Aditya Kusupati

Google DeepMind
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Google Scholar

Research Interests

I focus on designing fundamental *Machine Learning* algorithms with strong empirical performance & real-world deployability geared towards enabling **adaptive intelligence**. They have been widely adopted by industry serving over a Billion users daily (Google, OpenAI, Pinterest, Apple, Microsoft) and open-source communities (Hugging Face, Nomic AI, etc.,).

Education

University of Washington, Seattle *2019 - 2024*
PhD in Computer Science and Engineering
Visiting Research Associate in Harvard Computer Science *2023 - 2024*
Advisors: Prof. Ali Farhadi & Prof. Sham Kakade
Committee: Prof. Luke Zettlemoyer, Prof. Zaid Harchaoui & Dr. Rahul Sukthankar

Indian Institute of Technology Bombay *2013 - 2017*
B.Tech (Honours) in Computer Science and Engineering with Minor in Electrical Engineering
Advisor: Prof. Soumen Chakrabarti

Work Experience

Google DeepMind *July 2024 - Present*
Senior Research Scientist
Manager: Dr. Rahul Sukthankar

Google Research → DeepMind *January 2022 - June 2024*
Student Researcher in Perception
Advisors: Dr. Prateek Jain & Tom Duerig

Microsoft Research India *May 2017 - July 2019*
Research Fellow in Machine Learning and Optimization
Advisors: Dr. Manik Varma & Dr. Prateek Jain

Publications

Preprints

* - equal contribution

1. **ActionAtlas: A VideoQA Benchmark for Fine-grained Action Recognition**
   Mohammadreza Salehi, Jae Sung Park, **Aditya Kusupati**, Ranjay Krishna,
   Yejin Choi, Hannaneh Hajishirzi, Ali Farhadi.
   Under Review, ***NeurIPS D&B Track*** *2024.*

Conference Publications

22. **Superposed Decoding: Multiple Generations from a Single Autoregressive Inference Pass**
    Ethan Shen, Alan Fan, Sarah Pratt, Jae Sung Park, Matthew Wallingford, Sham Kakade, Ari Holtzman,
    Ranjay Krishna, Ali Farhadi, **Aditya Kusupati**.
    *Neural Information Processing Systems (****NeurIPS****), 2024.*

21. **From an Image to a Scene: Learning to Imagine the World from a Million 360° Videos**
    Matthew Wallingford, Anand Bhattad, **Aditya Kusupati**, Vivek Ramanujan, Matt Deitke, Sham Kakade, Aniruddha
    Kembhavi, Roozbeh Mottaghi, Wei-Chiu Ma, Ali Farhadi.
    *Neural Information Processing Systems (****NeurIPS****), 2024.*

20. **Mixture of Nested Experts: Adaptive Processing of Visual Tokens**
    Gagan Jain, Nidhi Hegde, **Aditya Kusupati**, Arsha Nagrani, Shyamal Buch,
    Prateek Jain, Anurag Arnab, Sujoy Paul.
    *Neural Information Processing Systems (****NeurIPS****), 2024.*

19. **MatFormer: Nested Transformer for Elastic Inference**
    Devvrit*, Sneha Kudugunta*, **Aditya Kusupati***, Tim Dettmers, Kaifeng Chen,
    Inderjit Dhillon, Yulia Tsvetkov, Hannaneh Hajishirzi, Sham Kakade, Ali Farhadi and Prateek Jain.

*Neural Information Processing Systems (**NeurIPS**), 2024.*
Efficient Natural Language and Speech Processing workshop @ NeurIPS 2023 **(Oral, 🏆 Best Paper Award)**.
Workshop on Advancing Neural Network Training @ NeurIPS 2023 **(Oral)**.

18. **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 (**TMLR**), 2024.*

17. **Gecko: Versatile Text Embeddings Distilled from Large Language Models**
Jinhyuk Lee*, Zhuyun Dai*, Xiaoqi Ren*, Blair Chen, Daniel Cer, Jeremy R. Cole, Kai Hui, Michael Boratko, Rajvi Kapadia, Wen Ding, Yi Luan, Sai Meher Karthik Duddu, Gustavo Hernandez Abrego, Weiqiang Shi, Nithi Gupta, **Aditya Kusupati**, Prateek Jain, Siddhartha Reddy Jonnalagadda, Ming-Wei Chang and Iftekhar Naim.
Google Technical Report, 2024.

