

KARM PATEL

M.Tech, Computer Science, IISc Bangalore
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INTERNSHIPS

1. Google Summer of Code (GSoC) - TensorFlow

[Contributions](#) | Apr'22 - Jul'22

- **Mentor:** [Dr. Kevin P. Murphy](#), Google Research.

- **Project:** Contributed few educational coding demos & figures in Dr. Kevin's textbook - [Probabilistic ML: Advanced Topics](#).

- I studied and implemented probabilistic ML algorithms such as Markov Chain Monte Carlo (MCMC) sampling, Variational Inference, & Bayesian Neural Networks in **JAX** framework.

2. Summer Research Internship - IIT Gandhinagar

[Publication](#) | [Github](#) | May'21 - Jul'21

- **Mentor:** [Prof. Nipun Batra](#)

- **Project:** I worked on a research project - "Samachar: Print News Media on Air Pollution in India". We scraped around **17.4K** air pollution-related English news articles. Then we applied **exploratory data analysis** and **topic modeling** to reveal the news media response to air pollution. This work has been accepted at the ACM COMPASS'22 conference.

EDUCATION

1. Indian Institute of Science, Bengaluru

July 2022 - July 2024

M.Tech, Computer Science & Automation

CGPA: 8.9/10.0

2. Vishwakarma Government Engineering College, Ahmedabad

Jun 2018 - May 2022

B.E. in Computer Engineering.

CGPA: 9.23/10.0

M.TECH THESIS:

Selective Classification on domain shifted medical images

May 2023 - Current

Advisors: [Prof. Sridharan Devrajan](#), Center for Neuroscience, IISc & [Dr. Pradeep Shenoy](#), Google Research.

Objective: Propose a well-calibrated model that must abstain from prediction if it is uncertain on domain-shifted medical images.

Summer term (Retinopathy & Chest-X-ray datasets): Explored **Vision Transformers**, **self-supervised** learning techniques (SimCLR and SimMIM), **uncertainty** estimation (Monte Carlo dropout), & well **calibrated** models (Domain Adversarial Networks). Co-authored in a publication under review at **AAAI-2024**.

Current term (Cancer datasets): Experimenting weak semi-supervised attention-based **Multiple Instance Learning** to handle large cancer images (100K X 100K, 1-2 GB per image).

PROJECTS

1. Neural Machine Translation using Transformers ([Paper Implementation](#)) [[Github](#)]

Sep 2023 | IISc - DLNLP

Implemented transformers (Attention Is All You Need paper) from scratch to translate English to Hindi using IITB dataset.

2. Sentiment Analysis on text data [[Github](#)]

Aug 2023 | IISc - DLNLP

Performed sentiment analysis using Deep Averaged Networks, **LSTM**, **BERT**, **GRU**, and **Hierarchical attention** based architectures on unbalanced datasets.

3. Graph Classification using Graph Convolutional Neural Network ([Paper Implementation](#)) [[Github](#)]

Apr 2023 | IISc - ML

How do we get a meaningful order of nodes to get permutation invariant graph representation? **Sortpooling layer:** We can sort the nodes by output from the Weisfeiler-Lehman kernel. I've implemented this technique on the IMDB dataset.

4. Did you really count my fingers? [[Github](#)]

Jul 2023 | Self

Finetuned **ResNet50** to count fingers on finger counting dataset. Then, applied Neural Networks' **interpretability** technique called local interpretable model-agnostic explanations (**LIME**) to visualize which part of the hand is used by the model to make decisions.

5. Image generation & Classification using VAEs [[Github](#)]

Sep 2023 | IISc - ADRL

Implemented Variational Auto Encoders & Vanilla Auto-encoders from scratch and compared their performance on classification and image generation tasks on the Animal-Faces HQ (AFHQ) dataset.

6. Vaccine Slot Notifier [[Github](#)]

Mar 2020 | Self

Web application to help people to get notifications of COVID vaccine slot availability and **200+** registered on this website.

PUBLICATIONS ([GOOGLE SCHOLAR PROFILE](#))

1. Rescuing referral failures during automated diagnosis of domain-shifted medical images [*Phase-1 cleared, Phase-2 ongoing*] ¹ [Anuj Srivastava](#), [Karm Patel](#), [Sridharan Devrajan](#), [Pradeep Shenoy](#). *Proceedings of the AAAI Conference Vol. 38 2024*.

2. Samachar: Print News Media on Air Pollution in India [[Publication](#)]

[Karm Patel](#), [Rishiraj Adhikary](#), [Zeel B Patel](#), [Nipun Batra](#), [Sarath Guttikunda](#). In *ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies (COMPASS) (COMPASS '22)*

TECHNICAL SKILLS

(1) **Technologies/Tools:** Python, C++, PyTorch, JAX, Flax, TensorFlow, Keras, Git, Github actions, docker, Data Structures

(2) **ML/DL:** a) **ML:** PCA, Linear Regression, Logistic Regression, Support Vector Machines; b) **NLP:** Word embeddings, RNN, LSTM, GRU, Transformers, BERT, GPT; c) **CV:** CNN, Vision Transformers; d) **Generative Models:** Naive Bayes, GMM, Variational Auto Encoders, GAN; e) **Graph Neural Networks**

¹Details given in M.Tech Thesis - Summer term section

COURSES

Probability and Statistics (A+)	Deep Learning - IIT Madras (NPTEL)	Computer Architecture (A)
Linear Algebra & Optimization (A)	Deep Learning for NLP *	Compiler Design (B+)
Machine Learning (A)	Advanced Deep Representation Learning *	Design & Analysis of Algorithms (B+)

* pursuing

ACHIEVEMENTS | POSITIONS

[2023] Placement coordinator of IISc & Student Representative of department of CSA, IISc.

[2023] Reliance Foundation PG Scholar (among 100 in India)

[2022] Received acknowledgement in well known ML books ([Probabilistic ML: An Introduction](#) & [Probabilistic ML: Advanced Topics](#)) of Dr. Kevin for my contributions.

[2022] AIR 128, GATE 2022.

OPEN SOURCE CONTRIBUTIONS

1. `pyro` [\[PR\]](#) [\[Issue\]](#) : Implemented a method to render parameters in the image of probabilistic graphical models.
2. `blackjax` [\[PR\]](#) [\[Issue\]](#) : Added demo notebook illustrating **change of variable** technique in Hamiltonian Monte Carlo algorithm.
3. `numpyro`:[\[PR\]](#) Added `__repr__` methods of various constraints which made the representation of objects readable

CONFERENCE/TALKS

1. [ACM COMPASS'22](#): I presented my paper 'Samachar' at the ACM COMPASS conference. *Virtual | 1 JUL 2022*
2. [Air Sensors International Conference \(ASIC\)](#): I gave a 4 minute lightning talk about my work related to 'Samachar' paper. *In person | 26 AUG 2022*