

PAT 204/504 (Fall 2024)

# Creative Coding

## Lecture 24: Case Studies

Instructor: Hao-Wen Dong



SCHOOL OF MUSIC, THEATRE & DANCE  
PERFORMING ARTS TECHNOLOGY  
UNIVERSITY OF MICHIGAN

# Final Project

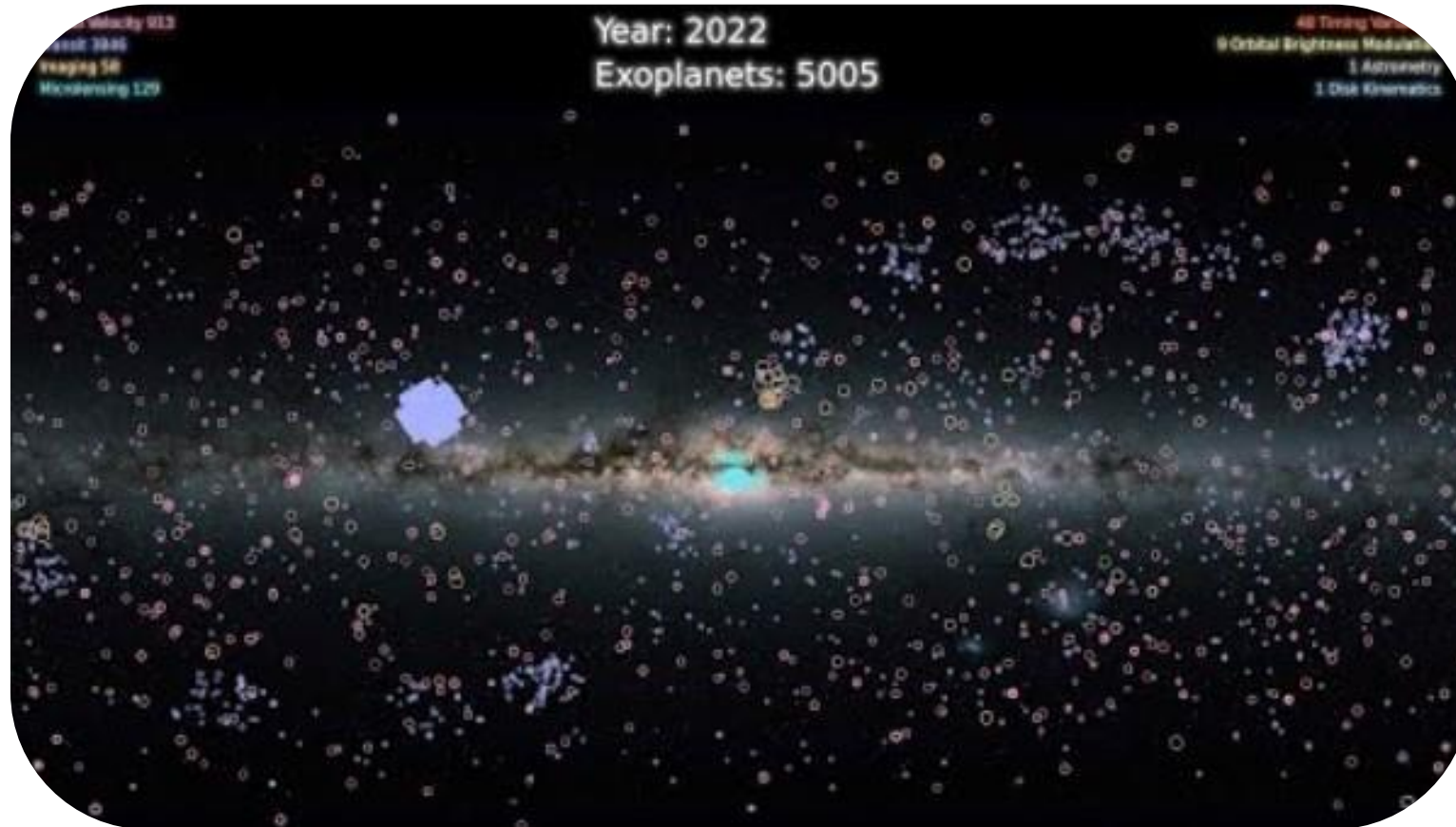
- Milestones (all due at the specified date at **11:59 PM ET**)
  - **Proposal**                      November 25                      Plans (1 page)
  - **Presentation**                  December 9                      Showcase & report
  - **Final report**                      December 15                      Full report (2-3 pages)
- Instructions will be released on Gradescope
- Late submissions: **NOT accepted**

# Final Project Rubrics

- **Proposal** 10pt
- **Presentation** 15pt
- **Final report** 25pt
  - Implementation 10pt
  - Code documentation 5pt
  - Explanation of design and implementation 10pt

# Scientific Data Sonification

# 5000 Exoplanets (Russo & Santaguida, 2022)



[youtu.be/yv4DbU1CWAY](https://youtu.be/yv4DbU1CWAY)

