# ARJUN R. AKULA

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## EDUCATION

**University of California, Los Angeles (UCLA)**                    *2016 - Present*
Ph.D. in Statistics
Advisors: Prof. Song-Chun Zhu (UCLA) and Prof. Joyce Chai (UMich)
Thesis topic: *Interpretability, Robustness, and Trust in Vision and Language Grounding*
GPA: **3.96**/4.0

**IIIT Hyderabad, India**                    *2012 - 2014*
MS by Research in Computer Science and Engineering
Advisors: Prof. Radhika Mamidi and Prof. Rajeev Sangal
Thesis title: *Context based Natural Language Interfaces to Database (NLIDB) Systems*
GPA: **9.02**/10.0

**IIIT Hyderabad, India**                    *2008 - 2012*
B.Tech in Computer Science and Engineering
GPA: **9.02**/10.0

## RESEARCH INTERESTS

I am broadly interested in deep learning and its applications to the field of natural language processing and computer vision and, with focuses on vision & language grounding, explainable AI models, neuro-symbolic AI & compositionality.

## PROFESSIONAL EXPERIENCE

**Amazon Alexa AI,** Sunnyvale, USA                    Jun 2021 - Sep 2021
*Research Intern (Applied Scientist), 3 months*

· Host/Mentors: Dr. Spandana Gella, Prof. Mohit Bansal, Prof. Jesse Thomason
· Manager: Dr. Dilek Hakkani-Tur
· I worked on identifying biases in Vision-Language-Navigation models for ALFRED benchmark. Specifically, we show that ALFRED models such as Episodic Transformer (ET) are heavily biased towards vision inputs and are language agnostic. We improve generalization performance of ET model through syntax based pre-training of language encoder, curriculum learning, and multi-task learning.
· Planning to submit this work to **ACL 2022**.

**Google Research,** Los Angeles, USA                    Jun 2020 - Sep 2020
*Research Intern, 3 months*

· Host/Mentors: Dr. Soravit Changpinyo, Boqing Gong, Piyush Sharma
· Manager: Dr. Radu Soricut
· Team: GARCON Vision and Language Grounding
· I proposed a visual question generation (VQG) module that facilitate in systematically evaluating cross-dataset adaptation capabilities of visual question answering (VQA) models. Specifically, using our proposed VQG module, we generate out-of-domain test sets for source and target datasets by controlling and disentangling distribution shifts in vision and language features.
· Published in **EMNLP 2021 (Long, main)**.

**Amazon AI,** Palo Alto, USA                                    Jun 2019 - Sep 2019
*Research Intern (Applied Scientist), 3 months*

· Host: Dr. Spandana Gella
· Manager: Dr. Yaser Al-Onaizan
· Team: Amazon Comprehend
· I worked on visual referring expression (RER) comprehension problem where the goal is to ground natural language expressions in images. We examine SOTA models (such as ViLBERT and MattNet) and show that they fail to perform reasoning on the linguistic structure.
· Published in **ACL 2020**.

**Mila,** Montreal, Canada                                        Oct 2019 - Apr 2020
*Research Collaboration (remote), 7 months*

· Mentor: Prof. Siva Reddy
· We proposed contextual Neural Module Networks (NMNs) for grounding visual referring expressions. We show that our approach enhances NMNs' ability to exploit visiolinguistic relationships.
· Published in **EMNLP 2021 (Long, Main)**.

**Google Research,** Cambridge, USA                              Jan 2020 - Jun 2020
*Research Collaboration (remote), 6 months*

· Mentor: Dr. Varun Jampani
· We critically examine the systematic generalization capabilities of NMNs in grounding in-domain and out-of-domain (o.o.d) referring expressions. We show that existing NMN implementations struggle to generalize and show a generalization gap of at least 20-25% in the performance.
· Published in **NeurIPS 2021**.

