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

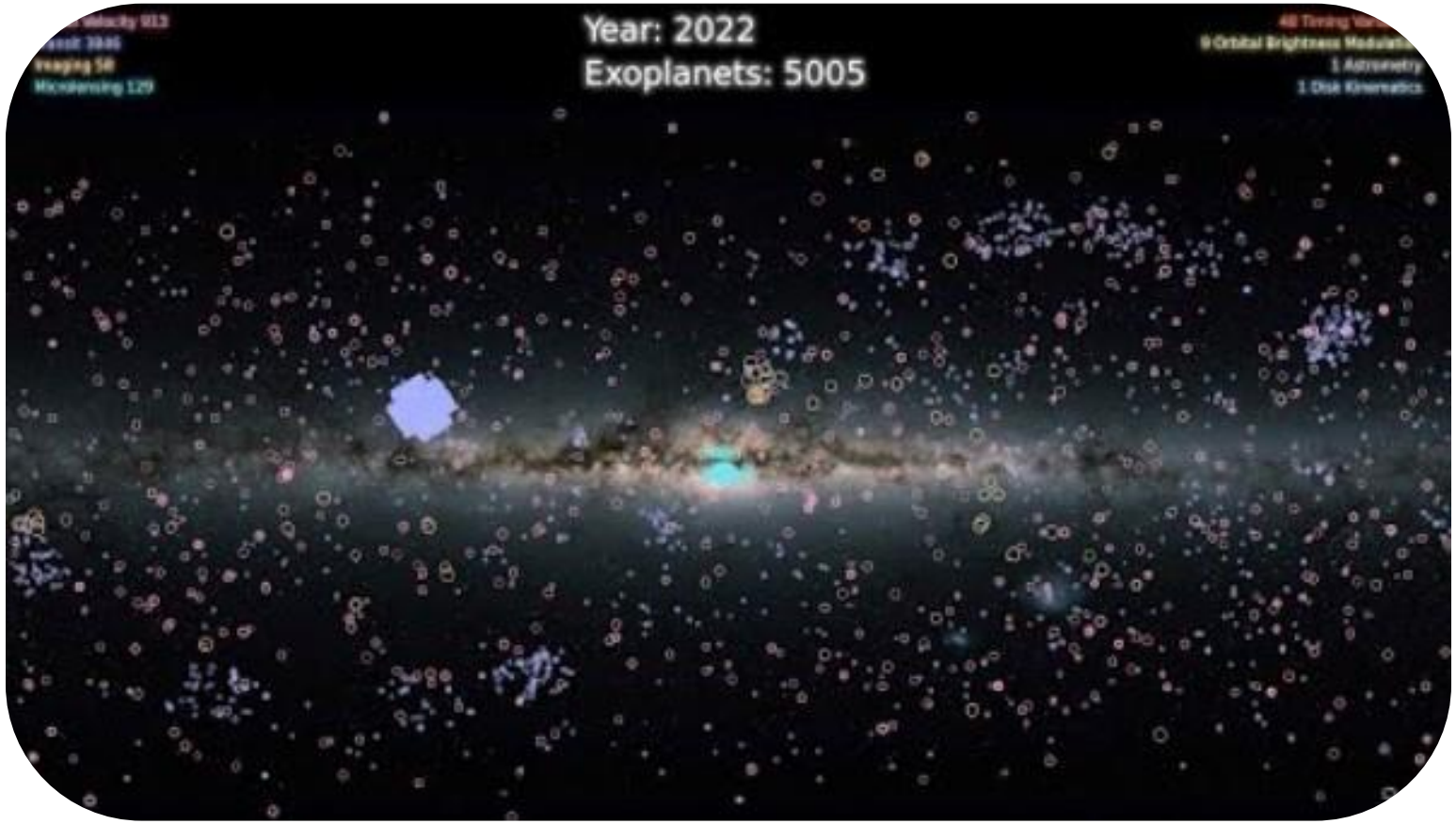
- Milestones (all due at the specified date at **11:59 PM ET**)
  - **Proposal** November 25 Plans (1 page)
  - **Presentation** December 9 Showcase & report
  - **Final report** December 15 Full report (2-3 pages)
- Instructions will be released on Gradescope
- Late submissions: **NOT accepted**

