

PAT 204/504 (Fall 2025)

Creative Coding

Lecture 21: Case Studies

Instructor: Hao-Wen Dong

Project: Presentation & Report

- **Presentation** in class on **Dec 1**
 - **10-min** presentation that demonstrates your design, implementation, results and discussion
 - You may follow any structure that best suits your narrative
- **Report** due at **11:59pm ET** on **Dec 15**
 - A **1 to 2-page** (excluding references) report that summarizes your design, implementation, results and discussion
 - You may use any template
- **No late submissions!** Submit your work early and update it later.



Project: Rubrics

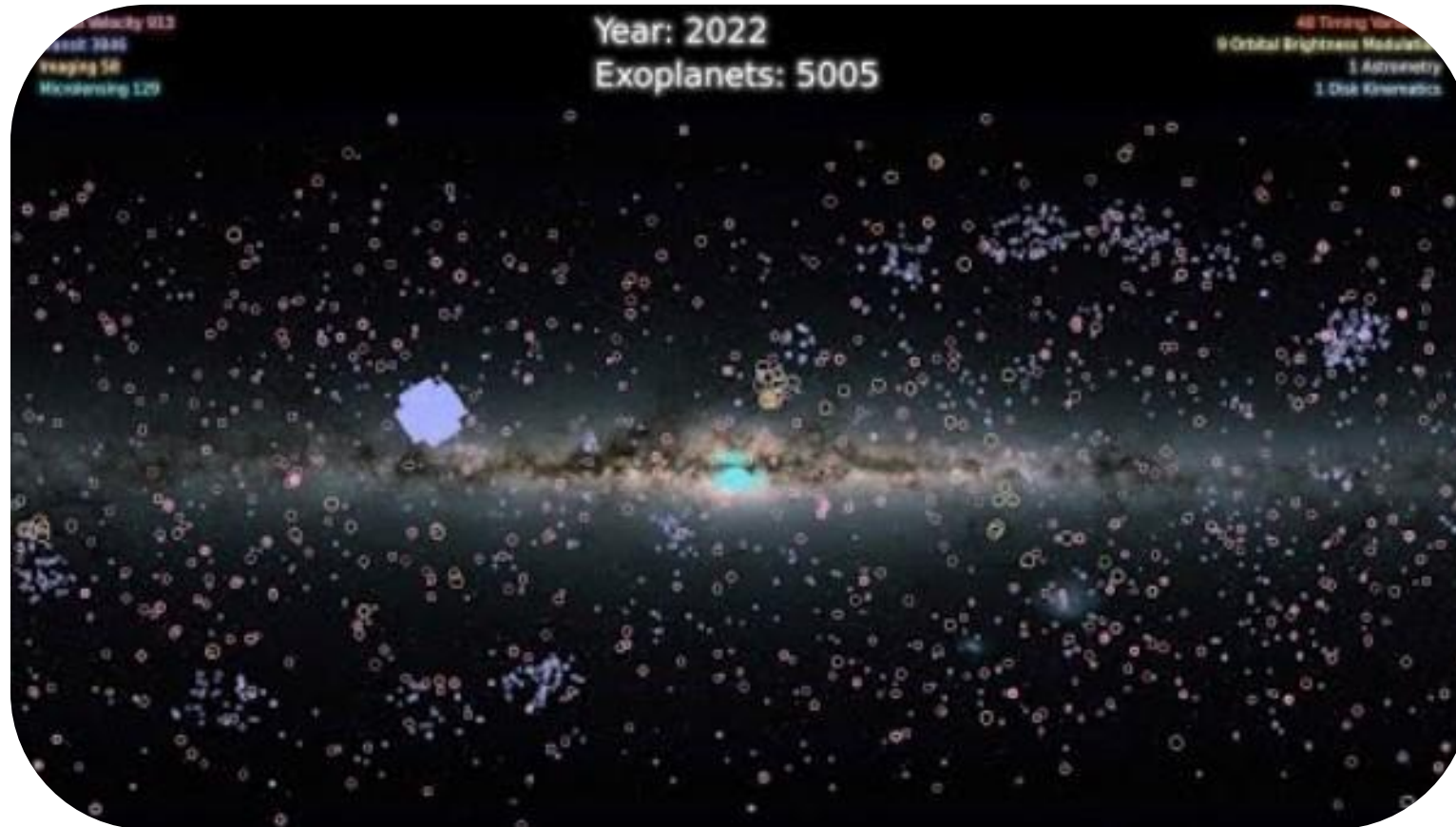
- **Presentation (20pt)**
 - Attendance (10pt)
 - Clarity (5pt)
 - Organization & presentation (5pt)
- **Report (20pt)**
 - Writing clarity (5pt)
 - Organization & presentation (5pt)
 - Results (5pt)
 - Discussion (5pt)

| Course Evaluation

- Your feedback is highly appreciated!
- Enter at umich.bluer.com/umich

Scientific Data Sonification

5000 Exoplanets (Russo & Santaguida, 2022)



youtu.be/yv4DbU1CWAY

Radial Velocity 913
Transit 7846
Imaging 58
Microlensing 129

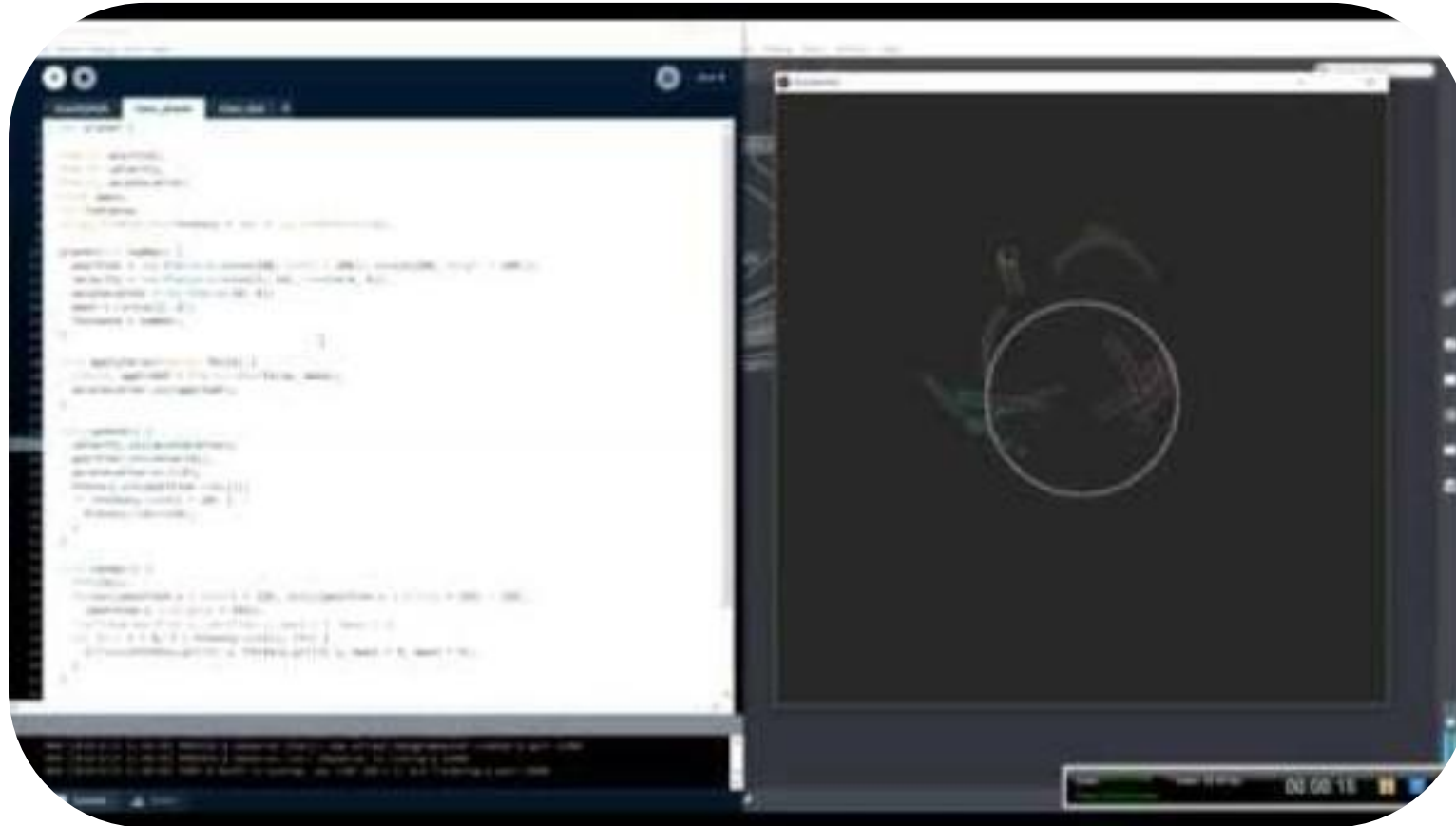
Year: 2022
Exoplanets: 5005

48 Timing Variations
9 Orbital Brightness Modulation
1 Astrometry
1 Disk Kinematics



Audiovisual Art

Processing Controlling Max/MSP



youtu.be/NdY7KshDdtM

Computer-assisted Orchestration

Orchidea & MaxOrch (Cella, 2022; Lesueur & Bloland, 2022)

