

Alexander Metzger

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My research aims to bridge gaps in information access for underserved languages and communities through a combination of algorithm design, machine learning, and edge device technology.

EDUCATION

University of Washington – 3.85 GPA, 3.97 in CS

09/22 – 06/26

Joint BS/MS Computer Science and BS Mathematics, Graduate Compilers & Cloud Security Teaching Assistant, UWSO First Violin, Accelerated Honors Math, Guest Lecturer [T7, T8, T9], NeurIPS reviewer, COM² Mentor.

AWARDS

[H3] CRA Outstanding Undergraduate Researcher Award: [Honorable Mention](#)

2025

[H2] Departmental Honors and Dean's List: Annual and Quarterly

2022–2025

[H1] Akvelon Mentor's Choice: Outstanding Leadership

2023

FUNDING

[F6] Mozilla Builders Accelerator – \$39K research grant, \$35K cloud credits

2024

Youngest out of 14 founders and researchers selected from 44 countries & 100s of applicants. Featured on the Stack Overflow podcast with more than 2 million viewers. Praised as “most promising” by Silicon & Pulse.

[F5] Microsoft Imagine Cup: Semifinalist, \$5K cloud credits

2025

[F4] Facebook AI for Health Challenge: 1st Place, \$1K Prize

2025

[F3] Google Research: Special Google TPU Research Cloud Access

2025

[F2] Nvidia Inception: Accepted Startup Founder, GPUs

2025

[F1] Clean Energy Institute: TARs Research Grant

2025

RESEARCH EXPERIENCE

Ubiquitous Computing Lab – Advisor: Dr. Shwetak Patel

Jun. 2024 – Present

Battery-Free DL on MCUs via Agentic Model and System Optimization. Embedded ML. [Link](#).

Goal: Automatically adapt Deep Learning models to ultra-low-power hardware/microcontrollers.

- Developed a novel model compression framework for hardware constraints in MCU accelerators.
- Co-first-authored paper submitted to ACM IMWUT [P6] analyzing applications including animal monitoring to prevent crop destruction, and wearables to assess linguistic development in toddlers.
- Created SoTA speech2ipa models that retain top performance with 600x smaller memory footprint.
- Learned from the amazing Zhihan Zhang (best advisor at the University of Washington).

CS 4 The Environment – Advisor: Dr. Vikram Iyer

Jun. 2024 – Present

Multi-modal automated lifecycle assessments of consumer electronics. ML for sustainability. [Link](#).

Goal: Democratize access to environmental impact estimates and empower sustainable consumption.

- Co-authored study design and research papers [P2, P4] and presented the work at top events [T10, T13].
- Industry adoption of our work by Google and Amazon as well as a publicly accessible Chrome Extension.
- Designed the multi-modal pipeline, enabling agents to consolidate information from many fragmented sources and departments (online tear downs, FCC records, environmental reports, company data).

ICTD Lab – Advisor: Dr. Richard Anderson

Sep. 2022 – May 2024

eKichabi v2: Digital phone directory for subsistence farmers in rural Tanzania. ICTD. [Link](#).

Goal: Study the economic impacts of digital agricultural information systems in Sub-Saharan Africa.

- Co-first-authored the paper [P5] accepted to ACM SIGCHI 2024. Presented talks [T7, T12].

- Led team of 4 developers for the USSD server and later also the Android App optimizing latency by 40%.
- Designed a binary protocol reducing data costs by 70%, making the platform accessible to 10K farmers.

UBC NLP Group – Advisor: Dr. Jian Zhu

Sep. 2024 – Present

Transcribing in Context: Temporal Trends in ASR Biases. Inclusive Speech Technology. [Link](#).

Goal: Re-evaluate the claim that speech models are becoming more universal in context of dialects.

- First-authoring the ACM FAccT submission, mentoring an undergrad and a high school student.
- First comprehensive evaluation of ASR model regressions over time for minority speaker profiles.
- Assembled a diverse research team from Korea, England, Denmark, Japan, India, Canada, and the US.
- Quantifying real world impact on immigration processes, job acquisition, and information access.

