Andrew Zhu

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Research Interests

Distributed systems and algorithms; programming languages; low-power systems and edge computing; distributed machine learning; Byzantine fault tolerance; volunteer computing.

Education

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

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 judgement elicitation to generative adversarial networks
- Contributed an implementation of multi-discriminator ("peer" or "duel") GANs later developed in the publication *DuelGAN: A Duel between Two Discriminators Stabilizes the GAN Training* (2021)

Publications

Wei, J., Liu, M., Luo, J., **Zhu, A.**, Li, Q., Davis, J., Liu, Y. (2021). *DuelGAN: A Duel between Two Discriminators Stabilizes the GAN Training.* IEEE/CVF Conference on Computer Vision and Pattern Recognition. [In review.]

Products/Professional Experience

Avrae Developed independently 2016 - 2019

https://avrae.io/ Purchased by D&D Beyond, FANDOM 2019 - Present

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 (see Open Source)

Software Engineer 2019 - Present
D&D Beyond, FANDOM

- After D&D Beyond's acquisition of Avrae (see above) 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 undergraduate and professional career, I made numerous contributions to open source software, with over 2,000 contributions on GitHub in the last year. Some of my open source projects that inspired my research interests are listed below.

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 reverse engineer 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 (e.g. client timestamp errors) on time-series data in asynchronous model
- Developed a probabilistic approach to analyze collected data points to account for fluidity of data collection network
- Collecting results and analysis in mock paper to present to community of peers

Draconic Language 2020 - Present
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 - Present
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 (see Products) to handle over 1 million dice rolls daily

Honors and Awards

Highest Honors in Computer Science, University of California, Santa Cruz	2021
University Honors, *summa cum laude*, University of California, Santa Cruz	2021
Phi Beta Kappa	2021 - Present
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
Nikola Tesla Award, Team 2144, Sacred Heart Preparatory, Atherton	2018

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 - Present

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.