

## Matthew J. Guzdial

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### Research Interests

My research focuses on creative **artificial intelligence** and **machine learning**. By creative I refer to the set of techniques, problem domains, and sources of knowledge that inspire my research. Modern AI and ML systems have shown great success at replicating the past, but struggle to generate classes of what hasn't been seen before. With creative AI and ML we can find novel, valuable, and surprising solutions to problems across domains.

### Education

Georgia Institute of Technology  
Ph.D. in Computer Science

*2014- present*

Georgia Institute of Technology  
B.S. in Computational Media  
Certificate in Social Psychology

*2010-2014*

### Course Information

#### Courses Taught

| <u>Term</u> | <u>Course</u>        | <u>Comments</u> |
|-------------|----------------------|-----------------|
| Summer 2017 | CS 4731/7632 Game AI | Grad/undergrad  |

#### Curriculum Development

**CS 4731 Game Artificial Intelligence:** The course explores the role of artificial intelligence in computer games and other entertainment computing applications as envisioned for the future. I co-designed the course to focus on more advanced Game AI topics. This unique approach to teaching Game AI emphasizes critical thinking and design over low-level implementation details and is meant to be a model for other universities. **My redesigned class assignments have been adopted by faculty at Northeastern University.**

#### Individual Student Guidance

Jonathan Chen (CS Undergrad)  
Summer 2017-Present  
*Procedural Content Generation*

Nicholas Liao (CS Undergrad)  
Spring 2016-Present  
*Player Modeling*

## Publications

### Refereed Conference

- C1.** **Guzdial, M.**, Li, B., and Riedl, M. Game Engine Learning from Video. *Proceedings of the Twenty-Sixth International Joint Conference on Artificial Intelligence*, Melbourne, Australia, 2017.
- C2.** Siu, K., **Guzdial M.**, and Riedl M. Evaluating Singleplayer and Multiplayer in Human Computation Games. *Proceedings of the Twelfth International Conference on the Foundations of Digital Games*, Cape Cod, MA, 2017.
- C3.** **Guzdial, M.**, and Riedl, M. Game Level Generation from Gameplay Videos. *Twelfth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*, San Francisco, California, 2016.
- C4.** **Guzdial, M.**, and Riedl, M. Learning to Blend Computer Game Levels. *Proceedings of the Seventh International Conference on Computational Creativity*, Paris, France, 2016. **Best Paper Award.**
- C5.** **Guzdial, M.**, Harrison, B., Li, B., and Riedl, M. Crowdsourcing Open Interactive Narrative. *Proceedings of the 10<sup>th</sup> International Conference on the Foundations of Digital Games*, Pacific Grove, CA, 2015.

### Refereed Workshop

- W1.** **Guzdial, M.**, Long, D., Cassion, C., and Das, A. Visual Procedural Content Generation with an Artificial Abstract Artist. *Proceedings of the 3<sup>rd</sup> Computational Creativity in Games Workshop*, Atlanta, GA, 2017.
- W2.** **Guzdial, M.**, Sturtevant, N., and Li, B. Deep Static and Dynamic Level Analysis: A Study on Infinite Mario. *Proceedings of the 3<sup>rd</sup> Experimental AI in Games Workshop*, San Francisco, CA, 2016.
- W3.** Summerville, A., **Guzdial, M.**, Mateas, M., and Riedl, M. Learning Player Tailored Content From Observation: Platformer Level Generation from Video Traces using LSTMs. *Proceedings of the 3<sup>rd</sup> Experimental AI in Games Workshop*, San Francisco, CA, 2016.
- W4.** **Guzdial, M.**, and Riedl, M. Toward Game Level Generation from Gameplay Videos. *Proceedings of the Workshop on Procedural Content Generation in Games*, Pacific Grove, CA, 2015.

### Other

- Zook, A., Summerville, A., **Guzdial, M.**, and Hoover, A. "Machine Learning for Procedural Content Generation" *Panel at the Twelfth International Conference on the Foundations of Digital Games*, Cape Cod, MA, 2017.

- Liao, N., **Guzdial, M.**, and Riedl, M. “Deep Convolutional Player Modeling on Log and Level Data” *Extended Abstract in the Proceedings of the Twelfth International Conference on the Foundations of Digital Games*, Cape Cod, MA, 2017.
- **Guzdial, M.**, and Riedl, M. “Conceptually Blended Levels in a Unity Engine” *Proceedings of the Playable Experience Track at the Twelfth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*, San Francisco, 2016.
- **Guzdial, M.**, and Riedl, M. “An Intelligent Game Level Design Editor Informed by Gameplay Videos” *Demonstration at the 2<sup>nd</sup> Experimental AI in Games Workshop*, Santa Cruz, 2015.
- **Guzdial, M.** “Solutions Manual for Introduction to Computing and Programming in Python: A Multimedia Approach, 4<sup>th</sup> Edition” 2015.