Final Project Rubrics

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

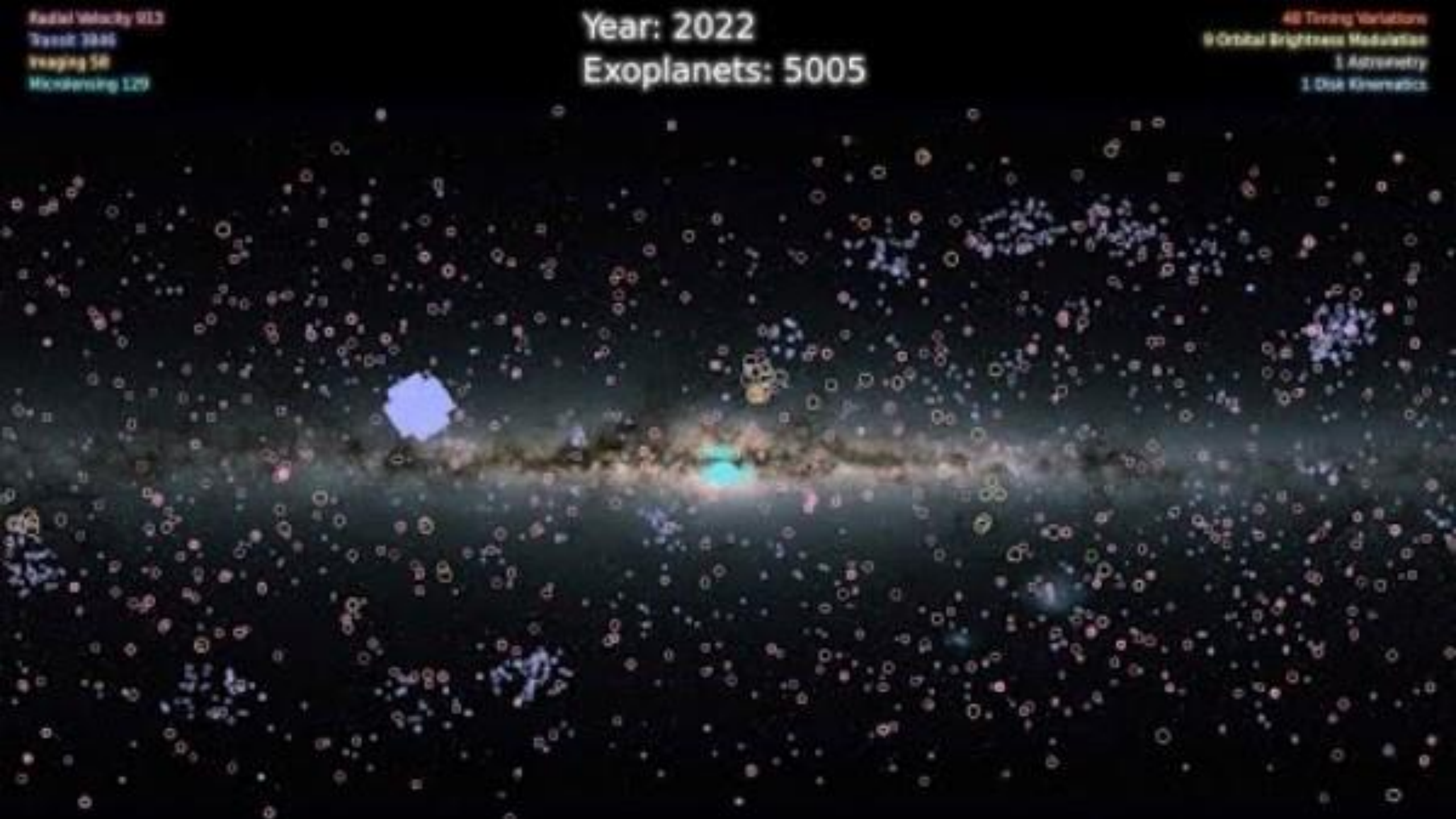
Scientific Data Sonification

5000 Exoplanets (Russo & Santaguida, 2022)



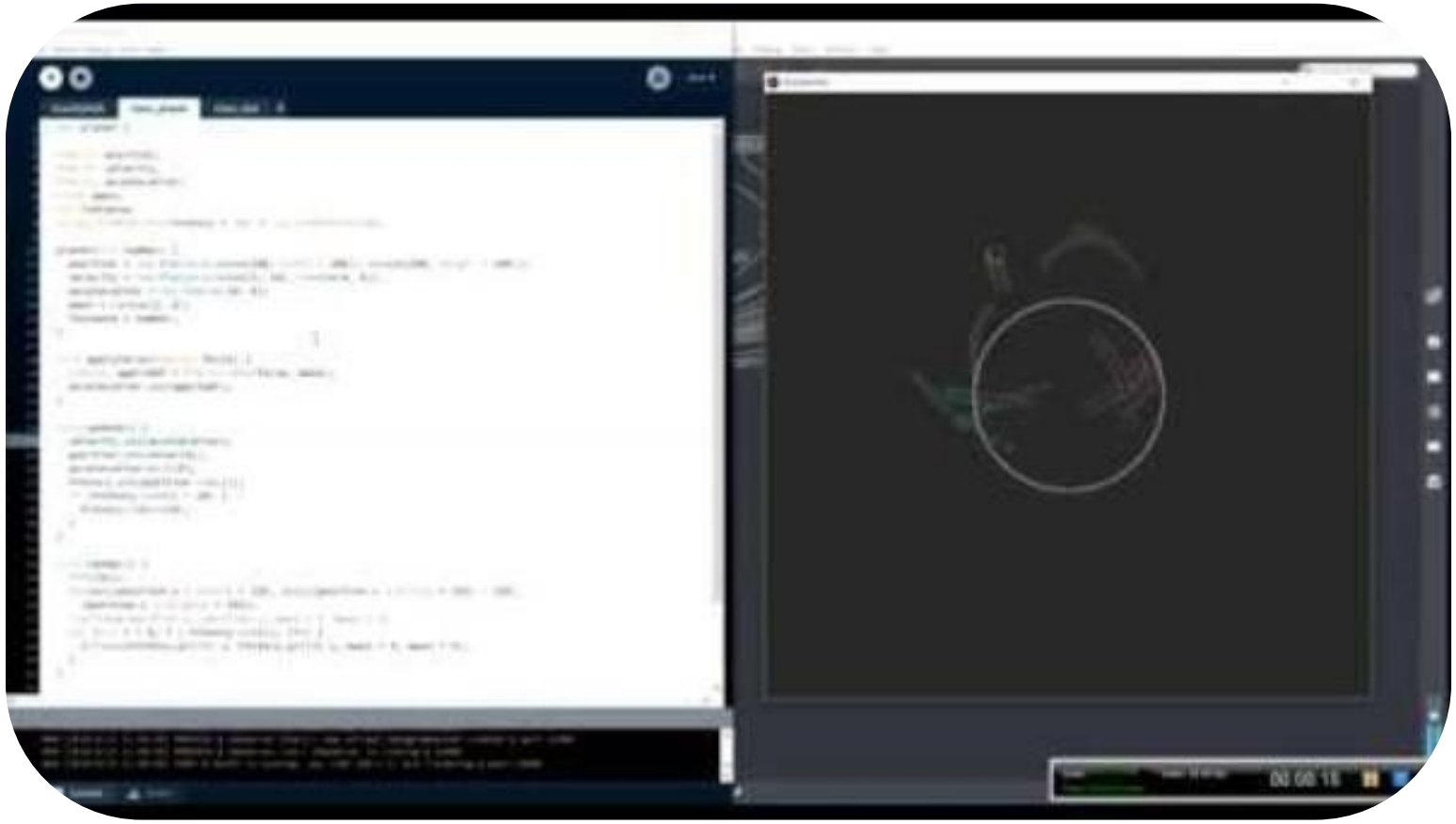
youtu.be/yv4DbU1CWAY

Matt Russo and Andrew Santaguida, "5000 Exoplanets: Listen to the Sounds of Discovery," *ICAD*, 2022.


Radial Velocity 913
Transit 3846
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

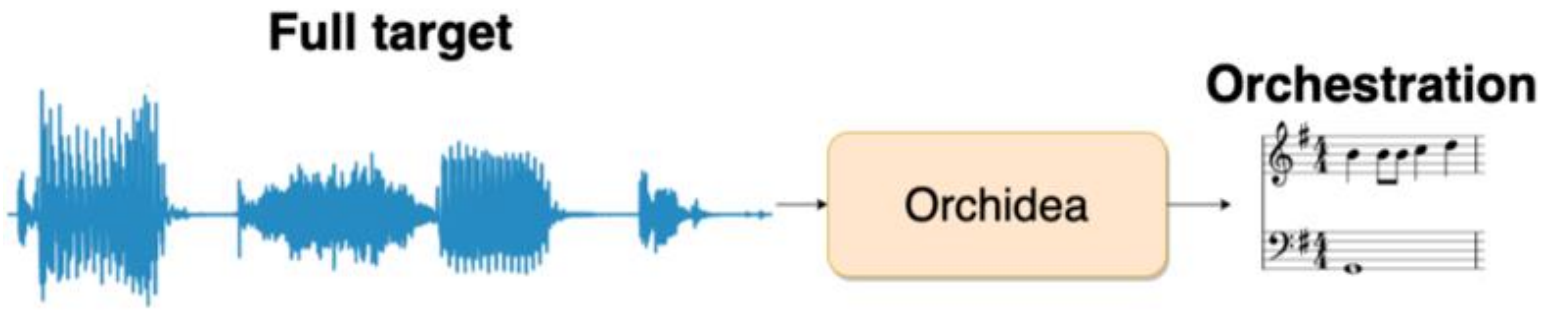
Orchidea & MaxOrch (Cella, 2022; Lesueur & Bloland, 2022)

youtu.be/ltups7UrTh4?t=3807

youtu.be/ltups7UrTh4?t=3933

Carmine-Emanuele Cella, "Orchidea: a comprehensive framework for target-based computer-assisted dynamic orchestration," *JNMR*, 2022.

Orchidea (Cella, 2022)



(Source: orch-idea.org)

Carmine-Emanuele Cella, "Orchidea: a comprehensive framework for target-based computer-assisted dynamic orchestration," *JNMR*, 2022.

