

# Sachin Yadav

Research Fellow (AI Resident)  
Machine Learning and AI Group  
Microsoft Research Lab - India

✉ sachinyadav7024@gmail.com  
☎ +91 704 216 8749  
🎓 Google Scholar

## EDUCATION

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### Indian Institute of Technology (IIT) Gandhinagar

2018 - 2022

*B.Tech. in Computer Science and Engineering*  
GPA: 9.26/10.0

### Mount Abu Public School, Delhi

2017

*Central Board of Secondary Education (CBSE) Class XII*  
Percentage: 96.0%

## WORK EXPERIENCE

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### Microsoft Research Lab - India

2022 - Present

*Research Fellow (AI Resident) in Machine Learning and AI Group*

Advisor: Dr. Manik Varma, Distinguished Scientist & Vice President

Working on problems around Extreme Classification (industry-scale search, retrieval and, recommendation systems) leading to top-tier publications and impact across Microsoft products.

### Samsung Research Institute Bangalore

Summer 2021

*Research Intern in Advanced Technology Lab (ATL) Group*

Advisor: Dr. Vijay Narayan Tiwari, Director of Software Engineering

Worked on Impulse Radio Ultra Wide-band (IR-UWB) radar sensor applications for human motion recognition, contributing to the advancement of next-generation Samsung devices.

## TALKS/PRESENTATIONS

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### 1. Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval.

Presenter: **Sachin Yadav**. Session: Ranking and Retrieval.

*ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2024, Barcelona. **Oral Presentation.**

## PUBLICATIONS

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\* - equal contribution

### 1. On the Necessity of World Knowledge for Mitigating Missing Labels in Extreme Classification.

Jatin Prakash, Anirudh Buvanesh, Bishal Santra, Deepak Saini, **Sachin Yadav**, Jian Jiao, Yashoteja Prabhu, Amit Sharma, Manik Varma

*Preprint, 2024*

### 2. Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval.

**Sachin Yadav**<sup>+</sup><sup>\*</sup>, Deepak Saini<sup>\*</sup>, Anirudh Buvanesh<sup>\*</sup>, Bhawna Paliwal, Kunal Dahiya, Siddarth Asokan, Yashoteja Prabhu, Jian Jiao and Manik Varma.

<sup>+</sup> - led the project

*ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2024. **Oral Presentation**

### 3. Deep Encoders with Auxiliary Parameters for Extreme Classification.

Kunal Dahiya, **Sachin Yadav**, Sushant Sondhi, Deepak Saini, Sonu Mehta, Jian Jiao, Sumeet Agarwal, Purushottam Kar, and Manik Varma.

*ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2023.

### 4. Deep Gaussian Processes for Air Quality Inference.

Aadesh Desai<sup>\*</sup>, Eshan Gujarathi<sup>\*</sup>, Saagar Parikh<sup>\*</sup>, **Sachin Yadav**<sup>\*</sup>, Zeel Patel, and Nipun Batra.

*Young Researchers' Symposium @ Joint International Conference on Data Science & Management of Data (CODS-COMAD)*, 2023

## RESEARCH ADOPTION

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### 1. Search Engine: Sponsored Ads ‡

‡ - Specific details withheld due to non-disclosure agreements.

EMMETT: Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval.

On live traffic from a popular search engine, EMMETT resulted in a 4.2% increase in Click Through Rate (CTR) and a 0.9% reduction in Quick Back Rate (QBR) for Sponsored Ads.

### 2. Personalized Ad Recommendations ‡

EMMETT: Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval.

In live trials on a popular Display Ads Platform, EMMETT achieved a 3.3% improvement in Click-Through Rate (CTR) and a 4.9% improvement in Click Yield for personalized ads targeting users.

## SELECTED AWARDS AND HONORS

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- Awarded the Ashok Jain Scholarship for merit, given to one B.Tech. student yearly at IIT Gandhinagar. 2021 & 2022
- Selected for ACM-ICPC Regionals programming competition. 2019
- Featured in Dean's List for semesters 1, 2, and 3 for exceptional academic performance at IIT Gandhinagar.
- Awarded KVPY Fellowship from the Department of Science and Technology, Government of India. 2016

## PATENTS

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**Improved Retrieval of Novel Keywords for Search.** 2024. (Filed, Microsoft)

Inventors: Sachin Yadav, Deepak Saini, Anirudh Buvanesh, Bhawna Paliwal, Jian Jiao and Manik Varma

## SOFTWARE

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### 1. TinyGP: Extremely Lightweight Library for Building Gaussian Process (GP) Models.

Dan Foreman-Mackey, Sachin Yadav, Andrew Fowlie, René Tronsgaard, Steve Schmerler, Thomas Killestein.

Stats as of May 2024: ★ 280

## BENCHMARKS

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### 1. ORCAS-800K

Benchmark for mapping user queries on the Bing search engine to the relevant subset of 800K web URLs.

## SELECTED PROJECTS

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### DEXA: Deep Encoders with Auxiliary Parameters for Extreme Classification

Advisors: Prof. Purushottam Kar and Dr. Manik Varma, *Microsoft Research India*

- Identified semantic gap and data paucity issues in Extreme Classification settings, leading to suboptimal encoder training.
- Proposed DEXA, a lightweight alternative that enhances Encoder embeddings with extra auxiliary parameters on the label side, addressing the identified training issues.
- Conducted comprehensive experiments with various architectures, showcasing DEXA's modularity within existing XC solutions, all achieved with minimal time and memory overheads during training.
- Attained accuracy improvements of 6% and 15% on public and proprietary benchmarks respectively.

### EMMETT: Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval

Advisor: Dr. Manik Varma, *Microsoft Research India*

- Developed EMMETT, an innovative framework for synthesizing classifiers for novel items in zero-shot retrieval, enhancing both accuracy and efficiency.
- Introduced IRENE, an effective instantiation of EMMETT suited for large-scale deployments, achieving up to 15% improvement in zero-shot retrieval accuracy and seamlessly integrating with existing Siamese encoders.
- Formulated a theoretical framework to guide algorithm and training strategy design for large-scale zero-shot retrieval, ensuring robust generalization across diverse applications.
- Empirically demonstrated the effectiveness of IRENE through comprehensive experiments and online A/B testing in a major search engine, resulting in a 4.2% increase in ad click-through rate.

### Adaptive Sparse Training of Large Networks on GPUs

Advisor: Prof. Anirban Dasgupta, *IIT Gandhinagar*

- Explored adaptive sparse training of large neural networks using approximate nearest neighbor search algorithms (HNSW and IVF-PQ) to accelerate training on CPU hardware.

- Proposed a customized variant of adaptive sparse training specifically designed for GPU-based training.
- Conducted extensive evaluations on industry-scale recommendation benchmarks, analyzing training bottlenecks.

## TEACHING & RESPONSIBILITIES

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- *Teaching Assistantship* - Computer Science and Engineering, IIT Gandhinagar
  - Introduction to Data Science - *Prof. Anirban Dasgupta* *Spring 2022*
- *Event Organizer* - Annual Coding Hackathon of IIT Gandhinagar *2019, 2020*