Radial Velocity 913  
Transit 7846  
Imaging 58  
Microlensing 129

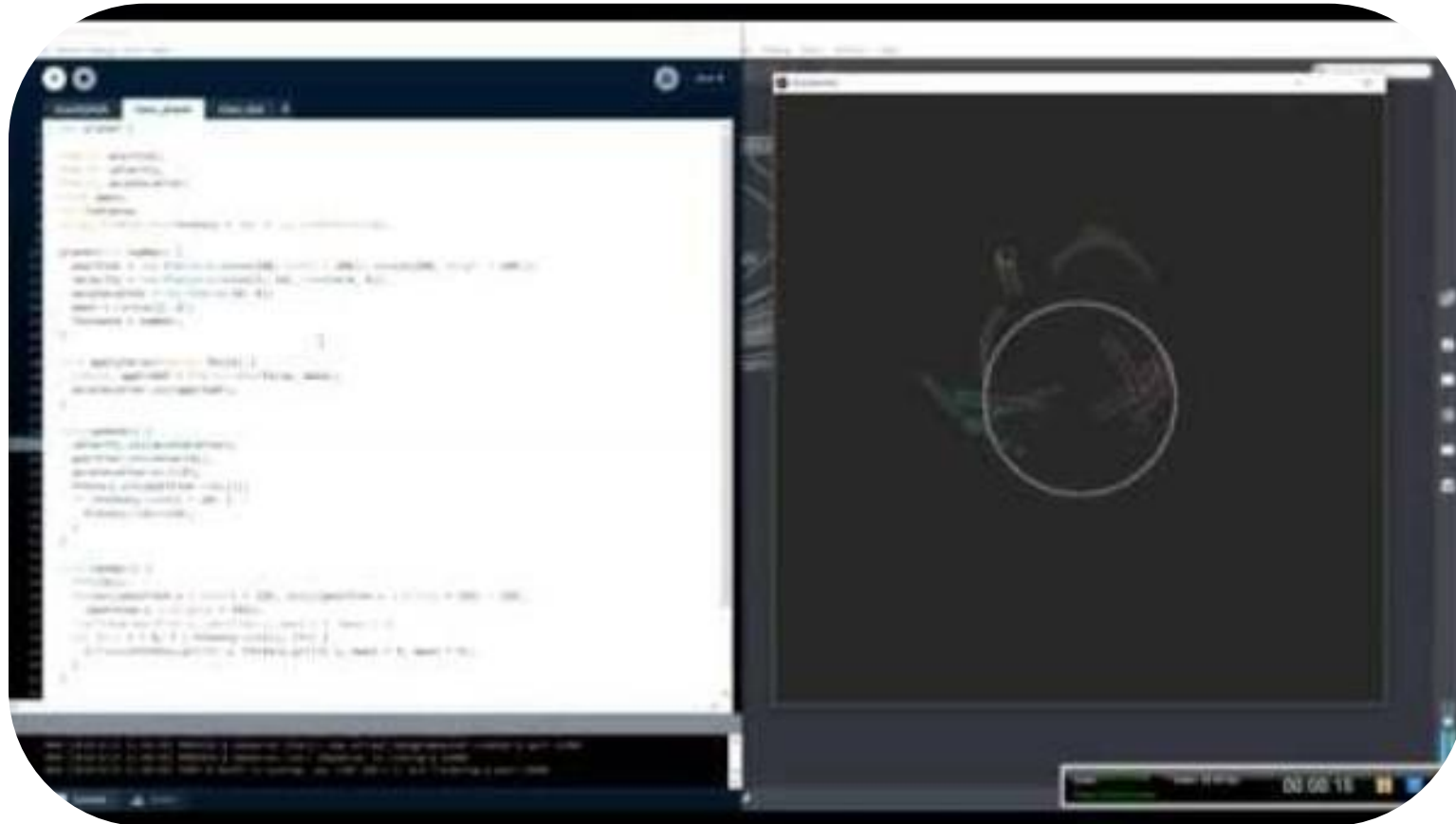
Year: 2022  
Exoplanets: 5005

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



# Audiovisual Art

# Processing Controlling Max/MSP



[youtu.be/NdY7KshDdtM](https://youtu.be/NdY7KshDdtM)



# Computer-assisted Orchestration

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

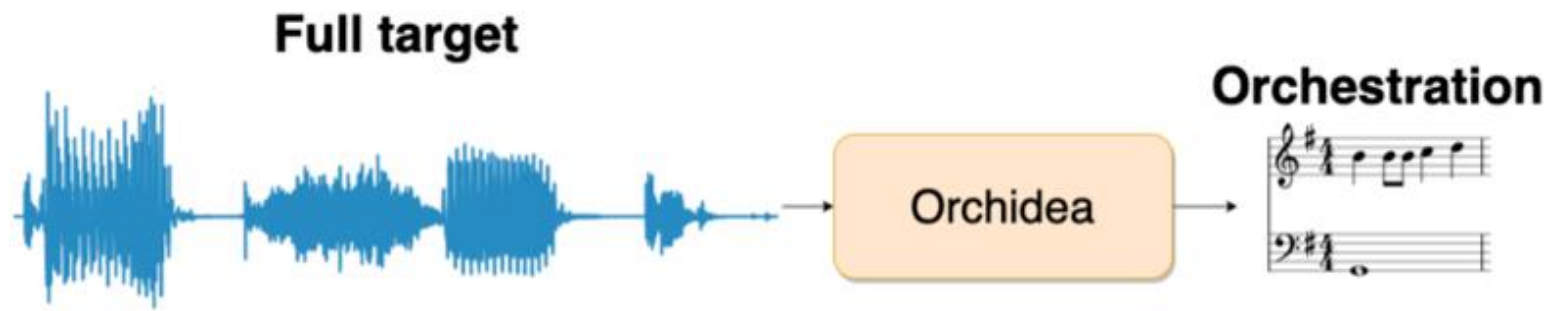


[youtu.be/ltups7UrTh4?t=3807](https://youtu.be/ltups7UrTh4?t=3807)



[youtu.be/ltups7UrTh4?t=3933](https://youtu.be/ltups7UrTh4?t=3933)

# Orchidea (Cella, 2022)



(Source: orch-idea.org)

