

# AUSTIN MAC

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## RESEARCH EXPERIENCE

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### Human-AI Integration Lab (UCSB)

*Researcher*

Mar 2022 - Jul 2023

*Santa Barbara, CA*

- Built Sonic Storyteller, an AR storytelling application that parses story text and emits spatial sound effects based on verbal cues during storytelling (Unity, CSharp, Python, GPT-3, AirPods)
- Conducted a pilot user study with Sonic Storyteller to measure effects of spatial audio on immersiveness and cognitive load, finding increased immersion from spatial audio
- Work presented at UIST 2023: <https://dl.acm.org/doi/10.1145/3586182.3616642>

### Wu Lab (Columbia University)

*Research Assistant*

May 2022 - Oct 2022

*New York City, NY*

- Extended the display capabilities of Precision Interfaces, a semi-automatic data analytics interface generator, allowing users to interact with geographical GeoJSON data (Python, JavaScript, Vega-Lite)
- Implemented a parameterized SQL grammar for Precision Interfaces, enabling it to accept natural language as input
- Work presented at SIGMOD 2022 & IEEE NLVIZ 2022: <https://arxiv.org/abs/2209.08834>

### Media Skill Research Lab (UCSB)

*Research Assistant*

May 2021 - Jun 2022

*Santa Barbara, CA*

- Built EMPTI, a human factors research testbed, which mimicks an email client with predictive text (Express, Node.js, GPT-3, PostgreSQL, Heroku, Docker)
- Used EMPTI to measure the relationship between technological affordances (interactivity, credibility, familiarity, identification) and Human-AI seamlessness in 400 participants
- Work presented at ICA 2024: <https://austinmac.org/res/Synergy.pdf>
- Repo: <https://github.com/austinmacmath/EMPTI/wiki>

## INDUSTRY EXPERIENCE

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### Roblox

*Software Engineer*

Aug 2022 - Present

*San Mateo, CA*

- Building a service mesh to reduce network hops, consolidate 4 legacy network proxies, and connect over 1000 microservices (Go, Nomad)
- Maintaining and updating an internal network proxy to support over 6 million requests/second (Traefik)

### Roblox

*Software Engineering Intern*

Jun 2021 - Sep 2021

*San Mateo, CA*

- Built a CLI & microservice to restart Nomad jobs 80% faster (Go, Nomad)
- Added features to a Nomad node problem detector to programatically build Docker images, decreasing build times by 20% (Go, Docker)

### Citadel

*Software Engineering Intern*

Mar 2021 - Jun 2021

*Chicago, IL*

- Deployed an SNMP trap receiver on Kubernetes, increasing error detection rate by 15% (Docker, Bash, Python, Splunk, Vault, Kerberos, Pagerduty)
- Built a data collector to publish stored procedure outputs to Kafka and consume outputs from Kafka to Clickhouse (Python)
- Created command line tool to suppress PagerDuty alerts 50% faster (Python)

## Tesla

*Data Analytics Intern*

Aug 2020 - Dec 2020

*Fremont, CA*

- Built a data pipeline to predict job efficiency from weather (Python, Pandas, SciKit-Learn, SQLAlchemy, SQL Server, MySQL, Ansible)
- Built dashboards to flag unusual install jobs, plan capacity, and visualize office jurisdiction, which increased utilization by 20% (SQL Server, Tableau)
- Automated the crew capacity modeling process, improving modeling time by 50% (Python, Excel)

## Roblox

*Software Engineering Intern*

Jun 2020 - Aug 2020

*San Mateo, CA*

- Built an open source service to track resource utilization of container orchestration servers, reducing resource waste by 30% (Docker, Go, Grafana, SQL Server, Nomad)
- Open source repo: [https://github.com/Roblox/rblx\\_nurd](https://github.com/Roblox/rblx_nurd)

## EDUCATION

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### University of California, Santa Barbara

