

PAT 463/563 (Fall 2025)

Music & AI

Lecture 1: Introduction

Instructor: Hao-Wen Dong

| Welcome! Tell Us about Yourself!

- Name
- Pronouns
- Program/year
- What is your **most familiar instrument** (if any)?
- What is your **most familiar programming language** (if any)?
- Have you ever used any **AI Music tools**? Which tools?

About Me

- Hao-Wen (**Herman**) Dong
- Pronouns: he/him
- Email: **hwdong**@umich.edu
- Office: **Stearns 131** (15 min walk to the north from Moore)
- Office hours: By appointments (link on the course website)
- Research areas: Generative AI for music, audio, and video



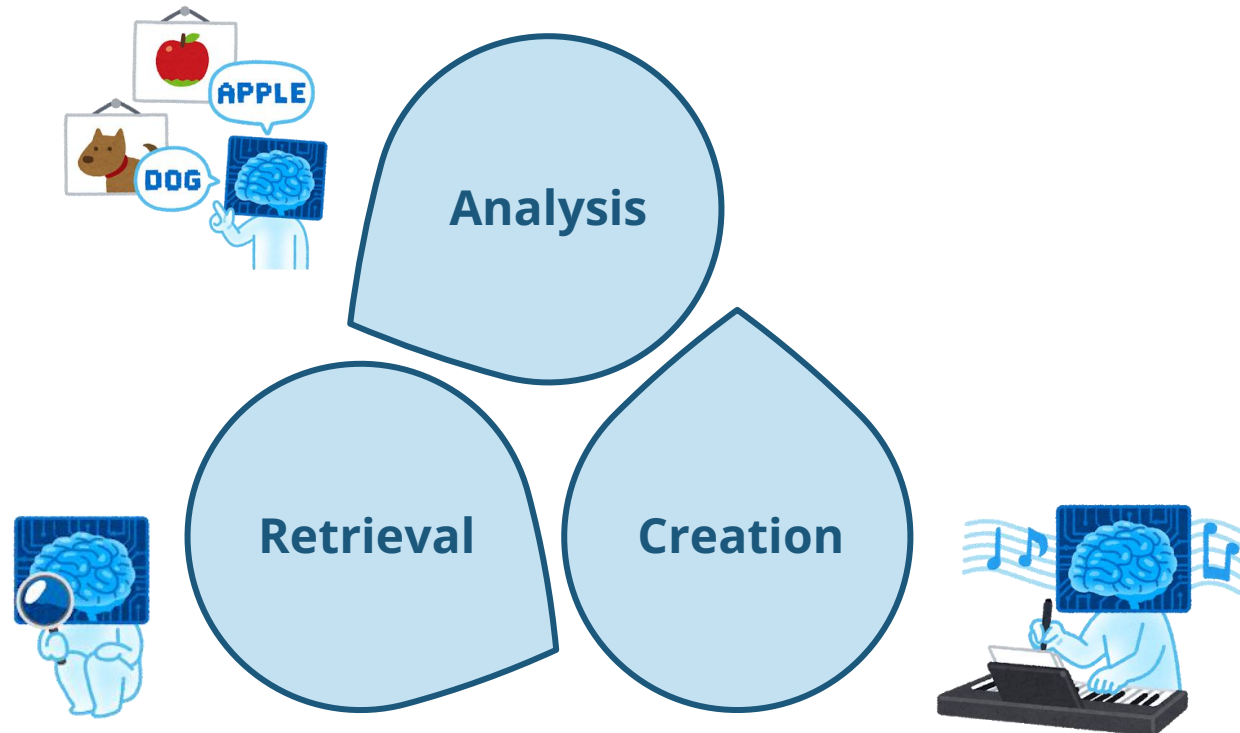
Music & AI

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What is this course all about?

An introduction to the **emerging field of AI music**. This course introduces students to AI's applications in music from **analysis**, **creation**, **retrieval** to **processing**.



| Topics

- **Analysis**

- Source separation, beat tracking, key/chord recognition, genre/mood classification, transcription, optical music recognition, structural analysis ...

- **Creation**

- Automatic music composition, arrangement, performance synthesis, improvisation ...

- **Retrieval & Processing**

- Search, query by humming, recommendation, production, editing, mixing, mastering ...

