

Andrew Zhu

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Research Interests

Natural language processing; AI co-creativity; programming languages; narrative generation; human-centered AI.

Education

PhD in Computer and Information Science 2022 - Present

University of Pennsylvania

BS in Computer Science 2018 - 2021

University of California, Santa Cruz

I graduated in 3 years with a cumulative GPA of 3.97 out of a possible 4.00, highest honors in the major, and university honors, *summa cum laude*.

Research Experience

Research Fellow 2022 - Present

Department of Computer and Information Science, University of Pennsylvania

- PhD student in Professor Chris Callison-Burch's lab working on improving upon recent results in TTRPGs and natural language processing

Undergraduate AI Research 2019

Department of Computer Science and Engineering, University of California, Santa Cruz

- Assisted in Professor Yang Liu's research in applying theory from crowdsourced judgment elicitation to generative adversarial networks

Publications

2023

Zhu, A., Aggarwal, K., Feng, A., Martin, L., Callison-Burch, C. (2023). *FIREBALL: A Dataset of Dungeons and Dragons Actual-Play with Structured Game State Information*. The 61st Annual Meeting of the Association for Computational Linguistics (ACL 2023).

Zhou, P., **Zhu, A.**, Hu, J., Pujara, J., Ren, X., Callison-Burch, C., Choi, Y., Ammanabrolu, P. (2023). *I Cast Detect Thoughts: Learning to Converse and Guide with Intents and Theory-of-Mind in Dungeons and Dragons*. The 61st Annual Meeting of the Association for Computational Linguistics (ACL 2023).

2022

Papazov, S., Gill, W., Garcia Ferreiro, M., **Zhu, A.**, Martin, L., Callison-Burch, C. (2022). *Using Language Models to Convert Between Natural Language and Game Commands*. NAACL 2022 Wordplay Workshop.

Wei, J., Liu, M., Luo, J., **Zhu, A.**, Li, Q., Davis, J., Liu, Y. (2022). *DuelGAN: A Duel Between Two Discriminators Stabilizes the GAN Training*. European Conference on Computer Vision.

Professional Experience

Chief Technology Officer 2023 - Present
Stealth Startup

Software Engineer 2019 - 2023
D&D Beyond, Wizards of the Coast

- After D&D Beyond's acquisition of Avrae (see below) in May 2019, continued development of product as lead software engineer on the Discord team
- Architected and implemented companion website, modding API, and copyrighted data entitlement system to serve customers and generate over \$8M of revenue
- Collaborated with peers to integrate existing project with D&D Beyond's infrastructure and systems, including real-time communication and state synchronization

Open Source

Alongside my academic and professional career, I make numerous contributions to open source software, averaging over 1,500 contributions on GitHub each year. Some of my open source projects that inspired my research interests are listed below.

Avrae Developed independently 2016 - 2019
<https://avrae.io/> D&D Beyond, Wizards of the Coast 2019 - 2023
<https://github.com/avrae/avrae>

- Unique open-source Discord application, web API, and website providing intuitive dice rolling, initiative tracking, and other services for users to play Dungeons & Dragons online, serving over 5 million users
- Developed a distributed startup system to coordinate startup and synchronization of 300+ application shards across 8 clusters to facilitate software upgrades
- Implemented two custom languages and interpreters to facilitate running thousands of user scripts server-side safely with strict upper bounds on resource usage

PaissaHouse + PaissaDB 2021 - Present
https://github.com/zhudotexe/FFXIV_PaissaHouse
https://github.com/zhudotexe/FFXIV_PaissaDB

- Distributed data collection agent to gather large amount of samples to investigate timing mechanism in video game Final Fantasy XIV, with over 8000 volunteer contributors

- Central low-power edge server to collate, analyze, and archive data packets from network of data collection agents, processing over 5.3 million data points per day
- Prototyping systems to identify and mitigate impact of network and Byzantine faults on time-series data in asynchronous model
- Developed a probabilistic approach to analyze collected data points to account for fluidity of data collection network

Draconic Language

2020 - 2023

<https://github.com/avrae/draconic>

- Server-side scripting language to allow users to write powerful user commands while enforcing limits on server resource usage
- Implemented subset of Python in custom interpreter with novel safe types and bindings to parent application's Python API to run user scripts on the application layer
- Used in production in Avrae (see Products) to run over 75,000 user scripts daily

d20

2020 - 2023

<https://github.com/avrae/d20>

<https://pypi.org/project/d20>

- Dice rolling library including custom grammar and interpreter to represent, roll, and modify complex dice expressions and results
- Built to be extendable, fast, safe, memory efficient, and project-agnostic
- Used in production in Avrae to handle over 1 million dice rolls daily

Honors and Awards

Coleman Sellers Fellow , University of Pennsylvania	2022
Highest Honors in Computer Science , University of California, Santa Cruz	2021
University Honors, <i>summa cum laude</i> , University of California, Santa Cruz	2021
Dean's Honors , University of California, Santa Cruz	2018 - 2021
Caldwell Merit Scholarship , University of California, Santa Cruz	2018 - 2021
CruzHacks Winner: Tech Cares, Best Use of Google Cloud Platform	2019

Projects & Activities

Iris 2019

CruzHacks, University of California, Santa Cruz

- Winner at CruzHacks 2019: collaborated with four others to produce an AI-powered virtual assistant using facial recognition to help Alzheimer's patients combat memory loss
- Presented methods and results at *Santa Cruz New Tech Meetup (2019)*

Control Systems Advisor

2018 - 2022

Team 2144, Sacred Heart Preparatory, Atherton

- After serving as the team's software and electrical lead for 4 years in high school, I returned to mentor later students on more advanced topics, including machine learning and computer vision
- Prepared lectures and demonstrations for high school students implementing robotic control algorithms, acted as volunteer CSA at team-hosted FIRST competitions

References

Available upon request.