# Orchidea (Cella, 2022)

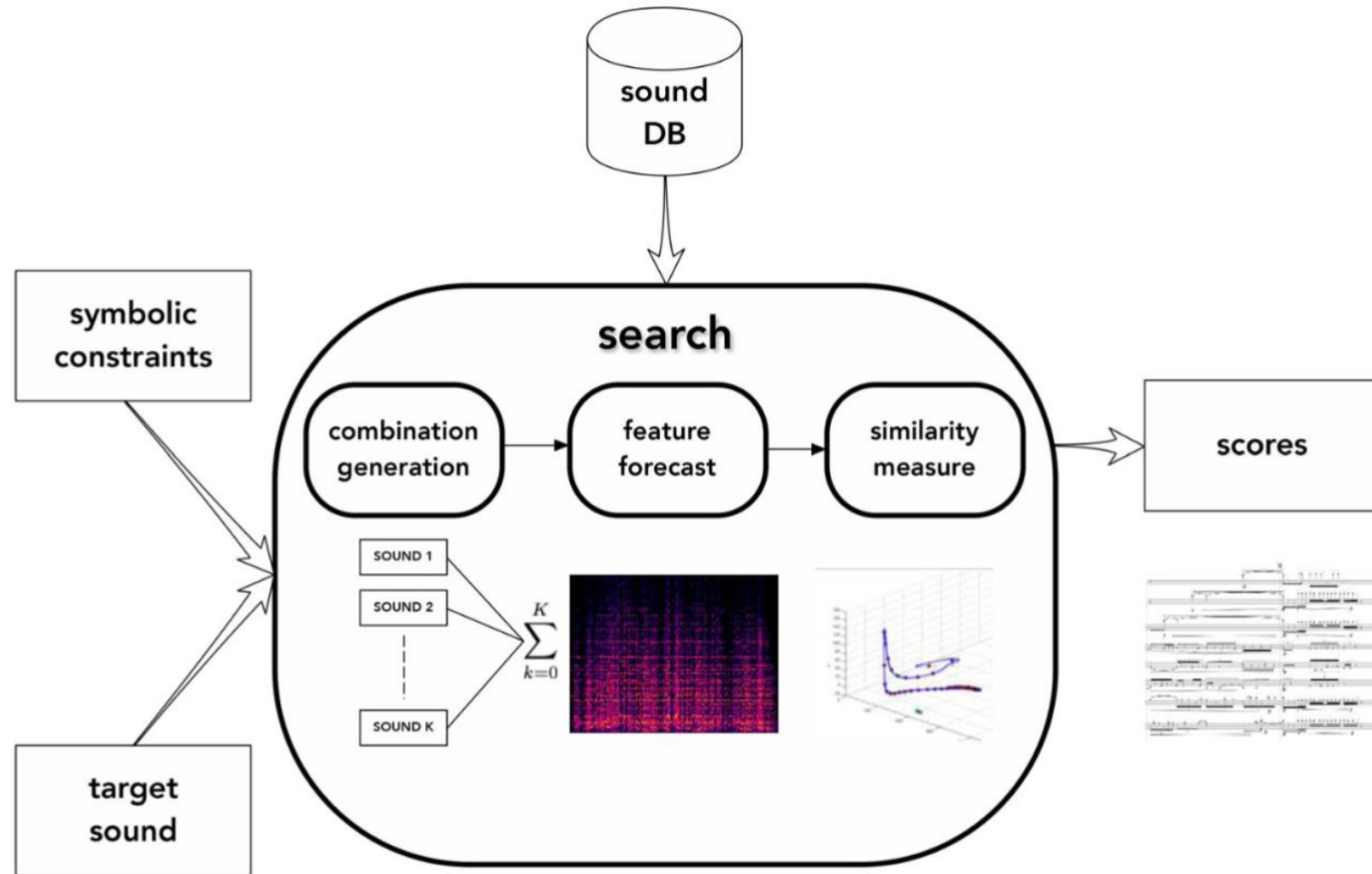
Target: Cars



Created by Yu luck  
from Noun Project

(Source: [orch-idea.org](http://orch-idea.org))

# Orchidea (Cella, 2022)



(Source: Cella, 2022)

# MaxOrch (Lesueur & Bloland, 2022)

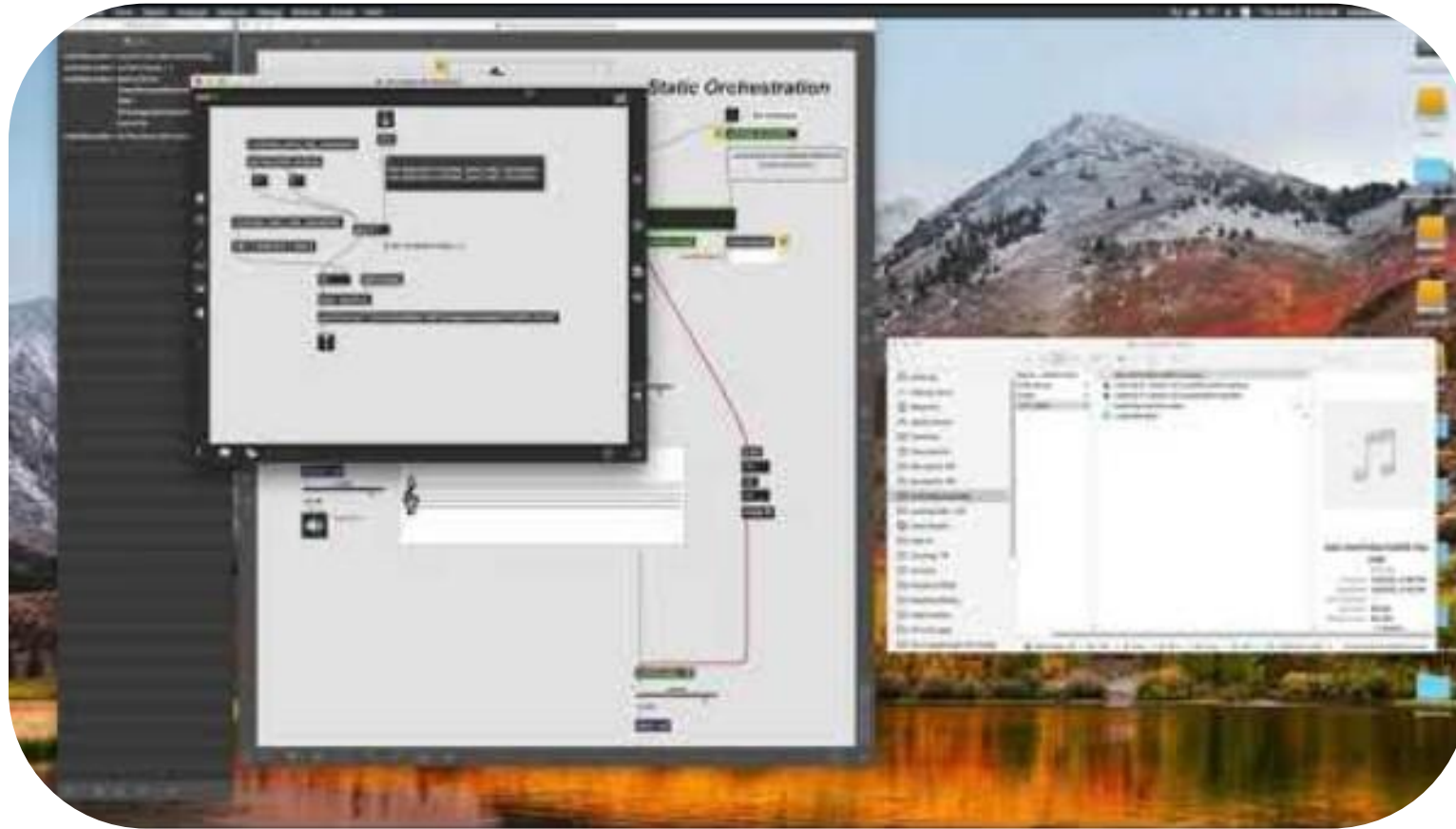
The screenshot displays the MaxOrch software interface, which is divided into several functional areas:

