

# 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
- 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 – **Conduent Labs India/Xerox Research Centre India**, Bangalore, India.  
July 2019 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.
- We intend to develop an 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)
  - Working on developing a framework to generalise vehicle controller systematically to different daytime situations but with minimum training data and overhead
  - We also aim to verify the vehicle controller exhaustively in all possible dynamic situations by manipulating the surrounding action-inducing objects
  - We recently proposed a Bayesian approach to Federated Learning where each user infers a predictive posterior distribution over its private dataset and communicate it to the server. The server then aggregates the users' models in varied ways and sends it back to all the users for the next round. *This work is under submission.*
- Sept 2020 – **SemEval-2021 Task 7: HaHackathon: Detecting and Rating Humor and Offense**  
Feb 2021 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.
  - Achieved 3<sup>rd</sup> 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.

May 2020 – **Detecting the outbreak of any infectious respiratory diseases**

March 2021 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.

Aug 2019 – **Learning Deep Networks Robust to Adversarial Attacks**

Jan 2020 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. Also, experimented with Locally Linear Embeddings (LLEs) to learn models robust to adversarial attacks.

Aug 2018 – **Light-Weight Network for Object Detection**

July 2019 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 function.
- Iteratively identified and pruned highly correlated filter pairs, followed by the training of the pruned model from scratch. Successfully pruned almost 40% of the model with a maximum accuracy drop of 3-4%.

Aug 2017 – **Vehicle Passenger Detection System**

July 2018 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 detecting HOV3+ violators using CNNs, trained on a highly imbalanced dataset of over-exposed and under-exposed monochrome images of the vehicle

Jan 2016 – **Probabilistic Models for Multi-label Learning**

June 2017 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-occurrence 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.

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## Other Research Projects

Jan 2018 – **Vehicle Re-identification in Surveillance Videos**

June 2018 Advisor: , 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 video to get vehicle tracks which are matched across videos collected from different locations 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 – **Survival Analysis using Multi-task Learning**

Oct 2018 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.

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## Scholarship

Sep 2021 - pr. Recipient of Prime Minister's Research Fellowship (PMRF)

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## Technical Skills

Languages Python, MATLAB, C/C++, Java,  $\text{\LaTeX}$

Libraries PyTorch, Caffe, Keras, TensorFlow

OpenCV, NumPy, SciPy, Scikit-learn, Pandas