Orchidea (Cella, 2022)

(Source: orch-idea.org)

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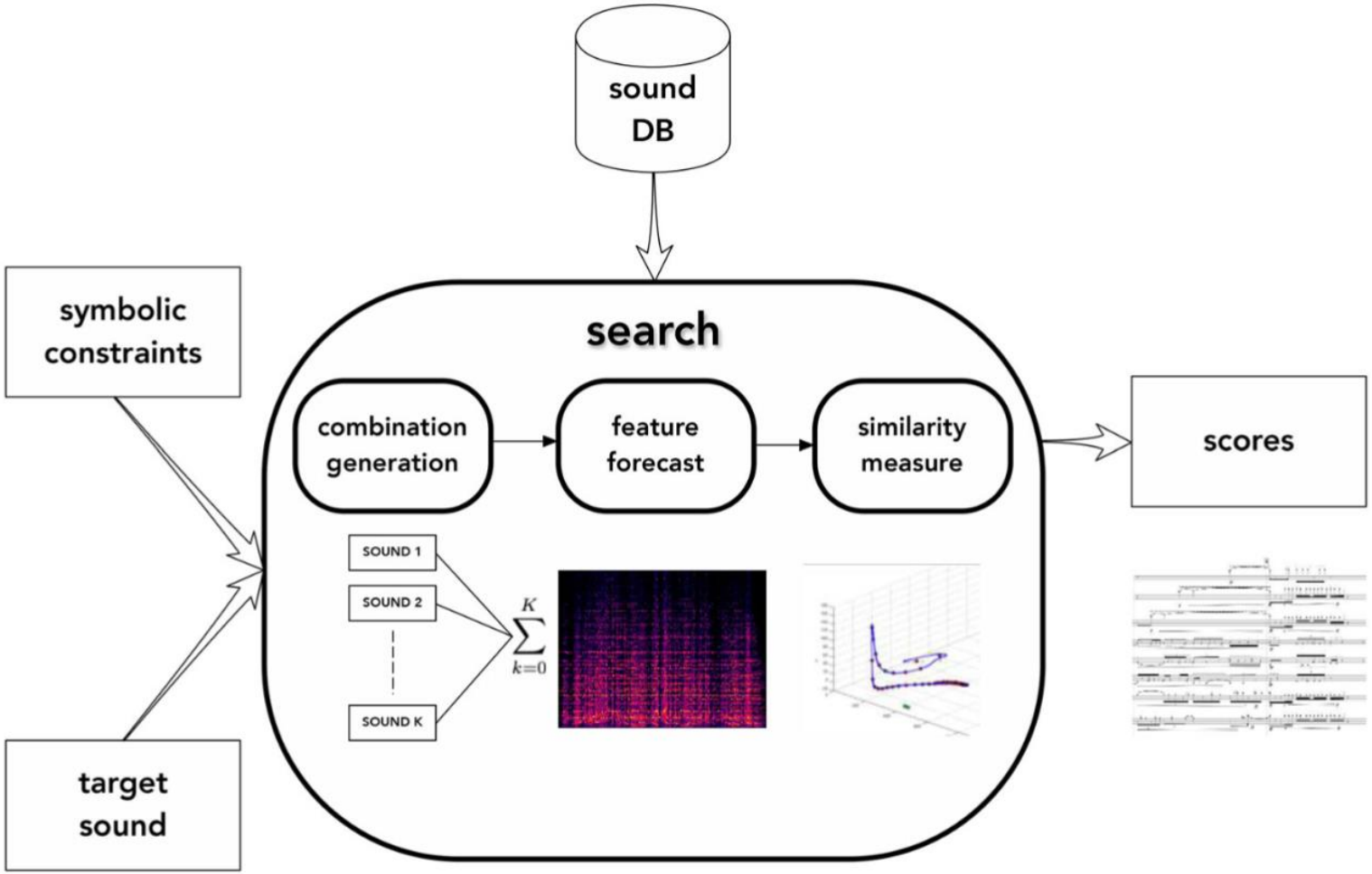
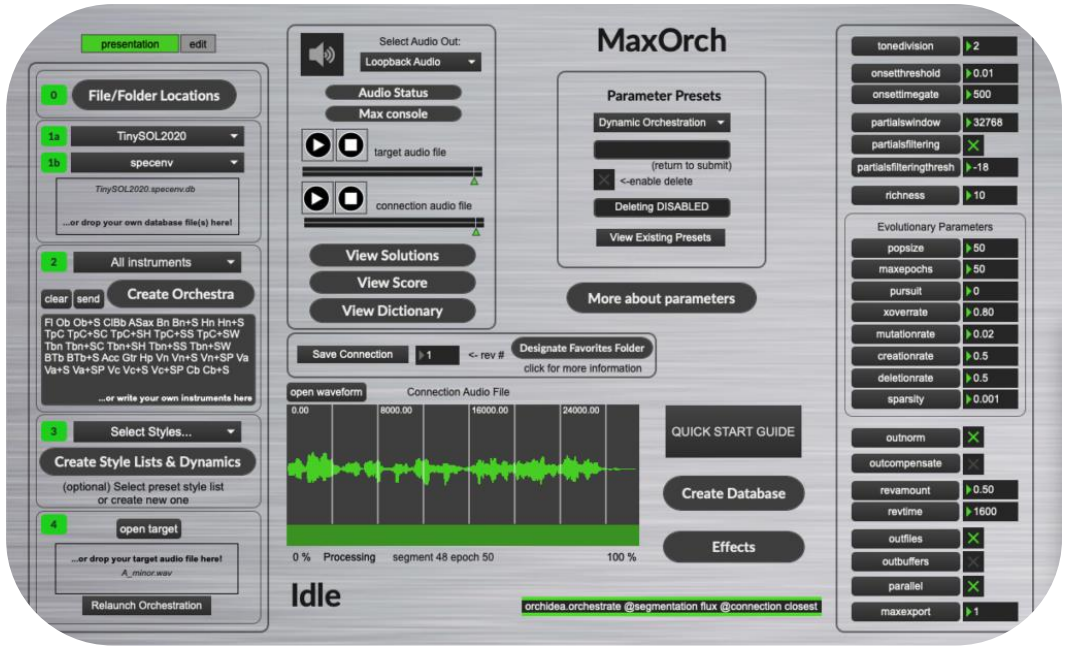
Orchidea (Cella, 2022)

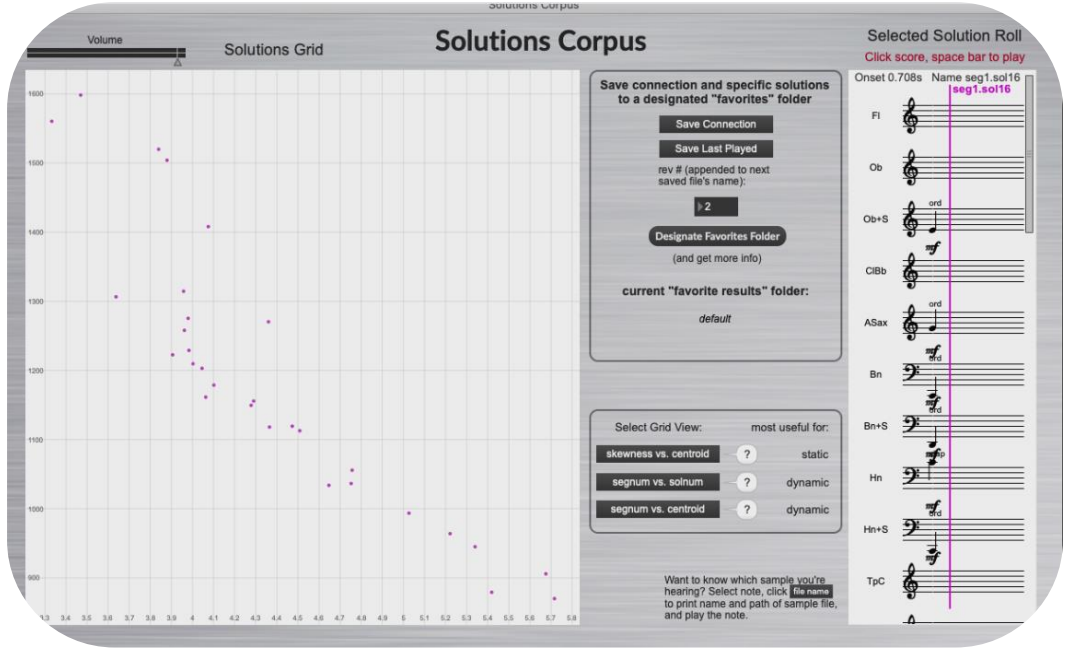


(Source: Cella, 2022)

Carmine-Emanuele Cella, "Orchidea: a comprehensive framework for target-based computer-assisted dynamic orchestration," *JNMR*, 2022.