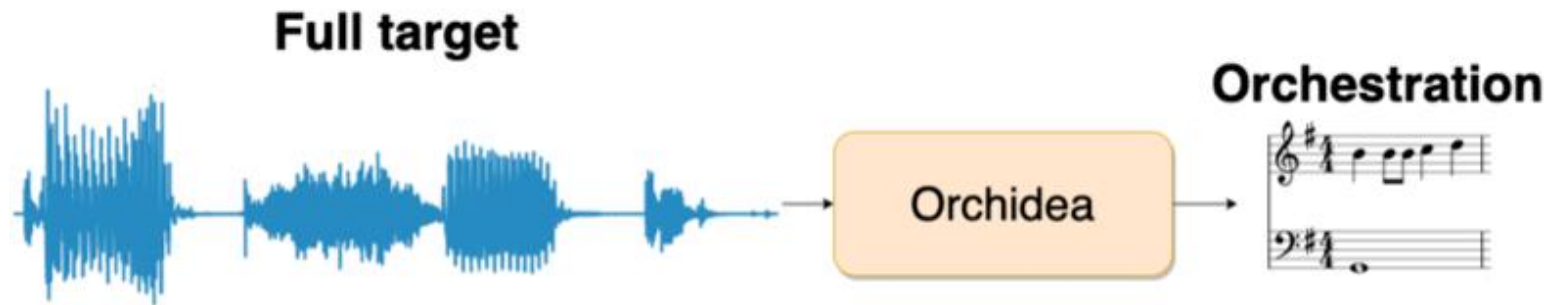


youtu.be/ltups7UrTh4?t=3807



youtu.be/ltups7UrTh4?t=3933

Orchidea (Cella, 2022)



(Source: orch-idea.org)

Orchidea (Cella, 2022)

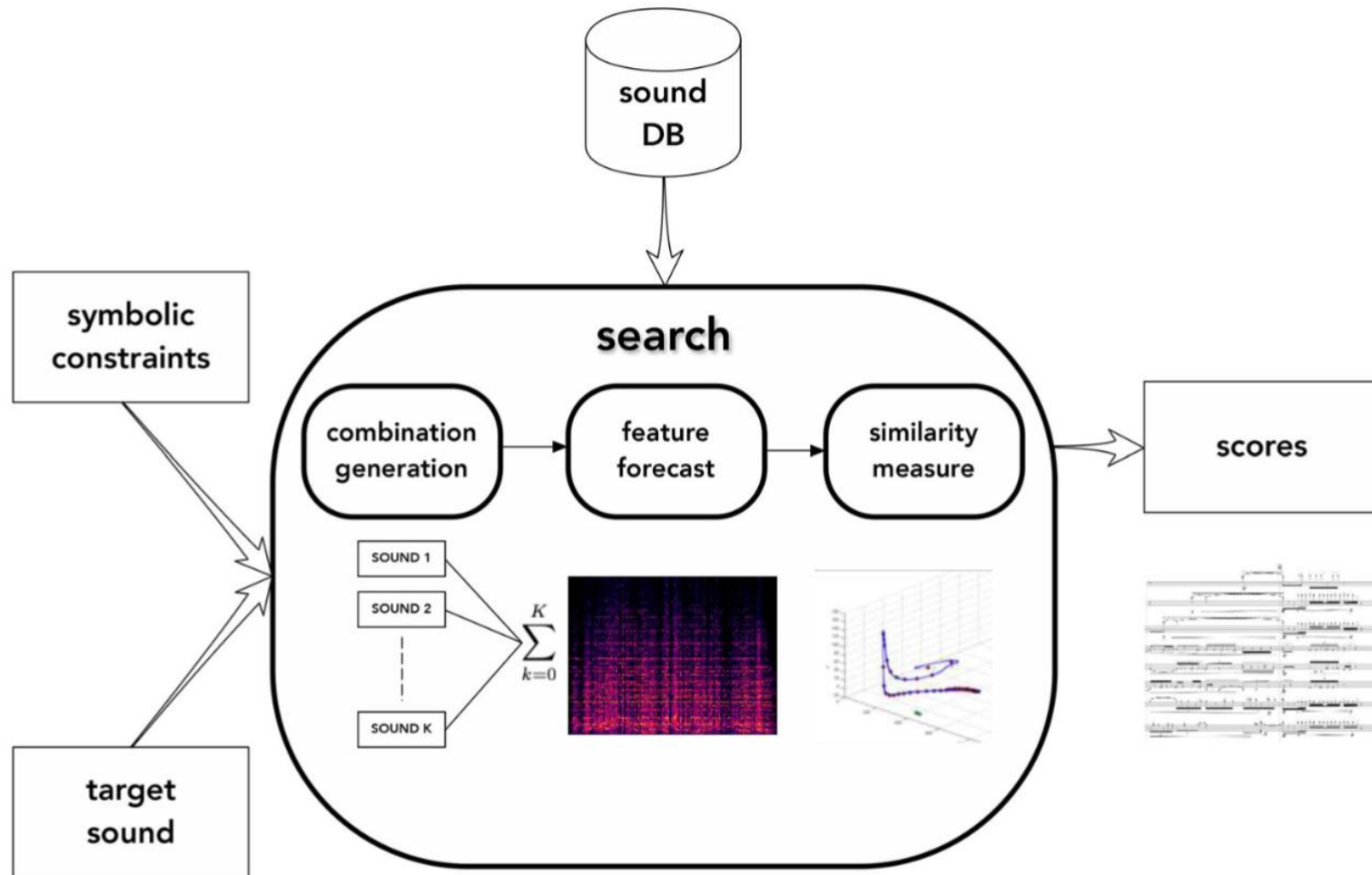
Target: Cars



Created by Yu luck
from Noun Project

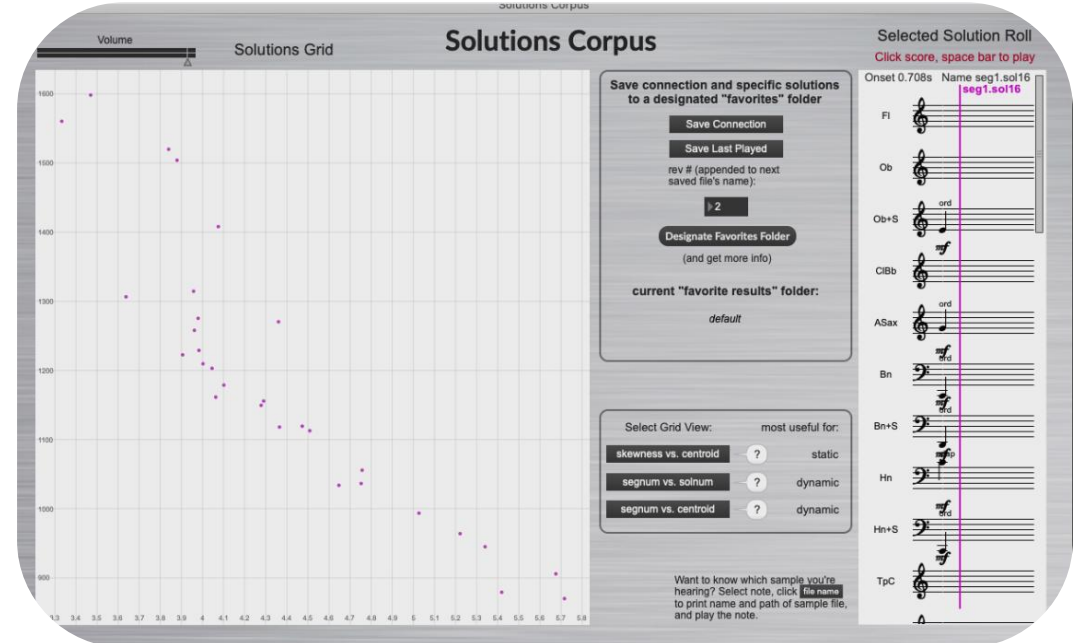
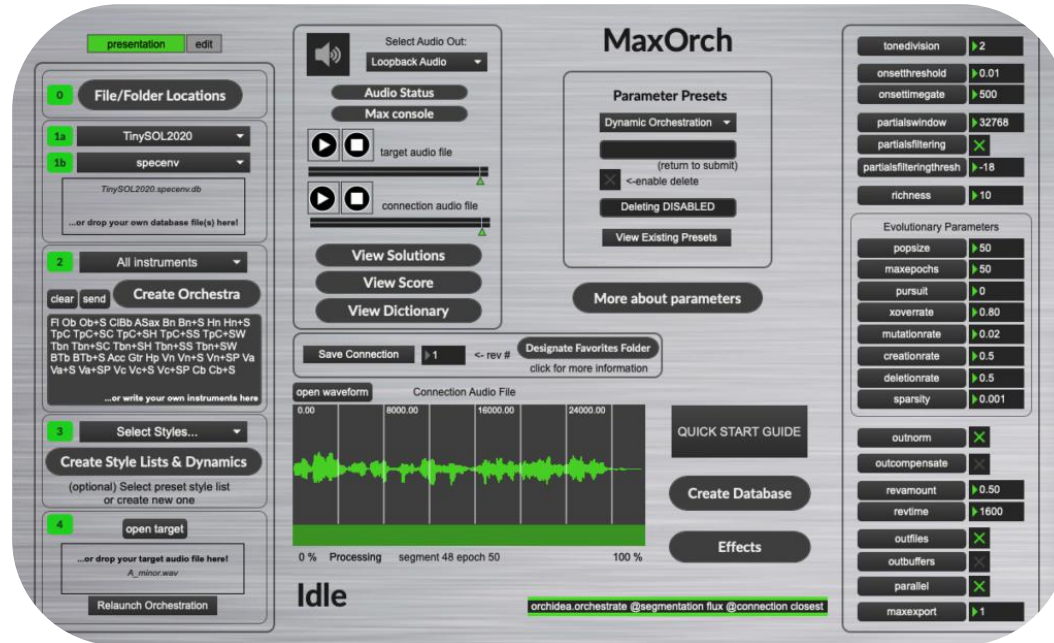
perbloland.com/maxorch-about

