

# Amita Kamath

Natural Language Processing · Vision-Language · Machine Learning  
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## EDUCATION

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| <b>University of California at Los Angeles</b><br>Ph.D. in Computer Science<br><i>Awarded Graduate Dean's Scholar Award.</i> Advisor: Prof. Kai-Wei Chang                | 2022 – Present<br>GPA: N/A |
| <b>Stanford University</b><br>M.S. in Computer Science (Specialization: Artificial Intelligence)<br><i>Awarded Distinction in Research.</i> Advisor: Prof. Percy Liang   | 2017 – 2020<br>GPA: 3.99   |
| <b>National Institute of Technology Karnataka (NITK), Surathkal, India</b><br>B.Tech. in Computer Science and Engineering<br><i>Gold medalist (1<sup>st</sup> Rank).</i> | 2013 – 2017<br>GPA: 9.54   |

## RESEARCH EXPERIENCE

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**Allen Institute for Artificial Intelligence** October 2020 – Present  
*Predoctoral Young Investigator, advised by Prof. Aniruddha Kembhavi*  
*Work done in collaboration with Prof. Derek Hoiem, UIUC*

★ **Webly Supervised Concept Expansion for General Purpose Vision Models**

- Curated 40K queries, obtained 1M image-query pairs from search engine data (for only \$150!) and converted them to a VQA-style dataset.
- Used this web data to introduce over 10K new visual concepts (including tail concepts, e.g. “hyacinth”) to three general purpose vision-language models, and studied how the models transferred them to tasks such as captioning and localization.
- Showed that the web data helps models obtain impressive zero-shot performance on action- and attribute-focused datasets. [ECCV 2022]

★ **Towards General Purpose Vision Systems**

- Co-created an end-to-end, task-agnostic vision-language model and an evaluation that tests model generality in terms of: (1) flexibility of architecture, (2) ability to transfer knowledge between tasks, and (3) ability to learn new tasks quickly.
- Conducted detailed analyses of the model performance on the new evaluation benchmark, identifying multiple kinds of knowledge transfer between tasks. [CVPR 2022, oral]

**Stanford University** September 2018 – June 2020  
*Graduate Research Assistant, advised by Prof. Percy Liang*

★ **Selective Question Answering under Domain Shift**

- Proposed a novel setting encapsulating the practical necessity of knowing when to abstain on test data that differs from the training data.
- Showed that QA models are overconfident on out-of-domain (OOD) examples relative to in-domain examples, leading to poor performance in mixed settings.
- Explored multiple selective prediction methods, showing that OOD data from even a non-target distribution can improve accuracy significantly when used to train a calibrator [ACL 2020].

★ **Evaluation and Improvement of Question Answering using Local Perturbations**

- Generated diverse local perturbations of QAs, using only a small number of crowdworker-labeled examples to classify these as meaning-altering or meaning-preserving.

- Showed that existing QA models had poor local decision boundaries, and that augmenting the training data with perturbations improved performance.

## University of British Columbia

May 2016 – December 2016

*Mitacs Summer Research Fellow, advised by Prof. Karthik Pattabiraman*

### ★ Dynamic Invariant Detection for Cyber-Physical System Security

- Mined dynamic system properties of two cyber-physical systems, a smart electric meter and a smart insulin pump, using Association Rule Mining and related techniques.
- Co-created a dynamic Intrusion Detection System based on these invariants, reducing false positives by 31% and false negatives by 93% [FSE 2017].

## Indian Institute of Science

May 2015 – December 2015

*IAS Summer Research Fellow, advised by J. Lakshmi and Prof. S. K. Nandy*

### ★ Secure Virtualization on a Network-on-Chip

- Completed a detailed security analysis of a novel Network-on-Chip (NoC) architecture for secure virtualization under a wide variety of virtual workloads.
- Suggested protocols to be followed by architecture components to prevent various NoC attacks.
- Upgraded the NoC design so it could be implemented on an FPGA.

## WORK EXPERIENCE

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### Amazon AI

June 2020 – September 2020

*Applied Science Intern, advised by Saab Mansour*

- Created a test-bed for Intent Classification and Slot Labeling under two realistic forms of distribution shift: (1) from synthetic data to real data, and (2) between different data collection methods.
- Explored methods to improve performance of state-of-the-art models on this test-bed, including modified pre-training, modified training losses, and self-training.

### Nutanix

June 2018 – September 2018

*Software Engineering Intern, advised by Bala Neerumalla*

- Built an orchestration service for Cloud Security.
- Proposed and initiated work on an Intrusion Detection System based on Association Rule Mining of system logs.

## PUBLICATIONS

\* denotes equal contribution

- [Amita Kamath](#)\*, Christopher Clark\*, Tanmay Gupta\*, Eric Kolve, Derek Hoiem, Aniruddha Kembhavi. **Webly Supervised Concept Expansion for General Purpose Vision Models**, *European Conference on Computer Vision (ECCV)*, 2022. URL: <https://arxiv.org/abs/2202.02317>
- Tanmay Gupta, [Amita Kamath](#), Aniruddha Kembhavi, Derek Hoiem. **Towards General Purpose Vision Systems: An End-to-End, Task-Agnostic Vision-Language Architecture**, *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. URL: <https://arxiv.org/pdf/2104.00743.pdf>
- [Amita Kamath](#), Robin Jia, Percy Liang. **Selective Question Answering under Domain Shift**, *Association of Computational Linguistics (ACL)*, 2020. URL: <https://aclanthology.org/2020.acl-main.503.pdf>
- [Amita Kamath](#). **Selective Prediction under Domain Shift for Question Answering**, Masters Thesis advised by Prof. Percy Liang and Prof. Christopher Manning. 2020. URL: <https://amitakamath.github.io/AmitaKamathMSThesis.pdf>

