Prithviraj (Raj) Ammanabrolu

Assistant Professor · University of California, San Diego
Research Scientist · MosaicML, DataBricks
Areas: Artificial Intelligence, Machine Learning, Natural Language Processing, Reinforcement Learning

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Professional Experience

Aug. 2023 - present	**Assistant Professor**, Dept of CSE, University of California, San Diego
Aug. 2023 - present	**Research Scientist**, MosaicML, DataBricks
Aug. 2021 - Aug 2023	**Researcher**, Allen Institute for AI & University of Washington
Jan. 2017 - July 2021	**Research Assistant**, Entertainment Intelligence Lab, Georgia Tech
Jan. 2017 - July 2020	**Teaching Assistant**, Georgia Tech
Summer 2020	**Research Intern**, Facebook AI Research
Summer 2019	**Research Intern**, Microsoft Research
Summer 2018	**Research Intern**, Oracle Intelligent Bots
Summer 2017	**Research Intern**, Radix Health

Education

Georgia Institute of Technology *Atlanta, GA*
PhD in Computer Science *2021*

- GPA: 4.0
- Advisor: Professor Mark O. Riedl
- Thesis: Language Learning in Interactive Environments
- Thesis Committee: Drs. Mark Riedl, Devi Parikh, Charles Isbell, Matthew Hausknecht, Jason Weston
- Research Areas: Natural Language Processing, Reinforcement Learning, Interactive Narrative, Knowledge Graphs, and Computational Creativity

Georgia Institute of Technology *Atlanta, GA*
BS in Computer Science *2018*

- GPA: 3.9
- Threads: Intelligence and Theory

Publications

Pre-Prints

[1] Ximing Lu, Faeze Brahman, Peter West, Jaehun Jang, Khyathi Chandu, Abhilasha Ravichander, Lianhui Qin, Prithviraj Ammanabrolu, Liwei Jiang, Sahana Ramnath, Nouha Dziri, Jillian Fisher, Bill Yuchen Lin, Skyler Hallinan, Xiang Ren, Sean Welleck, and Yejin Choi. Inference-time policy adapters (ipa): Tailoring extreme-scale lms without fine-tuning. *arXiv preprint arXiv:2305.15065*, 2023. URL: https://arxiv.org/abs/2305.15065.

[2] Bill Yuchen Lin, Yicheng Fu, Karina Yang, Prithviraj Ammanabrolu, Faeze Brahman, Shiyu Huang, Chandra Bhagavatula, Yejin Choi, and Xiang Ren. Swiftsage: A generative agent with fast and slow thinking for complex interactive tasks. *arXiv preprint arXiv:2305.17390*, 2023. URL: https://arxiv.org/abs/2305.17390.

[3] Zeqiu Wu, Yushi Hu, Weijia Shi, Nouha Dziri, Alane Suhr, Prithviraj Ammanabrolu, Noah A. Smith, Mari Ostendorf, and Hannaneh Hajishirzi. Fine-grained human feedback gives better rewards for language model training. *arXiv preprint arXiv:2306.01693*, 2023. URL: https://arxiv.org/abs/2306.01693.

[4] Prithviraj Ammanabrolu, Ethan Tien, Matthew Hausknecht, and Mark O Riedl. How to avoid being eaten by a grue: Structured exploration strategies for textual worlds. *arXiv preprint arXiv:2006.07409*, 2020. URL: https://arxiv.org/abs/2006.07409.

Conferences and Journals

[1] Kolby Nottingham, Prithviraj Ammanabrolu, Alane Suhr, Yejin Choi, Hannaneh Hajishirzi, Sameer Singh, and Roy Fox. Do embodied agents dream of pixelated sheep: Embodied decision making using language guided world modelling. In *International Conference on Machine Learning (ICML)*, 2023. URL: https://arxiv.org/abs/2301.12050.

[2] Rajkumar Ramamurthy*, Prithviraj Ammanabrolu*, Kianté Brantley, Jack Hessel, Rafet Sifa, Christian Bauckhage, Hannaneh Hajishirzi, and Yejin Choi. Is reinforcement learning (not) for natural language processing: Benchmarks, baselines, and building blocks for natural language policy optimization. In *International Conference on Learning Representations (ICLR)*, 2023. URL: https://arxiv.org/abs/2210.01241.