- File/Folder Locations:** Includes sections for TinySOL2020, specenv, and All Instruments, with options to create an orchestra and style lists.
- Audio Status:** Features a volume control, loopback audio, and buttons for audio status and max console.
- Parameter Presets:** A dropdown menu for Dynamic Orchestration with options to enable/delete, delete, and view existing presets.
- Evolutionary Parameters:** A list of parameters such as popsize, maxepochs, pursuit, xoverrate, mutationrate, creationrate, deletionrate, sparsity, outnorm, outcompensate, revamount, revtime, outfiles, outbuffers, parallel, and maxexport, each with a numerical value and a control icon.
- Solutions Grid:** A scatter plot showing the relationship between Volume (y-axis, 800-1600) and Solutions Grid (x-axis, 3.3-5.8).
- Solutions Corpus:** A panel for saving connections and solutions to a designated "favorites" folder, including buttons for Save Connection, Save Last Played, and Designate Favorites Folder.
- Selected Solution Roll:** A list of solutions with musical notation for various instruments (Fl, Ob, Ob+S, ClBb, ASax, Bn, Bn+S, Hn, Hn+S, Tpc, Tpc+SC, Tpc+SH, Tpc+SS, Tpc+SW, Tbn, Tbn+SC, Tbn+SH, Tbn+SS, Tbn+SW, BTb, BTb+S, Acc, Gtr, Hp, Vn, Vn+S, Vn+SP, Va, Vr+S, Vr+SP, Vc, Vc+S, Vc+SP, Cb, Cb+S).

(Source: orch-idea.org)

[perbloland.com/maxorch-about](http://perbloland.com/maxorch-about)

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



[youtu.be/DJh6zTe6T80](https://youtu.be/DJh6zTe6T80)

# Interactive Improvisation System

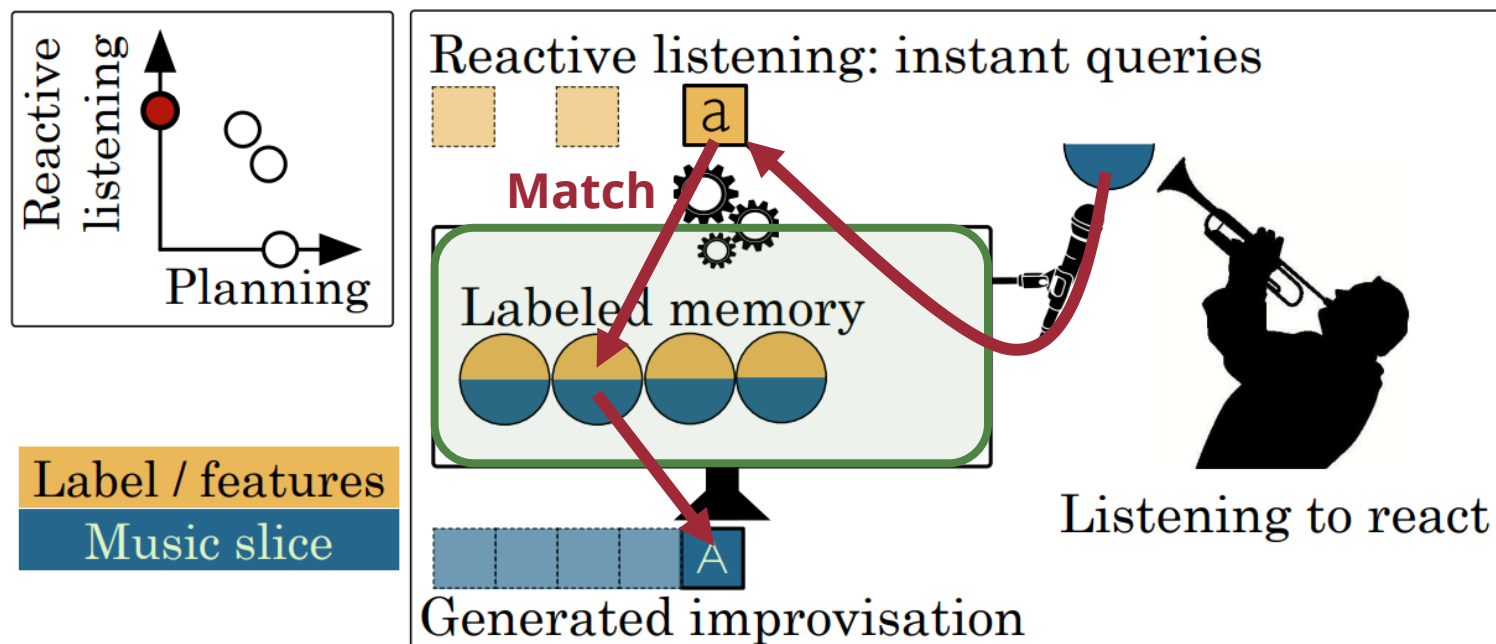


## AI Creative Agents (2015)



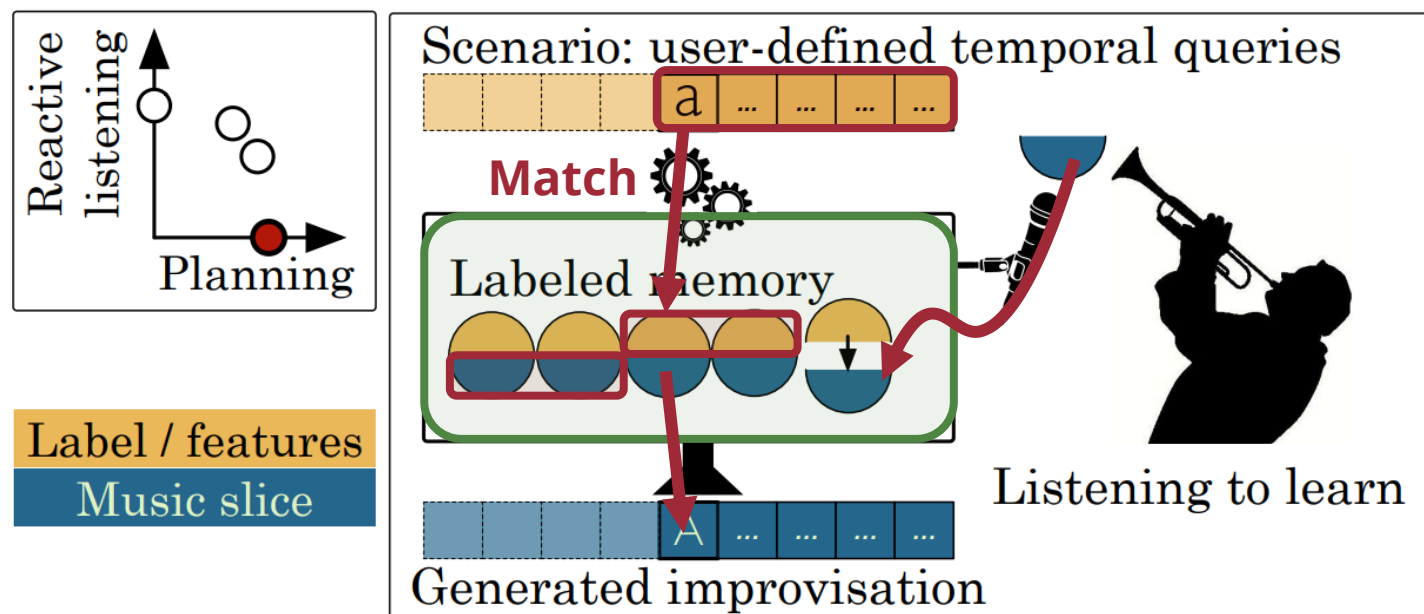
[youtu.be/DggF9m9xqik](https://youtu.be/DggF9m9xqik) & [github.com/DYCI2/Dicy2](https://github.com/DYCI2/Dicy2)

