in a video to get tracks which are matched across different location videos using the deep CNNs (trained using triplet loss).
- Further improved the re-identification accuracy by **augmenting the CNN features with the color features** extracted from a shallow network.

Nov 2017 – Oct 2018 **Survival Analysis using Multi-task Learning**
Advisor: *Dr Raman Sankaran & Dr Arun Rajkumar*, Conduent Labs.
- Modeled survival-analysis problem as a multi-task learning problem with timestamps as tasks and predicted the survival status of the patient at each timestamp.
- Learned a non-increasing weight matrix for PCA-reduced patient's micro-gene array data by framing an optimization problem using hinge loss and elastic net.

Technical Skills

Languages: Python, MATLAB, C/C++, Java, LaTeX

Libraries: PyTorch, Caffe, Keras, TensorFlow
OpenCV, NumPy, SciPy, Scikit-learn, Pandas