[3] Youngjae Yu, Jiwan Chung, Heeseung Yun, Jack Hessel, JaeSung Park, Ximing Lu, Rowan Zellers, Prithviraj Ammanabrolu, Ronan Le Bras, Gunhee Kim, and Yejin Choi. Multimodal knowledge alignment with reinforcement learning. In *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023. URL: https://arxiv.org/abs/2205.12630.

[4] Pei Zhou, Andrew Zhu, Jennifer Hu, Jay Pujara, Xiang Ren, Chris Callison-Burch, Yejin Choi, and Prithviraj Ammanabrolu. An ai dungeon master's guide: Learning to converse and guide with intents and theory-of-mind in dungeons and dragons. In *Association for Computational Linguistics (ACL)*, 2023. URL: https://arxiv.org/abs/2212.10060.

[5] Ruoyao Wang*, Peter Jansen*, Marc-Alexandre Côté, and Prithviraj Ammanabrolu. Behavior cloned transformers are neurosymbolic reasoners. In *European Chapter of the Association for Computational Linguistics (EACL)*, 2023. URL: https://arxiv.org/abs/2210.07382.

[6] Ximing Lu, Sean Welleck, Liwei Jiang, Jack Hessel, Lianhui Qin, Peter West, Prithviraj Ammanabrolu, and Yejin Choi. Quark: Controllable text generation with reinforced unlearning. In *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS)*, 2022. URL: https://arxiv.org/abs/2205.13636.

[7] Xiangyu Peng, Mark O Riedl, and Prithviraj Ammanabrolu. Inherently explainable reinforcement learning in natural language. In *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS)*, 2022. URL: https://arxiv.org/abs/2112.08907.

[8] Zeqiu Wu, Ryu Parish, Hao Cheng, Sewon Min, Prithviraj Ammanabrolu, Mari Ostendorf, and Hannaneh Hajishirzi. Inscit: Information-seeking conversations with mixed-initiative interactions. *Transactions of the Association for Computational Linguistics (TACL)*, 2022. URL: https://arxiv.org/abs/2207.00746.

[9] Ruoyao Wang*, Peter Jansen*, Marc-Alexandre Côté, and Prithviraj Ammanabrolu. Scienceworld: Is your agent smarter than a 5th grader? In *Empirical Methods in Natural Language Processing (EMNLP)*, 2022. URL: https://arxiv.org/abs/2203.07540.

[10] Prithviraj Ammanabrolu, Liwei Jiang, Maarten Sap, Hannaneh Hajizhirzi, and Yejin Choi. Aligning to social norms and values in interactive narratives. In *North American Chapter of the Association for Computational Linguistics (NAACL)*, 2022. URL: https://arxiv.org/abs/2205.01975.

[11] Prithviraj Ammanabrolu, Renee Jia, and Mark O Riedl. Situated dialogue learning through procedural environment generation. In *Association for Computational Linguistics (ACL) 2022*, 2022. URL: https://arxiv.org/abs/2110.03262.

[12] Prithviraj Ammanabrolu and Mark Riedl. Modeling worlds in text. In *Thirty-fifth Conference on Neural Information Processing Systems Datasets and Benchmarks Track (Round 1)*, 2021. URL: https://openreview.net/forum?id=7FHnnENUG0.

[13] Prithviraj Ammanabrolu and Mark Riedl. Learning knowledge graph-based world models of textual environments. In *Thirty-fifth Conference on Neural Information Processing Systems*, 2021. URL: https://arxiv.org/abs/2106.09608.

[14] Wai Man Si, Prithviraj Ammanabrolu, and Mark O Riedl. Telling stories through multi-user dialogue by modeling character relations. In *SIGDIAL 2021*, 2021. URL: https://arxiv.org/abs/2105.15054.

[15] Prithviraj Ammanabrolu and Mark O Riedl. Situated language learning via interactive narratives. *Patterns, Cell Press*, 2021. URL: https://www.cell.com/patterns/fulltext/S2666-3899(21)00159-8.

