

SURAJ KOTHAWADE

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EDUCATION

- University of Texas at Dallas** (Aug'19 - May'23)
PhD, Computer Engineering GPA: 3.86/4.0
Advisor: Prof. Rishabh Iyer
- University of Southern California** (Jan'19 - Jul'19)
MS, Computer Science, GPA: 3.7/4.0
- SGGS Institute of Engineering & Technology** (July'14 - June'18)
B.Tech, Computer Science & Engineering, GPA: 8.93/10.0

RESEARCH INTERESTS

My research revolves around targeted data subset selection for improving the performance of machine learning models in realistic dataset scenarios like class imbalance, redundancy and out-of-distribution data. I'm interested in applying my research to a broad spectrum of domains in computer vision, natural language processing, speech, and recommendation systems.

INTERSHIPS/WORK EXPERIENCE

- Google, Mountain View, CA** (May'22 - Aug'22)
Research Intern
 - Designed E^2 ViT: Efficient and Effective Vision Transformers. E^2 ViT outperforms recent ViTs by 1.6 AP on dense vision tasks. It performs significantly well for large objects due to richer modeling of long range dependencies by combining downscaled global attention, skip connections, and strong data augmentation methods.
 - Designed a search space for Neural Architecture Search in order to automatically find the optimal backbone for any given downstream vision task.
- NVIDIA, Santa Clara, CA** (May'21 - Aug'21)
AI Research Intern
 - Designed a framework for auto-labelling traffic sign objects in images from multiple countries by using only few samples of a completely unknown traffic sign.
- NVIDIA, Santa Clara, CA** (May'20 - Jan'21)
AI Research Intern
 - Devised and implemented an algorithm for semantic object based retrieval called Deep Template Matching (DTM) that efficiently mines for semantically similar images based on a region of interest in a query image. (US Patent filed)
 - Demonstrated the efficacy of DTM for retrieving small and underrepresented objects.
 - Applied DTM for fixing false negative failure cases of an objected detector deployed in NVIDIA autonomous vehicles — by mining semantically similar objects from large unlabeled dataset and adding such images to training data.
- University of Texas at Dallas** (Aug'19 - May'20, Jan'21 - May'21, Aug'21 - May'22)
Research/Teaching Assistant (Fall 2021, 2022, Spring 2021: CS 6375, 4375 - ML, Spring 2020, Fall 2019: CS 4348 - OS)
- University of Southern California, Los Angeles, CA** (Jan'19 - Aug'19)
Research Student (Advisor: Prof. Stefanos Nikolaidis)
 - Robotic Lime Picking using Cost-Based APF-RRTs by Modelling Leaves as Penetrable Obstacles
 - Learning Collaborative Action Plans from YouTube Videos — [ISRR 2019](#)
- Indian Institute of Technology, Bombay** (Dec'17 - Dec'18)
Research Intern (Advisor: Prof. Ganesh Ramakrishnan)
 - Worked with on developing machine learning models to solve computer vision problems in CCTV videos.
 - Lead a team to deliver a Compliance and Quality Monitoring System for the **Ministry of Rural Development**: for the following compliances: 1) Predict if a Class has Started or Not (Implemented Handcrafted features for higher accuracy). 2) Classroom Attendance and 3) Uniform Detection. (Used multi-class customized YOLOv2 on edge devices). [video](#)
 - Developed an open source toolkit for Visual Data Subset Selection and Summarization: [arXiv-preprint](#) [GitHub](#)
- Aitoe Labs** (Apr'18 - Dec'18)
Machine Learning Engineer
 - Implemented machine learning pipeline and system architecture for analyzing big data from 500+ CCTV cameras in Bhopal (IN) to deliver person search, face search, face recognition and text search for the state police department in Madhya Pradesh.
 - Solved problems like scheduling tasks efficiently to GPUs, storage and retrieval of huge metadata for quick search.

RESEARCH PAPERS

PREPRINTS

- [1] Suraj Kothawade, Shivang Chopra, Saikat Ghosh, and Rishabh Iyer. **Active Data Discovery: Mining Unknown Data using Submodular Information Measures**. In *arXiv preprint arXiv:2206.08566*.