**IBM Research,** Bangalore, India                               Mar 2014 - Sep 2016
*Research Software Engineer, 2.6 years*

· Team: Cognitive Research and Language Technologies
· Manager: Dr. Gargi B Dasgupta (Director & CTO, IBM Research India)
· I worked on a wide array of natural language processing and machine learning projects at IBM Research. Following is a brief overview of my research work at IBM:

  1. Implemented a prototype to answer natural language queries in IT Services Domain using IBM Watson Question Answering System.

  2. Designed and developed a web based reporting tool to measure adoption, utilization and business benefits of dynamic automations in IT & services delivery research. Many business units of IBM are now using this tool for auto-remediation of IT service tickets. I was awarded *IBM Research Division Award 2016* and *IBM Outstanding Research Accomplishment Award 2015* as this project directly resulted in $71.7M productivity improvements for IBM.

  3. Proposed a new set of Discourse relations among IT service tickets to improve classification accuracy of tickets. Filed a US patent application on this.

  4. Designed and developed a novel Classification algorithm to classify problem tickets in IT Incident Management Process. Published a paper on this in **ICSOC 2014**, a top-tier conference in IT services domain.

**DARPA XAI Grant**                                              May 2017 - Present
*Project Lead, 3.5 years*

· PI: Prof. Song-Chun Zhu

· I lead the DARPA Explainable AI (XAI) Grant ($5M) at UCLA. I proposed and implemented novel frameworks and methods to explain predictions of deep neural networks (and thereby improve human trust and reliance in AI system). I mentored six masters students and eight undergraduate students at UCLA.
· Published in **AAAI 2020**.

### IIIT Hyderabad                                                    Jan 2014 - Mar 2014
*Course Instructor, 3 months*

· Co-taught a graduate level course *Advanced Natural Language Processing*.

### UCLA                                                             Sep 2017 - Present
*Research Assistant (RA), 3 years*

· DARPA Explainable AI (XAI) Grant.

### IIIT Hyderabad                                                   Aug 2010 - Dec 2012
*Project Lead and Research Assistant, 2 years*

· Designed and developed a web-based 3D virtual laboratory at IIIT Hyderabad, funded by Ministry of Human Resource Development India (MHRD).

### IIIT Hyderabad
*Teaching Assistant, 8 months*

· Computer Programming course (Aug 2013 - Dec 2013) and Humanities course (Aug 2009 - Dec 2009).

### Center for Exact Humanities, IIIT Hyderabad                      May 2011 - Aug 2011
*Summer Intern, 3 months*

### UCLA                                                             Sep 2016 - Jun 2017
*Course Grader, 9 months*

· Introduction to Statistical Reasoning course

## AWARDS/ACHIEVEMENTS

- Received **Research Award - 2012** at IIIT-Hyderabad (Awarded for top 3 outstanding undergraduate students actively pursuing research).

- Received **Research Division Award - 2016** at IBM Research for proposing a novel text classification algorithm to classify problem tickets in IT Incident Management Process.

- Received **Outstanding Research Accomplishment Award - 2015** at IBM Research for designing and developing a web based reporting tool to measure adoption, utilization and business benefits of dynamic automations in IT Incident Management Process.

- Received **IBM Manager's Choice Award - 2014** for outstanding research contributions to Noisy Text Analytics at IBM Research.

- Awarded **Dean's list I** (for the top 5% of undergraduate students) for academic excellence in the semesters Spring 2011, Monsoon 2010 and Spring 2010 at IIIT-Hyderabad.

- Awarded **Dean's list II** (for the top 5-10% of undergraduate students) for academic excellence in the semesters Monsoon 2011 and Spring 2012 at IIIT-Hyderabad.

- Received **IBM Team Lunch Award − 2014** at IBM Research for filing outstanding patents and for publishing research papers in top-tier conferences.

- **Graduate Fellowship**, University of California, Los Angeles                    *2016 - 2017*

- Received **UCLA Travel Grant** for ACL 2017, CVPR 2019, AAAI 2020, ACL 2020.

