

ILANA SHAPIRO

CONTACT

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RESEARCH INTERESTS

My interests lie in the integration of programming languages, generative AI, and human-computer interaction. I aim to develop human-interpretable structural constraints on sequence models for the controllable generation of well-formed sequence data. My goal is to create a richly interactive, human-machine co-creation process enabling end-users to produce structurally sound media.

EDUCATION

University of California, San Diego, La Jolla, CA

2023-present

Ph.D. Computer Science

Programming Systems Group, advised by Professor Sorin Lerner

GPA: 4.0/4.0

Pomona College, Claremont, CA

2018-2022

B.A. Computer Science/Music (Flute) double major, minor in Mathematics

GPA: 4.0/4.0, Summa Cum Laude, Distinction in Senior Exercises

- **Computer Science Thesis:** "MusAssist: A Domain Specific Language for Music Notation"
 - Advised at Harvey Mudd College by Professor Ben Wiedermann
- **Music Thesis and Recital:** "Mieczysław Weinberg: Music Transcending Tragedy"
 - Advised by Professors Alfred Cramer, Joti Rockwell, and Eric Lindholm

RESEARCH PROJECTS

Synthesizing Composite Hierarchical Structure from Music Corpora [AAAI preprint][code] 2024

- Introduced a unified, hierarchical meta-representation of music structure as a k -partite DAG. Combined stochastic and formal logic techniques to frame and solve the dually NP-hard combinatorial optimization problem of music structure summarization. Under final round review at the 2025 AAAI Conference on Artificial Intelligence.

pgen-rs: LLM-Aided Efficient and User-Friendly Genomic Data Wrangling [paper][code][slides] 2024

- Developed pgen-rs, a tool enabling end-users to write genomic data wrangling requirements in natural language and execute with Rust-based high-performance genomic data processor.

ProCon: Continuous Enumeration for Just-In-Time Bottom-Up Synthesis [paper][code] 2024

- Introduced continuous, rule-based enumeration for just-in-time bottom-up search in SyGuS problems, where programs are enumerated in order of continuous, nonrounded weights as determined by a probabilistic weighting function.

MusAssist: A Domain Specific Language for Music [TENOR paper][thesis2][code][demo] 2022

- Published at 8th International Conference on Technologies for Music Notation and Representation 2023. Created DSL bridging the abstraction gap between music theoretical structures and notation. Wrote Haskell-based compiler to MusicXML.

Mieczysław Weinberg: Music Transcending Tragedy [thesis1][recital] 2022

- Published in Scholarship@Claremont. Wrote extensive musicology thesis examining narrative and memory in Weinberg's *Kaddish* Symphony. Presented flute recital of my transcriptions of Weinberg's cello works.

Markov Chain Music Generation [JHM paper][code] 2021

- Published in *Journal of Humanistic Mathematics*. Created a novel system of Markov chains using inverse transform sampling, enabling end-users to rapidly generate musical sketches.

Virtual Ensemble Assembly: Musicality in Separation [WAC paper][code] 2020

- Published at Web Audio Conference 2022. Assisted on Prof. Christopher Raphael's research at Indiana University Bloomington exploring synchronizing audio tracks without click tracks.

DNA to Music (MIDI) Translation [paper][code] 2019

- Created original Python-based model translating DNA to MIDI. Analyzed result for harmonic sequences to classify species into taxonomic classes. Ranked species by musicality.

RESEARCH ARTIFACTS

*equal contribution

Ilana Shapiro, Ruanqianqian (Lisa) Huang, Zachary Novack, Cheng-i Wang, Hao-Wen Dong, Taylor Berg-Kirkpatrick, Shlomo Dubnov, and Sorin Lerner. "Synthesizing Composite Hierarchical Structure from Music Corpora." Under review. 2024. [\[paper7\]](#)

Cole Kurashige,* Savitha Ravi,* and **Ilana Shapiro**.* "pgen-rs: LLM-Aided Efficient and User-Friendly Genomic Data Wrangling." Unpublished manuscript, 2024. [\[paper6\]](#)

Ani Canumalla,* **Ilana Shapiro**,* and Kyle Thompson.* "ProCon: Continuous Enumeration for Just-In-Time Bottom-Up Synthesis." Unpublished manuscript, 2024. [\[paper5\]](#)