Orchidea (Cella, 2022)



(Source: Cella, 2022)

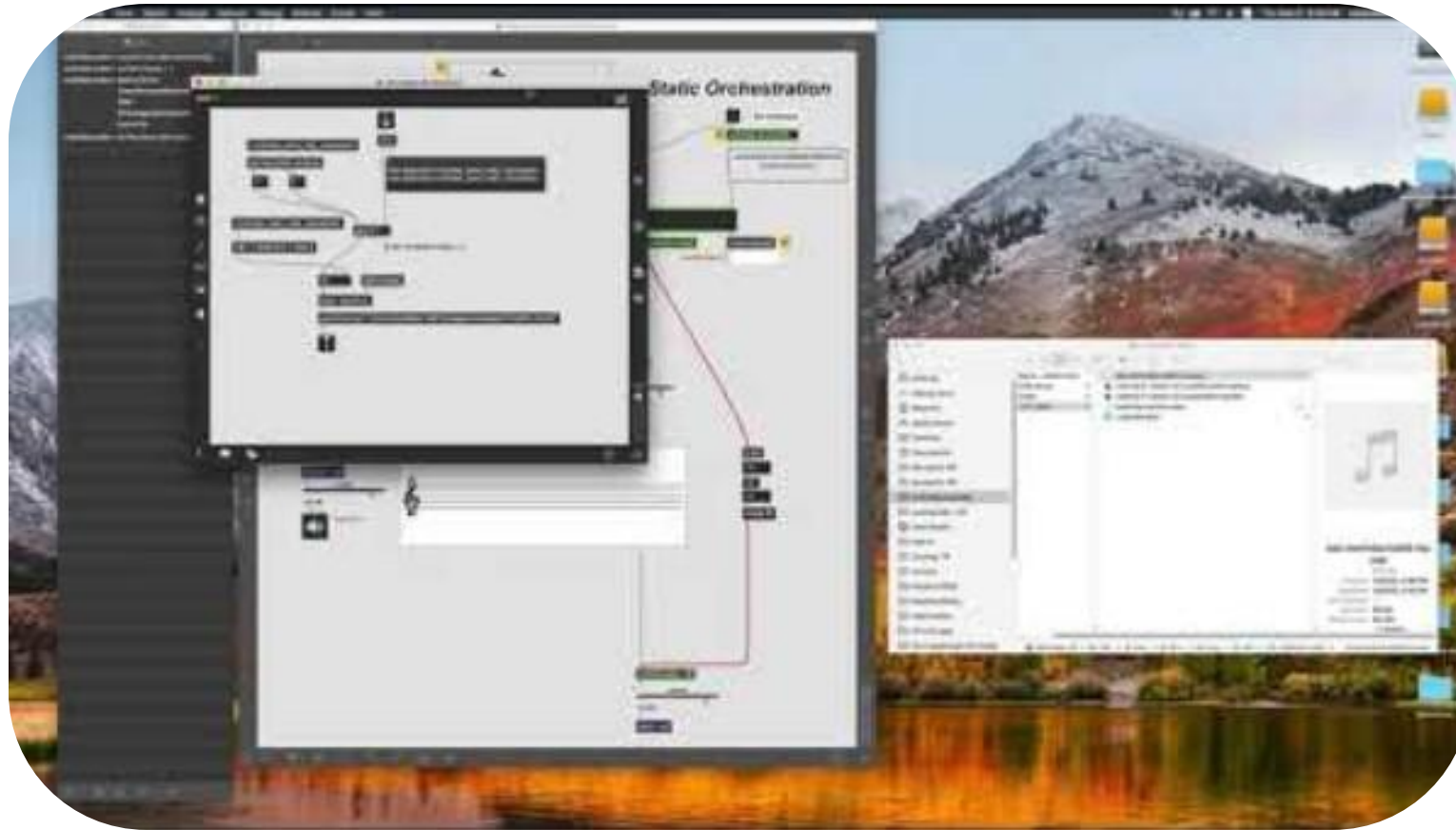
MaxOrch (Lesueur & Bloland, 2022)



(Source: orch-idea.org)

perbloland.com/maxorch-about

Orchidea & MaxOrch (Cella, 2022; Lesueur & Bloland, 2022)



youtu.be/DJh6zTe6T80

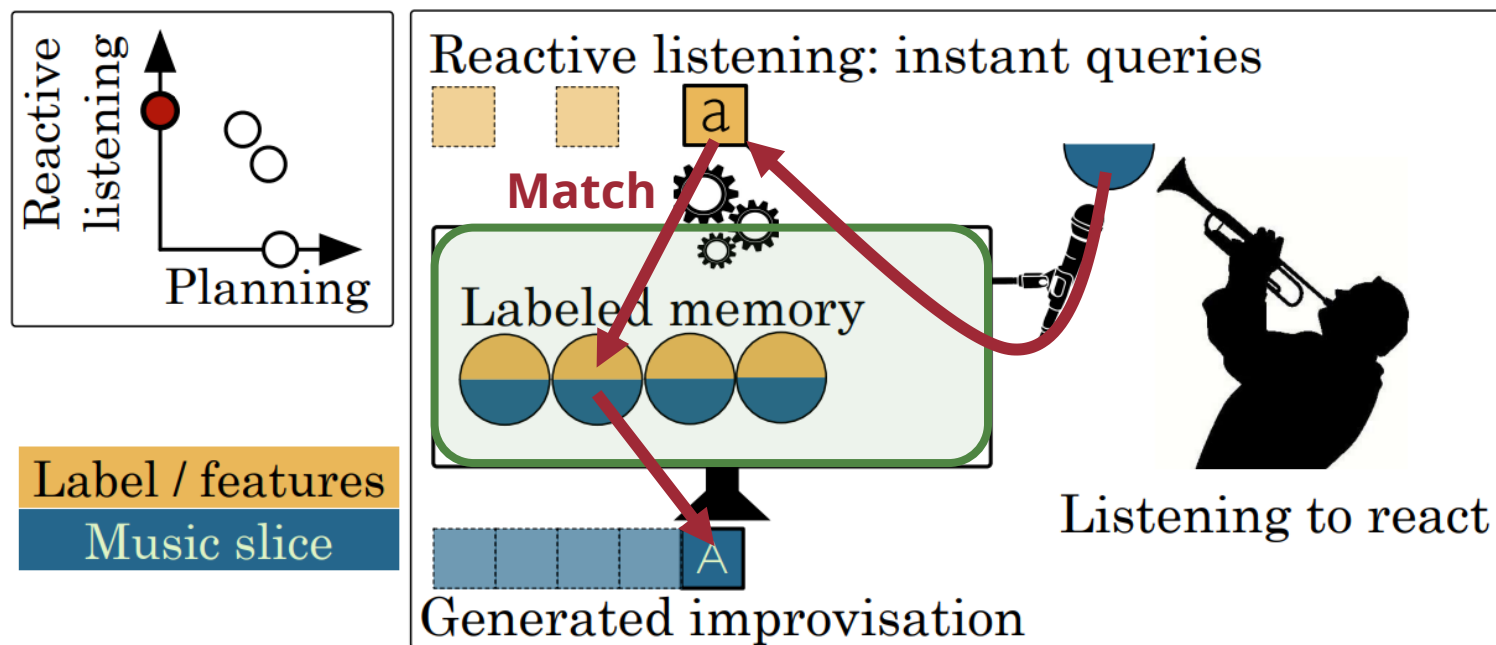
Interactive Improvisation

| AI Creative Agents (2015)



youtu.be/DggF9m9xqik & github.com/DYCI2/Dicy2

Somax: Generation by Reactive Listening (Bonnasse-Gahot, 2014)