## PUBLICATIONS

1. **Arjun R. Akula**, Soravit Changpinyo, Boqing Gong, Piyush Sharma, Song-Chun Zhu, Radu Soricut. CrossVQA: Generating Scalable and Nonstationary Benchmarks for Testing VQA Generalization. In *EMNLP*, 2021 (Long, Main).

2. **Arjun R. Akula**, Varun Jampani, Soravit Changpinyo, Song-Chun Zhu. Robust Visual Reasoning via Language-Guided Neural Module Networks. In *NeurIPS*, 2021.

3. **Arjun R. Akula**, Spandana Gella, Keze Wang, Song-Chun Zhu, Siva Reddy. Contextual Neural Module Networks for Grounding Visual Referring Expressions. In *EMNLP*, 2021 (Long, Main).

4. **Arjun R. Akula**, Changsong L, Sari S, Sinisa T, Joyce Chai, Song-Chun Zhu. X-ToM: Explaining with Theory-of-Mind for Gaining Justified Human Trust. In *iScience, Cell Press Journal*, 2021 (arXiv: 1909.06907).

5. **Arjun R. Akula**, Wang Shuai, Song-Chun Zhu. CoCoX: Generating Conceptual and Counterfactual Explanations via Fault-Lines. In *Association for the Advancement of Artificial Intelligence* (AAAI), 2020 [Oral, Spotlight, acceptance rate: 20.5%].

6. **Arjun R. Akula**, Spandana Gella, Yaser Al-Onaizan, Song-Chun Zhu, Siva Reddy. On the Robustness of Grounding Visual Referring Expressions. In *Association for Computational Linguistics* (ACL), 2020 [Oral, acceptance rate: 17.6%].

7. **Arjun R. Akula**, Song-Chun Zhu. Visual Discourse Parsing. In *CVPR 2019 workshop on Language and Vision* [Oral]. Selected as one among the three BEST oral papers.

8. **Arjun R. Akula**, Sinisa T, Joyce Chai, Song-Chun Zhu. Natural Language Interaction with Explainable AI models. In *CVPR 2019 workshop on Explainable AI*.

9. **Arjun R. Akula**, Sinisa T, Joyce Chai, Song-Chun Zhu. Visual Explanation Dialog. In *DARPA XAI PI Meeting*, Feb 2019, UC Berkeley [Poster].

10. **Arjun R. Akula**, Changsong L, Sinisa T, Joyce Chai, Song-Chun Zhu. Explainable AI as Collaborative Task Solving. In *CVPR 2019 workshop on Explainable AI*.

11. Agarwal S, Agarwal V, **Arjun R. Akula**, Gargi B, Sridhara G. Automatic Problem Extraction and Analysis from Unstructured Text in IT Tickets. In *IBM Journal of Research and Development*, 2017.

12. Ashish P, Ruthu S, **Arjun R. Akula**, Radhika Mamidi. Classification of Attributes in a Natural Language Query into Different SQL clauses. In *Proceedings of the Recent Advances in Natural Language Processing* (RANLP), 2015.

13. Gargi B, Tapan K, **Arjun R. Akula**, Shivali A, Shripad J. Towards Auto-Remediation in Services Delivery: Context-Based Classification of Noisy and Unstructured Tickets. In *Proceedings of the International Conference on Service-Oriented Computing* (ICSOC), 2014.

14. **Arjun R. Akula**, Rajeev Sangal, Radhika Mamidi. A Novel Approach towards Incorporating Context Processing Capabilities in NLIDB System. In *Proceedings of the International Joint Conference on Natural Language Processing* (IJCNLP), 2013 [Oral].

15. Vasu P, **Arjun R. Akula**, Syed A. A Web-based Virtual Laboratory for Electromagnetic Theory. In *Proceedings of the International Conference on Technology for Education* (T4E), IEEE, 2013.

16. Gupta A, **Arjun R. Akula**, Deepak M, Puneeth K, Vinay A, Rajeev Sangal. A Novel Approach towards Building a Portable NLIDB System Using the Computational Paninian Grammar Framework. In *Proceedings of the International Conference on Asian Language Processing* (IALP), IEEE, 2012 [Oral].