Ilana Shapiro. "MusAssist: A Domain Specific Language for Music Notation." *Proceedings of the International Conference on Technologies for Music Notation and Representation (TENOR'23)*, pp. 75-82, Northeastern University, Boston, MA, 2023. [\[paper4\]](#)

Kaitlin Pet, **Ilana Shapiro**, and Christopher Raphael. "Virtual Ensemble Assembly: Musicality in Separation." In *Web Audio Conference (WAC'22)*, Cannes, France, 2022. [\[paper3\]](#)

Ilana Shapiro. 2022. *MusAssist: A Domain Specific Language for Music Notation*. Bachelor's thesis. Pomona College. [\[thesis2\]](#)

Ilana Shapiro. 2022. *Mieczysław Weinberg: Music Transcending Tragedy*. Bachelor's thesis. Pomona College. [\[thesis1\]](#)

Ilana Shapiro and Mark Huber. "Markov Chains for Computer Music Generation." In *Journal of Humanistic Mathematics, Volume 11 Issue 2 (July 2021)*, pp. 167-195. [\[recital\]](#)

Ilana Shapiro. "Converting DNA to Music: Sonifying Structure, Splicing, and Translation." Unpublished manuscript, 2019. [\[paper2\]](#)

Talks

"Synthesizing Composite Hierarchical Structure from Music Corpora." *Programming Systems Group, UC San Diego*, Apr. 2024.

"MusAssist: A Domain Specific Language for Music Notation." *International Conference on Technologies for Music Notation and Representation*, May 2023.

ACADEMIC HONORS

The Phi Beta Kappa Award 2022

- Endowed by the Pomona Chapter of Phi Beta Kappa, awarded to one senior selected for high quality of scholarship and promise of future distinction.

The Rena Gurley Archibald High Scholarship Prize 2022

- Awarded to the member(s) of the Pomona College graduating class ranking highest in scholarship.

Distinction in Senior Exercise (Computer Science) 2022

- Exceptional work on the senior exercise is awarded based on review by the entire faculty of the Computer Science Department at Pomona College.

Distinction in Senior Exercise (Music) 2022

- Exceptional work on the senior exercise is awarded based on review by the entire faculty of the Music Department at Pomona College.

The Katherine J. Hagedorn Prize 2022

- Awarded annually to the Pomona College student(s) demonstrating exceptional loyalty and dedication to their music studies.

Phi Beta Kappa Induction (Junior Year) - Pomona College Chapter 2021

- 1 of 8 juniors awarded for "good moral character," distinguish in "breadth of culture," and "excellence of scholarship."

The William F. Russell Prize

2020

- Awarded annually to the Pomona College prospective music major(s) showing substantial accomplishment and significant promise in their study of music.

INDUSTRY EXPERIENCE

Freelance Software Engineer, Stainless

Feb. 2023-present

- Make open-source contributions to codebases such as Stoplight Prism, node-tree-sitter, Microsoft Pyright, NPM Trends, and json-schema-benchmark.

Software Engineer, Meta

Oct. 2022-Nov. 2022

- Improve type safety of Python and Hack code in engineering bootcamp. Impacted by the 13% company layoff as a new hire.

3x Software Engineering Intern, Facebook

Summers of 2019, 2020, 2021

- iOS/serverside fullstack intern on Facebook Events and Groups.

SKILLS

Programming Languages: Python • Haskell • TypeScript • Java • Objective-C • SQL • GraphQL

Tools/Frameworks: LaTeX • Git • Functional and Object-Oriented Programming

Domain Knowledge: Domain Specific Languages • Parsing/Compilers • Stochastic/Combinatorial Optimization • User Studies • Human-Centered Design • Constrained Generative Models

TEACHING EXPERIENCE AND LEADERSHIP

Mentorship Co-Chair, GradWIC UCSD

Fall 2024-present

- Manage the UCSD Graduate Women in Computing Mentorship Program. Pair 174 mentees with mentors, personally mentor 2 students, host inclusive group activities.

Teaching Assistant, Database Systems, Pomona College

Spring 2020

- Hold twice-weekly mentor hours, monitor Piazza forums, and reply when appropriate.