SHRINIVAS RAMASUBRAMANIAN

Long Tailed Classification | Semi-Supervised Learning | Non-Decomposable Objectives| Model Fairness

@ shrinivas.ramasubramanian@gmail.com +91 9819041490 @stablegradients github.io Google Scholar

EDUCATION

B.Tech in Electrical Engineering CGPA : 7.5
Indian Institute of Technology Bombay Aug 2020

RELEVANT COURSEWORK

Advanced ML | Image Processing | Advanced Computer Vision | Reinforcement Learning | Probability

PUBLICATION

Cost Sensitive Self-Training For Optimizing Non-Decomposable Objectives — **NeurIPS '22**
Harsh Rangwani*, **Shrinivas Ramasubramanian***, Sho Takemori*, Kato Takashi, Yuhei Umeda, Venkatesh Babu Radhakrishnan — Main Conference

SelMix: Selective Mixup Fine Tuning for Optimizing Non-Decomposable Metrics — **ICML'23**
Shrinivas Ramasubramanian*, Harsh Rangwani*, Sho Takemori*, Kunal Samanta, Kato Takashi, Yuhei Umeda, Venkatesh Babu Radhakrishnan — Diff. Everything

Selective Mixup Fine-Tuning for Optimizing Non-Decomposable Metrics — **Submitted ICLR'24**
Shrinivas Ramasubramanian*, Harsh Rangwani*, Sho Takemori*, Kunal Samanta, Kato Takashi, Yuhei Umeda, Venkatesh Babu Radhakrishnan — Main Conference

Long-Tail Temporal Action Segmentation via Group-wise Temporal Logit Adjustment — **Submitted CVPR'24**
Zhanzhong Pang, Fadime Sener, **Shrinivas Ramasubramanian**, Angela Yao — Main Conference

Going Beyond Patches for Regularizing Self-Supervised Vision Transformers — **Submitted CVPR'24**
Chaitanya Devaguptapu, Sumukh K Aithal, **Shrinivas Ramasubramanian**, Moyuru Yamada, Manohar Kaul — Main Conference
(* : first co-authors)

PATENT

United States Patent — US PA No. 20230376846
INFORMATION PROCESSING APPARATUS AND MACHINE LEARNING METHOD
Harsh Rangwani, **Shrinivas Ramasubramanian**, Sho Takemori, Kato Takashi
Yuhei Umeda, Venkatesh Babu Radhakrishnan

Patent Pending (India) — Application No. 202331050473
INFORMATION PROCESSING APPARATUS AND MACHINE LEARNING METHOD
Shrinivas Ramasubramanian, Harsh Rangwani, Kunal Samantha, Sho Takemori,
Yuhei Umeda, Venkatesh Babu Radhakrishnan

ACADEMIC SERVICE

- **Teaching Assistant:** Prepared academic material and delivered lectures on the topics of **Semi-supervised learning, Object Detection, and generative models** for the course DS-265, a masters level course during my tenure.
- Served as reviewer for NeurIPS'23, ICML'23, ICLR'24 and AAAI'24

WORK EXPERIENCE

Research Engineer — May 2023 - present
Fujitsu Research India Pvt. Ltd., Bangalore — Bangalore
- Currently working on fine-tuning foundation models for the task of robust person re-identification under distribution shifts.
- Working on consistent sub-sampling methods for large(84 million + nodes) heterogeneous temporal graphs of financial data for training and evaluation of PoCs for fraud detection.
- Worked on using graph neural nets for semantics based regularization for self-supervised pre-training for DINO, in submission for CVPR'24.

Intern under Prof. Angela Yao — March. 2022 - May 2023
CVML Group, National University Singapore (remote) — Bangalore
- Applied expertise in long-tail learning to enhance action segmentation in videos, collaborating with Prof. Angela Yao's research group.
- Demonstrated adaptability of established architectures and crafted novel loss functions, significantly improving performance metrics for imbalanced action segmentation; work under submission to CVPR'24.