[16] Prithviraj Ammanabrolu, Jack Urbanek, Margaret Li, Arthur Szlam, Tim Rocktäschel, and Jason Weston. How to motivate your dragon: Teaching goal-driven agents to speak and act in fantasy worlds. In *Proceedings of the 2021 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, pages 807–833, Online, June 2021. Association for Computational Linguistics. URL: https://aclanthology.org/2021.naacl-main.64, doi:10.18653/v1/2021.naacl-main.64.

[17] Prithviraj Ammanabrolu, Wesley Cheung, William Broniec, and Mark O Riedl. Automated storytelling via causal, commonsense plot ordering. In *Thirty-Second AAAI Conference on Artificial Intelligence*, 2020. URL: https://arxiv.org/abs/2009.00829.

[18] Prithviraj Ammanabrolu, Ethan Tien, Wesley Cheung, Zhaochen Luo, William Ma, Lara J. Martin, and Mark O. Riedl. Story realization: Expanding plot events into sentences. volume 34, pages 7375–7382, Apr. 2020. URL: https://ojs.aaai.org/index.php/AAAI/article/view/6232, doi:10.1609/aaai.v34i05.6232.

[19] Matthew Hausknecht, Prithviraj Ammanabrolu, Marc-Alexandre Côté, and Xingdi Yuan. Interactive fiction games: A colossal adventure. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 34, pages 7903–7910, 2020. URL: https://arxiv.org/abs/1909.05398.

[20] Prithviraj Ammanabrolu, William Broniec, Alex Mueller, Jeremy Paul, and Mark O. Riedl. Toward automated quest generation in text-adventure games. In *International Conference on Computational Creativity (ICCC)*, 2020. URL: https://arxiv.org/abs/1909.06283.

[21] Prithviraj Ammanabrolu, Wesley Cheung, Dan Tu, William Broniec, and Mark O Riedl. Bringing stories alive: Generating interactive fiction worlds. In *Proceedings of the Sixteenth AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE-20)*, 2020. URL: https://www.aaai.org/ojs/index.php/AIIDE/article/view/7400.

[22] Prithviraj Ammanabrolu and Matthew Hausknecht. Graph constrained reinforcement learning for natural language action spaces. In *International Conference on Learning Representations*, 2020. URL: https://openreview.net/forum?id=B1x6w0EtwH.

[23] Prithviraj Ammanabrolu and Mark Riedl. Playing text-adventure games with graph-based deep reinforcement learning. In *North American Chapter of the Association for Computational Linguistics (NAACL-HLT) 2019*, 2019. URL: https://aclanthology.org/N19-1358/.

[24] Lara J Martin, Prithviraj Ammanabrolu, Xinyu Wang, William Hancock, Shruti Singh, Brent Harrison, and Mark O Riedl. Event representations for automated story generation with deep neural nets. In *Thirty-Second AAAI Conference on Artificial Intelligence*, pages 868–875, 2018. URL: https://www.aaai.org/ocs/index.php/AAAI/AAAI18/paper/viewPDFInterstitial/17046/15769.

Peer Reviewed Workshops

[1] Lara J Martin, Prithviraj Ammanabrolu, Xinyu Wang, Shruti Singh, Brent Harrison, Murtaza Dhuliawala, Pradyumna Tambwekar, Animesh Mehta, Richa Arora, Nathan Dass, et al. Improvisational storytelling agents. In *Workshop on Machine Learning for Creativity and Design (NeurIPS 2017)*, page 4, 2017. URL: https://nips2017creativity.github.io/doc/Improvisational_Agents.pdf.

[2] Prithviraj Ammanabrolu and Mark Riedl. Transfer in deep reinforcement learning using knowledge graphs. In *Proceedings of the Thirteenth Workshop on Graph-Based Methods for Natural Language Processing (TextGraphs-13) at EMNLP*, 2019. URL: https://www.aclweb.org/anthology/D19-5301.