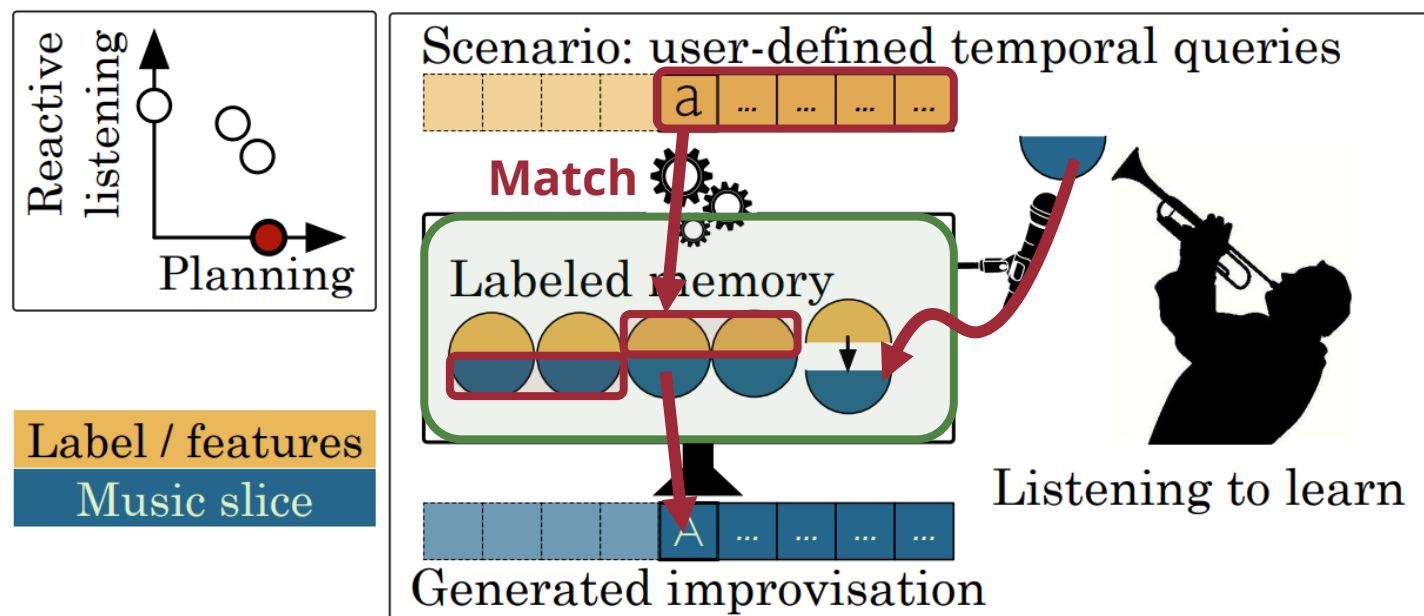


(Source: Nika et al., 2017)

Laurent Bonnasse-Gahot, "An update on the SOMax project," *Ircam*, 2014.

Jérôme Nika, Ken Déguernel, Axel Chemla-Romeu-Santos, Emmanuel Vincent, and Gérard Assayag, "DYCI2 agents: merging the "free", "reactive", and "scenario-based" music generation paradigms," *ICMC*, 2017.

ImproteK: Generation Guided by a Scenario (Nika et al., 2017)

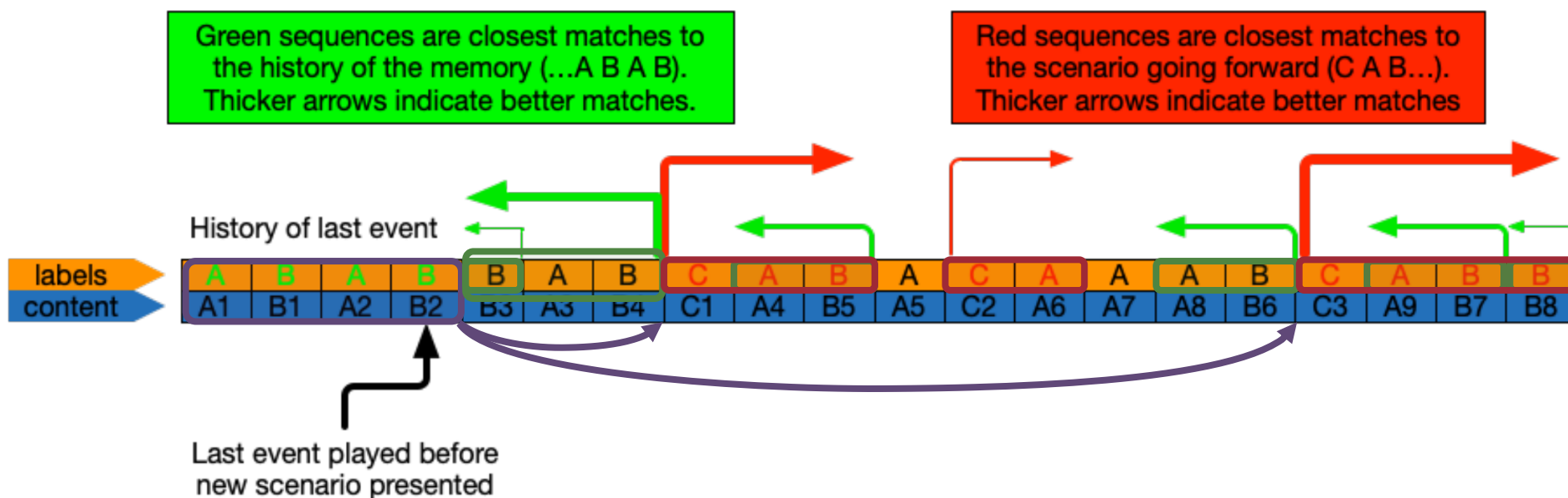


(Source: Nika et al., 2017)

ImproteK: Generation Guided by a Scenario (Nika et al., 2017)

For the scenario **C A B B C C B A**:

Matching both the **history of the memory** and the **future of the scenario**



(Source: Nika et al., 2022)

| Improvising with SomaX



youtu.be/AGZ4BaSqL4k

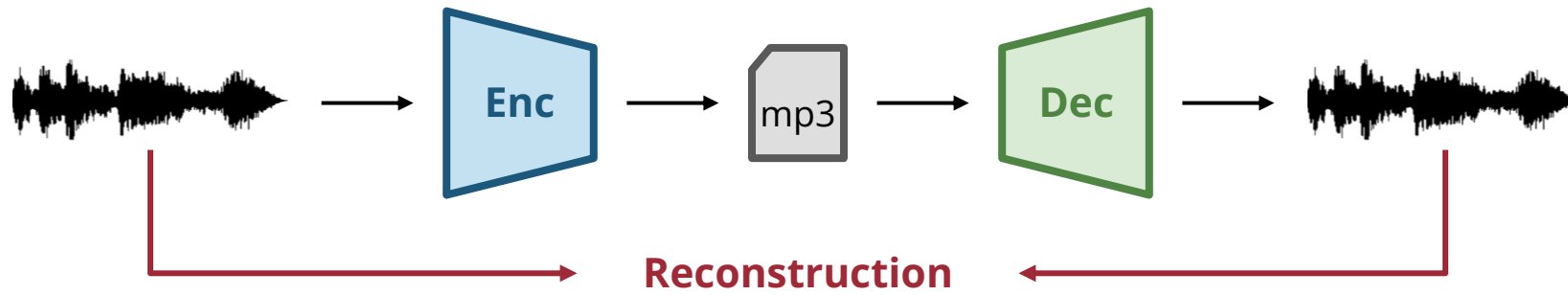
Neural Audio Synthesis

RAVE (Caillon & Esling, 2022)

