

# Zachary Novack

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**RESEARCH INTERESTS** Generative AI for Music/Audio, Controllable Generative Models, Efficient Generation

**EDUCATION BACKGROUND** *Ph.D. in Computer Science* Fall 2022 - Present  
[University of California – San Diego](#), San Diego, CA  
Advisors: Julian McAuley, Taylor Berg-Kirkpatrick

*B.S. in Statistics & Machine Learning* August 2018 - May 2022  
[Carnegie Mellon University](#), Pittsburgh, PA  
Advisors: Zachary Lipton, Simon DeDeo  
• Minor in Sonic Arts (music technology)  
• 3.93/4.0 GPA

**SELECTED RESEARCH** **[DITTO: Diffusion Inference-Time T-Optimization for Music Generation.](#)**  
**Zachary Novack**, Julian McAuley, Taylor Berg-Kirkpatrick, Nicholas J. Bryan. ICML 2024.

**[Unsupervised Lead Sheet Generation via Semantic Compression.](#)**  
**Zachary Novack**, Nikita Srivatsan, Taylor Berg-Kirkpatrick, Julian McAuley. AES Symposium on AI & the Musician, 2024.

**[CHiLS: Zero-Shot Image Classification with Hierarchical Label Sets.](#)**  
**Zachary Novack**, Julian McAuley, Zachary Lipton, Saurabh Garg. ICLR MRL Workshop, 2023. ICML 2023.

**[Disentangling the Mechanisms Behind Implicit Regularization in SGD.](#)**  
**Zachary Novack**, Simran Kaur, Tanya Marwah, Saurabh Garg, Zachary Lipton. NeurIPS HOOML Workshop ([Spotlight](#)), 2022. ICLR 2023.

**SELECTED ACCOLADES** 1<sup>st</sup> Place: Adobe Intern Project Expo August 2023  
NSF Graduate Research Fellowship - Honorable Mention Spring 2022  
Phi Beta Kappa Member October 2021 - Present  
[Andrew Carnegie Society Scholar](#) September 2021 - Present  
[Small Undergraduate Research Grant \(SURG\)](#) June 2021  
[Dietrich Senior Honors Research Fellowship](#) May 2021  
1<sup>st</sup> Place: Statistics & Data Science Research Showcase May 2021  
[Summer Undergraduate Research Fellowship \(SURF\)](#) June 2020  
2<sup>nd</sup> Place: 15-112 Term Project Showcase April 2019  
Dean’s List: High Honors December 2018 - May 2022  
[Quantitative Social Science Scholar](#) August 2018 - May 2022  
[Paul Mellon Memorial Presidential Scholarship](#) August 2018 - May 2022

**WORK EXPERIENCE** **[Adobe – Audio Group](#)** Summer 2023 - Present  
*Research Scientist Intern under Nicholas Bryan*  
• Investigating methods for interactive editing and control for audio-domain generative music models.

**ACMI Lab** (CMU) Spring 2021 - Spring 2023  
*Research Assistant under Zachary Lipton*

- Developed new method to leverage hierarchical class information for zero-shot prediction in CLIP models (ICML 2023).
- Performed large-scale verification study validate explicit regularization mechanisms for SGD across modern image benchmarks and model types (ICLR 2023).

**Laboratory for Social Minds** (CMU) Summer 2020 - Fall 2022  
*Research Assistant under Simon DeDeo*

- Designed a temporal Bayesian framework to analyze social media addiction.
- Investigated ideological network evolution on the fringe web forums /pol/ (4chan) and The Red Pill (Reddit).

**Unisys Corporation** Summer 2020 - Spring 2021  
*AI/ML Intern*

- Designed time-series models (ARIMA, LSTM, Facebook Prophet) for computer resource utilization prediction under distribution shift

**PAPERS &  
PUBLIC WORKS**

*Workshops / Preprints*

- **Unsupervised Lead Sheet Generation via Semantic Compression**  
**Zachary Novack**, Nikita Srivatsan, Taylor Berg-Kirkpatrick, Julian McAuley  
AES International Symposium on AI and the Musician, 2024

*Conference Papers*

- **DITTO: Diffusion Inference-Time T-Optimization for Music Generation.**  
**Zachary Novack**, Julian McAuley, Taylor Berg-Kirkpatrick, Nicholas J. Bryan  
International Conference on Machine Learning (ICML), 2024
- **CHiLS: Zero-Shot Image Classification with Hierarchical Label Sets**  
**Zachary Novack**, Julian McAuley, Zachary Lipton, Saurabh Garg  
International Conference on Machine Learning (ICML), 2023  
ICLR Workshop on Multimodal Representation Learning, 2023
- **Disentangling the Mechanisms Behind Implicit Regularization in SGD**  
**Zachary Novack**, Simran Kaur, Tanya Marwah, Saurabh Garg, Zachary Lipton  
International Conference on Learning Representations (ICLR), 2023  
**Spotlight** and **Best Poster** at NeurIPS Workshop on The Benefits of Higher-Order Optimization in Machine Learning, 2022