[3] Prithviraj Ammanabrolu, Ethan Tien, Wesley Cheung, Zhaochen Luo, William Ma, Lara Martin, and Mark Riedl. Guided neural language generation for automated storytelling. In *Proceedings of the Second Workshop on Storytelling*, pages 46–55, Florence, Italy, August 2019. Association for Computational Linguistics. URL: https://www.aclweb.org/anthology/W19-3405, doi:10.18653/v1/W19-3405.

[4] Sahith Dambekodi, Spencer Frazier, Prithviraj Ammanabrolu, and Mark O Riedl. Playing text-based games with common sense. In *The Second WordPlay: When Language Meets Games Workshop at NeurIPS*, 2020. URL: https://arxiv.org/abs/2012.02757.

[5] Prithviraj Ammanabrolu and Mark Riedl. Modeling worlds in text. In *The First Workshop on Commonsense Reasoning and Knowledge Bases (CSKB) at AKBC*, 2021. URL: https://openreview.net/forum?id=7FHnnENUG0.

[6] Xiangyu Peng, Prithviraj Ammanabrolu, and Mark Riedl. Explainable reinforcement learning agents with stacked hierarchical graph attention. In *Workshop on Explainable Graph-based Machine Learning at AKBC*, 2021.

[7] Rajkumar Ramamurthy*, Prithviraj Ammanabrolu*, Kianté Brantley, Jack Hessel, Rafet Sifa, Christian Bauckhage, Hannaneh Hajishirzi, and Yejin Choi. Is reinforcement learning (not) for natural language processing?: Benchmarks, baselines, and building blocks for natural language policy optimization. In *Second Workshop on Interactive Learning for Natural Language Processing (InterNLP) @ NeurIPS*, 2022. URL: https://arxiv.org/abs/2210.01241.

[8] Bill Yuchen Lin, Yicheng Fu, Karina Yang, Prithviraj Ammanabrolu, Faeze Brahman, Shiyu Huang, Chandra Bhagavatula, Yejin Choi, and Xiang Ren. Swiftsage: A generative agent with fast and slow thinking for complex interactive tasks. In *Interactive Learning with Implicit Human Feedback (ILHF) @ ICML*, 2023. URL: https://arxiv.org/abs/2305.17390.

Patents

[1] Gautam Singaraju and Prithviraj Ammanabrolu. Techniques for building a knowledge graph in limited knowledge domains, April 11 2023. US Patent 11,625,620.

Teaching Experience

Mar. 2022 - June. 2022	**CSE 473: Introduction to AI (Graduate Level)**, Guest Instructor	*University of Washington*
Jan. 2017 - Aug. 2020	**CS 3600: Introduction to AI (Undergraduate Level)**, Teaching Assistant	*Georgia Tech*

Mentoring

2020 - Curr. **Xiangyu (Becky) Peng**, PhD Student, Georgia Institute of Technology
2021 - Curr. **Ellen (Zeqiu) Wu**, PhD Student, University of Washington
2022 - Curr. **Rajkumar Ramamurthy**, PhD Student, IAIS Fraunhofer
2023 - Curr. **Joel Jang**, PhD Student, University of Washington
2023 - Curr. **Kolby Nottingham**, PhD Student, University of California, Irvine
2022 - 2023 **Jennifer Hu**, PhD Student, Massachusetts Institute of Technology
2022 - 2023 **Pei Zhou**, PhD Student, University of Southern California
2021 - 2023 **Ruoyao Wang**, PhD Student, University of Arizona
2021 - 2022 **Liwei Jiang**, PhD Student, University of Washington
2020 - 2021 **Dan Tu**, PhD Student, Georgia Institute of Technology
2019 - 2021 **Ran (Renee) Jia**, MS Student, Georgia Institute of Technology
2019 - 2021 **Wai Man (Raymond) Si**, MS Student, Georgia Institute of Technology, Now: PhD Student at Max Planck/Helmholtz Institute
2019 - 2021 **Sahith Dambekodi**, MS Student, Georgia Institute of Technology
2020 - 2021 **Winston Li**, MS Student, Georgia Institute of Technology
2019 - 2021 **William Broniec**, MS Student, Georgia Institute of Technology
2018 - 2021 **Ethan Tien**, MS Student, Georgia Institute of Technology,
2018 - 2021 **Wesley Cheung**, MS Student, Georgia Institute of Technology, Now: Software Engineer at Facebook
2018 - 2021 **William Ma**, MS Student, Georgia Institute of Technology, Now: Software Engineer at Amazon
2021 - Curr. **Deepti Ramani**, BS Student, University of Washington
2021 - Curr. **Ximing Lu**, Pre-doc, Allen Institute for AI
2022 - Curr. **Ravi Ghadia**, Now: GPU Architect at Nvidia
2018 - 2020 **Jeffery Luo**, BS Student, Georgia Institute of Technology, Now: Research Analyst at Goldman Sachs
2018 - 2020 **Alejandro Escontrela**, BS Student, Georgia Institute of Technology, Now: Research Engineer at Google Brain
2018 - 2020 **Anush Mattapalli**, BS Student, Georgia Institute of Technology, Now: Software Engineer at NCR Corporation