- [2] Nathan Beck*, Suraj Kothawade*, Pradeep Shenoy, Rishabh Iyer. **STREAMLINE: Streaming Active Learning for Multi-Distributional Settings.**
- [3] Suraj Kothawade, and Rishabh Iyer. **PROBE: Deep Submodular Networks for Subset Selection.** *In arXiv preprint arXiv:2010.08593.*

* Equal Contribution

CONFERENCE PAPERS

- [1] Suraj Kothawade, Saikat Ghosh, Sumit Shekhar, Yu Xiang, and Rishabh Iyer. **TALISMAN: Targeted Active Learning for Object Detection with Rare Classes and Slices using Submodular Mutual Information.** *European Conference on Computer Vision, ECCV 2022; In arXiv preprint arXiv:2112.00166.*
- [2] Changbin Li*, Suraj Kothawade*, Feng Chen, Rishabh Iyer. **PLATINUM: Semi-Supervised Model Agnostic Meta-Learning using Submodular Mutual Information.** *To appear at The Thirty-ninth International Conference on Machine Learning, ICML 2022.*
- [3] Suraj Kothawade, Vishal Kaushal, Ganesh Ramakrishnan, Jeff Bilmes, and Rishabh Iyer. **PRISM: A Unified Framework of Parameterized Submodular Information Measures for Targeted Data Subset Selection and Summarization.** *In Thirty-Sixth AAAI Conference on Artificial Intelligence, AAAI 2022.*
- [4] Suraj Kothawade, Donna Roy, Michele Fenzi, Elmar Haussman, Jose M. Alvarez, and Christoph Angerer. **Object Level Targeted Selection using Deep Template Matching,** *In 33rd IEEE Intelligent Vehicles Symposium, IV 2022*
- [5] Suraj Kothawade, Nathan Beck, Krishnateja Killamsetty and Rishabh Iyer, **SIMILAR: Submodular Information Measures Based Active Learning In Realistic Scenarios,** *In 35th Conference on Neural Information Processing Systems, NeurIPS 2021.*
- [6] Vishal Kaushal, Rishabh Iyer, Suraj Kothawade, Rohan Mahadev, Khoshrav Doctor and Ganesh Ramakrishnan, **Learning from less data: A unified data subset selection and active learning framework for computer vision,** *In 2019 IEEE Winter Conference on Applications of Computer Vision (WACV), pp. 1289-1299.*
- [7] Vishal Kaushal, Sandeep Subramanian, Suraj Kothawade, Rishabh Iyer and Ganesh Ramakrishnan, **A framework towards domain specific video summarization.** *In 2019 IEEE Winter Conference on Applications of Computer Vision (WACV), pp.666-675.*
- [8] Vishal Kaushal, Rishabh Iyer, Khoshrav Doctor, Anurag Sahoo, Pratik Dubal, Suraj Kothawade, Rohan Mahadev, Kunal Dargan and Ganesh Ramakrishnan, **Demystifying multi-faceted video summarization: Tradeoff between diversity, representation, coverage and importance.** *In 2019 IEEE Winter Conference on Applications of Computer Vision (WACV), pp. 452-461.*
- [9] Heramb Nemlekar, Ziang Liu, Suraj Kothawade, Sherdil Niyaz, Barath Raghavan, Stefanos Nikolaidis, **Robotic Lime Picking by Considering Leaves as Permeable Obstacles,** *In International Conference on Intelligent Robots and Systems (IROS 2021)*
- [10] Hejia Zhang, Po-Jen Lai, Sayan Paul, Suraj Kothawade and Stefanos Nikolaidis. **Learning collaborative action plans from youtube videos.** *In Proceedings of the International Symposium on Robotics Research (ISRR 2019), Hanoi, Vietnam, 2019.*

WORKSHOP PAPERS

- [1] Suraj Kothawade, Saikat Ghosh, Sumit Shekhar, Yu Xiang, and Rishabh Iyer. **TALISMAN: Targeted Active Learning for Object Detection with Rare Classes and Slices using Submodular Mutual Information.** *Machine Learning for Autonomous Driving Workshop at the 36th Conference on Neural Information Processing Systems (NeurIPS 2022).*
- [2] Suraj Kothawade, Atharv Savarkar, Venkatapathy Subramanian, Lakshman Tamil, Ganesh Ramakrishnan, Rishabh Iyer. **CLINICAL: Targeted Active Learning for Imbalanced Medical Image Classification.** *In MILLanD, MICCAI 2022, Medical Image Learning with Limited and Noisy Data.*
- [3] Suraj Kothawade, Akshit Srivastava, Venkatapathy Subramanian, Ganesh Ramakrishnan, Rishabh Iyer. **DIAGNOSE: Avoiding Out-of-distribution Data using Submodular Information Measures.** *In MILLanD, MICCAI 2022, Medical Image Learning with Limited and Noisy Data.*
- [4] Suraj Kothawade, Shivang Chopra, Saikat Ghosh, and Rishabh Iyer. **Active Data Discovery: Mining Unknown Data using Submodular Information Measures.** *In ReALML, ICML 2022, Adaptive Experimental Design and Active Learning in the Real World.*
- [5] Suraj Kothawade, Donna Roy, Michele Fenzi, Elmar Haussman, Jose M. Alvarez, and Christoph Angerer. **Object Level Targeted Selection using Deep Template Matching,** *Spotlight Talk at Machine Learning for Autonomous Driving Workshop at the 35th Conference on Neural Information Processing Systems (NeurIPS 2021)*
- [6] Suraj Kothawade, Lakshman Tamil, Rishabh Iyer. **Targeted Active Learning using Submodular Mutual Information for Imbalanced Medical Image Classification,** *Medical Imaging Meets NeurIPS Workshop at the 35th Conference on Neural Information Processing Systems (NeurIPS 2021)*
- [7] Suraj Kothawade, Vishal Kaushal, Ganesh Ramakrishnan, Jeff Bilmes, and Rishabh Iyer. **Submodular Mutual Information for Targeted Data Subset Selection,** *In ICLR 2021 Workshop: From Shallow to Deep: Overcoming Limited and Adverse Data.*
- [8] Suraj Kothawade, Nathan Beck, Krishnateja Killamsetty and Rishabh Iyer, **SIMILAR: Submodular Information Measures Based Active Learning In Realistic Scenarios,** *In ICML 2021 Workshop: Subset Selection in Machine Learning.*
- [9] Suraj Kothawade, Vinaya Khandelwal, Huaduo Wang, Kinjal Basu, Gopal Gupta. **AUTO-DISCERN: Autonomous Driving Using Common Sense Reasoning,** *In ICLP 2021 Workshop on Goal-directed Execution of Answer Set Programs.*