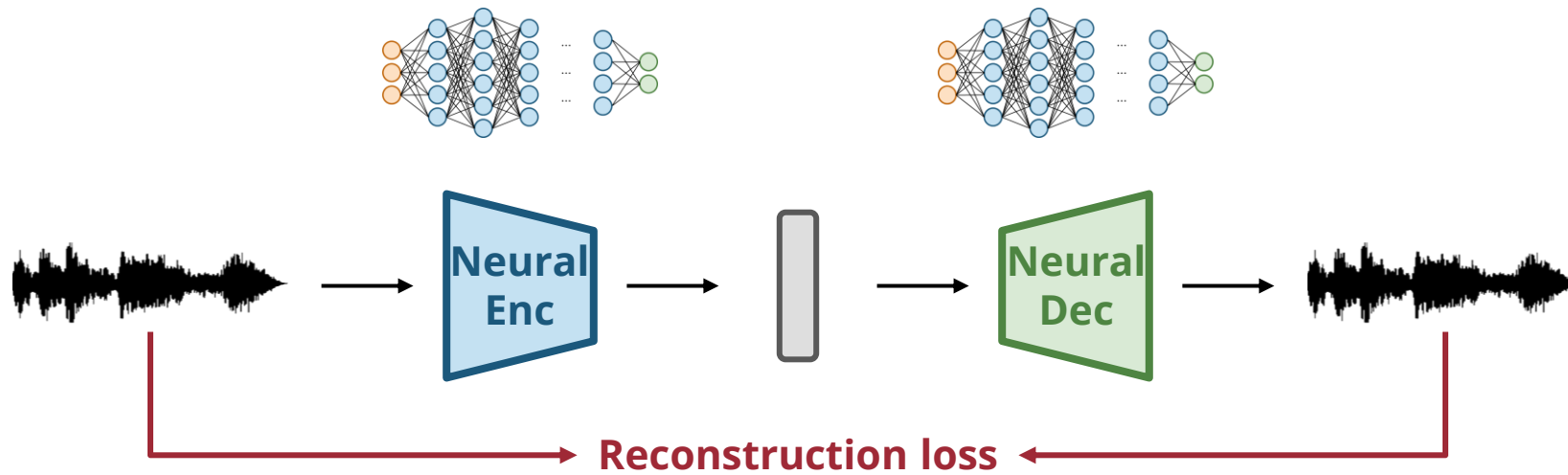


youtu.be/dMZs04TzxUI & github.com/acids-ircam/RAVE

| Codec

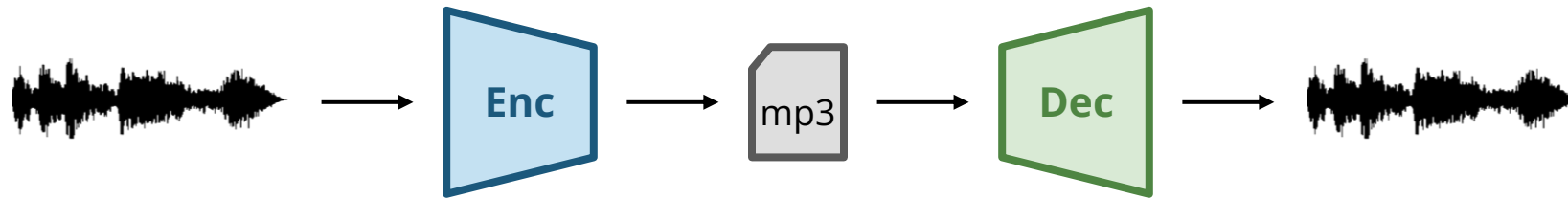


Neural Codec

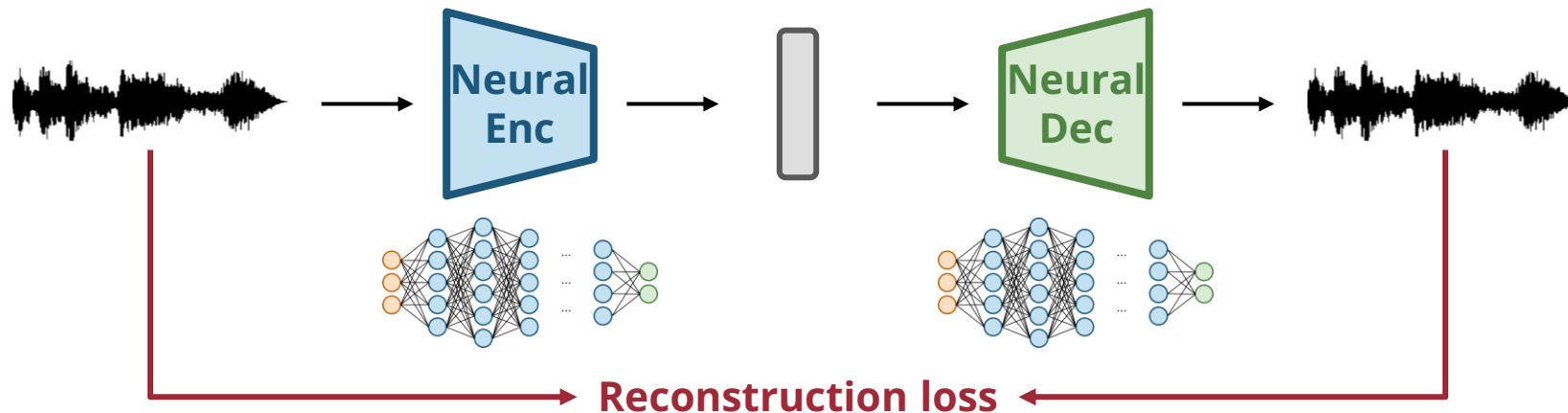


Traditional vs Neural Codecs

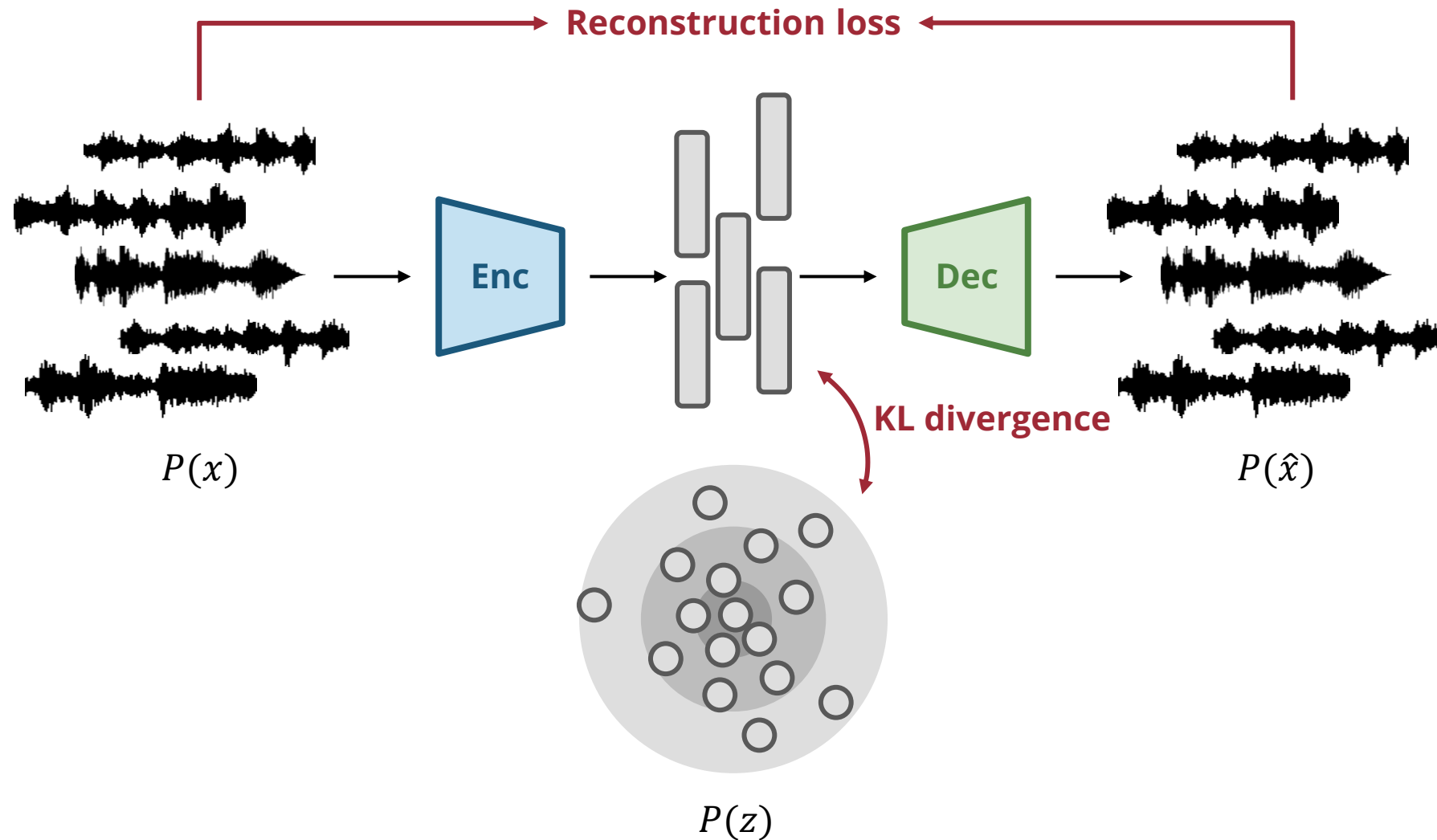
Traditional Codec