*Nonrefereed Papers*

- **Down the Rabbit Hole: Modeling Twitter Dynamics through Bayesian Inference**  
**Zachary Novack**  
Senior Honors Thesis (Carnegie Mellon University), 2022
- **Personalized Sequential Recommendation for Adaptive Itemization in MOBA Games**  
**Zachary Novack**  
Web Mining and Recommender Systems (CSE 258) Course Project (UC San Diego), 2022
- **Towards Generalizable Deep Speech Anonymization**  
Aaron Broukhim, **Zachary Novack**  
Deep Generative Models (CSE 291) Course Project (UC San Diego), 2022

- [Approximating Optimal Transport via GANs for Recourse Disparity Analysis](#)  
Zachary Novack, Qi Xuan Teo, Ryan Steed  
Probabilistic Graphic Models (10-708) Course Project (Carnegie Mellon University), 2022
- [Tracking Political Sentiment on Cold War China in Congressional Speeches](#)  
Zachary Novack, Eden Hu, and Mason Lin  
**1st Place** at Statistics and Data Science Research Showcase (Carnegie Mellon University), 2021
- [Lunch at the EigenSalad Bar: Linear Approaches to Dimensionality Reduction for Image Processing](#)  
Zachary Novack  
Numerical Linear Algebra (21-344) Course Project (Carnegie Mellon University), 2021

*Blog Posts*

- [Armchair Statistics: Benford's Law and other Misconceptions in the Age of Data](#)  
Zachary Novack  
Carnegie Mellon University Triple Helix, 2021

**TEACHING  
EXPERIENCE**

*Graduate Teaching Assistant*

University of California - San Diego, San Diego, CA

- CSE 258: Web Mining and Recommender Systems Fall 2023  
*Prof. Julian McAuley*

*Undergraduate Teaching Assistant*

Carnegie Mellon University, Pittsburgh, PA

- 10-600: Machine Learning Primer Summer 2022  
*Prof. Matthew Gormley*
- [10-301/601: Introduction to Machine Learning](#) Fall 2021 - Summer 2022  
*Prof. Matthew Gormley and Henry Chai*
- 85-340: Research Methods for Social Psychology Fall 2021  
*Prof. David Creswell*
- 36-225: Introduction to Probability Theory Summer 2021  
*Prof. Peter Freeman*
- 36-226: Introduction to Statistical Inference Spring 2021  
*Prof. Peter Freeman and Nynke Niezink*
- 88-300: Programming for Social Scientists Summer 2020 - Spring 2021  
*Prof. Mark Patterson*

**ACADEMIC  
SERVICE**

**Reviewer:** ICLR (2023), ICASSP (2023), NeurIPS (2023)

**Ph.D. Admissions Committee:** CSE Department, UCSD (2023)

**Ph.D. Visit Day Committee:** CSE Department, UCSD (2023)

**MUSICAL  
ACTIVITIES**

**Teaching Experience**

*Front Ensemble Technician*

[POW Percussion Ensemble](#), Anaheim, CA

Fall 2023 - Present

- Audio Team* Summer 2023 - Present  
[Pacific Crest Drum & Bugle Corps](#), Diamond Bar, CA
- Facilitated design and live interfacing with large-scale audio rig for 150 active performers
- Front Ensemble Coordinator* Fall 2019 - Summer 2020  
[Gateway Senior High School](#), Monroeville, PA
- Led rehearsals and designed pedagogical structure for the front ensemble (non-mobile percussion) in Gateway's marching band and indoor percussion programs, working with a group of 10-15 students from ages 14-18.
- Performer and Composer* Spring 2019 - Spring 2020  
[Exploded Ensemble](#), Carnegie Mellon University, Pittsburgh, PA
- Designed large-scale Max/MSP programs for multimedia interactive performances
  - Composed electro-acoustic pieces for mixed instrumentation ensembles
- Percussion Arranger* Fall 2018 - Spring 2019  
[Tomball High School Indoor Percussion](#), Tomball, TX
- Arranged musical production for large percussion ensemble in order to compete in the Winter Guard International (WGI) national circuit

## Projects

- RoboPierre* Spring 2020  
 Adaptive Impressionist Music via Generative Modeling
- Developed interactive web app to randomly generate polyphonic music trained on impressionistic composers
  - Implemented using Google Magenta's Polyphony RNN and custom stochastic voice leading algorithm
- ThereMyn* Spring 2019  
 Motion-Controlled Monophonic Synthesizer
- Used infrared distance monitor to drive audio signal creation
  - Created front-end GUI to translate audio signals into a usable motion-controlled synthesizer

## SKILLS

- Programming Languages and Packages*
- Python (Pytorch, Tensorflow, Scikit-Learn, PySpark, CVXPY), R (dplyr, tscout, zoo), C, Matlab, SQL (postgres, MySQL), Stan, Git, Shell, Max/MSP/Jitter
- Other Skills*
- AWS (S3, EC2, EMR), Microsoft Azure, Docker, Agile, Jira, Grafana, Ableton Live

## SELECTED COURSEWORK

**UC San Diego**  
 Deep Generative Models, Search and Optimization, Information Visualization, Recommender Systems, Computing Education, Math for Robotics

**Carnegie Mellon University**  
 Probabilistic Graphical Models, Convex Optimization, Multimedia Signal Processing, ML w/Large Datasets, Real Analysis, Numerical Linear Algebra, Probability &

Statistics, Statistical Computing, Linear Algebra, Philosophy of ML, Algorithms & Data Structures