MaxOrch (Lesueur & Bloland, 2022)

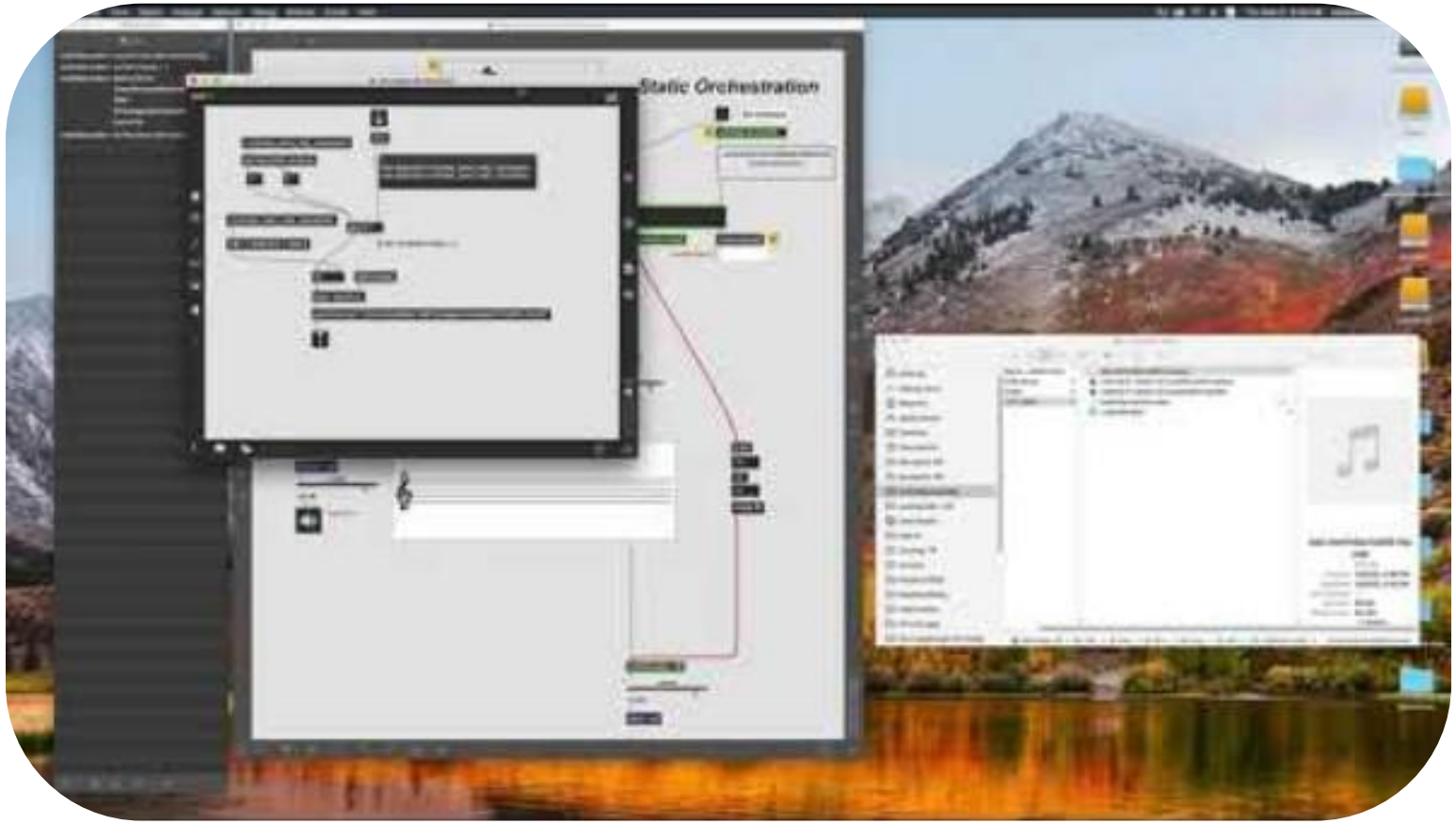




(Source: orch-idea.org)

perbloland.com/maxorch-about

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



youtu.be/DJh6zTe6T80

Carmine-Emanuele Cella, "Orchidea: a comprehensive framework for target-based computer-assisted dynamic orchestration," *JNMR*, 2022.

Interactive Improvisation System

AI Creative Agents (2015)

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

Somax 2 (Nika et al., 2019)

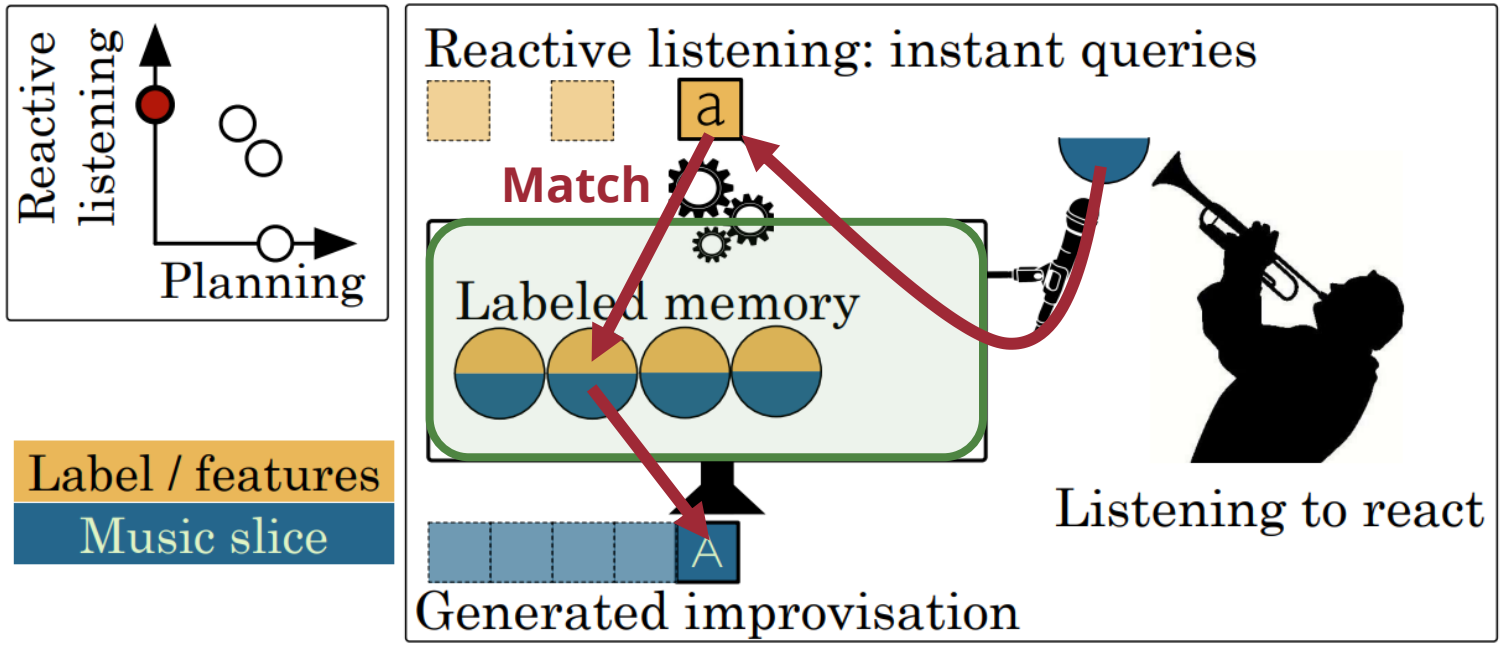


Figure 1. Somax: music generation guided by reactive listening.