Research Experience

University of California, San Diego *San Diego, CA*

Aug. 2023 - Present

- Tenure-track Assistant Professor and Director of the PEARL Lab in the Department of Computer Science and Engineering focused on interactive and grounded language learning.

MosaicML, DataBricks *San Diego, CA*

Aug. 2023 - Present

- Building agents that align to human's preferences through feedback.

Mosaic Team, Allen Institute for AI *Seattle, WA*

Managers: Prof. Yejin Choi, Prof. Hannaneh Hajishirzi *Aug. 2021 - Present*

- Building agents that align to human's preferences through feedback.
- Creating world models for agents to learn from environmental observation.
- **Taught as Guest Instructor and mentored 10 Master's and Ph.D. students at the University of Washington**

Entertainment Intelligence Lab, Georgia Tech *Atlanta, GA*

Advisor: Prof. Mark Riedl *Jan 2017 - July 2021*

- Exploring the use of deep reinforcement learning with natural language state and action spaces
- Using knowledge graphs to inject domain knowledge into language-based tasks such as automated story generation and procedural content generation
- **Mentored 10 Bachelor's and Master's students** on their research theses

Facebook AI Research *New York City, NYC*

Advisors: Jason Weston, Prof. Tim Rocktäschel, Arthur Szlam *May 2020 - Aug. 2020*

- Worked on the ParlAI team and LIGHT, a large-scale crowdsourced text-game
- Collected and released datasets **crowdsourced by over 15,000 players** of natural language quests in LIGHT and a commonsense knowledge graph ATOMIC-LIGHT
- Developed goal-driven questing agents with reinforcement learning that act and speak in LIGHT

Microsoft Research *Redmond, WA*

Advisor: Matthew Hausknecht *May 2019 - Aug. 2019*

- Worked on the Reinforcement Learning team and aided in development of baseline text-game playing agents for Jericho, a text-game playing platform
- Developed **SOTA RL algorithm that is able to dynamically generate language** in text-games

Oracle Inc. *Redwood City, CA*

Intelligent Bots Service *May 2018 - Aug. 2018*

- Developed a **patented algorithm to create knowledge graphs** for low resource natural language datasets
- Created a method that improves the natural language understanding capabilities by over 10% (classification rate) of the chatbot platform using the generated graph and graph embedding techniques

Radix Health *Atlanta, GA*

Advisors: Arun Mohan, Anup Lakare, Ravindra Jore *May 2017 - May 2018*

- Used predictive analytics techniques to model patients' no-show risks for healthcare clinics
- Used natural language processing to design a chatbot to improve patient access by triaging diagnostics
- Built and deployed machine learning systems for these cases from scratch to production, currently **used by over 40 clinics and over a 1,000 doctors** across America

Skills

Technical

- Natural Language Processing, Reinforcement Learning, Machine Learning, Knowledge Graphs, Semantic Web Technologies, Computer Vision, Predictive Analytics, Agile Methodologies, NoSQL

Programming Languages

- Python, R, Java, C/C++, C#, SQL, SPARQL

Frameworks and Tools

- pyTorch, scikit-learn, Tensorflow, nltk, AutoML, Couchbase, MongoDB, Spring Boot, Unity Engine

Languages

- English, Telugu, Sanskrit, Tamil, Hindi

Professional Activities

Organizer

2023 **Creative AI Across Modalities**, AAAI 2023 https://creativeai-ws.github.io/

