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Parth Kothari

Education

2018–Present **Ph.D in Electrical Engineering**, *EPFL*, *6.0/6.0*.
Advised by Prof. Alexandre Alahi
Affiliated with the Visual Intelligence For Transportation (VITA) Labratory
Conducting research in areas of Behavior Prediction and Planning, Socially-Aware Agents

2014–2018 **B.Tech in Electrical Engineering**, *IIT Bombay*, *9.74/10*.
Completed with Minor in Computer Science and Honors in Electrical Engineering
Department Rank 2 in a batch of 66 students
Institute Rank 7 in a batch of 880 students

Publications

- TTT++: Improved Test-Time Training, **NeurIPS 2021**
- Interpretable Social Anchors for Human Trajectory Forecasting in Crowds, **CVPR 2021**
- Human Trajectory Forecasting in Crowds: A Deep Learning Perspective, **IEEE ITS 2020**
- Collaborative Sampling in Generative Adversarial Networks, **AAAI 2020**
- Adversarial Loss for Human Trajectory Prediction, **hEART 2019**

Research Internship

Title **DriverGym: Democratising RL for Autonomous Driving** [Code] [2021]
L5 Research, Woven Planet (Previously, Lyft)
Submission Under Review

Description DriverGym is an open-source OpenAI Gym-compatible environment specifically tailored for developing RL algorithms for autonomous driving. It provides access to more than 1000 hours of expert logged data and also supports reactive and data-driven agent behavior. Further, we provide an extensive and flexible closed-loop evaluation protocol. The DriverGym code, as well as all the accompanying baselines are publicly available to further stimulate development from the community.

Research Projects

Title **TrajNet++: Human Trajectory Forecasting in Crowds** [Paper] [Code] [2020]

Description We present an in-depth analysis of existing deep learning-based methods for modelling social interactions. To objectively compare the performance of these trajectory forecasting models, we develop a large scale interaction-centric benchmark TrajNet++. We propose a domain-knowledge inspired data-driven method to provide safer, socially compliant predictions and validate its efficacy on TrajNet++. Finally, we apply layer-wise relevance propagation to explain the decision-making of current models.

Title **Interpretable Social Anchors for Human Trajectory Forecasting** [Paper] [2021]

Description Current neural network based forecasting models suffer from one crucial limitation: lack of interpretability. To overcome this, we leverage the power of discrete choice models to learn interpretable rule-based intents, and subsequently utilise the expressibility of neural networks to model scene-specific residual. Experiments on TrajNet++ demonstrates the efficacy of our method to explain its predictions without compromising the accuracy.

Title **TTT++: Improved Test-Time Training** [Paper] [2021]

Description Test-Time Training (TTT) is a promising paradigm that leverages an auxiliary Self-Supervised Learning (SSL) task at test-time to improve generalization. In this work, we improve upon TTT, by introducing *TTT++*, an online feature alignment strategy by utilizing offline feature summarization. Further, we incorporate a suitable SSL task in the form of contrastive learning and empirically demonstrate that our proposed strategy outperforms state-of-the-art methods on multiple benchmarks.

Title **Collaborative Sampling in Generative Adversarial Networks** [Paper] [Code] [2019]

Description Developed a collaborative sampling scheme between the generator and the discriminator for improved data generation during sampling. Proposed a practical discriminator shaping method for effective sample refinement. Experiments on synthetic and image datasets demonstrate the efficacy of our method to improve generated samples both quantitatively and qualitatively, offering a new degree of freedom in GAN sampling.

Title **Adversarial Loss for Human Trajectory Prediction** [Paper] [Code] [2019]

Description Highlighted an unexpected pitfall in the state-of-the-art architecture for multimodal human prediction via controlled experiments. Proposed a modification to the architecture leveraging the progress in the GAN community. Demonstrate the efficacy of the proposed modification on real world datasets, indicating room for improvement on state-of-the-art.

Workshops and Challenges

Title **TrajNet++: Human Trajectory Forecasting Benchmark** [Challenge] [Code] [2020]
Appearing in Multi-Agent Interaction and Reasoning Workshop, ***ICCV 2021***
Appeared in Long-term Human Motion Prediction Workshop, ***ICRA 2021***
Appeared in Benchmarking Trajectory Forecasting Models, ***ECCV 2020***

Technical Strengths

Languages Python, C++, C, MATLAB, Embedded C, Latex, HTML, CSS

Softwares Pytorch, Tensorflow, OpenCV, Raspberry Pi, OpenGL, AVR

Academic Achievements

- Recipient of the **Institute Academic Prize** for securing **First Rank** out of 66 students of the Electrical Engineering Department in the second academic year 2015-16.
- Secured **State Rank 1** and **All India Rank 11** in JEE-Mains-2014, national level engineering entrance examination, out of **1.5 million** candidates
- Secured **All India Rank 458** in JEE-Advanced-2014 out of **150,000** candidates
- Awarded **Gold medal** in Indian National Physics Olympiad-2014 and Indian National Chemistry Olympiad-2014 for being among the top 35 students in India

Relevant Courses

CS Courses	Machine Learning, Computer Vision, Digital Image Processing, Advanced Image Processing, Medical Image Processing, Data Structures and Algorithms
EE Courses	Signals and Systems, Digital Signal Processing, Advanced Topics in Signal Processing, Markov Chains, Control Systems, Probability and Random Processes
Math Courses	Linear Algebra, Applied Mathematical Analysis, Complex Analysis, Calculus

Leadership

Spring 2020 **Teaching Assistant for Deep Learning for Autonomous Vehicles**, *EPFL*, [Page].

Autumn 2018 **Teaching Assistant for Calculus**, *IIT Bombay*.

2016–2017 **Manager, Electronics Club**, *IIT Bombay*.
Conducted workshops, institute-wide events, hackathons and group discussions to promote Electronics among the student community
Awarded Technical Organizational Special Mention for exemplary contribution

2017-2018 **Student Mentor, Institute Student Mentorship Programme**.
Responsible for mentoring a group of 12 freshmen to help adjust to the new environment, academically and socially and guide them towards a holistic development ensuring a smooth transition to college life