*Major: Computer Science, Minor: Statistics*

Sep 2018 - Jun 2022

*GPA: 3.81/4.00 with honors*

## PUBLICATIONS

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- Hamilton, K. A., Wang, L. H., Delaney, K., & **Mac, A.** (2024, June 20-24). *Evaluating Manipulations for Creating Perceived Human-AI Seamlessness* [Paper presentation]. 74th Annual International Communication Association Conference, Gold Coast, Australia.
- **Mac, A.**, & Sra, M. (2023, October). Sonic Storyteller: Augmenting Oral Storytelling with Spatial Sound Effects. In *Adjunct Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology* (pp. 1-3).
- Chen, Y., Li, R., **Mac, A.**, Xie, T., Yu, T., & Wu, E. (2022, October 16). *NL2INTERFACE: Interactive Visualization Interface Generation from Natural Language Queries*. [In person presentation] IEEE NLVIZ 2022.
- **Mac, A.** (2019). Don't Get Stuck. *Starting Lines*, 18(41), 141-143.

## VOLUNTEERING

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### UCSB Running Club - President

UCSB Running Club is an entirely student run organization with over 300 registered members. Our goal is to provide an inclusive, welcoming community for runners of all levels. Organized practice schedules, coordinated race carpools, applied for race registration discounts, purchased uniforms, managed/delegated tasks.

## SKILLS

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### Languages

C++, Python, Go, SQL, R, HTML, CSS

### Tools

Unity, Blender, Figma, Tableau, GPT, Git, Docker, Nomad

## **Overview**

I aim to increase social engagement, particularly for people who face difficulty engaging with their communities in-person. My inspiration comes from observing my mother, who struggled to create and share her music from home. Thanks to Twitch, she is now able to happily share her love of making music with an encouraging community. However, many others struggle to reap the benefits of community interaction. According to the US Surgeon General, Dr. Vivek H. Murthy, one symptom of our national epidemic of loneliness and isolation is a decline in social participation. From 2003 to 2020, people aged 15 - 24 spent 70% less time engaging with their friends in-person. After observing my mother's joy from finding community online, I am motivated to develop tools that facilitate social involvement. Further, I am strongly interested in evaluating these tools to determine their psychological impacts. Previously, I developed AI-powered tools for communication: (1) Sonic Storyteller, an AR audio application which enhances storytelling by enabling storytellers to automatically inject spatial sound effects into any oral storytelling experience, and (2) NL2Interface, a system which lowers barriers for performing data analysis and visualization by generating data analytics dashboards from natural language input. To evaluate similar tools, I developed (3) EMPTI, a human factors research testbed that measures peoples' psychological responses to AI-generated content. My experience developing programs for creativity, productivity, and AR aligns well with the work of Dr. Tseng, Dr. Chilton, and Dr. Smith. As a PhD student and future professor, my goal is to build effective tooling to promote social engagement online and encourage the growth of accommodating, inclusive online communities.

### **(1) Sonic Storyteller: Creating spatial storytelling experiences**

Personal Statement: Austin Mac

In Dungeons & Dragons, an experienced Dungeon Master can greatly enrich the gameplay experience with vivid sound effects, good storytelling, and creative use of the physical space. Inspired by my love for the game, I strove to facilitate the creation of immersive 3D stories that could be experienced remotely. By using Unity to develop a 3D space, Apple AirPods to enable immersive spatial sound effects, and GPT-3 for sound effect generation, I built Sonic Storyteller, an AR audio storytelling application which allows storytellers to automatically inject spatial sound effects into any oral storytelling experience. Triggered by specific cue words while a storyteller presents a story aloud, Sonic Storyteller automatically emits contextually relevant spatial sound effects through a listener's AirPods in real time. In my user study, participants reported higher levels of immersion when using Sonic Storyteller with spatial sound effects versus without spatial sound effects, indicating potential for this tool to enhance oral storytelling. My work was presented at ACM UIST 2023.

