Sachin Goyal

Ph.D. Student, Machine Learning Department
Carnegie Mellon University
Advisors:* *Prof. Zico Kolter

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Education

Carnegie Mellon University — *Pittsburgh, US*
Ph.D. in Machine Learning — *August '21 - Current*
Advisor: Prof. Zico Kolter

Indian Institute of Technology Bombay — *India*
B.Tech in Electrical Engineering with Minors in Computer Science and Engineering — *July '15 - August '19*
GPA: 9.11/10
Advisor: Prof. Subhasis Chaudhuri

Work Experience

Microsoft Research, India — *Bangalore*
Research Fellow in Machine Learning and Optimization Group — *July '19 - June '21*
Advisors: Dr. Prateek Jain and Dr. Harsha Vardhan Simhadri
Worked on resource-efficient and large-scale machine learning resulting in top-tier publication and Microsoft product impact.

Research Interests

Domain Generalization, Out-of-Distribution Detection,
Robust Representation Learning, System Aware Machine Learning

Preprints

Test Time Adaptation via Conjugate Pseudo-Labels
Sachin Goyal*, Mingjie Sun*, Aditi Raghunathan and Zico Kolter.
Under Review

MET : Masked Encoding for Tabular Data
Kushal Majmundar, **Sachin Goyal**, Praneeth Netrapalli and Prateek Jain.
Under Review

Publications

PAL: Pretext-based Active Learning.
Shubhang Bhatnagar, **Sachin Goyal**, Darshan Tank, Amit Sethi.
*British Machine Vision Conference (**BMVC, 2021**).* [Paper]

DROCC: Deep Robust One-Class Classification.
Sachin Goyal, Aditi Raghunathan, Moksh Jain, Harsha Simhadri and Prateek Jain.
In *International Conference on Machine Learning (**ICML, 2020**).* [Paper]

Indoor Distance Estimation using LSTMs over WLAN Network
Pranav Sankhe, Saqib Azim, **Sachin Goyal** , Tanya Choudhary, Kumar Appaiah , Sukumar Srikant
India Patent Application 201821047043, filed Dec' 2018. Patent Pending.
In *IEEE Workshop on Positioning, Navigation and Communications (WPNC, 2019).* [Paper]

Improving Self Super Resolution in Magnetic Resonance Images.
Sachin Goyal, Can Zhao, Amod Jog, Jerry L. Prince, Aaron Carass.
In ***SPIE** Conference on Medical Imaging and Biomedical Applications, **2018**.* [Paper]

Research Experience

Test Time Domain Adaptation

Advisors: Prof. Zico Kolter — *Sept '21 - May '22,* ***CMU***

Worked towards developing algorithms for adapting a classifier trained on some source data, at test-time to new target domains with a distribution shift. Specifically, we worked in the setting where we do not assume access to the source training data anymore (due to privacy and efficiency concerns), and want to adapt the model on target domain in an online fashion i.e. making predictions while learning in an unsupervised manner from the test-samples at the same time. Our proposed algorithm highlights that the test-time adaptation objective should take into consideration the objective used to train the source classifier. ***(Under Review)***

Low False Positive Rate (FPR) Classifiers for WakeWord Detection [ICML 2020]

Advisors: Dr. Prateek Jain & Dr. Harsha Simhadri — *Sept '19 - May '20,* ***Microsoft Research***

Worked towards developing wake-word systems robust to unseen non wake-word (negative) data distribution. Proposed a *key idea* of modelling positives as lying on a low dimensional manifold and negatives as off the manifold. To make the system robust to very close negatives, generated informative negatives around the manifold via adversarial perturbations. Proposed method, DROCC, gave classifiers with upto 10% better recall at a fixed FPR across domains like timeseries, tabular and image data. ***(Published at ICML '20)***

EdgeML : Phonemes based KeyWord Spotting (KWS) on Resource Constrained Devices [Project]

Advisors: Dr. Prateek Jain & Dr. Harsha Simhadri — *June '20 - May '21,* ***Microsoft Research***

Edge Machine **L**earning aims to develop ML algorithms deployable on resource constrained devices (micro-controllers). Developed **1mB** size phoneme prediction models, used for building robust to noise KWS schemes. Moreover, my approach required minimal train samples for adding new keyword. Deployed the models on an ARM Cortex M7 processor with **only 2MB flash and 1MB RAM**. Models found to be competitive even in non resource constrained settings and are being tested for use in "Hey Cortana" detection on Windows.

Indoor Positioning System Using WiFi [Paper]

Advisors: Prof. Kumar Appaiah and Prof. Sukumar Srikant — *Jan '17 - Jan '19,* ***IIT Bombay***

Designed, developed and prototyped a SOTA system to locate an object with high accuracy ($< 10cm$) in indoor environments. Used a LSTM to estimate the relation between strength of received WiFi signals and the distance from a wireless access point. Proposed a setup of 4 static signal receivers to account for indoor topology and signal attenuation effects. Further, designed a bot traversing a predetermined path for train data collection. ***(Undergraduate Research Award, India Patent Pending, filed Dec' 2018)***.

PAL : Pretext based Active Learnig [Preprint]

Advisor: Prof. Amit Sethi — *Jan '19 - July '20,* ***IIT Bombay***

Proposed an active learning scheme to select the most informative unlabeled samples to be sent for labelling by an oracle. Used the difficulty of solving an auxiliary self-supervised task on an unlabeled sample as a proxy measure of the sample's informativeness for neural network training. ***(Published at BMVC '21)***

Internship Experience

Super Resolution of MRI Images [Paper]

Advisor: Prof. Jerry L. Prince — *Summer Internship '17,* ***Johns Hopkins University***

Worked on unsupervised super resolution of MRI images. Proposed to learn a regression between the fourier space of input and it's downsampled counterpart, subsequently using it to super resolve the input image. ***(Published at SPIE '18)***

MirrorLink for Car Infotainment System
Advisor: Praveen Sisodia *Summer Internship '18,* ***Qualcomm, India***

Developed framework for voice transmission from car dashboard microphone to driver's mobile. Enhanced the car's command engine to extract commands from voice and processed it for necessary android actions

Miscellaneous

Awards and Honors

- Undergraduate Research Award, IIT Bombay. 2019
- Among Top 300 in Chemistry (INChO) and Astronomy(INAO) Olympiads. 2015
- Awarded KVPY Fellowship from Government of India - All India Rank 90. 2015
- Awarded NTSE Scholarship from Government of India - All India Rank 6. 2011

Service

- Undergraduate Teaching Assistant : Biology 101 2017
- Hostel System Administrator , IIT Bombay 2019
- National Cadet Corps (NCC), Indian Air Force '15-'17