GUNSHI GUPTA

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Areas of Interest : Bayesian DL, Robotics, Meta-Learning, Out-of-Distribution Detection, Continual Learning

Education

Montreal Institute of Learning Algorithms (MILA)   Montreal, Quebec
Research Master's, Machine Learning | GPA: 4.0/4.0   *Sept. 2018-Present*

Delhi Technological University (DTU)   New Delhi, India
Bachelor of Technology, Mathematics and Computing | GPA: 8.05/10   *Sept. 2012-May 2016*

Recent Work Experience

Robotics Research Center, IIIT Hyderabad   Hyderabad, India
Graduate Research Assistant (under Dr. K. Madhava Krishna)   *Jan. 2017-May 2018*

- Project for Center of Artificial Intelligence and Robotics : Developed Multi Robot SLAM framework facilitating Incremental/Batch Optimization, Centralized/Distributed map merging, Dense point cloud registration, Robot Encounters with Visual Odometry based front-end [Nonlinear Convex optimisation, Multi-View Geometry]
- Tested framework successfully on Husky UGV Robot Platform for complex trajectories.

Micrsoft Corporation   Hyderabad, India
Software Developer   *Jun. 2016-Jan. 2017*

- Built modules to predict employee performance scores, summarize employer-and-employee feedback, recommend and extract salient keyphrases while writing feedback through NLP techniques.
- Conducted sessions on 'Mathematics Fundamentals for ML' in Machine Learning workshops held for HRCELA division(150 attendees). Prepared course material and assignments, and headed planning committee for the same.

Graphics Research Group, IIIT Delhi   New Delhi, India
Intern   *Oct. 2015-Dec. 2015*

- Developed an optimized C++ implementation of the existing pipeline from the work titled "3D surface reconstruction of objects from arbitrary planar cross sections", based on constraints satisfied by object geometry [Computational Geometry]

Ongoing Research/Course Projects

Out of Distribution Detection(OOD) for Probabilistic Object Detection   Montreal, Quebec
Prof. Liam Paull, Denso Corporation   *Jul. 2019- Present*

- Researching Bayesian Object Detection for uncertainty-based decision making in Autonomous Driving (AD).
- Investigated approximation of diverse ensembles through Stein variational methods.
- Researched few-shot metric learning for employing neural network models in open-set conditions.

Adversarially Learning Human-like Driving Behaviour in the CARLA Simulator   Montreal, Quebec
Prof. Liam Paull, Dr. Felipe Codevilla   *May 2019- Sept. 2019*

- Developed behaviour cloning, reinforcement learning baselines (SAC, PPO), and environment wrappers for route following tasks in the CARLA simulator to enable scalable RL research for AD.
- Investigated adversarial learning techniques to interactively learn generalizable driving behaviour from demonstrations within the framework of Inverse Reinforcement Learning.

MetaLS : Meta-Opt for Non-Linear Least Squares   Montreal, Quebec
Prof. Liam Paull, Krishna J Murthy   *Nov. 2019- Present*

- Exploring meta-optimization algorithms with closed-form solvers for geometric computer-vision problems.

Course Projects   **Montreal, Quebec**
PGM -IFT6269, Autonomous Vehicles (Duckietown)-IFT6757, Reinforcement Learning - COMP767   *2018-2019*

- Analysed the paper : "Junction Tree Variational Auto-Encoders for Molecular Graph Generation", ran additional experiments involving Bayesian Optimisation for targeted drug discovery
- Implemented a planner for moving obstacles using Monte-Carlo Tree Search in Duckietown
- Reproduced the paper : "Learning and Querying Fast Generative Models for Reinforcement Leaning"

Publications & Workshops

- *Reviewer*: IEEE-RA-L, ICRA, ICML, CVPR 2020
- *Look-Ahead Meta Learning for Continual Learning* : **Gunshi Gupta***, Karmesh Yadav* and Liam Paull [Under Review].
- *Unifying Variational Inference and PAC-Bayes for Generalisation Bounds in Imitation Leaning* : Sanjay Thakur, Herke Van Hoof, **Gunshi Gupta** and David Meger [Preprint].
- *Viewpoint Invariant Junction Recognition using Deep Network Ensembles (IROS 2018)* : Abhijeet Kumar*, **Gunshi Gupta***, Avinash Sharma and K. Madhava Krishna. [Link].
- *Geometric Consistency for Self-Supervised End-to-End Visual Odometry* (1st International Workshop on Deep Learning for Visual SLAM, CVPR 2018) : Ganesh Iyer*, J. Krishna Murthy*, **Gunshi Gupta**, and Liam Paull. [Link].
- *Stein Variational Methods for Robot Navigation* : Poster at ICML 2019 Workshop: Stein Methods in Machine Learning.

Skills & Courses

- Languages: C++, C, Python
- Frameworks: Pytorch, Tensorflow, GTSAM, g2o, ROS, Point Cloud Library, Docker, CARLA
- Courses:
  Master's : Deep Learning, Reinforcement Learning, Autonomous Vehicles, Probabilistic Graphical Models;
  Bachelor's : Probability and Statistics (I, II), Algorithm Design and Analysis, Software Engineering, Matrix Computations, Stochastic Processes, Optimization Techniques, Differential Equations, Advanced Differential Equations, Applied Graph Theory, Theory of Computation, Discrete Mathematics, Fuzzy sets and logic, Real Analysis, Operations Research, Modern Algebra