- **Advanced Topics**

- Interactive tools, singing voice synthesis, sound design, audiovisual tools ...

| Learning Objectives

- Gain an **overview of the field of AI music**
- Learn **fundamental AI concepts and principles**
- Learn **representative AI tools** for music analysis, creation, retrieval and processing
- Gain hands-on experience on **using AI music tools**

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Hildegard Dodel, Public domain, via Wikimedia Commons.
Taken at Hamamatsu Museum of Musical Instruments, August 2019.
yan, CC BY-SA 4.0, via Wikimedia Commons.

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(Source: Yamaha)



(Source: Sankei Shimbun)



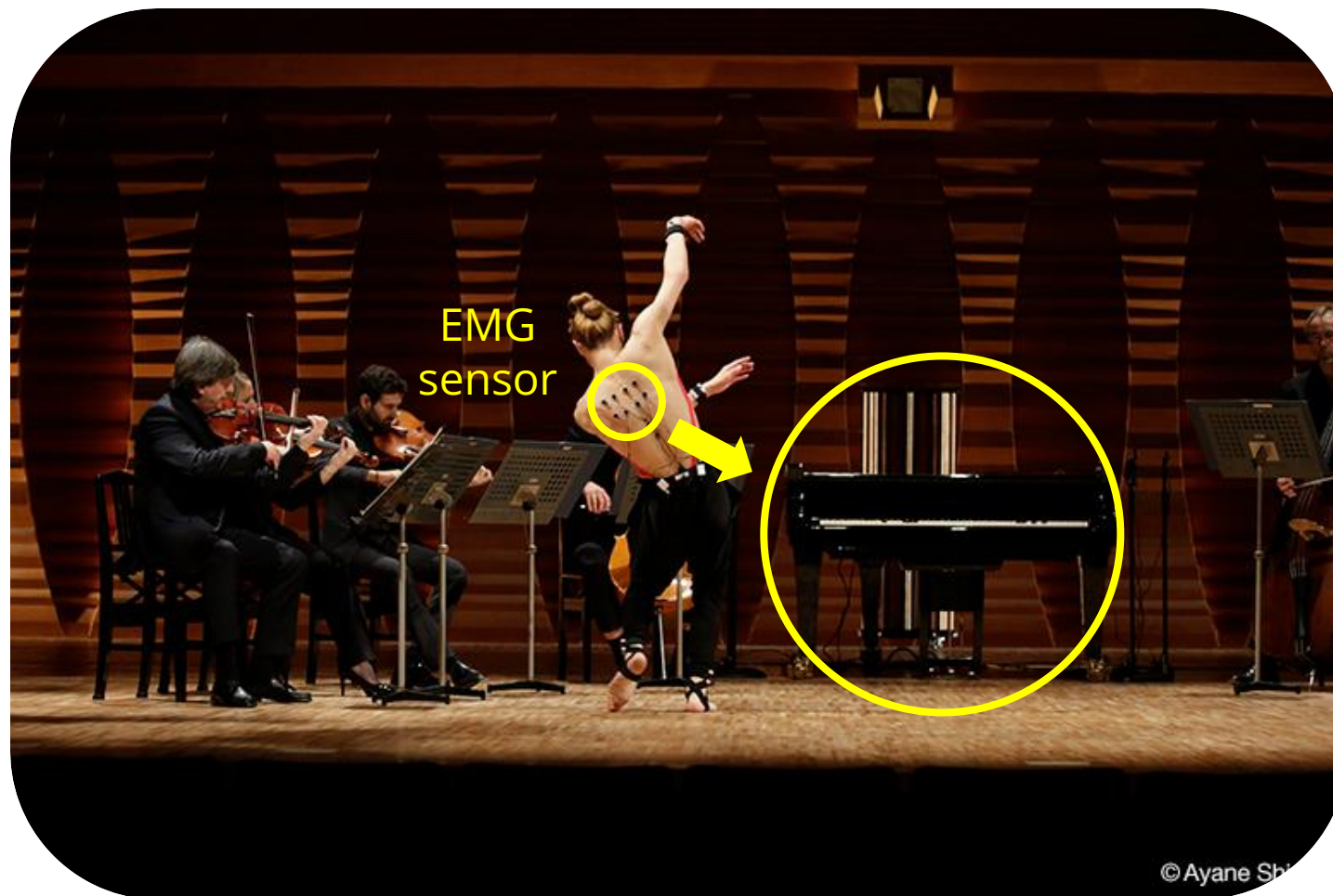
(Source: Robot Gizmos)



(Source: NBC DFW)

yamaha.com/en/news_release/2018/18013101/
sankei.com/article/20240113-CQCOSQHJWFIYPJJKZDCITRTRVI/
roboticgizmos.com/shimon-musical-robot-deep-learning/
nbcdfw.com/entertainment/the-scene/how-verdigris-ensemble-is-using-ai-to-create-a-new-concert-experience/3366031/

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(Source: Yamaha)

yamaha.com/en/news_release/2018/18013101/

Yamaha Global, "Yamaha Artificial Intelligence (AI) Transforms a Dancer into a Pianist - Short Version," *YouTube*, youtu.be/21injmy1wsU, 2018.



