

# 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, Renee Jia, and Mark O Riedl. Situated dialogue learning through procedural environment generation. *arXiv preprint arXiv:2110.03262*, 2021. URL: <https://arxiv.org/abs/2110.03262>.
- [2] 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 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>.
- [2] 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>.
- [3] 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>.

- [4] 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](https://www.cell.com/patterns/fulltext/S2666-3899(21)00159-8).
- [5] 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.
- [6] 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>.
- [7] 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.
- [8] 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>.
- [9] 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>.
- [10] 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>.
- [11] 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>.
- [12] 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/>.
- [13] 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](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 Work-*

*shop 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 Common-sense Reasoning and Knowledge Bases (CSKB) at AKBC*, 2021. URL: <https://openreview.net/forum?id=7FHnnENUGO>.
- [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

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

## Mentoring

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

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

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

2019 - **Wai Man (Raymond) Si**, MS Student, Georgia Institute of Technology, Now: PhD Student at Max Planck/Helmholtz Institute  
Present

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

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## Mosaic Team, Allen Institute for AI

MANAGERS: PROF. YEJIN CHOI, PROF. HANNANEH HAJISHIRZI

- Building AI with commonsense.

Seattle, WA

Aug. 2021 - Present

## 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 common-sense 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

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### 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

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### ORGANIZER

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

### PROGRAM COMMITTEE

- Aug. 2018 - **Conferences, Journals, and Workshops,**  
Present
- 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 - **Institutional Service, Georgia Institute of Technology** Atlanta, GA  
Jul. 2021
- 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 - **Hackathons and Video Game Development,**  
July 2018
- 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

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- 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

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- Mark O. Riedl (PhD Advisor), Professor Georgia Institute of Technology, [riedl@cc.gatech.edu](mailto:riedl@cc.gatech.edu)
- Yejin Choi, Professor University of Washington & Allen Institute for AI, [yejin@cs.washington.edu](mailto:yejin@cs.washington.edu)
- Hannaneh Hajishirzi, Professor University of Washington & Allen Institute for AI, [hannaneh@cs.washington.edu](mailto:hannaneh@cs.washington.edu)
- Devi Parikh, Associate Professor Georgia Institute of Technology & Facebook AI Research, [parikh@gatech.edu](mailto:parikh@gatech.edu)
- Charles Lee Isbell Jr., Professor and Dean Georgia Institute of Technology, [isbell@cc.gatech.edu](mailto:isbell@cc.gatech.edu)
- Matthew Hausknecht, Senior Research Scientist, Microsoft Research, [matthew.hausknecht@microsoft.com](mailto:matthew.hausknecht@microsoft.com)
- Jason Weston, Research Scientist Facebook AI Research, [jase@fb.com](mailto:jase@fb.com)