Project Assistant under Prof. Venkatesh Babu — Oct. 2021 - May 2023
Video Analytics Lab (VAL), IISc Bangalore — Bangalore

- **Publication:** Worked on the problem of optimizing **Linear Non-Decomposable Objectives** such as bias and other fairness measures for long-tailed data using **Semi-Supervised Learning**, resulting in our **NeurIPS'22** publication in collaboration with **Fujitsu Research**.
- **Teaching Assistant:** Prepared academic material and delivered lectures on the topics of **Semi-supervised learning, Object Detection, and generative models** for the course DS-265 during my tenure as a teaching assistant for the course.
- Mentored summer interns and undergraduates and authored a paper **"Selective Mixup Fine-Tuning for Optimizing Non-Decomposable Metrics"** (ICLR submitted) which solves the problem of optimizing both non-linear and linear objectives of confusion matrix for a classifier under semi-supervised and supervised setting.

Computer Vision Engineer
Beltech — Jan 2021 - Oct 2021, Bangalore

Automatic License Plate Recognition
- Fine-tuned and modified CRAFT for localising multi-line text in license plate.
- Developed and deployed an OCR model by using Spatial Transformer for orientation correction followed by a custom **LSTM** based OCR.
- Applied template based correction heuristic and achieved **normalised edit distance score** 0.01 for the OCR on test set.

SLAM for traffic intersection
- Generated an occupancy grid of the entities at an intersection from multiple camera feeds using object detection data and static satellite data by applying a **homo-graphic projection**.
- Developed heuristics-based methods for traffic violation detection such as over-speeding, no parking, red light jump, wrong direction, and BRTS zone violation using occupancy grid information.

Object Tracking
- Deployed an object tracker using a YOLO-v4 detector followed by DeepSort to track objects across frames.
- Used tracking information to store the entire life cycle of a given entity's bounding box prediction, category, and location history to apply a heuristics-based algorithm to achieve **mAP scores of 0.71** for the tracks on the test set.

Robotics Research Internship
University of Oxford Brookes — Apr-2018 - July 2018, Oxford, UK
- Worked on the problem of intersection traffic management using Deep Actor-Critic based models
- Trained a transformer using a sequence of state vectors, each containing the complete static information of the intersection.
- Reduced the average wait time by 10% and built a small-scale traffic intersection using autonomous bots for demonstration.

ACHIEVEMENTS
- NeurIPS'22 paper "Cost Sensitive Self-Training For Optimizing Non-Decomposable Objectives" presented at IISc-EECS symposium
- All India Rank 156 in **JEE advanced** exam among 150k aspirants and received a scholarship of INR 95k from Vidyamandir Classes
- Technical citation for leading the computer vision team for Mahindra RISE Autonomous Vehicle Development.
- Awarded INSPIRE India scholarship for academic merit in science and mathematics by Dept. of Science and Technology, Govt. of India.

NOTABLE PROJECTS
Long exposure images from short exposure image using cGAN
- Designed a **Conditional-GAN** to covert a low light short exposure image to a long exposure one.
- Overcame **exploding gradient problem** for generator training using **regularisation** and ϵ**-soft sigmoid activation.**

Semantic Segmentation
- Developed an **encoder-decoder** based segmentation network and trained it on **Mapillary dataset**.
- Achieved **IOU score** $\approx$ **0.84** on important classes, an improvement of 15% in IOU compared to our baseline network LinkNet by using dilated convolutions and **LeakyReLU** activation for the middle layers.

Distance estimation from monocular images
- Developed a convnet to estimate distance using monocular images and achieved $\Delta d/d \leq 0.1$ at distances under 100m.
- The network **outputs at multiple scales**, improving general depth estimate as well as fine details.

Super Resolution of Images
- Built a multi scale super resolution convnet using Densely Connected Convolutional Networks as the convolutional layers.
- Loss used was a combination of SSIM and L1 error and achieved an **SSIM of 0.85 for 8X super resolved image**.

REFERENCES

Dr Venkatesh Babu
Professor
CDS Dept. IISc
venky@iisc.ac.in

Dr Umeda Yuhei
Senior Project Director
Fujitsu AI Lab, Japan
umeda.yuhei@fujitsu.com

Dr Angela Yao
Assitant Professor
School of Computing, NUS
ayao@comp.nus.edu.sg

Pinakee Biswas
Chief Technology Officer
Beltech Green pvt ltd
pinakee@beltech.ai