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roboticgizmos.com/shimon-musical-robot-deep-learning/
Georgia Tech Center for Music Technology, "Shimon with the Aarhus Jazz Orchestra," *YouTube*, youtu.be/ZpTV1-acSU8, 2021.



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Shlizerman et al., "Audio to Body Dynamics," *Proc. CVPR*, 2018.
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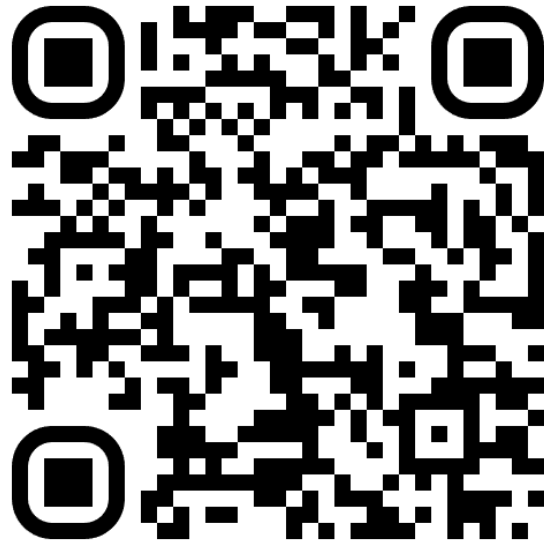
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Course Logistics

Communications

- **Course website:** Syllabus, schedule, readings, recordings, etc.
- **Email:** Announcements
- **Google Chat:** Q&A



hermandong.com/teaching/pat463_563

| Prerequisites

- **Prior coding experience** is recommended!
 - If you've taken any programming course, you should be fine
 - You should be comfortable reading code written by others

| Assignments (tentative)

- **Homework**

- Real or fake!?
- Stem separation & beat tracking
- Music generation
- AI song contest

- **Programming assignments**

- Symbolic music processing
- Spectral analysis
- Source separation
- Musical note classification

| Assignment Policies

- All assignments must be **completed on your own**
 - You are welcome to exchange ideas with your peers, but this should be in the form of concepts and discussion, not in the form of writing and code.
- **Please turn in your work even if it's incomplete!**
- Due at **11:59pm ET** on the date specified
- Late submissions: **up to a week, 1 point deducted per day**

| Project

- **Open-ended project**
- Group size: 1–3
- **Milestones** (tentative)
 - **Group forming** Oct 29
 - **Pitch** Nov 5
 - **Video presentation** Dec 15
 - **Final report** Dec 15
- Video presentations will be published on the course website
- Deliverables due at **11:59pm ET** on the date specified
- **No late submissions!** Submit your work early and update it later

| Project Topics

- Building a new AI music tool
- Exploring creative & artistic use of AI tools
- Analyzing systematically existing AI music tools

| Grading

- All **grading** and **regrade requests** will be handled on Gradescope
- **Homework (20%)**
- **Programming assignments (40%)**
- **Project (40%)**
 - Presentation (20%)
 - Final report (20%)

Optional Reading

- *[“Fundamentals of Music Processing”](#)* by Meinard Müller ([notebooks](#))
- *[“Intelligent Music Production”](#)* by Brecht De Man, Ryan Stables, and Joshua D. Reiss
- Course material for *[“Deep Learning for Music Analysis and Generation”](#)* by Yi-Hsuan Yang
- Course material for *[“Musical Applications of Machine Learning”](#)* by Juhan Nam
- Course material for *[“Machine Learning for Music”](#)* by Julian McAuley

| Policies: Attendance

- In-person attendance is strongly encouraged
- Course lectures will be recorded and made available on the course website
- Please **attend in-person** for the **project pitch**

Policies: Generative AI Usage

- Feel free to use GenAI tools (U-M GPT, ChatGPT, Stable Diffusion, DALLE, etc.) in your workflow. However, **you must disclose your usage of GenAI services in your write-ups.**
- **You take full responsibility for AI-generated materials as if you had produced them yourself:** ideas should be attributed and facts should be true.

