Colan Biemer

Education

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Northeastern University
PhD Computer Science, 2019-expected May 2025
MS Computer Science, 2021

Drexel University
B.S., Computer Science, with Math Minor, 2017

Experience

Research and Teaching Assistant, Northeastern
Boston, MA — September 2019 - Present

- Built a Markov Decision Process for dynamic difficulty with a graph of level segments. A director modified the MDP based on player performance. We modified policy iteration, and our approach showed increased exploration over standard optimization approaches. Our director was also able to adapt to player-switching between levels within seven levels played, whereas baseline approaches showed no improvement after fifteen levels played.
- Developed improvements to concatenation for linking level segments using two Markov Chains and a tree search. For *Kid Icarus,* the concatenation of two segments resulted in a completable level 12% of the time. Our method improved this to 100%.
- Created new mutation and crossover operators that use n-grams for level generation. For *Kid Icarus*, these operators with MAP-Elites resulted in a 65% increase in levels found over standard genetic operators.

Applications Programmer, University of California Riverside Brain Game Center
Riverside, CA — August 2017 - June 2019

- Created a submodule used across all Unity game repositories. It contains generic tools, generic scripts, and core game functionality to prevent previous issues of out-of-sync code across multiple repositories.
- Developed HIPAA-compliant serverless architecture with AWS used by multiple labs for managing users, storing logs, producing analytics, delivering configurations, automatically assigning users to configurations, and uploading assets to applications to reduce initial download size.
- Implemented configuration-driven games to allow researchers to easily modify a game's behavior without a programmer's help.

Information Technology Research Center Co-op, BMW
Greenville, SC — April 2016 - September 2016

- Administrator for ELK stack and cluster to provide National Highway Traffic Safety Administration data for analysts.
- Reduced merging of Hive tables from one month to ~6 hours with a multithread algorithm that took advantage of a 50-node cluster.
- Created a distributed machine learning algorithm to classify defects on doors which outperformed AlexNet and other architectures by ~35%.
- Built an eight-node Raspberry Pi cluster for training new interns on cluster computing before using the main cluster.

Programmer, Entrepreneurial Game Studio
Philadelphia, PA — October 2013 - July 2017

- Built the "World's Largest Architectural Video Game" with single and multiplayer Tetris on both sides of the Cira Center skyscraper, and it had an estimated 2.2 billion views.

- Developed an IOS augmented reality game using city buildings as objectives for players to capture as a team using a chat system to communicate.

R&D Innovations Team Development Co-op, iPipeline
Philadelphia, PA — April 2015 - September 2015

- Created “Text-a-Quote,” an SMS chatbot that sent users a life insurance quote based on information from the user.
- Built “Pipe-SMS,” a one-way texting service designed for iPipeline applications to text users information like confirmation codes.
- Coordinated with an outside vendor to implement form tracking and analytics for existing products.

Publications

- **Biemer, C.**, & Cooper, S. (2024, May). Solution Path Heuristics for Predicting Difficulty and Enjoyment Ratings of Roguelike Level Segments. In Proceedings of the 19th International Conference on the Foundations of Digital Games (pp. 1-8).
- **Biemer, C.** (2023, October). Dynamic difficulty adjustment via procedural level generation guided by a Markov decision process for platformers and roguelikes. In Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (Vol. 19, No. 1, pp. 436-439).
- **Biemer, C.**, & Cooper, S. (2022, October). Level Assembly as a Markov Decision Process. In 2022 Proceedings of the Experimental AI in Games Workshop.
- **Biemer, C.**, & Cooper, S. (2022, August). On Linking Level Segments. In 2022 IEEE Conference on Games (CoG) (pp. 199-205). IEEE. ★ *Best Paper Nominee*
- **Biemer, C.**, Hervella, A., & Cooper, S. (2021, August). Gram-Elites: N-Gram Based Quality-Diversity Search. In The 16th International Conference on the Foundations of Digital Games (FDG) 2021 (pp. 1-6).
- Villareale, J., **Biemer, C.**, Seif El-Nasr, M., & Zhu, J. (2020, September). Reflection in Game-Based Learning: A Survey of Programming Games. In International Conference on the Foundations of Digital Games (pp. 1-9).

Teaching

- Northeastern, Game Engines, Teaching Assistant (Winter 2021-2022, Spring 2024)
- Northeastern, Programming in C++, Teaching Assistant (Fall 2020-2023; Summer 2021-2022)
- Northeastern, Graphics, Teaching Assistant (Summer 2023)
- Drexel, Introduction to Computing, Teaching Assistant (Winter 2016)
- Drexel, Computer Programming Fundamentals, Teaching Assistant (Winter 2016)
- Drexel, Introduction to Computer Science, Teaching Assistant (Fall 2015)

Skills

AWS | C# | C++ | CSS | Database Management | Git | HTML | Hive QL | Java | Jupyter | Keras | MongoDB | Optimization | Pandas | Python | Rust | SQL | SQLite | Software Development | Spark | TensorFlow | Tools & Technology | TypeScript | Unity | nvim | scikit-learn