16. **SHARCS: Efficient Transformers through Routing with Dynamic Width Sub-networks**
Mohammadreza Salehi, Sachin Mehta, **Aditya Kusupati**, Ali Farhadi and Hanna Hajishirzi.
*Empirical Methods in Natural Language Processing (**EMNLP**) Findings, 2023.*

15. **Objaverse-XL: A Universe of 10M+ 3D Objects**
Matt Deitke, Ruoshi Liu, Matthew Wallingford, Huong Ngo, Oscar Michel, **Aditya Kusupati**, Alan Fan, Christian Laforte, Vikram Voleti, Samir Yitzhak Gadre, Aniruddha Kembhavi, Carl Vondrick, Georgia Gkioxari, Kiana Ehsani, Ludwig Schmidt and Ali Farhadi.
*Neural Information Processing Systems (**NeurIPS**) Dataset and Benchmarks Track, 2023.*

14. **MADLAD-400: Monolingual And Document-Level Large Audited Dataset**
Sneha Kudugunta, Isaac Caswell, Biao Zhang, Xavier Garcia, Christopher A. Choquette-Choo, Katherine Lee, Derrick Xin, **Aditya Kusupati**, Romi Stella, Ankur Bapna and Orhan Firat.
*Neural Information Processing Systems (**NeurIPS**) Dataset and Benchmarks Track, 2023.*

13. **Neural Priming for Sample-Efficient Adaptation**
Matthew Wallingford*, Vivek Ramanujan*, Alex Fang, **Aditya Kusupati**,
Roozbeh Mottaghi, Aniruddha Kembhavi, Ludwig Schmidt and Ali Farhadi.
*Neural Information Processing Systems (**NeurIPS**), 2023.*

12. **AdANNS: A Framework for Adaptive Semantic Search**
Aniket Rege*, **Aditya Kusupati***, Sharan Ranjit, Alan Fan, Qingqing Cao,
Sham Kakade, Prateek Jain and Ali Farhadi.
*Neural Information Processing Systems (**NeurIPS**), 2023.*
Practical ML for Developing Countries workshop @ ICLR 2023 **(Oral)**.

11. **FLUID: A Unified Evaluation Framework for Flexible Sequential Data**
Matthew Wallingford, **Aditya Kusupati***, Keivan Alizadeh-Vahid*, Aaron Walsman,
Aniruddha Kembhavi and Ali Farhadi.
*Transactions on Machine Learning Research (**TMLR**), 2023.*

10. **Neural Radiance Field Codebooks**
Matthew Wallingford, **Aditya Kusupati**, Alex Fang, Vivek Ramanujan,
Aniruddha Kembhavi, Roozbeh Mottaghi and Ali Farhadi
*International Conference on Learning Representations (**ICLR**), 2023.*

9. **Matryoshka Representation Learning.**
Aditya Kusupati*, Gantavya Bhatt*, Aniket Rege*, Matthew Wallingford, Aditya Sinha, Vivek Ramanujan, William Howard-Snyder, Kaifeng Chen, Sham Kakade, Prateek Jain, and Ali Farhadi.
*Neural Information Processing Systems (**NeurIPS**), 2022.*
Vision Transformers: Theory and Applications workshop @ NeurIPS, 2022 **(Oral)**.
Self-Supervised Learning - Theory and Practice workshop @ NeurIPS, 2022.
Computer Vision in the Wild workshop @ ECCV, 2022.

8. **MERLOT RESERVE: Neural Script Knowledge through Vision and Language and Sound**
Rowan Zellers, Jiasen Lu, Ximing Lu, Youngjae Yu, Yanpeng Zhao, Mohammadreza Salehi, **Aditya Kusupati**,
Jack Hessel, Ali Farhadi and Yejin Choi.
*IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2022* **(Oral)**.