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 (Nika et al., 2017)

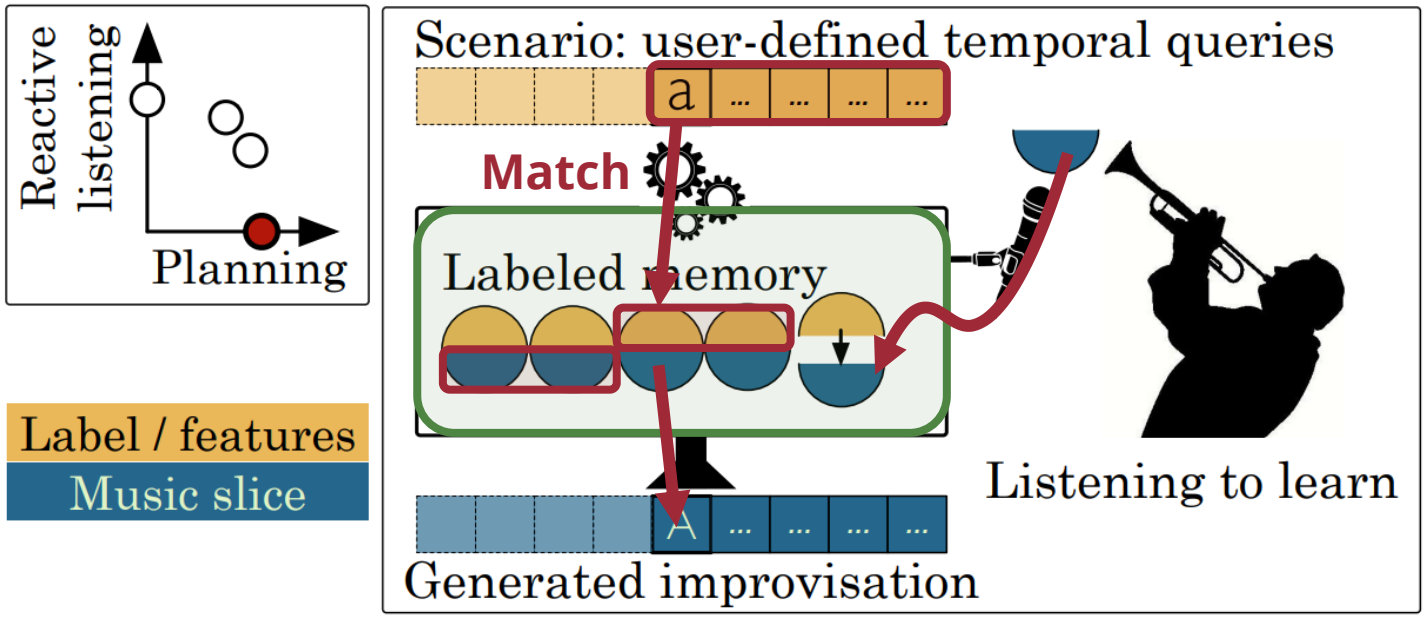


Figure 2. ImproteK: music generation guided by a temporal scenario.

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 (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

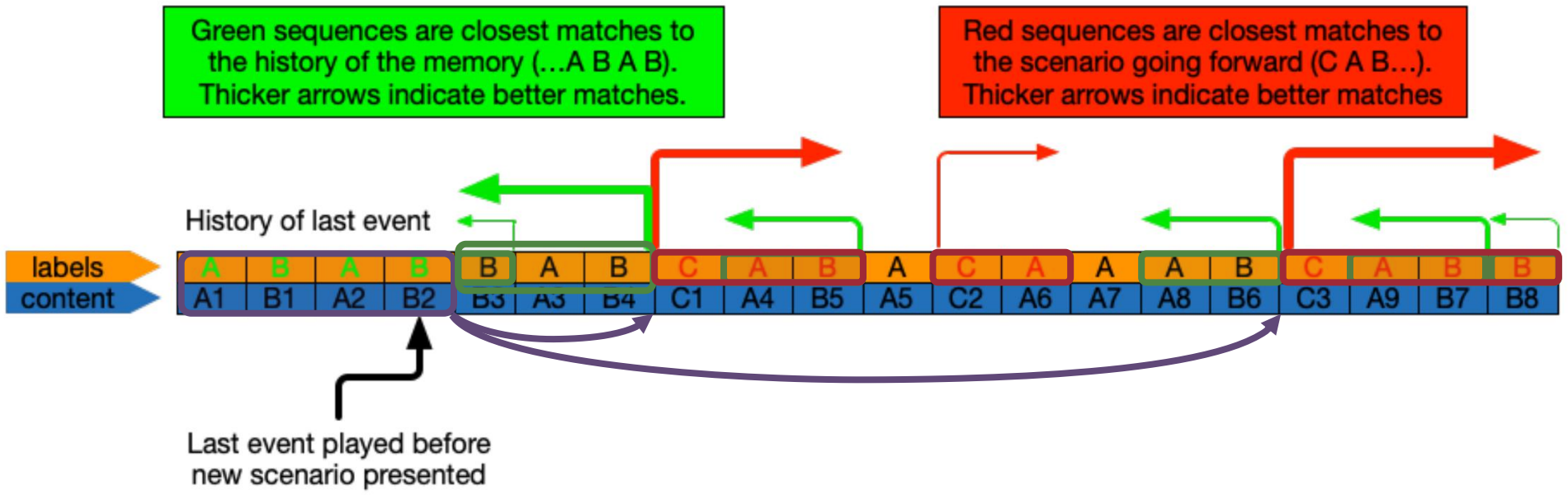


Figure 4: How an Agent responds to a Scenario

Jérôme Nika, Augustin Muller, Joakim Borg, Gérard Assayag, and Matthew Ostrowski, "Dicy2 for Live," *Ircam*, 2022.