## **(2) NL2Interface: Creating data analytics interfaces**

Often, I observed the difficulties that my coworkers experienced when creating data analytics dashboards. These difficulties stemmed from the complex engineering skills necessary to build complicated user interfaces combined with fetching backend data. To make interface generation easier for my coworkers and democratize data analysis for everyone, I developed NL2Interface, an application which transforms a natural language query and a dataset into an interactive data analytics dashboard. Given a query such as "What are the total COVID cases across the US?" and an underlying COVID cases dataset, NL2Interface generates an interactive data analytics dashboard, which allows the user to interact with map visualizations, transform data, and more. The generation works by first translating natural language to SQL queries using OpenAI Codex.

Personal Statement: Austin Mac

Then, the structural differences in these SQL queries are mapped to specific dashboard widgets that can be used to transform data and generate visualizations. NL2Interface demonstrates the feasibility of making data analysis easier by allowing simple natural language to develop a complex data analytics dashboard. My work was presented at IEEE NLVIZ 2022.

### **(3) EMPTI: Evaluating psychological responses to AI generated content**

As AI-generated content rapidly becomes more prevalent, it is paramount to understand its psychological effects to build better tooling and improve human-AI interaction. To measure these effects, I developed EMPTI, a human factors research testbed that measures users' psychological responses to AI-generated content. In the context of predictive text in email clients, I used EMPTI to measure peoples' responses to misspelled predictive text generated by language models. EMPTI housed a language model which powered predictive text suggestions and measured user behavior such as: the user's response to predictive text (accept or ignore), the user's response time, the suggestion (correctly or incorrectly spelled), and more. While no statistically significant results were concluded, EMPTI's use by approximately 400 MTurk participants validated its performance as a framework for human factors research. I made EMPTI's code open source to expand its utility for future human factors research. My work was presented at the annual International Communication Association Conference in 2024.

### **Why Columbia**

Within Columbia's Department of Computer Science, I am motivated to collaborate with HCI professors due to their research using AI for creative tooling and AR for communication. In particular, I am interested in working alongside Dr. Tseng, Dr. Chilton, and Dr. Smith.

Personal Statement: Austin Mac

I am motivated to collaborate with Dr. Tiffany Tseng due to her work on AI powered tooling for creative tasks. Her work in *PlushPal: Storytelling with Interactive Plush Toys and Machine Learning* shares similar themes as my work with Sonic Storyteller, as both projects utilize AI/ML methods to facilitate the creation of enhanced storytelling experiences. By working with Dr. Tseng, I hope to lower thresholds for creative expression to empower individuals to actively engage in their communities.

Similarly, I am excited about the opportunity to work with Dr. Lydia Chilton. Her focus on productivity tooling complements my work with NL2Interface, which simplifies the generation of data analysis dashboards to make them more accessible. I had the privilege of meeting Dr. Chilton in 2022 when she consulted on needfinding for incorporating user feedback into Dr. Eugene Wu's Precision Interfaces project. With Dr. Chilton, I hope to leverage the collective wisdom of internet communities to explore and implement more inclusive practices.

I am also drawn to the research of Dr. Brian Smith, whose work on AR for enhancing communication resonates with my work on Sonic Storyteller. His paper *Exploring Immersive Interpersonal Communication via AR* and Sonic Storyteller both explore using AR to communicate in personal, meaningful, and immersive ways. By working with Dr. Smith I hope to design more expressive methods of interaction, improving the quality of remote interpersonal relationships.

My work with AI tools and AR for communication aligns well with the research interests of Dr. Tseng, Dr. Chilton, and Dr. Smith. With these professors, I will contribute a human-centric focus on iterative product development to contribute to better communication methods for all.

### **Future career plans**

## Personal Statement: Austin Mac

Currently, I work as a software engineer at Roblox, where I build networking infrastructure to enable millions of users per day to connect in online communities. In the future, I also intend for my work to remain community focused. After my graduate studies, I hope to form a lab focused on increasing social engagement to create meaningful relationships. In addition to working towards this goal, the lab will also be an inclusive safe space for all ideas, backgrounds, and perspectives. As I continue working, my mother's success of finding community online serves as my motivation for building welcoming spaces for anyone.