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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

- DriverGym: Democratising RL for Autonomous Driving, **ML4AD Workshop, NeurIPS 2021**
- 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)*

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

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|---|---|
| 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