Neural Codec

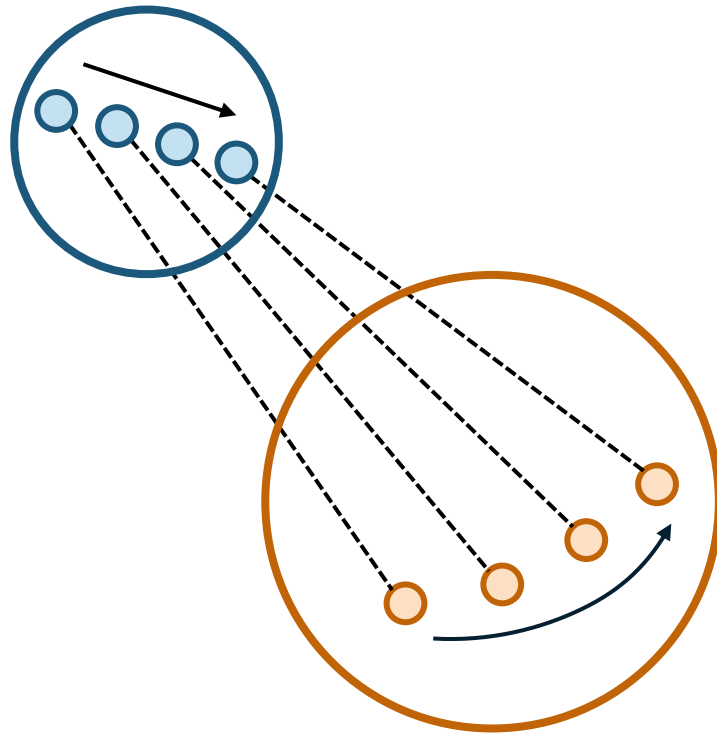


Training a Variational Autoencoders (VAEs)

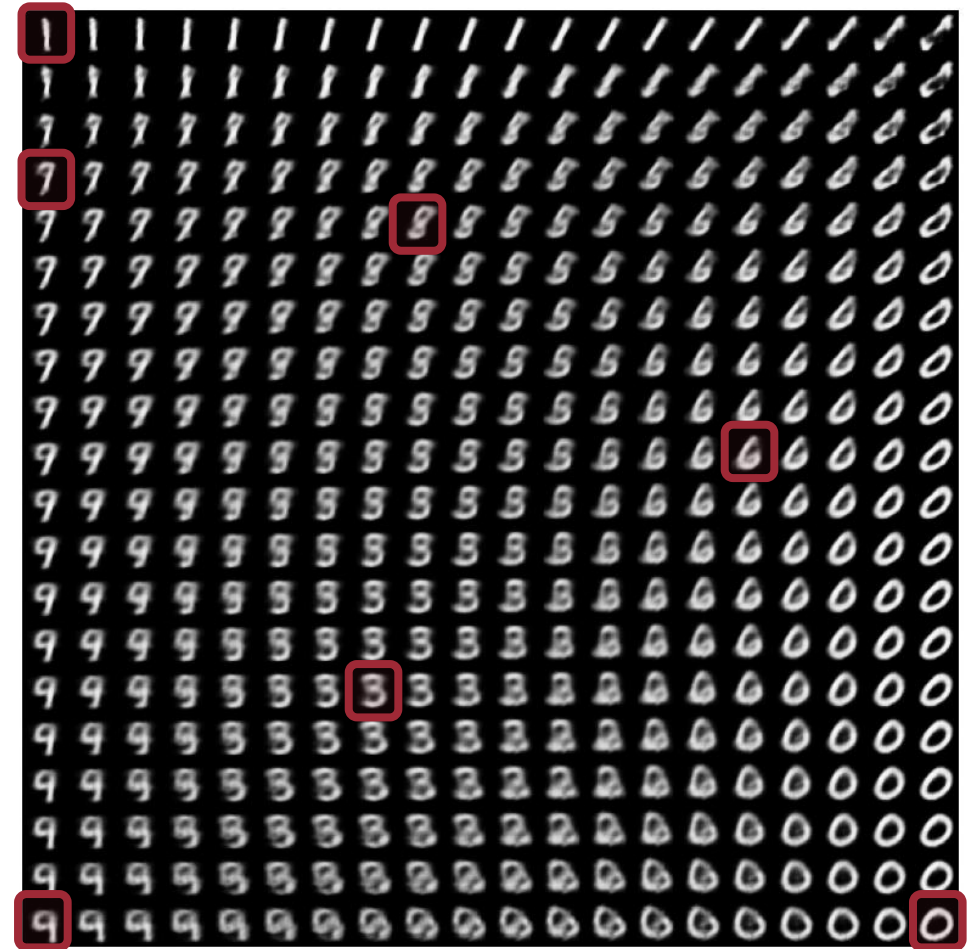


Decoding the Latent Space of a VAE

Latent space



Data space



(Source: tensorflow.org)

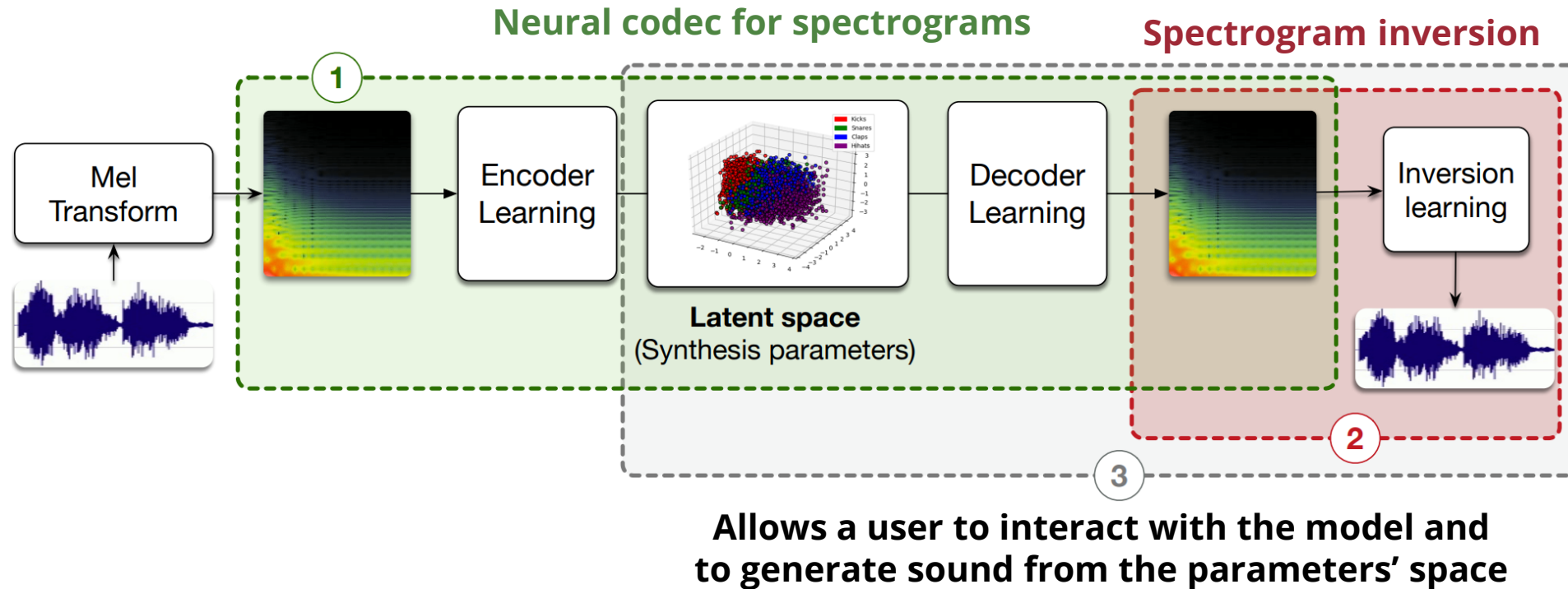
RAVE (Caillon & Esling, 2022)