# Somax 2 (Nika et al., 2019)



**Figure 1.** Somax: music generation guided by reactive listening.

# ImproteK (Nika et al., 2017)



**Figure 2.** ImproteK: music generation guided by a temporal scenario.

# ImproteK (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**

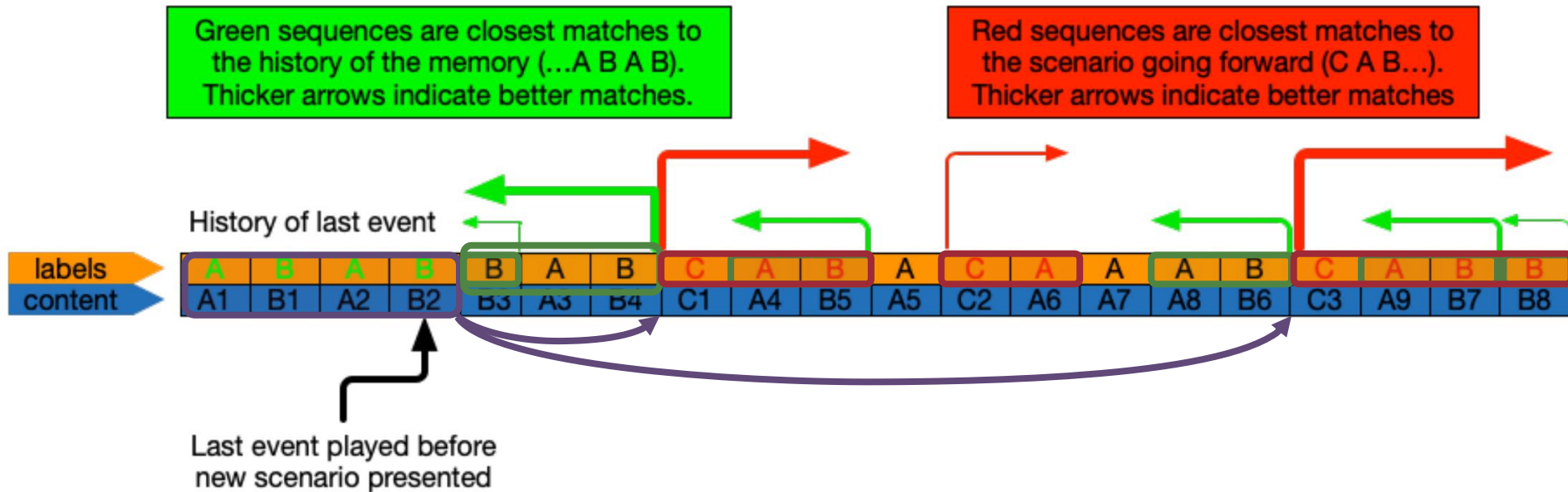


Figure 4: How an Agent responds to a Scenario

# Improvising with Somax



[youtu.be/AGZ4BaSql4k](https://youtu.be/AGZ4BaSql4k)