ChangeLing Lab – Advisor: Dr. David R. Mortensen

Sep. 2025 – Present

PhoneBench: Towards Universal Phoneme Recognition. Computational Linguistics. [Link](#).

Goal: Device an inclusive benchmark for phoneme recognition and plan for a universal model.

- Established the current standard phoneme recognition leaderboard and trained the top model.
- Mentoring a high school student and collaborating with the PhD/MS students at the lab on a unique method to evaluate phonetic model bias against underserved dialects through representation learning.
- Pioneering a new approach to universal phoneme transcription using in-context learning.

University of Washington – Advisor: Dr. Stefan Steinerberger

Sep. 2024 – Present

Practical algorithms for graph embedding. Graph Theory, Algorithms, Combinatorics. [Link](#).

Goal: Compute the genus of the previously intractable $(3, 12)$ -cage graph (turns out it is 17).

- Invented and implemented SoTA algorithm in C with visualization and verification in Python.
- Started as independent research and then reached out to Professor Steinerberger and Brinkmann.
- Co-first authored paper submitted to Discrete Mathematics, published thesis, and gave talks [T4, T6].
- Taking a novel approach to extend prior work on shortcuts to characterize higher genus obstructions.

PUBLICATIONS

[P6] – Submitted to ACM IMWUT

Embedded ML, Wearables, Agents

Alexander Metzger*, Jiuyang Lyu*, Chun-Cheng Chang, Jiayi Shao, Emmanuel Azuh, Yujia Liu, Zachary Englhardt, Ethan Schwartz, Devin Mackenzie, Gregory D. Abowd, Edward Wang, Tingyu Cheng, Kurtis Heimerl, Shwetak Patel, Vikram Iyer, Zhihan Zhang. Battery-Free Deep Learning on MCUs via Agentic Model and System Co-Optimization.

[P5] – ACM SIGCHI

HCI, ICTD

Ananditha Raghunath*, Alexander Metzger*, Hans Easton, XunMei Liu, Fanchong Wang, Yunqi Wang, Yunwei Zhao, Hosea Mpogole, and Richard Anderson. 2024. eKichabi v2: Designing and Scaling a Dual-Platform Agricultural Technology in Rural Tanzania.

[P4] – ACM IMWUT

ML for Sustainability, CV, HCI

Zhihan Zhang, Puvarin Thavikulwat, Alexander Metzger, Yuxuan Mei, Felix Hähnlein, Zachary Englhardt, Gregory D. Abowd, Shwetak Patel, Adriana Schulz, Tingyu Cheng, and Vikram Iyer. 2025. Living Sustainability: In-Context Interactive Environmental Impact Communication.

[P3] – Pre-print, submitted to Discrete Mathematics

Algorithms, Graph Combinatorics

Alexander Metzger* and Austin Ulrigg*. An Efficient Genus Algorithm Based on Graph Rotations.

[P2] – Pre-print, submitted to Nature Electronics

ML for Sustainability, CV, Agents

Zhihan Zhang, Alexander Metzger, Yuxuan Mei, Felix Hähnlein, Zachary Englhardt, Tingyu Cheng, Gregory D. Abowd, Shwetak Patel, Adriana Schulz, Vikram Iyer. Towards Autonomous Sustainability Assessment via Multimodal AI Agents.

[P1] – University of Washington Student Research Paper

Topology, Graph Theory, Algorithms

Alexander Metzger. A Practical Algorithmic Approach to Graph Embedding. University of Washington.

Department of Mathematics. Honors Thesis. <https://hdl.handle.net/1773/53829>.