- [Undergraduate] Maryam Aliabadi, [Amita Kamath](#), Julien Gascon-Samson, Karthik Pattabiraman. **ARTINALI: Dynamic Invariant Detection for Cyber-Physical System Security**, *ACM SIGSOFT Symposium on Foundations of Software Engineering (FSE)*, 2017.  
URL: <http://blogs.ubc.ca/karthik/files/2017/07/ARTINALI-FSE17.pdf>
- [Undergraduate] [Amita Kamath](#), Chirag Jamadagni, Kevin Mathew, Abhijith Anilkumar, Mohit Tahlilani. **GCPiN: Group Caching for Privacy in Named Data Networking**, *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, 2017.
- [Undergraduate] [Amita Kamath](#), Chirag Jamadagni, K Chandrasekaran. **VirtTorrent: BitTorrent for Inter-VM File Distribution**, *International Conference on IoT and Cloud Computing (ICC)*, 2016.
- [Undergraduate] Dhruv Chand, Sunil Nayak, K Bhat, Shivani Parikh, Yuvraj Singh, [Amita Kamath](#). **A mobile application for Women’s Safety: WoSApp**, *IEEE Region 10 Conference (TENCON)*, 2015.

## TEACHING EXPERIENCE

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- Head Teaching Assistant for Stanford CS221 (Artificial Intelligence), Summer 2019, with instructor Robin Jia. Managed a team of 6 TAs and 100+ students, taught sections, held office hours, and mentored several students.
- Teaching Assistant for Stanford CS224n (NLP with Deep Learning), Winter 2020, with Prof. Christopher Manning. Worked with a team of 23 TAs for 450+ students, taught sections, held office hours, and mentored 10+ student course project teams.
- Teaching Assistant for Stanford CS224n (NLP with Deep Learning), Winter 2019, with Prof. Christopher Manning. Worked with a team of 20 TAs for 400+ students to develop new assignments and re-implement existing assignment code in PyTorch. Held office hours and mentored 10+ student course project teams.
- Teaching Assistant for Stanford CS221 (Artificial Intelligence), Autumn 2018, with Prof. Percy Liang and Kelvin Guu. Worked with a team of 15 TAs for 400+ students to refine course assignments. Held office hours and mentored 10+ student course project teams.

## PROFESSIONAL AND DEPARTMENT SERVICE

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- Reviewer at CVPR 2022 and NeurIPS 2021 Workshop on Distribution Shifts (DistShift 2021)
- Student Member of the Stanford MSCS Admissions Committee, 2019. Reviewed student applications and discussed with faculty on the committee to select the incoming MS students.
- Organizer of the weekly Stanford NLP Reading Group, Autumn 2019, attended by graduate students and faculty of the NLP Group.

## AWARDS

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- Graduate Dean’s Scholar Award, awarded by UCLA 2022-24.
- Distinction in Research, awarded by the Stanford CS Department, 2020. For significant research conducted during my MS degree and the approval of a thesis based on the same.
- Top 3 Projects Award, Stanford CS224n (NLP with Deep Learning) 2018. My teammate and I studied adversarial attacks on Question Answering systems and devised methods to improve robustness against the same. Awarded 2nd Prize out of 145+ projects.
- Stanford-CISPA Research Fellowship, 2018. To perform work on Reinforcement Learning for web security.
- Mitacs Globalink Summer Research Fellowship, 2016. This fellowship is awarded by the Government of Canada to the top 5% of 10,000+ student applicants from developing countries based on academic performance and research potential, to perform research in top Canadian universities.
- Indian Academies of Science (IAS) Summer Research Fellowship, 2015. This fellowship is awarded to the top 5% of 25,000+ student applicants based on outstanding academic performance, to perform research in top Indian universities.

- Highest SGPA and CGPA awards, 2015-17. Awarded by the Department of Computer Science, NITK to the student with highest semester/cumulative GPA.
- Selected as one of 10 student volunteers from across the country for COMSNETS 2017, the top computer networks conference in India.
- INSPIRE, SPDC, DASA scholarships, 2010-2017. Awarded by the Government of India for outstanding academic performance.

## RELEVANT COURSEWORK

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| <b>Undergraduate</b> | Data Structures and Algorithms, Design and Analysis of Algorithms, Continuous and Discrete Math, Discrete Mathematical Structures, Artificial Intelligence, Distributed Systems, Advanced Data Structures, Computer Networks        |
| <b>Graduate</b>      | Artificial Intelligence, Machine Learning, NLP with Deep Learning, CNNs for Visual Recognition, Deep Generative Models, Cryptography, Natural Language Understanding, Information Retrieval and Web Search, Mining Massive Datasets |

## SKILLS

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| <b>Programming</b>      | Python, PyTorch, Tensorflow, C, C++ (proficient)<br>Javascript, Java, MATLAB, HTML (basic)  |
| <b>Languages</b>        | English, Konkani (native)<br>Hindi, Kannada, French (basic)   |
| <b>Extra-curricular</b> | Social Dancing (performed in Stanford's The Nutcracker, 2019)<br>Art (Creative Coordinator of Artists' Forum, NITK, 2017)<br>Handicrafts (Guinness World Record [group] for largest crocheted blanket, 2016)<br>MaRRS Spelling Bee (Second place in national and international levels, 2012)<br>Creative Writing (published two short stories through Scholastic) |