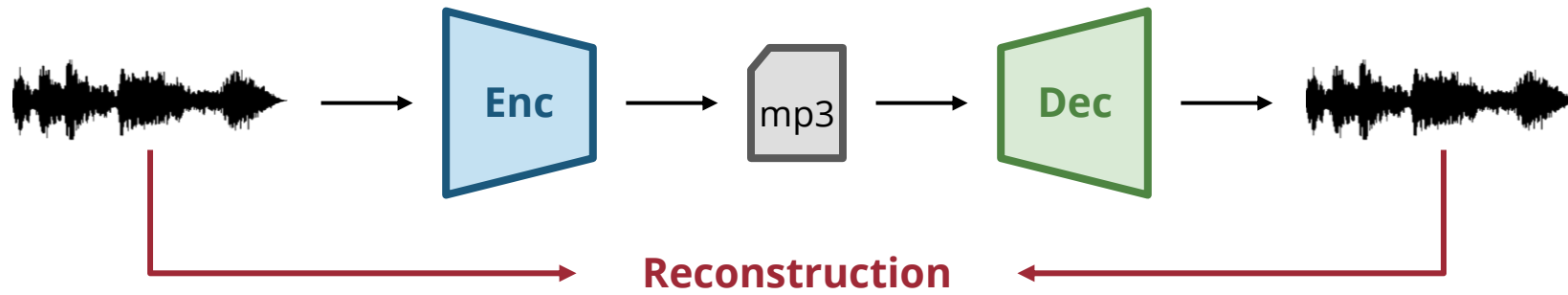
# Neural Audio Synthesis

# RAVE (Caillon & Esling, 2022)



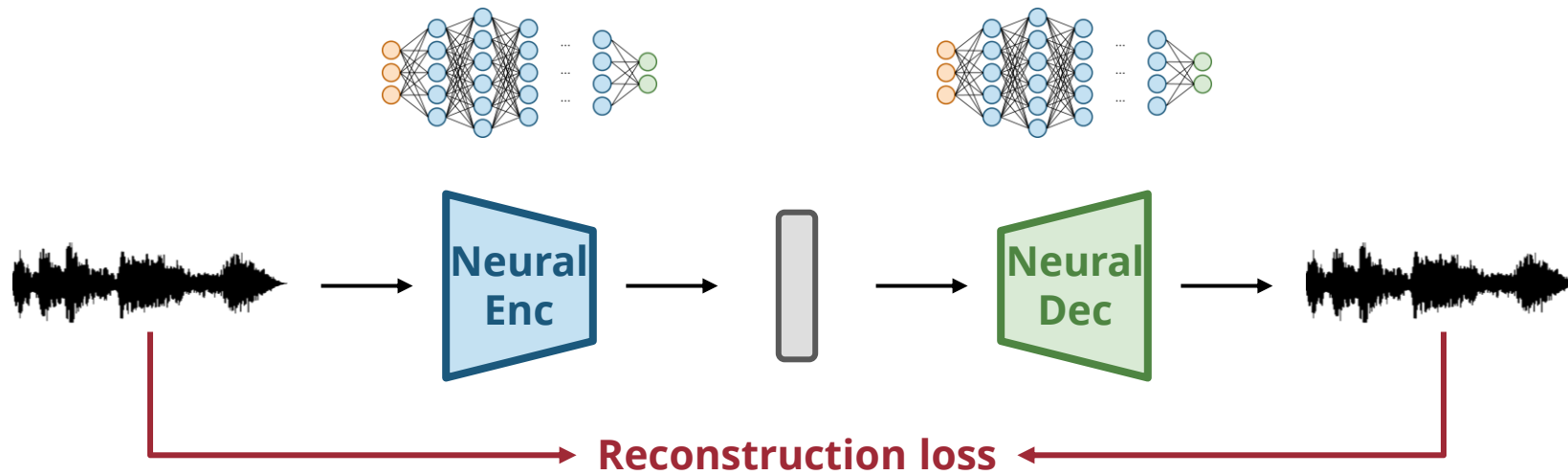
[youtu.be/dMZs04TzxUI](https://youtu.be/dMZs04TzxUI) & [github.com/acids-ircam/RAVE](https://github.com/acids-ircam/RAVE)