Improvising with Somax

youtu.be/AGZ4BaSqL4k

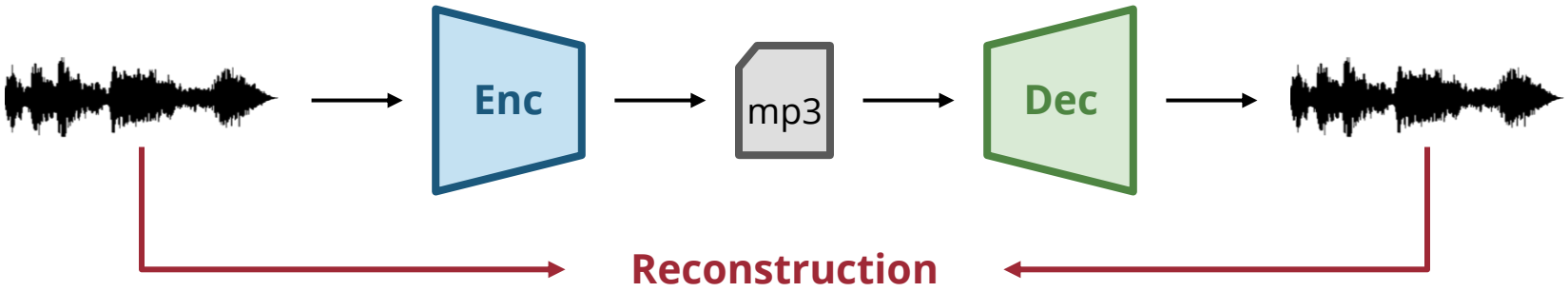
Neural Audio Synthesis

RAVE (Caillon & Esling, 2022)

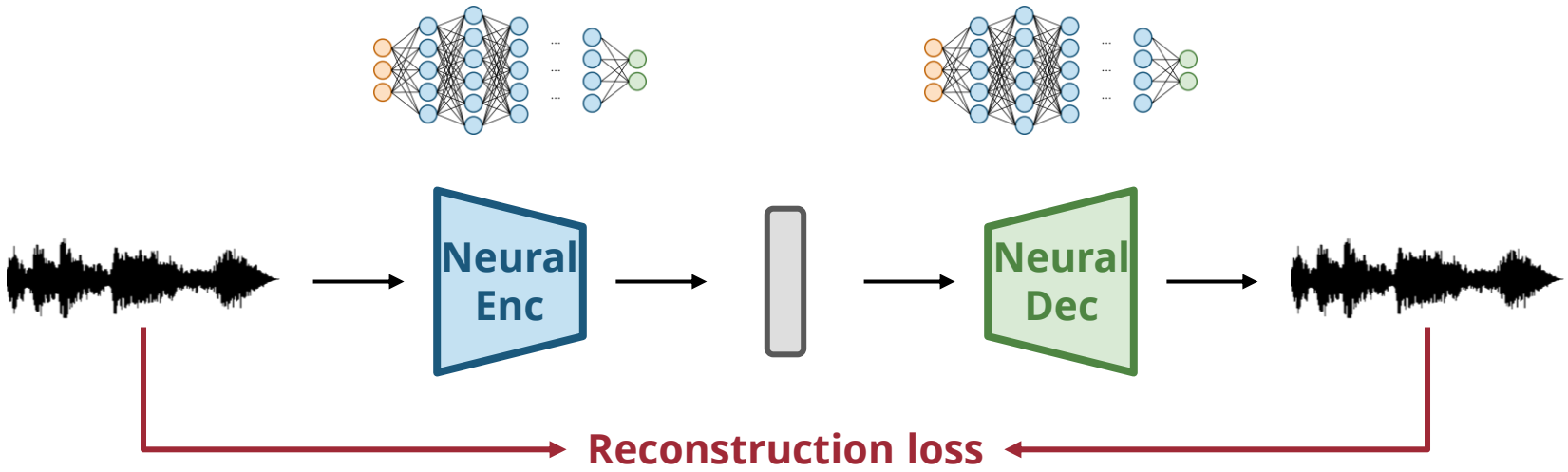
youtu.be/dMZs04TzxUI & github.com/acids-ircam/RAVE

Antoine Caillon and Philippe Esling, "RAVE: A variational autoencoder for fast and high-quality neural audio synthesis," *arXiv preprint arXiv:2111.05011*, 2021.

