Ramnath Kumar

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RESEARCH INTERESTS & SUMMARY

Robust, efficient and scalable large-scale deep learning algorithms, especially for representation learning, and applications in domains such as LLMs, meta-learning and dense retrieval. I also maintain a small blog of few interesting papers here.

EDUCATION

University of California, Los Angeles (UCLA)   Los Angeles, USA
PhD. in Computer Science   *09/2024 – Present*
. Advisor: Prof. Cho-Jui Hsieh , UCLA Samueli School of Engineering

BITS Pilani, Hyderabad Campus   Hyderabad, India
B.E. in Computer Science, MSc. in Economics   *08/2016 – 08/2021*
. CGPA in Computer Science major: **9.65/10.0** (Top 10 in class of 255)
. Overall CGPA: 8.92/10.0

SELECTED RESEARCH/WORK EXPERIENCE

Google DeepMind   Bangalore, India
Pre-Doctoral Researcher in MLO Group & Ads ML Team   *07/2022 – 08/2024*
. Advisor: Dr. Prateek Jain and Prof. Inderjit S. Dhillon
. Developed an end-to-end efficient retrieval architecture [3] which improved upon prior retrieval benchmarks by up to **1.45%** at the fixed compute budget. EHI is slated for integration into various Google products.
. Led a cross-functional team in developing and deploying RGD [2] solutions, demonstrating leadership in product-driven research and innovation improving upto **1.01%** on ImageNet-1K with ViT.
. Coordinated efforts between the MLO and Ads ML teams, ensuring seamless collaboration and alignment with real-world applications, receiving a spot bonus leading to significant rise in revenue.
. Took initiative in proposing a novel end-to-end retrieval architecture, improving efficiency and robustness in ongoing projects, with contributions recognized in 🌐 🐦.

Google Research   Bangalore, India
Research Associate in Machine Learning and Optimization Group (MLO)   *04/2022 – 07/ 2022*
. Advisor: Dr. Dheeraj Nagaraj
. Devised IER, a replay buffer sampler inspired by prior method - RER, with potential to enhance convergence of RL algorithms such as DQN, TD3, and more [6] by up to **7x** speedup.

Mila - Quebec Artificial Intelligence Institute   Montreal, Canada
Consultant   *07/2021 – 03/2022*
. Advisor: Prof. Yoshua Bengio
. Initiated and led a project exploring impact of diversity in meta-learning, collaborating closely with another PhD student. Designed and executed experiments, leading to an oral presentation at AAAI [4] that challenged the conventional wisdom surrounding meta-learning.
. Demonstrated strong leadership and communication skills by presenting findings at AAAI and co-authoring workshop publications, including presentations at the EEML summer school [8].

Amazon ML   Bangalore, India
Applied Scientist Intern   *01/2021 – 06/2021*
. Advisor: Dr. Gokul Swamy
. Published at Amazon's internal conference (AMLC 2021) and investigated causal attributions and its significance within the Amazon sales model 🎧 at capacity of first-author.

Mila - Quebec Artificial Intelligence Institute   Montreal, Canada
Research Intern   *11/2020 – 04/2021*
  . Advisor: Prof. Samira E. Kahou
  . Collaborated with a team of PhD students and advisors on the Limits of Multi-modal Meta-Learning [7].

CoCo Lab, Université de Montréal   Montreal, Canada
Research Intern   *06/2020 – 11/2020*
  . Advisor: Prof. Karim Jerbi
  . Studied Brain based subject identification using EEG data �.

Kno.e.sis, Wright State University   Dayton, USA
Research Intern   *05/2019 – 08/2019*
  . Advisor: Prof. Amit P. Sheth and Prof. Krishnaprasad Thirunarayan
  . Collaborated with a large team from multiple time-zones and led a research at the capacity of a first-author.
    Developed a sybil detection system in darknet markets using an unsupervised multi-view framework [5].

PUBLICATIONS

[1] FastLane: Accelerating Multi-View Search with Dynamic View Routing
    Ramnath Kumar, Prateek Jain, and Cho-Jui Hsieh
    Under Preparation, ICLR 2025

[2] Stochastic Re-weighted Gradient Descent via Distributionally Robust Optimization
    Ramnath Kumar, Kushal Alpesh Majmundar, Dheeraj Mysore Nagaraj, and Arun Suggala
    Transactions on Machine Learning Research, 2024.
    ICLR 2023 Workshop on Pitfalls of limited data and computation for Trustworthy ML.
    Google AI Blog Coverage.

[3] 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
    Transactions on Machine Learning Research, 2024.

[4] 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.

[5] 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.

[6] Introspective Experience Replay: Look Back When Surprised ⌘
    Ramnath Kumar and Dheeraj Nagaraj
    Transactions on Machine Learning Research, 2024
    NeurIPS Workshop on DeepRL, 2022.
    Google Research: "Algorithms for efficient deep learning" Blog Coverage.

[7] On the Limits of Multi-modal Meta-Learning with Auxiliary Task Modulation Using Conditional Batch
    Normalization
    Jordi Armengol-Estapé, Vincent Michalski, **Ramnath Kumar**, Pierre-Luc St-Charles, Doina Precup, and
    Samira Ebrahimi Kahou
    NAACL Workshop on Insights from Negative Results, 2024

[8] 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.

[9] Temporal Dynamics and Spatial Content in IoT Malware detection ⚙
Ramnath Kumar and G Geethakumari
TENCON 2019.

SELECTED AWARDS AND HIGHLIGHTS

Quad Fellowship, accepted QUAD fellowship of 40,000$ for research aiding positive social impact 🌐.	2024
Graduate Dean's Scholars Award, UCLA scholarship of 15,000$.	2024
Google Blog, RGD work [2] was highlighted, and well accepted 🌐 🐦.	2023
Presentee, *AAAI* Oral Presentation (Acceptance Rate: 4.7%).	2023
Awardee, NTSE Scholar (Awarded to 775 students amongst 0.5 million candidates).	2014-2020

ACADEMIC SERVICES

- **Reviewer:** NeurIPS (2022, '23, '24) and ICML (2022, '23), ICLR(2023), 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