2022 **Wordplay When Language Meets Games**, NAACL 2022
https://wordplay-workshop.github.io/

2020 **Wordplay When Language Meets Games**, NeurIPS 2020
https://wordplay-workshop.github.io/wordplay2020/

Program Committee

Aug. 2018 - Present **Conferences, Journals, and Workshops**,

- Transactions on Machine Learning Research (TMLR) 2022
- Neural Information Processing Systems (NeurIPS) 2019, 2020, 2021, 2022
- Meeting of the Association for Computational Linguistics (ACL) main and demo tracks 2020, 2021, 2022
- ACL Rolling Review 2021, 2022
- North American Chapter of the Meeting of the Association for Computational Linguistics (NAACL) 2019, 2021
- AAAI Conference on Artificial Intelligence (AAAI) 2019, 2020
- International Conference on Machine Learning (ICML) 2020, 2021, 2022
- International Conference on Learning Representations (ICLR) 2020, 2021
- Empirical Methods in Natural Language Processing (EMNLP) 2020, 2022
- ACM CSUR Computing Surveys
- Interactive Learning for Natural Language Processing (InterNLP) at NeurIPS2022
- TextGraphs Workshop at EMNLP 2020
- Language and Reinforcement Learning Workshop (LaReL) at ICML2020
- Workshop on Learning in Artificial Open Worlds (LAOW) at ICML 2020

Service and Outreach

Aug. 2018 - Jul. 2021 **Institutional Service**, Georgia Institute of Technology *Atlanta, GA*

- Reviewer for President's Undergraduate Research Awards (PURA) 2019
- Co-founder of the MCV PhD Student Support Group 2018-2020
- School of Computer Science's Prospective Student Visit Week, Coordinator 2019
- School of Interactive Computing's Prospective Student Visit Week, Volunteer 2019, 2020

Extracurriculars

Aug. 2015 - July 2018 **Hackathons and Video Game Development**,

- HackIllinois: Health Desk - Desktop app that checks posture using computer vision
- SwampHacks: Labyrinth - 3D survival maze game built with Unity engine and C#; top 10 overall
- HackGT: CorCal - App to sync multiple calendars; built with Java and the Swing library
- Video Game Development Club (VG Dev) at Georgia Tech: HowRogue a Roguelike built in C++

Selected Media Coverage

How role-playing a dragon can teach an AI to manipulate and persuade MIT Tech Review. Will Douglas Heaven. November 20, 2020. LINK.

How to Train Your AI: Researchers Teach AI How to Move Around Fantasy Worlds Science Times. Mark B. November 5, 2020. LINK.

AI can make your favourite game characters speak to each other INDIAai National AI Portal of India. November 5, 2020. LINK.

Teaching AI agents to communicate and act in fantasy worlds Tech Xplore. Ingrid Fadelli, November 3, 2020. LINK.

Researchers combine reinforcement learning and NLP to escape a Grue monster Venture Beat. Khari Johnson, June 30, 2020. LINK.

Sztuczna inteligencja jako pisarz: Generowanie fabuły (Translation from Polish: Artificial Intelligence as a Writer: Story Generation) Zeszyty Maryny. Patrycja Świeczkowska, Oct 4, 2019. LINK.

Georgia Tech Artificial Intelligence Research Includes Collaborative Approaches with Humans, Automating Content, and More Georgia Tech GVU Center. Joshua Preston, Feb 2, 2018. LINK.

Changing the Conversation: Georgia Tech Researchers Provide New Approach to Automated Story Generation Georgia Tech School of Interactive Computing. David Mitchell, Feb 4, 2020. LINK.

References

- Mark O. Riedl, Professor, Georgia Institute of Technology, riedl@cc.gatech.edu
- Yejin Choi, Professor, University of Washington & Allen Institute for AI, yejin@cs.washington.edu
- Hannaneh Hajishirzi, Associate Professor, University of Washington & Allen Institute for AI, hannaneh@cs.washington.edu
- Chris Callison-Burch, Associate Professor, University of Pennsylvania, ccb@upenn.edu