7. **ProtoSound: Personalized, Scalable Sound Recognition for d/Deaf and Hard of Hearing Users through In-the-Wild Few-Shot Interactions.**
Dhruv Jain, Khoa Nguyen, Steven Goodman, Rachel Grossman-Kahn, Hung Ngo, **Aditya Kusupati**, Ruofei Du,

Alex Olwal, Leah Findlater and Jon Froehlich.
*ACM CHI Conference on Human Factors in Computing Systems (**CHI**), 2022* **(Talk)**.

6. **LLC: Accurate, Multi-purpose Learnt Low-dimensional Binary Codes**
Aditya Kusupati, Matthew Wallingford, Vivek Ramanujan, Raghav Somani, Jae Sung Park, Krishna Pillutla, Prateek Jain, Sham Kakade and Ali Farhadi.
*Neural Information Processing Systems (**NeurIPS**), 2021* **(Virtual Talk)**.

5. **RNNPool: Efficient Non-linear Pooling for RAM Constrained Inference**
Oindrila Saha, **Aditya Kusupati**, Harsha Vardhan Simhadri, Manik Varma and Prateek Jain.
*Neural Information Processing Systems (**NeurIPS**), 2020* **(Virtual Spotlight)**.
WiCV workshop @ CVPR, 2020.

4. **Soft Threshold Weight Reparameterization for Learnable Sparsity**
Aditya Kusupati, Vivek Ramanujan*, Raghav Somani*, Mitchell Wortsman*, Prateek Jain, Sham Kakade and Ali Farhadi.
*International Conference on Machine Learning (**ICML**), 2020* **(Virtual Talk)**.

3. **Extreme Regression for Dynamic Search Advertising**
Yashoteja Prabhu, **Aditya Kusupati**, Nilesh Gupta and Manik Varma.
*International Conference on Web Search and Data Mining (**WSDM**), 2020* **(Long Oral)**.
eXtreme Classification: Theory and Applications workshop @ ICML, 2020.

2. **One Size Does Not Fit All: Multi-Scale, Cascaded RNNs for Radar Classification**
Dhrubojyoti Roy*, Sangeeta Srivatsava*, **Aditya Kusupati**, Pranshu Jain, Manik Varma and Anish Arora.
*International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2019.*
🏆 **Best Paper Runner-Up Award**.

1. **FastGRNN: A Fast, Accurate, Stable and Tiny Kilobyte Sized Gated Recurrent Neural Network**
Aditya Kusupati, Manish Singh, Kush Bhatia, Ashish Kumar, Prateek Jain and Manik Varma.
*Neural Information Processing Systems (**NeurIPS**), 2018.*

Workshop Publications

2. **Are "Hierarchical" Visual Representations Hierarchical?**
Ethan Shen, Ali Farhadi and **Aditya Kusupati**.
Workshop on Symmetry and Geometry in Neural Representations @ NeurIPS 2023.

1. **Disrupting Model Training with Adversarial Shortcuts**
Ivan Evtimov, Ian Covert, **Aditya Kusupati** and Tadayoshi Kohno.
Workshop on Adversarial Machine Learning @ ICML 2021.

Journal Publications

1. **One Size Does Not Fit All: Multi-Scale, Cascaded RNNs for Radar Classification**
Dhrubojyoti Roy*, Sangeeta Srivatsava*, **Aditya Kusupati**, Pranshu Jain, Manik Varma and Anish Arora.
*ACM Transactions on Sensor Networks (**TOSN**), 17(2), January 2021.* **(Best Paper Nomination)**.

Demos

1. **Lightweight, Deep RNNs for Radar Classification**
Dhrubojyoti Roy*, Sangeeta Srivatsava*, Pranshu Jain, **Aditya Kusupati**, Manik Varma and Anish Arora.
*International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (**BuildSys**), 2019.*

Theses

2. **Towards Adaptive Intelligence**
Aditya Kusupati.
PhD Thesis, Paul G. Allen School of Computer Science and Engineering, University of Washington, 2019 - 24.

1. **Efficient Spatial Representation for Entity-Typing**
Anand Dhoot*, **Aditya Kusupati*** and Soumen Chakrabarti.
Undergraduate Thesis, Computer Science and Engineering, IIT Bombay, 2016 - 17.

Software

1. **EdgeML: Machine Learning for Resource-constrained Edge Devices**.
Dennis et al., including **Aditya Kusupati**.
Microsoft Research India, 2017.
Stats: ★ >1,200, >320, >300,000, >4,500.

