

# Aditya Kusupati

Bill & Melinda Gates Center for Computer Science & Engineering  
Paul G. Allen School of Computer Science & Engineering  
University of Washington, Seattle, WA, USA 98195

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🎓 Google Scholar

## RESEARCH INTERESTS

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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

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**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

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**Google Research → DeepMind** January 2022 - June 2024  
*Student Researcher in Perception*  
Advisors: Dr. Prateek Jain, Tom Duerig & Dr. Rahul Sukthankar  
Worked on making fundamental Machine Learning algorithms elastic, flexible, and end-to-end differentiable for efficient and accurate deployment in web-scale systems like Google Search & Ads along with top-tier publications. Lead multiple research and product adoption efforts with a team of interns, research, and software engineers.

**Berkeley Artificial Intelligence Research Lab** June - September, 2022  
*Visiting Researcher*  
Advisor: Prof. Alexei A. Efros  
Worked on understanding the underlying discretization of the natural visual world through variable length representations.

**NVIDIA Toronto AI Lab** June - September, 2020  
*Research Scientist Intern*  
Advisor: Prof. Sanja Fidler  
Explored missing modality (audio/visual/control) generation with cross-modal supervision for Atari video games using GANs.

**Microsoft Research India** May 2017 - July 2019  
*Research Fellow in Machine Learning and Optimization*  
Advisors: Dr. Manik Varma & Dr. Prateek Jain  
Worked on resource-efficient and large-scale machine learning resulting in top-tier publications & deployment in Bing.

## PUBLICATIONS

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### Preprints

\* - equal contribution

6. **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.*
5. **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**.  
*Under Review, NeurIPS 2024.*
4. **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.  
*Under Review, NeurIPS 2024.*

3. **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.  
*Under Review, **NeurIPS** 2024.*
2. **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.  
*Under Review, **NeurIPS** 2024.*  
*Efficient Natural Language and Speech Processing workshop @ NeurIPS 2023 (Oral, 🏆 Best Paper Award).*  
*Workshop on Advancing Neural Network Training @ NeurIPS 2023 (Oral).*
1. **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, **TMLR** 2024.*

## Conference Publications

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**, Nilesch 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

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### 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

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- **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

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- **Towards Adaptive Intelligence**
  - 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

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### • *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

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### • *Reviewing*: IEEE TPAMI, TMLR, NeurIPS (2019 - present), ICML (2020 - present), ICLR (2021 - present), CVPR (2021 - present), ICCV/ECCV (2021 - present).

### • *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