### Awards and Honors

- **Best Paper Award**, Guzdial, M., and Riedl, M. Learning to Blend Computer Game Levels. *Proceedings of the Seventh International Conference on Computational Creativity*, Paris, France, 2016
- **National Science Foundation Graduate Student Fellowship Honorable Mention**, 2015
- **Georgia Tech College of Computing Best Undergraduate Research Award**, 2013
- **Presidential Undergraduate Research Grant**, 2013

### Research Projects

#### Automated Game Creation from Gameplay Videos

Automated Game Creation from Gameplay Videos supports novice developers creating games for education, entertainment, and other purposes. It draws on probabilistic modeling, rule learning, and machine vision to extract design knowledge from videos of humans playing games and reinterpret this knowledge to a desired effect.

**Related publications:** C1, C2, C4, W3

#### Scheherazade-IF

Scheherazade-IF is an “open interactive narrative generator”, capable of creating an interactive narrative game of near-human quality on any subject. It learns this model by reading stories on the desired subject. The system relies on crowdsourcing from everyday individuals to supply these stories, addressing the time and experience requirements of game development.

**Related publications:** C5

### Service

#### Academic Service

- **Media Chair**, International Conference on Computational Creativity 2017

- **Workshop Co-organizer**, Third Computational Creativity in Games Workshop 2017
- **Local Coordinator**, Experimental AI in Games Workshop 2016
- **Juror**, IndieCade International Festival of Independent Games 2016
- **Juror**, IndieCade International Festival of Independent Games 2015
- **Mentor**, College of Computing Ph.D. Mentor Program 2015
- **Panelist**, Science Fiction Radio Lab, 2013-2015
- **Mentor**, College of Computing Undergraduate Ph.D. Mentor Program, 2013-2014
- **President**, VGDev: Campus Video Game Development Organization, 2012-2013

#### Reviewing

- IEEE Transactions on Computational Intelligence and AI in Games: Special Issue on AI-based and AI-assisted Game Design
- Twelfth International Conference on the Foundations of Digital Games
- Eighth International Conference on Computational Creativity
- Playable Experiences Track at the Twelfth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment
- Twelfth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (Sub-reviewer)
- Third Experimental AI in Games Workshop
- Seventh Workshop on Procedural Content Generation
- Eleventh Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (Sub-reviewer)

#### Work Experience

Disney Research, Pittsburgh, PA

*May 2016-August 2016*

##### **Research Assistant Intern**

Applied DNN techniques to player experience prediction and simulation

Zynga Inc., Orlando, FL

*May 2014-August 2014*

##### **Design Intern**

Led weekly bug-fix count across entire team of twenty-six developers

Georgia Institute of Technology, Atlanta, GA

*January 2012-December 2013*

##### **Undergraduate Research Assistant**

Ran human subject studies, developed virtual environments for research

Zynga Inc., San Francisco, CA

*May 2013-August 2013*

##### **Production Intern**

Developed mobile game prototype single-handedly

#### Popular Media Mentions

“Has a Black Mirror episode predicted the future of video games?” The Guardian, October 26, 2016  
<https://www.theguardian.com/technology/2016/oct/26/black-mirror-episode-playtest-predicted-future-video-games-augmented-reality>

“How Computers Learned to Play Mario,” Smithsonian Magazine, November 3, 2015. <http://www.smithsonianmag.com/smart-news/how-computers-learned-to-play-nintendo-180957125/?no-ist>

“Algorithm Turns Fiction into Interactive Games,” Popular Science, September 3, 2015. <http://www.popsoci.com/algorithm-helps-you-write-an-interactive-fiction-story>

“This AI Creates Interactive Fiction by Reading Other People’s Stories,” Motherboard, September 2, 2015. <http://motherboard.vice.com/read/this-ai-creates-interactive-fiction-by-reading-other-peoples-stories>

“Computer designs Mario levels by watching gameplay videos,” Polygon, June 25, 2015. <http://www.polygon.com/2015/6/25/8848631/computer-designs-mario-levels-by-watching-gameplay-videos>

“This AI Builds Super Mario Levels by Watching YouTube,” WIRED, June, 24, 2015. <http://www.wired.com/2015/06/mario-level-creator-ai/>