youtu.be/jAIRf4nGgYI & github.com/acids-ircam/RAVE

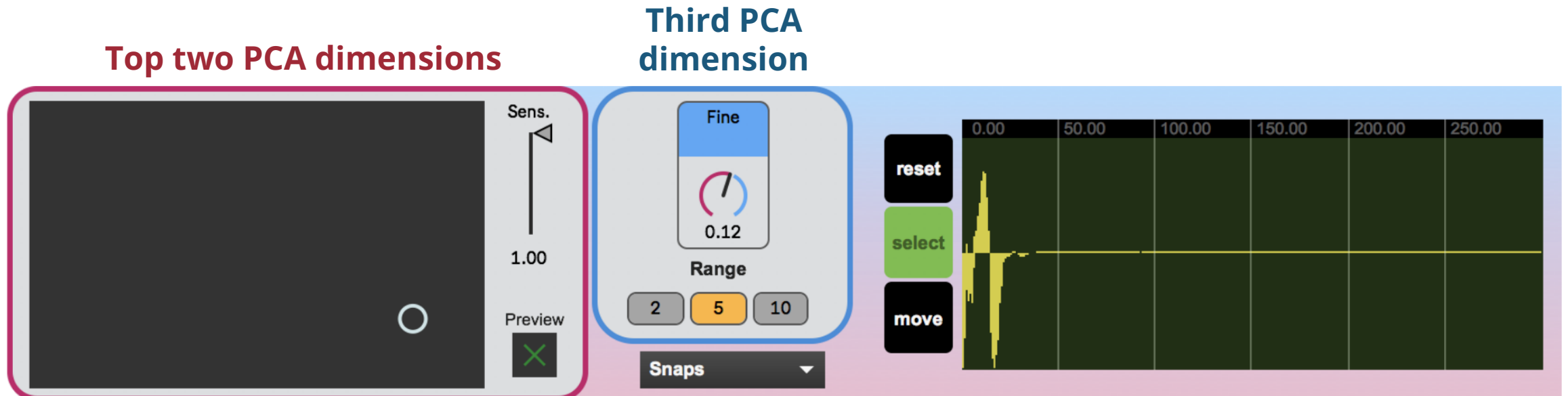
Neural Drum Machine

Neural Drum Machine (Aouameur et al., 2019)



(Source: Aouameur et al., 2019)

Neural Drum Machine (Aouameur et al., 2019)



(Source: Aouameur et al., 2019)

drive.google.com/file/d/1DDo0_KnwkWirCM4t0PT8cp6uotsfuufj/view

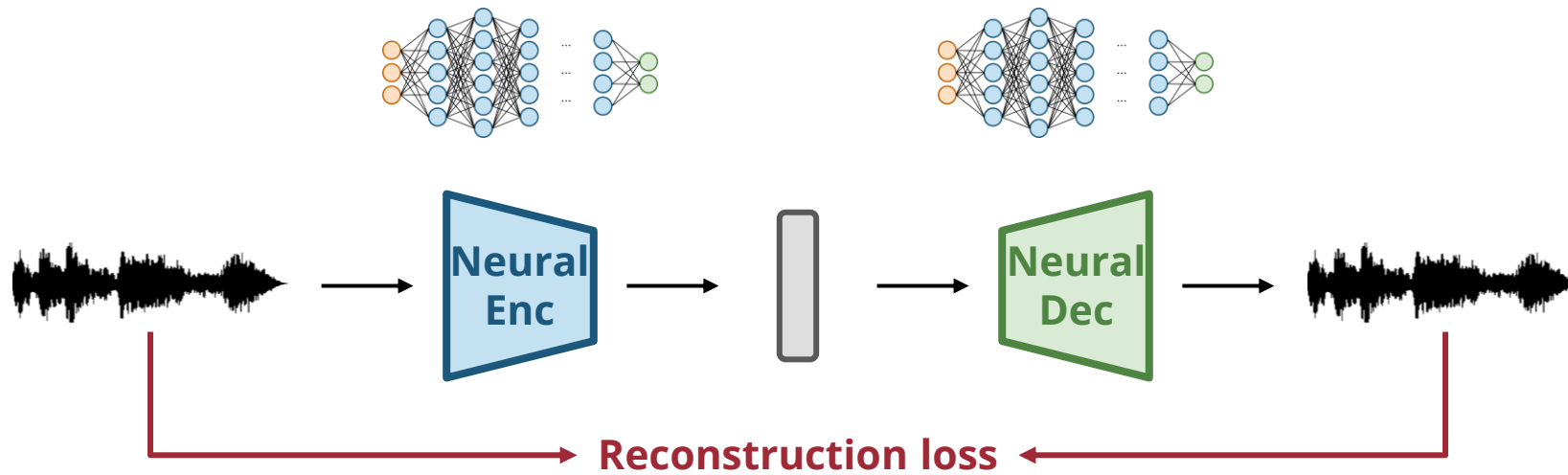
Neural Looper

unloop (Garcia et al., 2023)

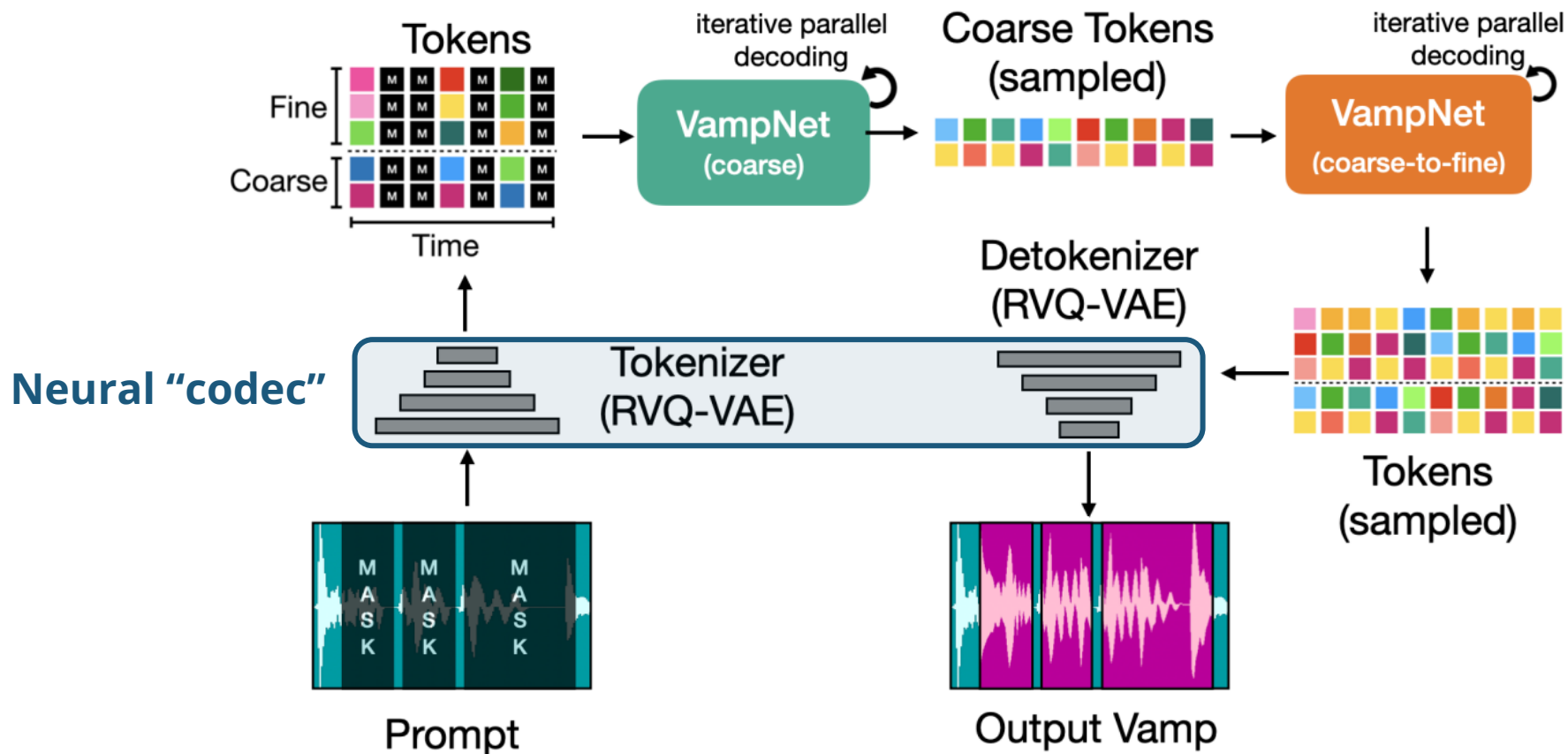


youtu.be/yzBl8Vcjd2s & github.com/hugofloresgarcia/unloop

Neural Codec

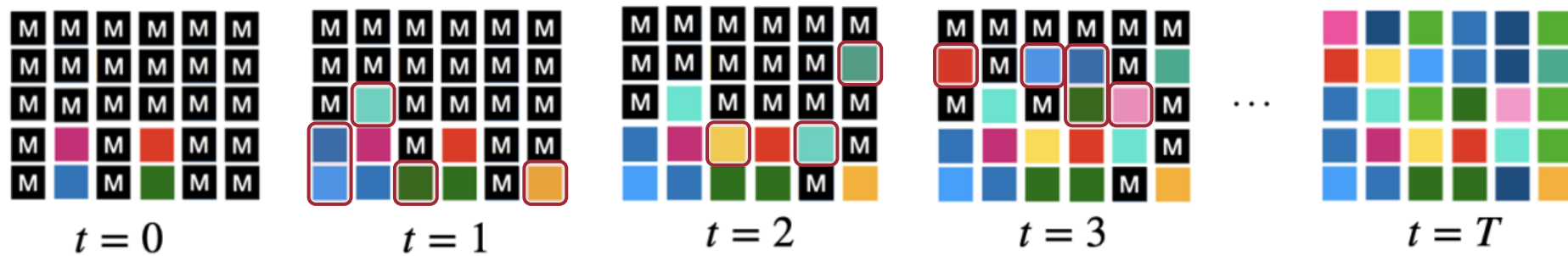


VampNet (Garcia et al., 2023)