# Codec



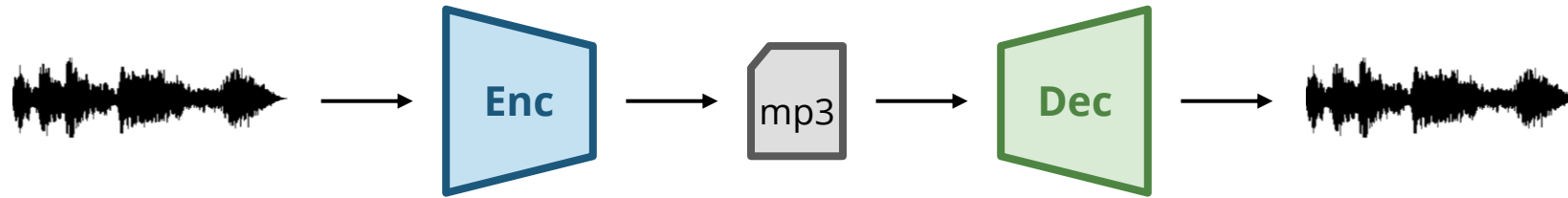


# Neural Codec

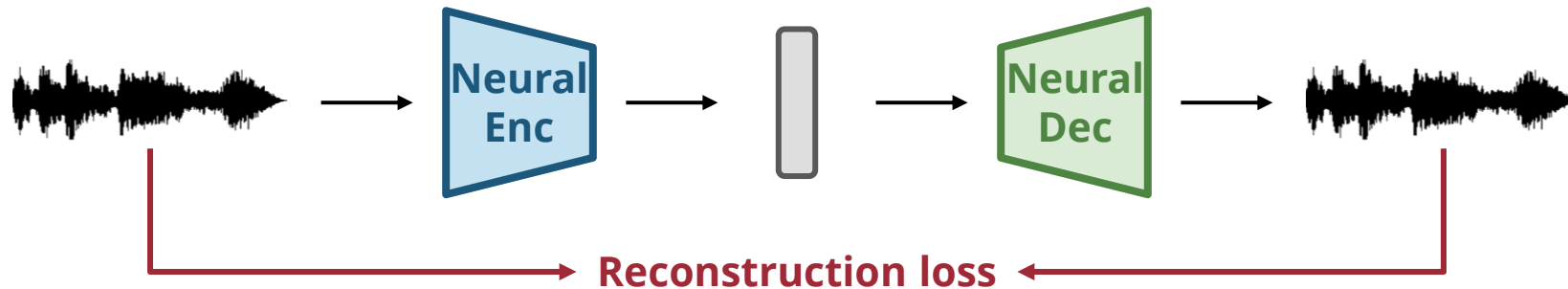


# Traditional Codec vs Neural Codec

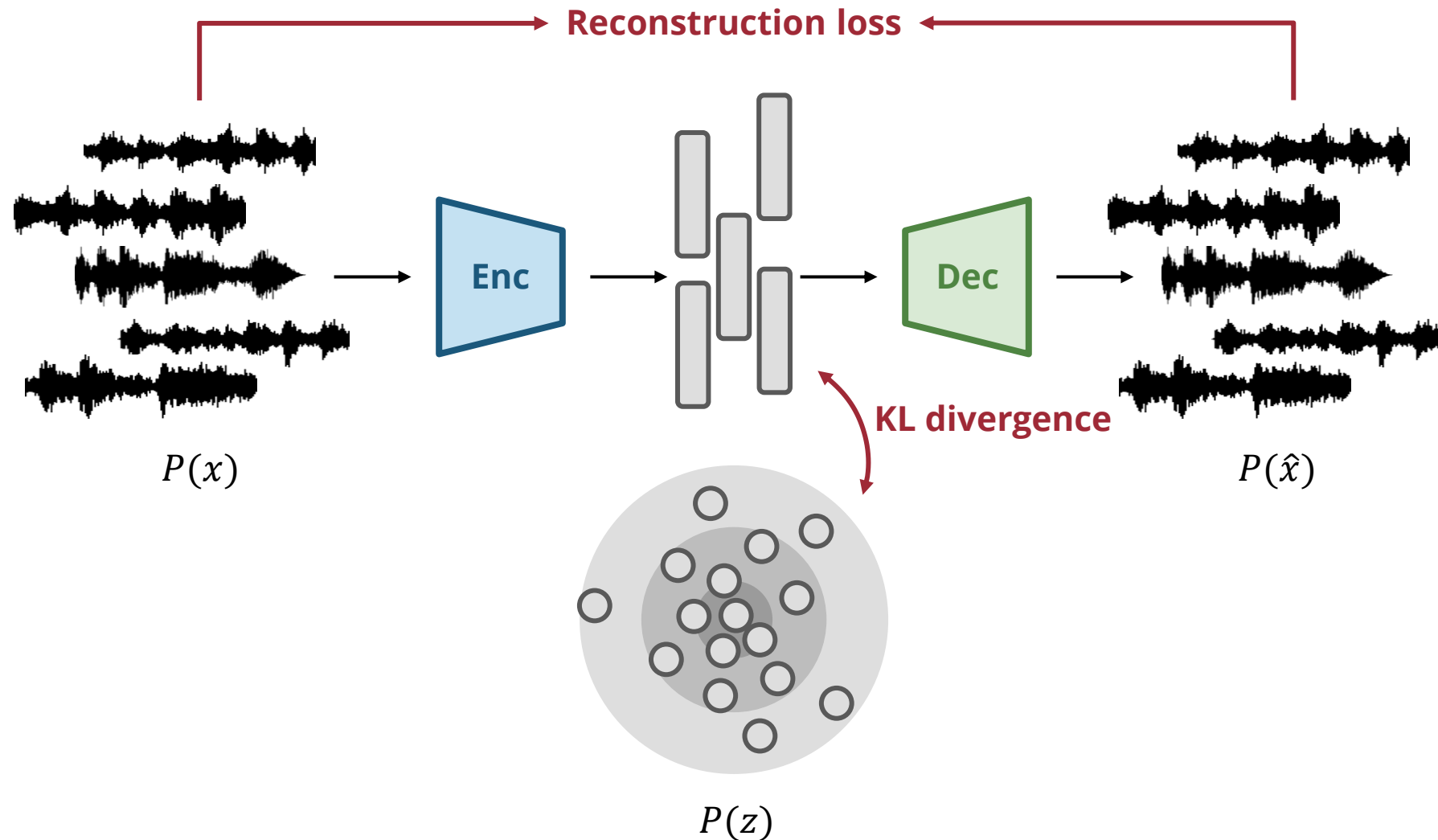
## Traditional Codec



## Neural Codec

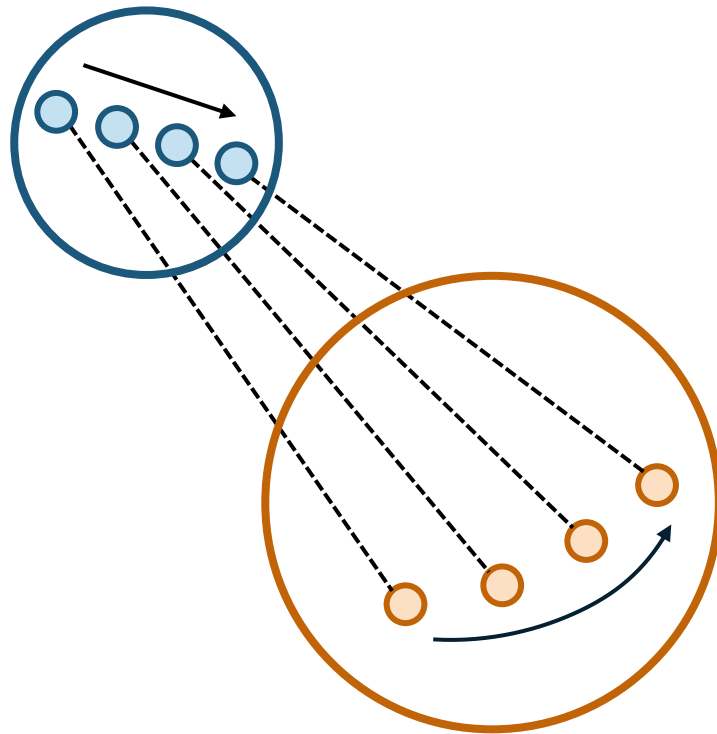


# Variational Autoencoders (VAEs) – Training

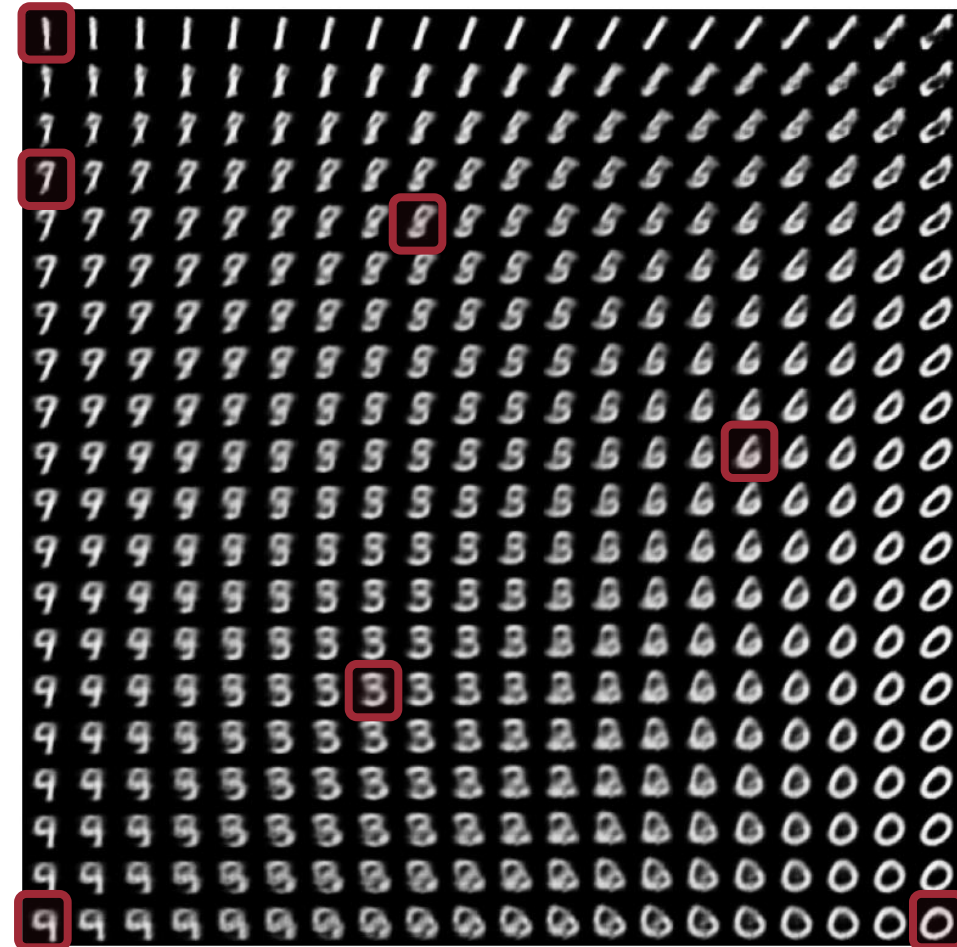


# Decoding the Latent Space of a VAE

Latent space



Data space



(Source: tensorflow.org)