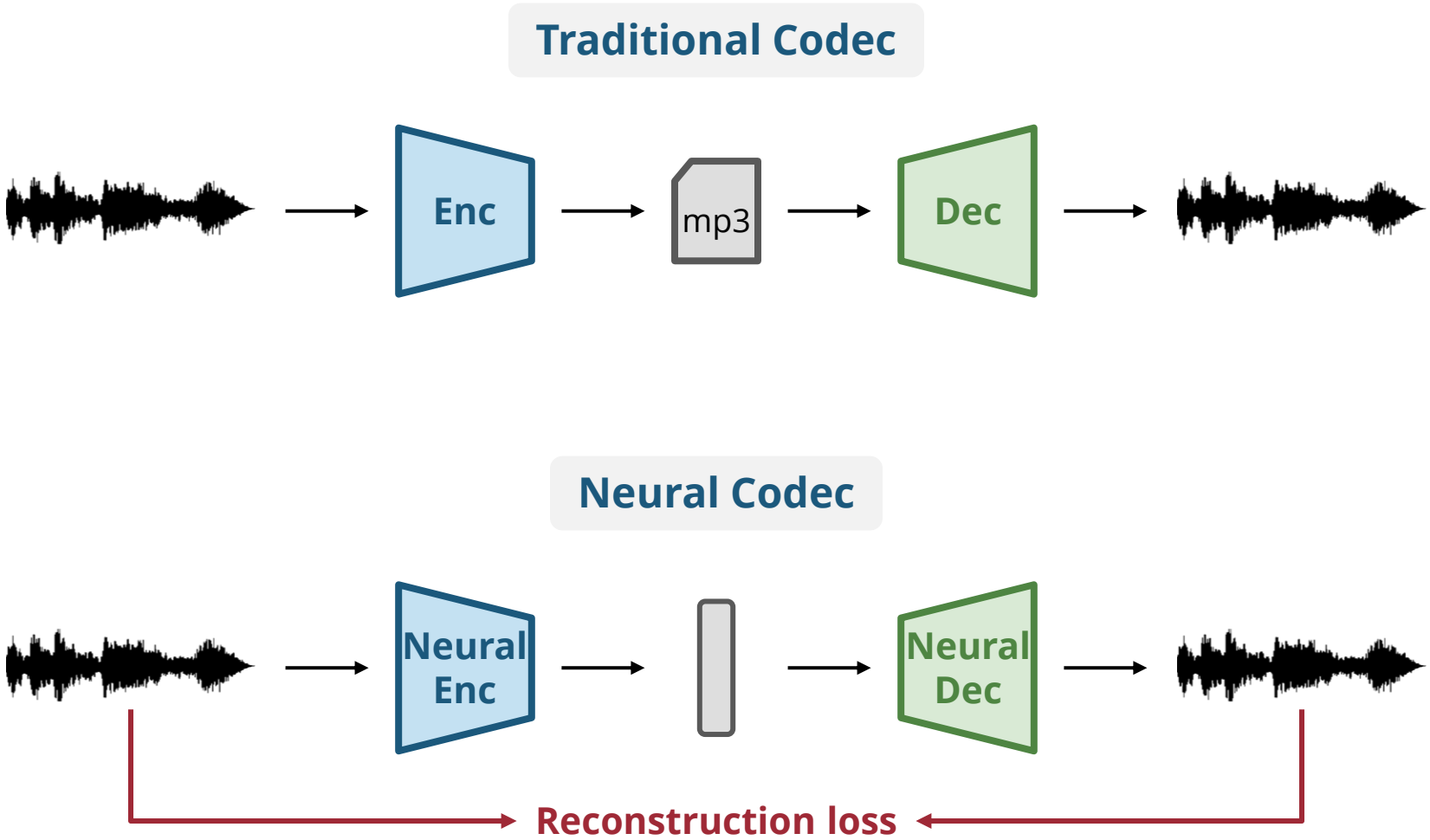
Codec



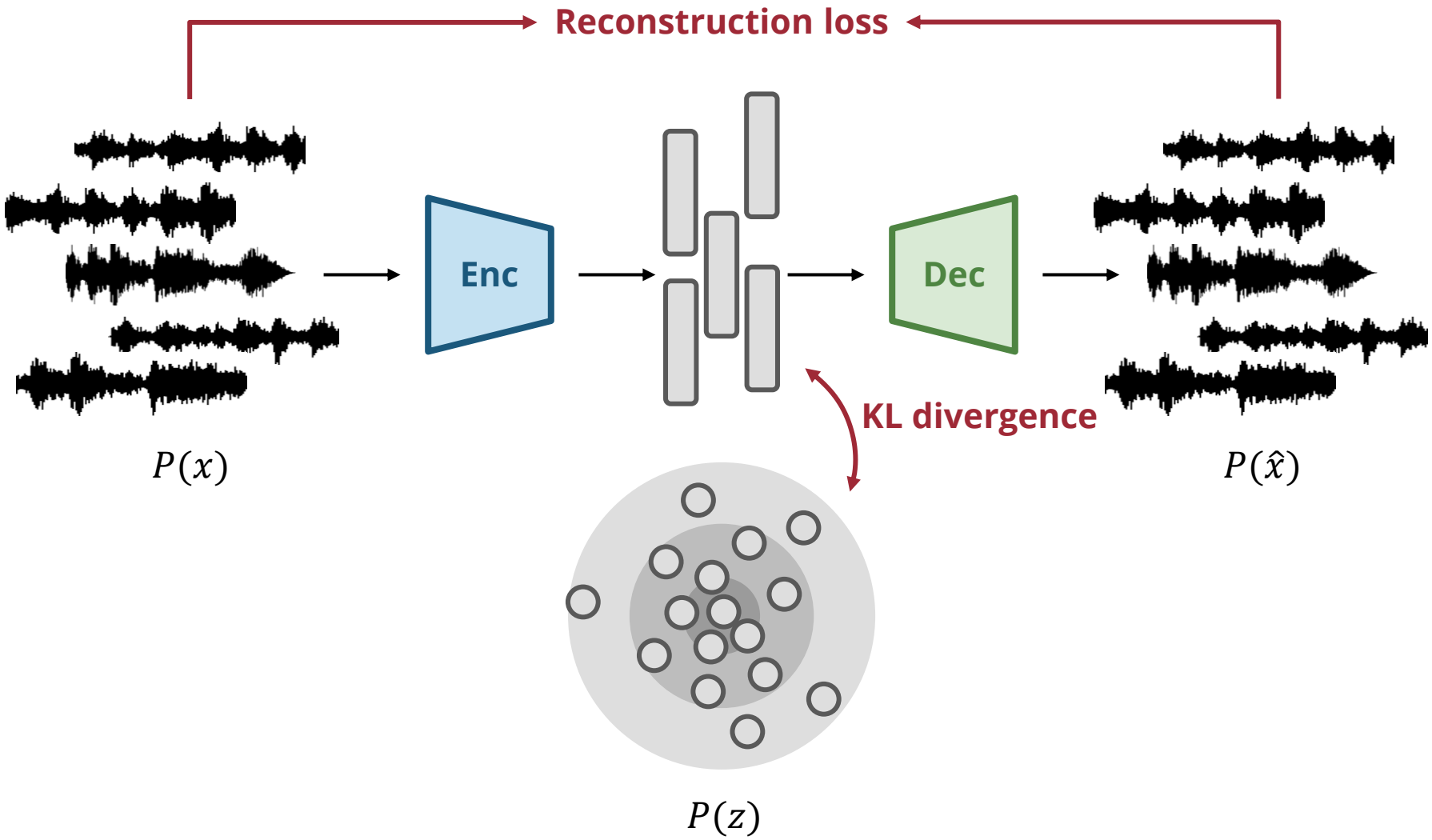
Neural Codec



Traditional Codec vs Neural Codec

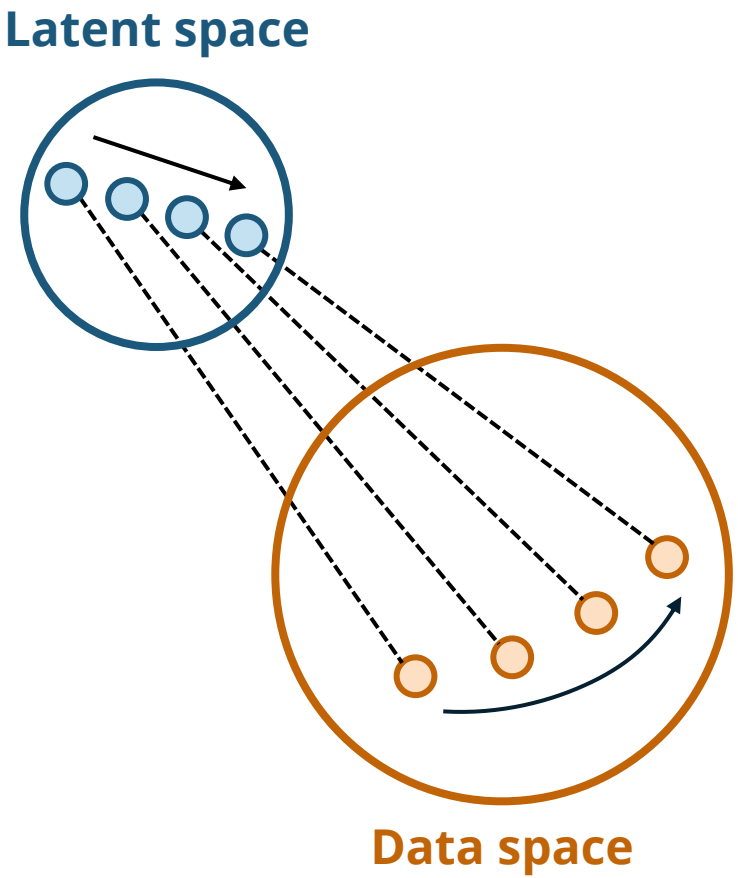


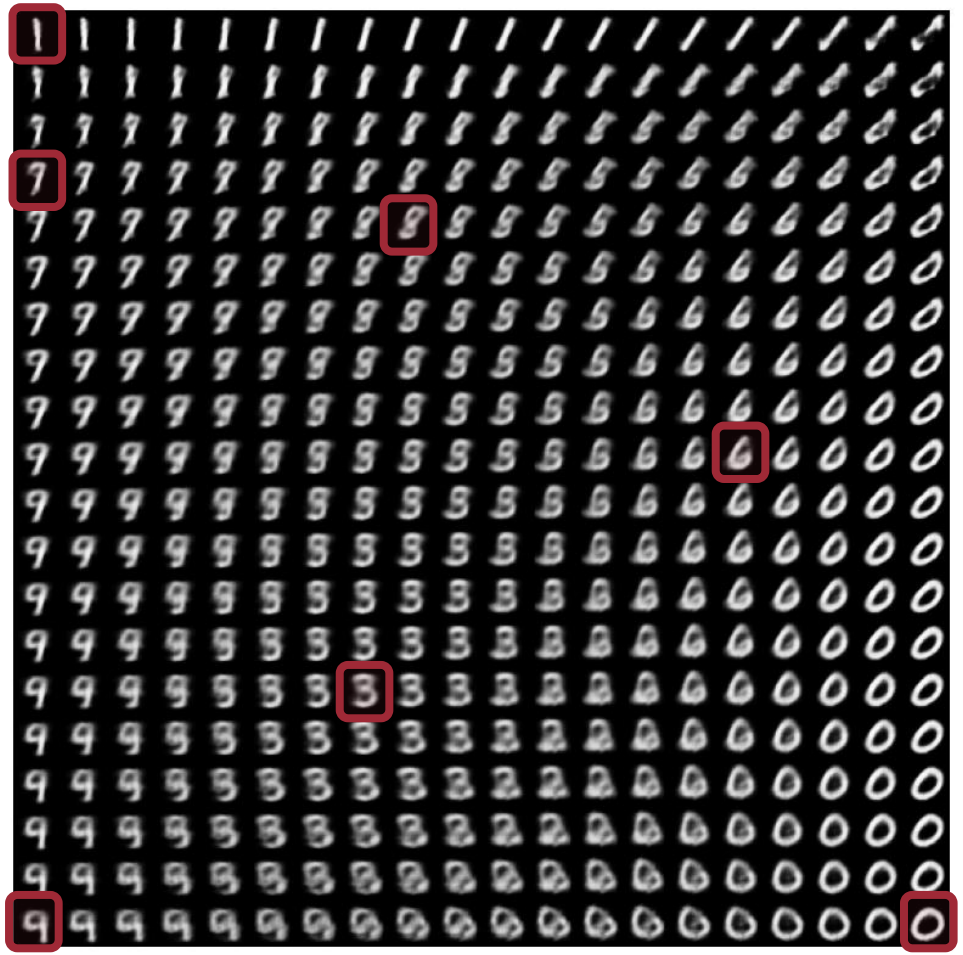
Variational Autoencoders (VAEs) – Training



