

# Parker Carlson

parker\_carlson@ucsb.edu ◦ (503) 318-9304 ◦ thefxperson.github.io

## EDUCATION

---

### University of California, Santa Barbara

Ph.D. in Computer Science (GPA: 4.00)

Sep 2023 – Jun 2028

### Oregon State University

B.S. in Computer Science (GPA: 3.98; *summa cum laude*)

Sep 2019 – Jun 2023

## SKILLS

---

**Programming Languages:** Python, C, C++, Java, Rust, SQL, HTML, CSS, JavaScript

**Packages:** Tensorflow, PyTorch, Transformers, Numpy, Pandas, SKLearn, Matplotlib, Seaborn, React

**Selected Coursework:** Information Retrieval, Operating Systems, Web-scale Systems, Distributed Systems, Deep Learning, Machine Learning, Data Structures & Algorithms, Linear Algebra, Mathematical Statistics

**Communication:** Led teams of 5+ both in-person and remote, presented to small (2-20) and large (100+) groups

**Languages:** English (native), French (DELF B2)

## AWARDS & FELLOWSHIPS

---

UCSB Regents' Fellowship

AY2023; AY2027

UCSB Excellence in Computer Science Fellowship

2024

OSU URSA Engage Research Fellowship

2020

OSU Engineering Virtual Showcase - 2nd Place Industry Choice

2020

## RESEARCH

---

### University of California, Santa Barbara

*Information Retrieval Lab*

Sep 2023 – Present

- Developed an algorithm to improve pruning accuracy for cluster-based approximate sparse retrieval and improved its implementation, an over 400% speedup with comparable relevance to existing methods
- Designed an efficient sparse-dense hybrid retrieval algorithm. Found a 14x to 27x speedup over other disk-based methods like SPANN and DiskANN for on-disk LLM-based embeddings

### Oregon State University

*Soundbendor Lab*

Nov 2019 – Jun 2023

- Introduced the first successful models for classification of sung vowels using transformers and other neural methods. Existing methods failed to replicate and methods for spoken vowels did not generalize
- Developed recurrent neural networks to transpose audio while maintaining timbre without spectral methods. Neural models better preserved the timbre and maintained the phase of audio, but introduced noise

## CONFERENCE PUBLICATIONS

---

1. Yang, Y., **Carlson, P.**, Qiao, Y., Xie, W., He, S., and Yang, T. Lstm-based selective dense text retrieval guided by sparse lexical retrieval. In *The 47th European Conference on Information Retrieval (ECIR '25)*, 2025. AR=23%
2. Qiao, Y., **Carlson, P.**, He, S., Yang, Y., and Yang, T. Threshold-driven pruning with segmented maximum term weights for approximate cluster-based sparse retrieval. In *The 2024 Conference on Empirical Methods in Natural Language Processing (EMNLP '24)*, 2024. AR=21%; Outstanding Paper Award (Top 1%)
3. Yang, Y., **Carlson, P.**, He, S., Qiao, Y., and Yang, T. Cluster-based partial dense retrieval fused with sparse text retrieval. In *Proceedings of the 47th International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR '24)*. ACM, 2024. AR=24%
4. **Carlson, P.** and Donnelly, P. J. Deep learning approaches for sung vowel classification. In *Proceedings of the 13th International Conference of Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMUSART '24)*, volume 14633, pages 67–83. Lecture Notes in Computer Science, Springer, 2024, doi:10.1007/978-3-031-56992-0\_5
5. Donnelly, P. J. and **Carlson, P.** Transposition of simple waveforms from raw audio with deep learning. In *Proceedings of the 12th International Conference of Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMUSART '23)*, volume 13988, pages 341–356. Lecture Notes in Computer Science, Springer, 2023, doi:10.1007/978-3-031-29956-8\_22. AR=36%

## PRESENTATIONS

---

1. **Carlson, P.** and Donnelly, P. J. Deep learning approaches for sung vowel classification. April 2024. Paper presented at the 13th International Conference of Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMUSART '24). Aberystwyth, United Kingdom
2. **Carlson, P.** and Donnelly, P. J. Musical transposition directly from audio with deep recurrent neural networks. April 2021. Poster presented at the National Conference on Undergraduate Research (NCUR '21). (virtual)
3. **Carlson, P.** and Donnelly, P. J. Musical transposition directly from audio with deep recurrent neural networks. August 2020. Poster presented at Oregon State University's Celebrating Undergraduate Excellence (CUE '20). (virtual)

## PROFESSIONAL EXPERIENCE

---

### University of California, Santa Barbara

*Research Assistant*

Jun 2024 – Present

- Developed a unified strategy for cluster-based approximate sparse retrieval and created an adaptive two-stage search algorithm. Anticipated publication in SIGIR '25.

*Teaching Assistant*

Aug 2024 – Present

- Taught lab sections and designed the final project for Intro to Computer Science with over 120 students

### Micro Systems Engineering Inc.

*Data Science Intern*

Jun 2022 – Dec 2022

- Created TIBCO Spotfire dashboards to provide analytics and quality assurance of manufacturing processes
- Reduced manual data examination during root cause failure analysis by 95% using data mining
- Presented analytic-enabled dashboards to 20 employees, including 5 department heads

### Viewpoint, a Trimble Company

*Data Science Intern*

Jun 2021 – Sep 2021

- Created interactive Domo charts featured in Viewpoint's Executive QBR to inform market decisions
- Forecasted spending in the construction industry using time-series analysis and machine learning
- Optimized frequent SQL queries to reduce length by 64% and execute over 300% faster

### Oregon State University

*Research Assistant*

Jun 2020 – Sep 2020

- Designed and implemented a library for efficient data processing for Tensorflow, used by 10+ lab members
- Developed technical tutorials for audio-based machine learning and Slurm used by 15+ lab members
- Engineered and implemented various deep learning models in Tensorflow, Pandas, and SKLearn
- Animated custom graphics to explain audio-based deep learning visually in Adobe After Effects

## MENTORSHIP & LEADERSHIP

---

### University of California, Santa Barbara

*Early Research Scholars Program Mentor*

Sep 2023 – Present

*ERSP supports undergraduates from traditionally underserved backgrounds in their first research experience*

- Led a group of four students to develop a research proposal, complete the work and present their findings
- Met with the students for an hour each week, giving mini-lectures on important background material, answering research questions, solving technical problems, and providing career and academic advice
- Supported two students in developing their successful graduate school applications

### Oregon State University

*Academic Learning Assistant*

Sep 2020 – Jun 2022

- Assisted new college students in navigating university resources and cultivating strong academic habits
- Engaged with 200+ students, mainly first-generation students, women in STEM, and international students
- Organized and promoted several academic and professional skill-building workshops, with up to 40 attendees
- Led a team of six to write, film, produce, advertise, and distribute seven educational videos in two months