(Source: Garcia et al., 2023)

VampNet (Garcia et al., 2023)

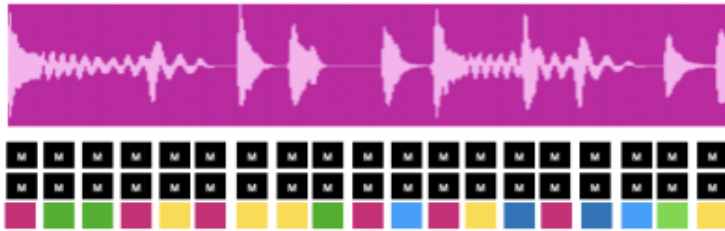


(Source: Garcia et al., 2023)

Sample a subset of the **most confident predicted tokens** in each iteration

VampNet (Garcia et al., 2023)

Compression



Beat Driven

 = predicted beat mark



Periodic

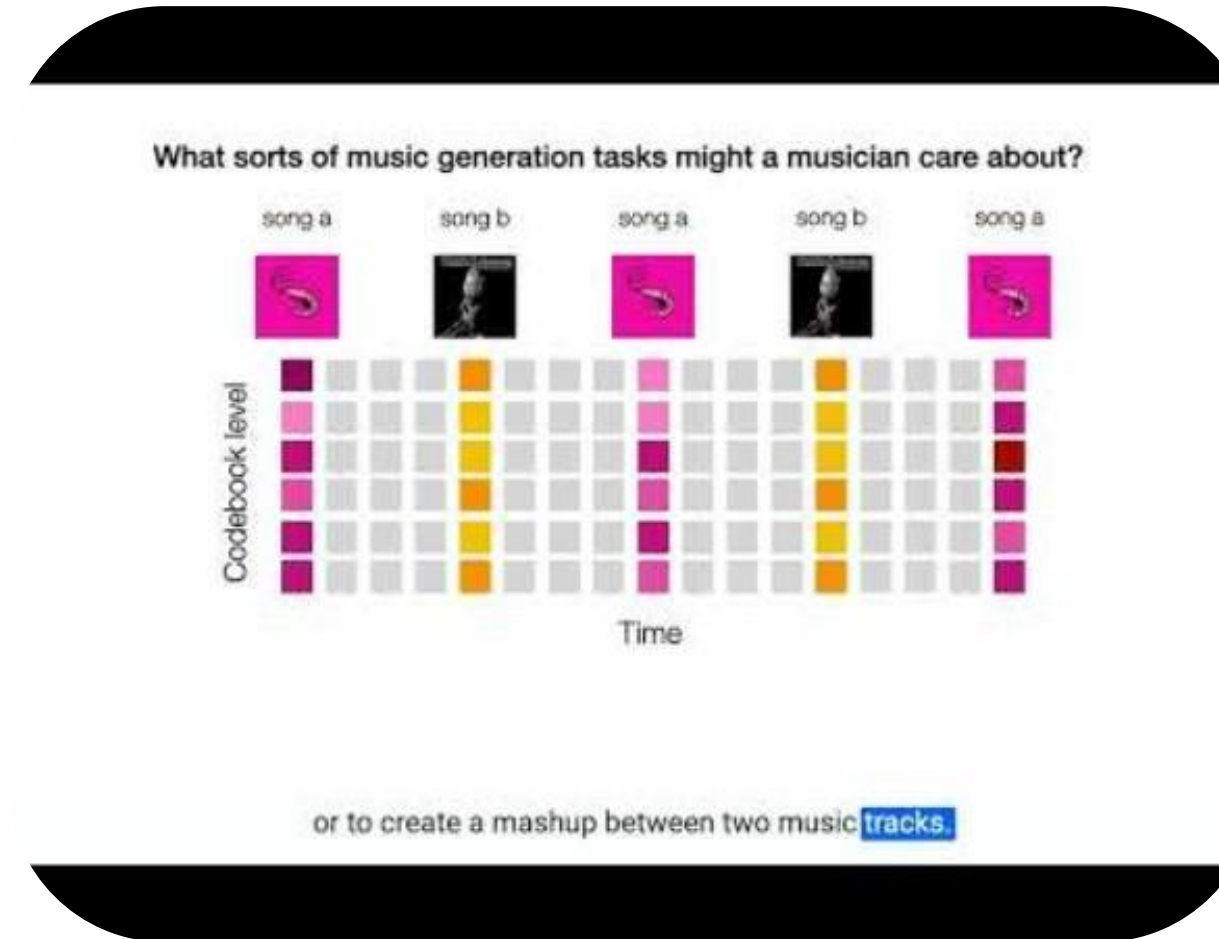


Inpainting



(Source: Garcia et al., 2023)

VampNet (Garcia et al., 2023)



youtu.be/3XfeWIV9Cp0

unloop (Garcia et al., 2023)



youtu.be/yzBl8Vcjd2s & github.com/hugofloresgarcia/unloop

Sonifying Hubble Deep Field





Course Promos

Music & AI

Learn about AI's applications in music for analysis, creation, processing and retrieval



PAT 463/563 (Fall 2025)

Mon & Wed 1:30-3PM @ Moore 376 (Davis)

Instructor: Hao-Wen Dong



PERFORMING ARTS TECHNOLOGY
UNIVERSITY OF MICHIGAN

Fall 2026
Music and AI
(PAT 463/563)

Learn about AI's applications in music for analysis, creation, processing & retrieval

Generative AI for Music & Audio Creation

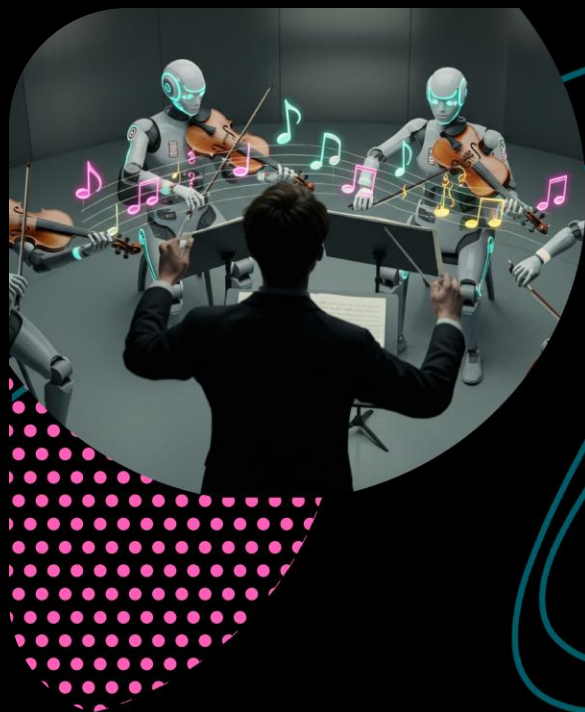
Winter 2026
Generative AI for Music and Audio Creation
(PAT 464/564)

Dive deeper into GenAI for music & audio

PAT 464/564 (Winter 2026)
Instructor: Hao-Wen Dong



PERFORMING ARTS TECHNOLOGY
UNIVERSITY OF MICHIGAN



SUPERCONDUCTOR: **EXPLORING PLAYFUL HUMAN-AI** **MUSIC CO-CREATIVITY**

UARTS FACULTY ENGINEERING/ARTS STUDENT TEAMS (FEAST)
SCHOOL OF MUSIC, THEATRE & DANCE

HAO-WEN DONG
Assistant Professor
School of Music, Theatre & Dance



Winter-Fall 2026

UARTS FEAST

Join an interdisciplinary research team
Apply by October 12

Final Thoughts