- [10] Vishal Kaushal, Suraj Kothawade, Rishabh Iyer and Ganesh Ramakrishnan. **Realistic Video Summarization through VI-SIOCITY: A New Benchmark and Evaluation Framework**. In *Proceedings of the ACMMM 2nd International Workshop on AI for Smart TV Content Production, Access and Delivery*, pp. 37-44, 2020.

DEMONSTRATIONS

- [1] Suraj Kothawade and Rishabh Iyer. **Data Exploration and Targeted Learning**. At *ECCV 2022 demonstrations track*.
- [2] Suraj Kothawade and Rishabh Iyer. **An Efficient Data Exploration Framework for Effective Learning**. At *33rd IEEE Intelligent Vehicles Symposium, IV 2022*.

PATENTS

1. US Patent Application 17/226584, "Scalable Semantic Image Retrieval In The Wild With Deep Template Matching," Apr 9, 2021. Inventors: Donna Roy, Suraj Kothawade, Michele Fenzi, Elmar Haussman, Jose M. Alvarez, and Christoph Angerer.
2. US Patent Application 17/689799, "Object Data Curation of Map Information Using Neural Networks For Autonomous Systems and Applications," March 15, 2022. Inventors: Michele Fenzi, Suraj Kothawade, Nisan Haramati, Ozan Tonkal, Christoph Angerer.

ACHIEVEMENTS & AWARDS

- *Jan Van der Ziel Fellowship* - University of Texas at Dallas.
- *Runner-up* at the University of Texas at Dallas 2022 Three Minute Thesis (3MT) Competition.
 - Over 50 PhD students participated from 30 PhD programs at UT Dallas.
 - Competing speeches were judged based on comprehension, content, engagement and communication.
- ICML 2022 Participation Grant.
- Accepted for Doctoral Consortium at WACV 2022.
- **Best Student Award** 2018 by Tata Sons. (Awarded to 1 out of 630 students across all engineering departments)
- **Best Project Award** 2018 by Tata Sons. (Awarded to 1 out of 30 projects across all engineering departments)
- Only student to receive both, the Best Student Award and Best Project Award awards since 1981 by Tata Sons
- **ACM ICPC 2017** Honorable mention.
- Ranked **1st/160** in Computer science & Engineering department in Junior year also cumulatively ranked **2nd/160**.

PROFESSIONAL ACTIVITIES/SERVICE

- Program Committee Member for NeurIPS 2022 Main Track, NeurIPS 2022 Datasets and Benchmarks Track, NeurIPS 2022 Autonomous Driving Workshop, ICML 2022, ICLR 2022, WACV 2022, AAAI (2021,2022), SIGKDD 2022, CVPR 2021, IROS 2021

SOFTWARE CONTRIBUTIONS

- **DISTIL: Deep dIversified inTeractive Learning** (<https://github.com/decile-team/distil>)
DISTIL implements a number of state-of-the-art active learning algorithms.
- **TRUST: TaRgeted sUbSet selecTion** (<https://github.com/decile-team/trust>)
TRUST supports a number of algorithms for targeted selection which provides a mechanism to include additional information via data to prioritize the semantics of the selection.

PROGRAMMING SKILLS

- **Languages:** Python, C++, C
- **Frameworks:** PyTorch, Tensorflow, Caffe, Keras, OpenCV