Select Awards and Honors

- **Best Paper Award** at ENLSP workshop @ NeurIPS '23 *2023*
- **JUWELS Booster Compute Grant** worth 100K A100 GPU hours *2023*
- **Best Poster Award** and a Research Grant worth $25,000 at Citadel Securities PhD Summit *2023*
- Google **Level 3: Accelerate** Research Grant worth $300,000 extendable up to 1M dollars *2022*
- Academic Research **GCP Credit Award** worth $100,000 *2021 - 2023*
- **Expert Reviewer** for **ICML '21** *2021*
- **Best Paper Runner-Up Award** at **BuildSys '19** *2019*
- Young Researcher at Heidelberg Laureate Forum (**HLF '19**) with Romberg Grant & MSR Travel Grant *2019*
- **Facebook AI Research International Scholarship** for DPhil at VGG, Oxford (2019 - 22, declined) *2019*
- IIT Bombay CSE **Teaching Assistant of the month** (Feb '16 and Feb '17) award *2016 - 2017*
- **All India Rank 44** in JEE Advanced (IIT-JEE) 2013 among 150,000 candidates qualified from 1.5 million *2013*
- Gold Medal and rank **6 out of top 40** in India at OCSC for International Chemistry Olympiad '13 *2013*
- KVPY Fellowship from Government of India - All India Rank 22. *2011*
- NTSE Scholarship from Government of India. *2008*
- **Best/Top/Outstanding Reviewer** award for **NeurIPS '19, '20, '22**; **ICML '20, '21**; **CVPR '21** & **ICLR '22**

Talks

- **Towards Adaptive Intelligence**
  - Exa AI *September 2024*
  - Sage Bionetworks *August 2024*
  - University of Washington *June 2024*
  - Microsoft Research AI Frontiers *May 2024*
  - Snowflake *May 2024*
  - Google DeepMind *May 2024*
  - UT Austin Computer Science Colloquium *April 2024*
  - NVIDIA Research *April 2024*
  - Google Research *April 2024*
  - Microsoft Research India *March 2024*
  - IIT Bombay Computer Science & C-MInDS *March 2024*
  - Harvard University Computer Science & Kempner Institute Lecture *February 2024*
  - Columbia University Computer Science Colloquium *February 2024*
- **Indexing the World**
  - Hazy Research Lab @ Stanford *November 2023*
  - Scaled Foundations *October 2023*
  - MIT Vision and Graphics Seminar *March 2023*
  - Harvard Machine Learning Foundations Seminar *March 2023*
  - Google Research India *February 2023*
  - H2Lab Seminar @ UW CSE *January 2023*
- **Matryoshka Representation Learning**
  - Jina AI *March 2024*
  - ThursdAI *February 2024*
  - Weaviate Podcast *February 2024*
  - Mosaic ML *June 2023*
  - Neural Information Processing Systems (NeurIPS) *December 2022*
  - Pinterest Labs *September 2022*
  - Perception Spotlight @ Google Research *August 2022*
  - DeepPhenomena @ Google Research *August 2022*

  - Image Understanding @ Google Research *June 2022*
- **LLC: Accurate, Multi-purpose Learnt Low-dimensional Binary Codes**
  - Image Understanding @ Google Research *February 2022*
  - Neural Information Processing Systems (NeurIPS) *December 2021*
  - Microsoft Research India *November 2021*
  - UC Berkeley Computer Vision Seminar *November 2021*
  - University of Washington CSE Colloquium *October 2021*
- **Soft Threshold Weight Reparameterization for Learnable Sparsity**
  - International Conference on Machine Learning (ICML) *July 2020*
  - NVIDIA Research *July 2020*
  - Deep Learning: Classics and Trends *June 2020*
- **The Edge of Machine Learning**
  - University of Washington CSE Colloquium & Sensor Systems Seminar *October 2019*
  - VGG @ Oxford University, UK *April 2019*
  - Microsoft Research Redmond *March 2019*
  - Microsoft Research India *August 2018*
- **The Extremes of Machine Learning**
  - Microsoft Bing *March 2019*