TALKS

[T13] – <i>In-Context Interactive Environmental Impact Communication</i>	Oct. 2025
DUB Research Day, Seattle, WA [100s of attendees, only undergrad of 8 invited speakers]	
[T12] – <i>eKichabi v2: Designing and Scaling a Dual Platform Technology in Rural Tanzania</i>	May 2024
DUB Para.chi Event, Seattle, WA [100s of attendees, youngest invited speaker]	
[T11] – <i>Deploying Speech Technology at Scale</i>	Aug. 2025
Interspeech Conference, Rotterdam, Netherlands [2K attendees, 1 of 4 speakers invited for the science slam]	
[T10] – <i>In-Context Interactive Environmental Impact Communication</i>	Oct. 2025
Paul G. Allen's Annual Research Showcase, Seattle, WA [100s of attendees, 3 posters and a talk]	
[T9] – <i>Embedded ML - Computer Vision Demo</i>	Oct. 2025
University of Washington Embedded Systems Capstone Guest Talk, Seattle, WA [20 students]	
[T8] – <i>Computational Linguistics for Machine Aided Pronunciation Learning</i>	Oct. 2024
University of Washington Computational Linguistics Group Guest Talk, Seattle, WA [30 PhD attendees]	
[T7] – <i>Designing and Deploying Digital Information Systems in Sub-Saharan Africa</i>	Oct. 2023
University of Washington CHANGE Seminar Guest Talk, Seattle, WA [40 PhD attendees]	
[T6] – <i>Graph Algorithms and Optimization</i>	Nov. 2025
Northwest Undergraduate Mathematics Symposium, Bothell, WA [30 attendees]	
[T4&T5] – <i>Graph Embedding and Genus Speech Technology Built For Everyone, Everywhere</i>	May. 2025
University of Washington Research Symposium, Seattle, WA [60 attendees]	
[T2&T3] – <i>The Future of Language Learning</i>	Sep. & Dec. 2024
Mozilla Builders, New York, NY Mozilla Builders, San Francisco, CA [500 attendees]	
[T1] – <i>Building Inclusive Speech Technology</i>	Apr. 2025
DubHacks Next Demo Day, Seattle, WA [100 attendees]	

WORK EXPERIENCE

Koel Labs – <i>Founder and CEO</i>	Aug. 2024 – Present
○ Raised \$100K in funding (Mozilla, Microsoft, Google, Nvidia) for computational linguistics research.	
○ Trained SoTA NLP models, cutting streaming latency by 60% and doubling accuracy.	
○ Managed open-source team of 4 engineers and 6 researchers from CMU, UToronto, UT Austin, and UBC.	
○ Established strategic partnerships and research collaborations with 5 companies and 5 institutions.	
Gooey.AI – <i>Software Engineer</i>	Jun. 2023 – Sep. 2024
○ Led client communication and 4-member intern team, merging 70+ PRs across production ML pipelines.	
○ Deployed ML solutions to 10M+ farmers across 5+ countries, demoed to 193 world leaders at the UN.	
Akvelon, Inc. – <i>Software Development Intern</i>	Jun. 2023 – Aug. 2023
○ Led team of 4 to make 200K open-source contributions to 7 Microsoft repos across 27 pull requests.	

LEADERSHIP

Seattle Tutoring Partners – <i>Founder and Research Mentor</i>	May 2022 – Present
○ Mentoring research projects for High Schoolers, and collaborating on internationally recognized projects.	
○ Developed software for 500+ youth musicians and antenna software for 10K+ aspiring scientists.	
Cascade Enrichment – <i>Technical Lead</i>	Sep. 2022 – Sep. 2024
○ Managing certification and curriculum for 30+ tutors; developed online platform for 100+ students.	
Design Build Fly – <i>Lead Computer Scientist</i>	Sep. 2023 – Sep. 2024
○ Coordinated optimization algorithms and data analysis for 30 engineers; placing 3rd nationally.	

RELEVANT COURSEWORK

HCI: Capstone Software Design to Empower Underserved Populations, Software Design and Implementation, Social Networks, Photography, Robotics Colloquium, Computer Science Colloquium

Systems: Compilers, Operating Systems, Computer Communication Networks, Distributed Systems, Systems Programming, Hardware/Software Interface, Computer Systems Architecture, Computer Graphics, Concurrency/Parrallelism and Rust, Digital Design, Coursera Nand To Tetris

ML: Capstone Natural Language Processing, Computational Biology, Probabilistic Robotics, Probability and Statistics, Reinforcement Learning, Machine Learning by Andrew Ng

Theory: Theory of Computation, Algorithms, Modern Algorithms, Data Structures and Parallelism, Numerical Analysis, Combinatorics, Quantum Information/Computation, Cryptography, Modern Algebra and Coding Theory, Databases, Linear Algebra, Differential Equations, Vector Calculus