Prithviraj (Raj) Ammanabrolu

Researcher · Allen Institute for AI

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Education

Georgia Institute of Technology *Atlanta, GA*

PhD in Computer Science *2018 - 2021*

- GPA: 4.0
- Advisor: Professor Mark O. Riedl
- Thesis: Language Learning in Interactive Environments
- Research Areas: Natural Language Processing, Reinforcement Learning, Interactive Narrative, Knowledge Graphs, and Computational Creativity

Georgia Institute of Technology *Atlanta, GA*

BS in Computer Science *2015 - 2018*

- GPA: 3.9
- Threads: Intelligence and Theory, Dean's List 2015-2018

Professional Experience

Aug. 2021 - present	**Young Investigator**, Mosaic Team, Allen Institute for AI
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

Publications

Under Review

[1] 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] 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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

[6] 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.

[7] 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.

[8] 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.

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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/.

[14] 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. *arXiv preprint arXiv:2012.02757*, 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.

Patents

[1] Gautam Singaraju and Prithviraj Venkata Ammanabrolu. Techniques for building a knowledge graph in limited knowledge domains, 2020. US Patent App. 20200057946, Priority 16/542,017. URL: https://www.freepatentsonline.com/y2020/0057946.html.

Teaching Experience

Jan. 2017 - Aug. 2020 **CS 3600 Introduction to AI**, Teaching Assistant

Mentoring

2020 - Present **Xiangyu (Becky) Peng**, PhD Student, Georgia Institute of Technology

2020 - Present **Dan Tu**, PhD Student, Georgia Institute of Technology

2019 - Present **Ran (Renee) Jia**, MS Student, Georgia Institute of Technology

2019 - Present **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

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

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

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

- Building AI with commonsense.

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

Languages

- English, Telugu, Sanskrit

Professional Activities

Organizer

2020 **Wordplay When Language Meets Games**, NeurIPS 2020

Program Committee

Aug. 2018 - Present

Conferences, Journals, and Workshops,
- Neural Information Processing Systems (NeurIPS) 2019, 2020, 2021
- Meeting of the Association for Computational Linguistics (ACL) main and demo tracks 2020
- 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
- International Conference on Learning Representations (ICLR) 2020, 2021
- Empirical Methods in Natural Language Processing (EMNLP) 2020
- ACM CSUR Computing Surveys
- 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 (PhD Advisor), 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, Assistant Professor, University of Washington & Allen Institute for AI, hannaneh@cs.washington.edu
- Devi Parikh, Associate Professor, Georgia Institute of Technology & Facebook AI Research, parikh@gatech.edu
- Charles Lee Isbell Jr., Professor and Dean, Georgia Institute of Technology, isbell@cc.gatech.edu
- Matthew Hausknecht, Senior Research Scientist, Microsoft Research, matthew.hausknecht@microsoft.com
- Jason Weston, Research Scientist, Facebook AI Research, jase@fb.com