

# Sachin Goyal

Ph.D. Student, Machine Learning Department  
Carnegie Mellon University  
Advisors: [Prof. Zico Kolter](#)

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## EDUCATION

**Carnegie Mellon University**  
Ph.D. in Machine Learning  
Advisor: [Prof. Zico Kolter](#)

Pittsburgh, US  
August '21 - Current

**Indian Institute of Technology Bombay**

B.Tech in Electrical Engineering with Minors in Computer Science and Engineering

**GPA: 9.11/10**

Advisor: [Prof. Subhasis Chaudhuri](#)

India  
July '15 - August '19

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## WORK EXPERIENCE

**Microsoft Research, India**

Research Fellow in Machine Learning and Optimization Group

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.

Bangalore  
July '19 - June '21

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## RESEARCH INTERESTS

Domain Adaptation, Compute Efficient Machine Learning

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## PREPRINTS

**MET : Masked Encoding for Tabular Data**

Kushal Majmundar, **Sachin Goyal**, Praneeth Netrapalli and Prateek Jain.

*Under Review*

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## PUBLICATIONS

**Test Time Adaptation via Conjugate Pseudo-Labels**

**Sachin Goyal\***, Mingjie Sun\*, Aditi Raghunathan and Zico Kolter.

*Advances in Neural Information Processing Systems (NeurIPS), 2022.* [\[Paper\]](#)

**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.* [\[Paper\]](#)

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## 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 Learning** 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*).

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## 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

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## 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