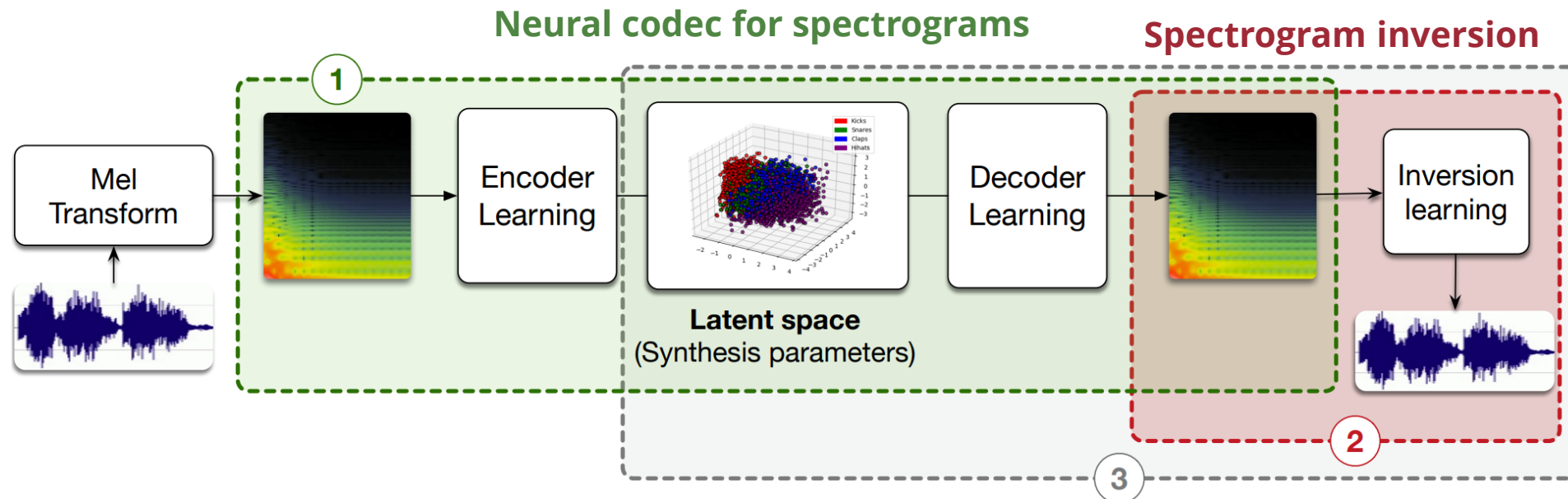
# Example: RAVE (Caillon & Esling, 2022)



[youtu.be/jAIRf4nGgYI](https://youtu.be/jAIRf4nGgYI) & [github.com/acids-ircam/RAVE](https://github.com/acids-ircam/RAVE)

# Neural Drum Machine

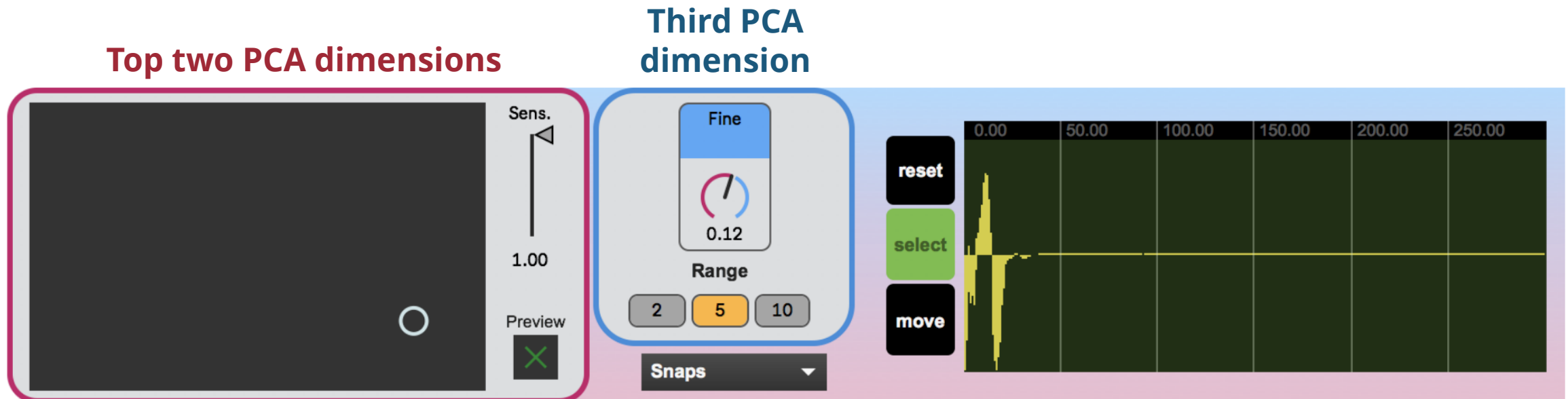
# Neural Drum Machine (Aouameur et al., 2019)



**Allows a user to interact with the model and to generate sound from the parameters' space**

(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](https://drive.google.com/file/d/1DDo0_KnwkWirCM4t0PT8cp6uotsfuufj/view)



# Neural Looper

Example: **unloop** (Garcia et al., 2023)



[youtu.be/yzBI8Vcjd2s](https://youtu.be/yzBI8Vcjd2s)

[github.com/hugofloresgarcia/unloop](https://github.com/hugofloresgarcia/unloop)



# Music & AI

Learn about AI's applications in music from analysis, creation, retrieval to processing



PAT 498/598 (Winter 2025)  
Mon & Wed 9-10:30AM @ Moore 376 (Davis)  
Instructor: Hao-Wen Dong

**M** MUSIC, THEATRE & DANCE

*New Course!*