Diederik P Kingma and Max Welling, "Auto-Encoding Variational Bayes," *ICLR*, 2014.

Decoding the Latent Space of a VAE





(Source: tensorflow.org)

tensorflow.org/tutorials/generative/autoencoder

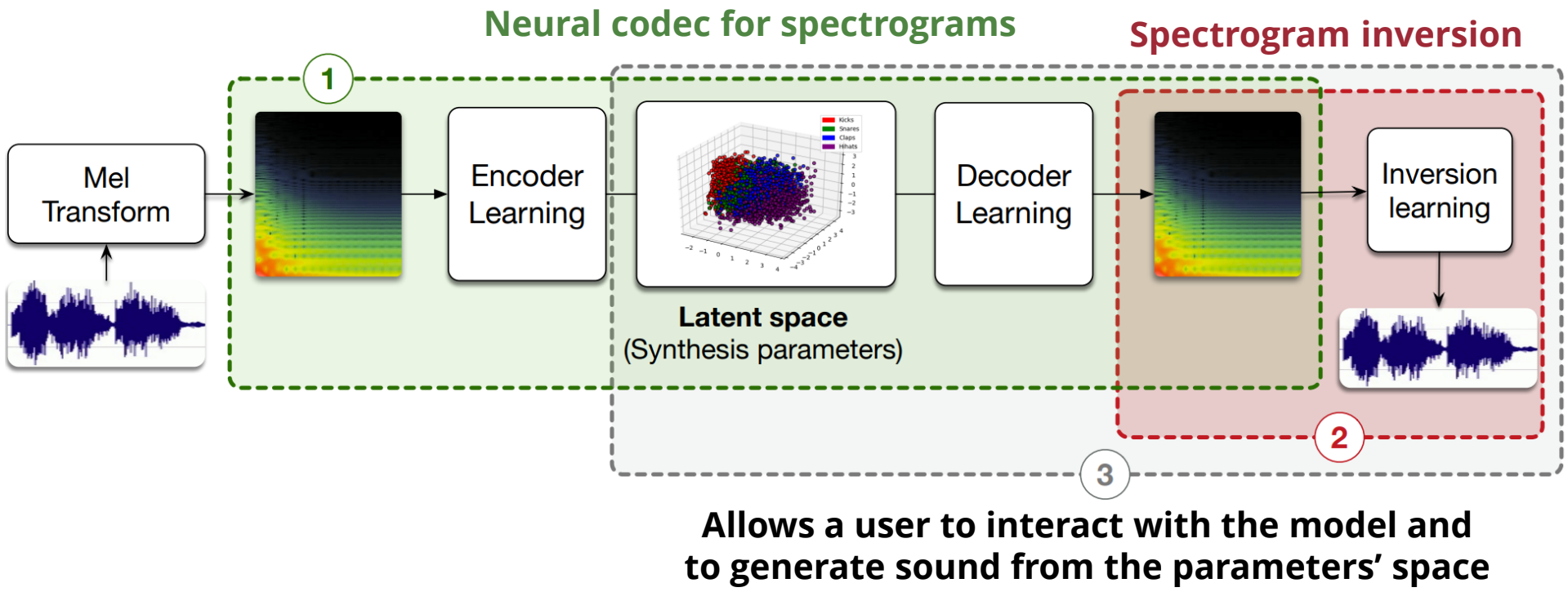
Example: RAVE (Caillon & Esling, 2022)

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

Antoine Caillon and Philippe Esling, "RAVE: A variational autoencoder for fast and high-quality neural audio synthesis," *arXiv preprint arXiv:2111.05011*, 2021.

Neural Drum Machine

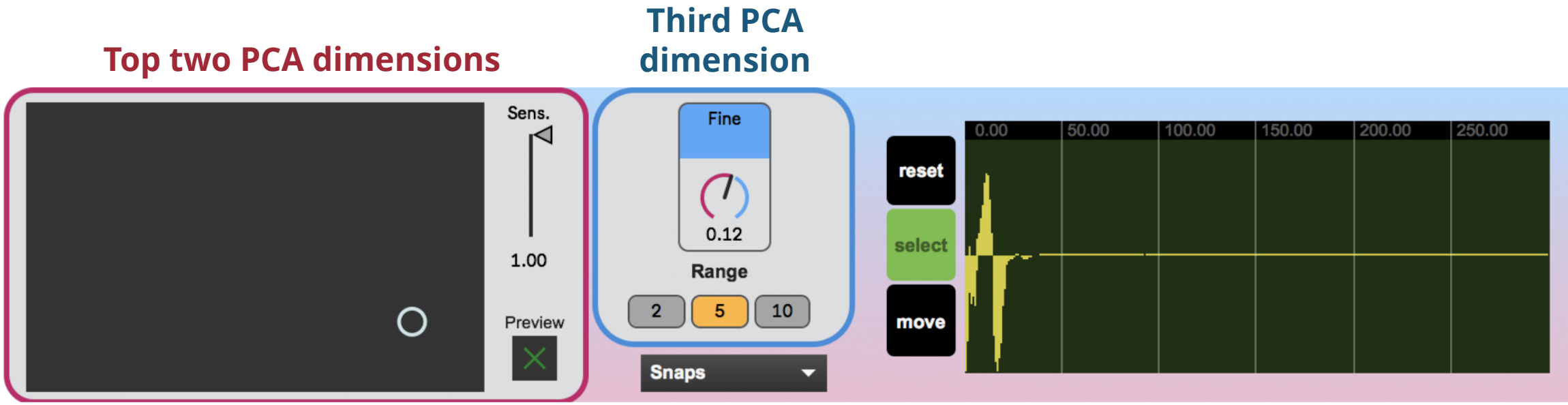
Neural Drum Machine (Aouameur et al., 2019)



(Source: Aouameur et al., 2019)

Cyran Aouameur, Philippe Esling, and Gaëtan Hadjeres, "Neural Drum Machine : An Interactive System for Real-time Synthesis of Drum Sounds," *ICCC*, 2019.

Neural Drum Machine (Aouameur et al., 2019)



(Source: Aouameur et al., 2019)

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

Cyran Aouameur, Philippe Esling, and Gaëtan Hadjeres, "Neural Drum Machine : An Interactive System for Real-time Synthesis of Drum Sounds," *ICCC*, 2019.

Neural Looper

Example: unloop (Garcia et al., 2023)

youtu.be/yzBI8Vcjd2s

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
MUSIC, THEATRE & DANCE
New Course!