Teaching Experience

- *Co-instructor* – Computer Science and Engineering, University of Washington
  - CSE 493G1/599G1: Deep Learning w/ Prof. Ali Farhadi *Fall 2023*
  - CSE 493G1/599G1: Deep Learning w/ Prof. Ranjay Krishna *Spring 2023*
- *Undergraduate Teaching Assistantship* – Computer Science and Engineering, IIT Bombay
  - Digital Logic Design - *Prof. Supratik Chakraborty* - **TA of the month, Feb '17** *Spring 2017*
  - Software Systems Lab - *Prof. Sharat Chandran* *Autumn 2016*
  - Digital Logic Design - *Prof. Supratik Chakraborty* - **TA of the month, Feb '16** *Spring 2016*
  - Computer Programming and Utilisation - *Prof. Varsha Apte* *Autumn 2015*
  - Computer Programming and Utilisation - *Prof. Kavi Arya* *Spring 2015*

Professional Service

- *Reviewing:* IEEE TPAMI, TMLR, NeurIPS (2019 - present), ICML (2020 - present), ICLR (2021 - present), CVPR (2021 - present), ICCV/ECCV (2021 - present), AAAI 2025.
- *Workshop Organization*
  - ML in India Social *NeurIPS 2021*
  - Rethinking ML Papers *ICLR 2021*
- *Mentorship*
  - Students (Position → Next Placement)
    * Ethan Shen [W.2, P.5]
      BS Student, UW CSE *2023 - 24*
    * Devvrit [P.2]
      PhD Student, UT Austin CS *2023 - 24*
    * Alan Fan [C.12, C.15, P.5]
      BS Student, UW CSE → Software Engineer @ LinkedIn *2023 - 24*
    * Pruthvi Raju
      Software Engineer, Google *2022 - 23*
    * Sharan Ranjit [C.12]
      MS student, UW ECE → Machine Learning Engineer @ Autodesk *2022 - 23*
    * Venkata Sailesh Sanampudi
      Software Engineer, Google *2022 - 24*

* Umangi Jain [C.17]
  Pre-doc Researcher, Google Research India → PhD Student @ UofT CS *2022 - 23*
* Avishree Khare
  Software Engineer, Google → Research Fellow @ MSR India → PhD Student @ UPenn CS *2022*
* Gantavya Bhatt [C.9]
  PhD Student, UW ECE *2022 - 23*
* Aniket Rege [C.9, C.12]
  MS Thesis, UW ECE → PhD Student @ UW–Madison CS *2022 - 23*
* William Howard-Snyder [C.9]
  BS/MS Student, UW CSE *Fall 2021*
* Sahil Verma
  PhD Student UW CSE *2021 - 22*
* Oindrila Saha [C.5]
  Research Fellow, MSR India → PhD Student @ UMass CS *2019 - 21*
* Sachin Goyal
  Research Fellow, MSR India → PhD Student @ CMU MLD *2019 - 21*
* Nilesh Gupta [C.3, P.1]
  Research Fellow, MSR India → PhD Student @ UT Austin CS *2019 - 20*
* Sahil Bhatia
  Research Fellow, MSR India → PhD Student @ UC Berkeley EECS *2018 - 20*
* Sheshansh Agrawal
  Bachelor's Thesis, IIT Bombay → RSDE @ MSR India *2018 - 19*
* Manish Singh [C.1]
  Bachelor's Thesis, IIT Delhi → PhD Student @ MIT EECS *2017 - 18*
  🏆 **Best Undergraduate Thesis Award (2018), IIT Delhi**

– New In ML session @ NeurIPS '19 *2019*

– MSR India Summer Workshop 2018: Machine Learning on Constrained Devices *Summer 2018*

- *Faculty Recruiting Liaison* - Paul G. Allen School of CSE, University of Washington *2020 - 2022*
- *Student Area Chair (ML/AI): PhD Admissions* - Paul G. Allen School of CSE, University of Washington *2020 - 2022*
- *Co-Founder & Organizing Committee Member* - Allen School PhD Pre-Application Mentorship Service (PAMS) *2021*
- *Co-Founder & Co-Lead* - Allen School PhD Pre-Application Review Service (PARS) *2020*
- *Department General Secretary* - Computer Science and Engineering, IIT Bombay *2016 - 2017*