

Ramnath Kumar

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Research Interests

Robust, efficient and scalable large-scale deep learning algorithms, especially for representation learning, and their applications in domains like LLMs, meta-learning and dense retrieval.

EDUCATION

BITS Pilani, Hyderabad Campus

Masters of Science in Economics

Bachelor of Engineering in Computer Science

Hyderabad, India

Aug 2016 – Aug 2021

- . CGPA in Computer Science major: **9.65/10.0** (Top 10 in class of 255)
- . Overall CGPA (B.E. Computer Science and Msc. Economics): 8.92/10.0
- . Thesis: Worked on malware detection in IoT devices using machine learning techniques [7].

SELECTED RESEARCH/WORK EXPERIENCE

Google

Bangalore, India

Pre-Doctoral Researcher in Machine Learning and Optimization Group & Ads ML Team

Jul 2022 – Present

- . Advisor: [Dr. Prateek Jain](#) and [Prof. Inderjit S. Dhillon](#)
- . Developed an optimization technique for reweighting gradient descent samples [1], alongside an end-to-end efficient retrieval architecture [2], both slated for integration into various Google products.

Research Associate in Machine Learning and Optimization Group

Apr 2022 – Jul 2022

- . Advisor: [Dr. Dheeraj Nagaraj](#)
- . Developed IER, a replay buffer sampler inspired by previous methods like RER, with the potential to enhance the convergence of RL algorithms like DQN, TD3, and more [5].

Mila - Quebec Artificial Intelligence Institute

Montreal, Canada

Consultant

Jul 2021 – March 2022

- . Advisor: [Prof. Yoshua Bengio](#)
- . Explored the impact of diversity in meta-learning, resulting in an oral presentation at AAAI [3], and delved into the meta-RL, contributing to workshop publications and presentations at the EEML summer school [6].

Amazon ML

Bangalore, India

Applied Scientist Intern

Jan 2021 – Jun 2021

- . Advisor: Dr. Gokul Swamy
- . Published as the first author at Amazon's internal conference (AMLC 2021) and investigated causal attributions and their significance within the Amazon sales model. 📄

Mila - Quebec Artificial Intelligence Institute

Montreal, Canada

Research Intern

Nov 2020 – Apr 2021

- . Advisor: [Prof. Samira E. Kahou](#)
- . Worked on theoretical machine learning in the domain of graph neural networks 📄

CoCo Lab, Université de Montréal

Montreal, Canada

Research Intern

Jun 2020 – Nov 2020

- . Advisor: [Prof. Karim Jerbi](#)
- . Worked on Brain based subject identification using EEG data 📄

Kno.e.sis, Wright State University

Dayton, USA

Research Intern

May 2019 – August 2019

- . Advisor: [Prof. Amit P. Sheth](#) and [Prof. Krishnaprasad Thirunarayan](#)
- . Worked on sybil detection in the darknet markets using an unsupervised multi-view learning framework [4].

PUBLICATIONS

- [1] [Stochastic Re-weighted Gradient Descent via Distributionally Robust Optimization](#)
Ramnath Kumar, Kushal Alpesh Majmundar, Dheeraj Mysore Nagaraj, and Arun Suggala
In preparation, ICML 2024.
ICLR 2023 Workshop on Pitfalls of limited data and computation for Trustworthy ML.
[Google AI Blog Coverage](#).
- [2] [EHI: End-to-end Learning of Hierarchical Index for Efficient Dense Retrieval](#)
Ramnath Kumar*, Anshul Mittal*, Nilesh Gupta, Aditya Kusupati, Inderjit Dhillon, and Prateek Jain
Under Review, ICLR 2024.
- [3] [The Effect of diversity in Meta-Learning](#) 
Ramnath Kumar, Tristan Deleu, and Yoshua Bengio
AAAI 2023 (Oral; Acceptance Rate: 4.7%).
NeurIPS Workshop on Meta-Learning, 2021.
[SyncedReview Blog Coverage](#).
- [4] [eDarkFind: Unsupervised Multi-view Learning for Sybil Account Detection](#) 
Ramnath Kumar, Shweta Yadav, Raminta Daniulaityte, Francois Lamy, Krishnaprasad Thirunarayan, Usha Lokala, and Amit Sheth
The Web Conference (WWW), 2020.
- [5] [Look Back When Surprised: Stabilizing Reverse Experience Replay for Neural Approximation](#) 
Ramnath Kumar and Dheeraj Nagaraj
Under Review, TMLR.
NeurIPS Workshop on DeepRL, 2022.
[Google AI Blog Coverage](#)
- [6] [Rethinking Learning Dynamics in RL using Adversarial Networks](#) 
Ramnath Kumar, Tristan Deleu, and Yoshua Bengio
NeurIPS Workshop on DeepRL, 2022.
Presented findings at EEML 2022.
- [7] [Temporal Dynamics and Spatial Content in IoT Malware detection](#) 
Ramnath Kumar and G Geethakumari
TENCON 2019.

SELECTED AWARDS AND HIGHLIGHTS

Awardee , INSPIRE Scholar (Awarded to Top 1 Percentile)	2016-2021
Awardee , NTSE Scholar (Awarded to 775 students amongst 0.5 million candidates)	2014-2020

ACADEMIC SERVICES

- **Reviewer:** ICLR (2023) and NeurIPS (2022, '23), ICML (2022), AutoML (2022) and ICWSM (2020, '21, '22, '23)
- **Volunteer:** COLT (2023)

RELEVANT COURSEWORK AND SKILLS

- **Math, Stats and Machine Learning:** Calculus, Linear Algebra, Probability and Statistics, Differential Equations, Convex Optimization, Foundations of Data Science, Artificial Intelligence, Machine Learning, Information Retrieval.
- **Summer School:** Eastern European Machine Learning Summer School, Vilnius Lithuania (EEML 2022), *ML Foundations*; Research Week with Google, India (2022), Machine Learning Summer School, Taipei (2021), Google AI Summer School, India (2020)
- **Programming Languages and Libraries:** Python, C++, Pytorch, Tensorflow, Jax, OpenCV