## PATENTS

1. **Arjun R. Akula**, Gargi B, Vijay E, Ramasuri N. Measuring Effective Utilization of a Service Practitioner for Ticket Resolution via a Wearable Device. Disclosure Number: IN920160178US1, Aug 2016, US Patent App.

2. **Arjun R. Akula**, Gargi B Dasgupta, Tapan K Nayak. Analyzing Unstructured Ticket Text Using Discourse Cues in Communication Logs, Disclosure Number: IN920150227, July 2015. US Patent App.

3. Shivali A, **Arjun R. Akula**, Gargi B, Tapan K, Shripad J. A System and Method for Structured Representation and Classification of Unstructured Tickets in Services Delivery, Disclosure Number: IN820140677, Oct 2014. US Patent App.

## ACADEMIC ACTIVITIES

| | |
|---|---|
| **Reviewer/PC** | CVPR 2022, AAAI 2022, NeurIPS 2021, EMNLP 2021, ACL-IJCNLP 2021, ICCV 2021, CVPR 2021, NAACL 2021, AAAI 2021, ACM TiiS, EACL 2021, XAI-AAAI 2021, ALVR 2021, ACL 2020, EMNLP 2020, RepL4NLP 2020, ICON 2018, 2017 |
| **Sub-Reviewer** | CVPR 2019, ACL 2019, EMNLP-IJCNLP 2019, ECCV 2018, EMNLP 2018, EMNLP 2017 |
| **Panelist/Organizer** | UCLA Data Science Workshop 2018, UCLA ASA DataFest 2017 |
| **Graduate Admission Review** | Computer Science Department, UCLA, 2020 |

## RELATED COURSE WORK

Machine Learning, Natural Language Processing (NLP), Statistical Modeling and Learning in Computer Vision and Cognition, Advanced Topics in Natural Language Generation (NLG), Adversarial Robustness of Machine Learning Models, Deep Learning for NLP, Matrix Algebra and Optimization, Recent Trends in Artificial Intelligence, Distributed Systems, Statistical Programming, Statistical Methods in Artificial Intelligence, Monte Carlo Methods for Optimization, Computational Linguistics, Algorithms, Operating Systems, Database Systems, Computer Networks, Programming in C, Data Structures, Artificial Intelligence, Cloud Computing (Audit), Structured System Analysis and Design, Principles of Programming Languages, Product Design and Engineering, Computer Graphics.

## TECHNICAL SKILL SET

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|---|---|
| **Programming Languages** | C, C++, Python, Java, Matlab, Shell Scripting, R |
| **Web Technologies** | HTML, JSP, PHP, Javascript, CSS |
| **Miscellaneous** | Pytorch, Tensorflow, Keras, Apache Hadoop, Spark, IBM SCALA, Ganglia, Libvirt, Java 3D, LibSVM, GIZA++, Neo4j, Latex |

## INVITED TALKS

Research Talk on *Interpretability, Robustness, and Trust in Vision and Language Grounding Models* at **Google Research**, Feb 2021.

Research Talk on *Interpretability, Robustness, and Trust in Vision and Language Grounding Models* at **Microsoft AI**, Feb 2021.

Research Talk on *Interpretability, Robustness, and Trust in Vision and Language Grounding Models* at **Adobe Research**, Oct 2020.

Research Talk on *Interpretability, Robustness, and Trust in Vision and Language Grounding Models* at **Baidu Research**, Oct 2020.

Research Talk on *Robustness of Grounding Visual Referring Expression* at **Google AI**, Aug 2020.

Research Talk on *Interpretability and Trust in Vision and Language Grounding Models* at **UCLA**, Aug 2019.

Research Talk on *Semantic Role Labelling for Watson Question Answering System* at **IBM Research**, Feb 2016.

Research Talk on *Context based NLIDB and Dialogue Systems* at **Sixth IIIT-H Advanced Summer School on NLP (IASNLP 2015)**.