Policies: Academic Integrity

- Plagiarism and cheating violate SMTD's Academic Code of Conduct. **All plagiarism, cheating and other academic misconduct cases will be reported to SMTD's Office of Academic and Student Affairs.**
- **All assignments must be completed on your own.** You are welcome to exchange ideas with your peers, but this should be in the form of concepts and discussion, not in the form of writing and code.
- You must **provide proper citations/references for any external resources** you use in your writing and code.

Questions on the Syllabus?



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~~The State of the Art~~

Not so long ago in June 2023

Prompt: relaxing and smooth jazz played in a stylish cafe



Prompt: delightful country music with acoustic guitars



Prompt: cinematic and suspenseful orchestral music



huggingface.co/spaces/facebook/MusicGen

Not so long ago in July 2023



Video **Runway Gen-2**

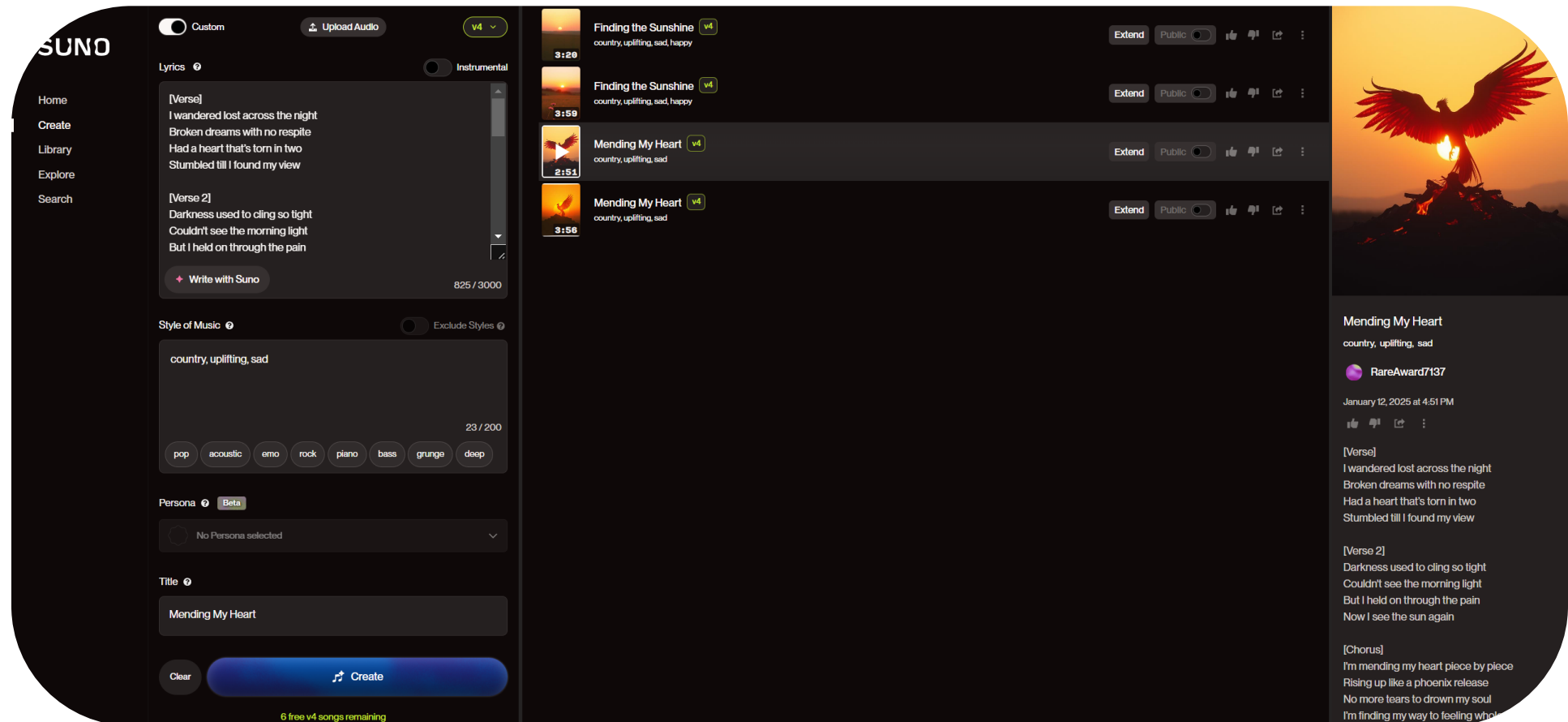
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The State of the Art

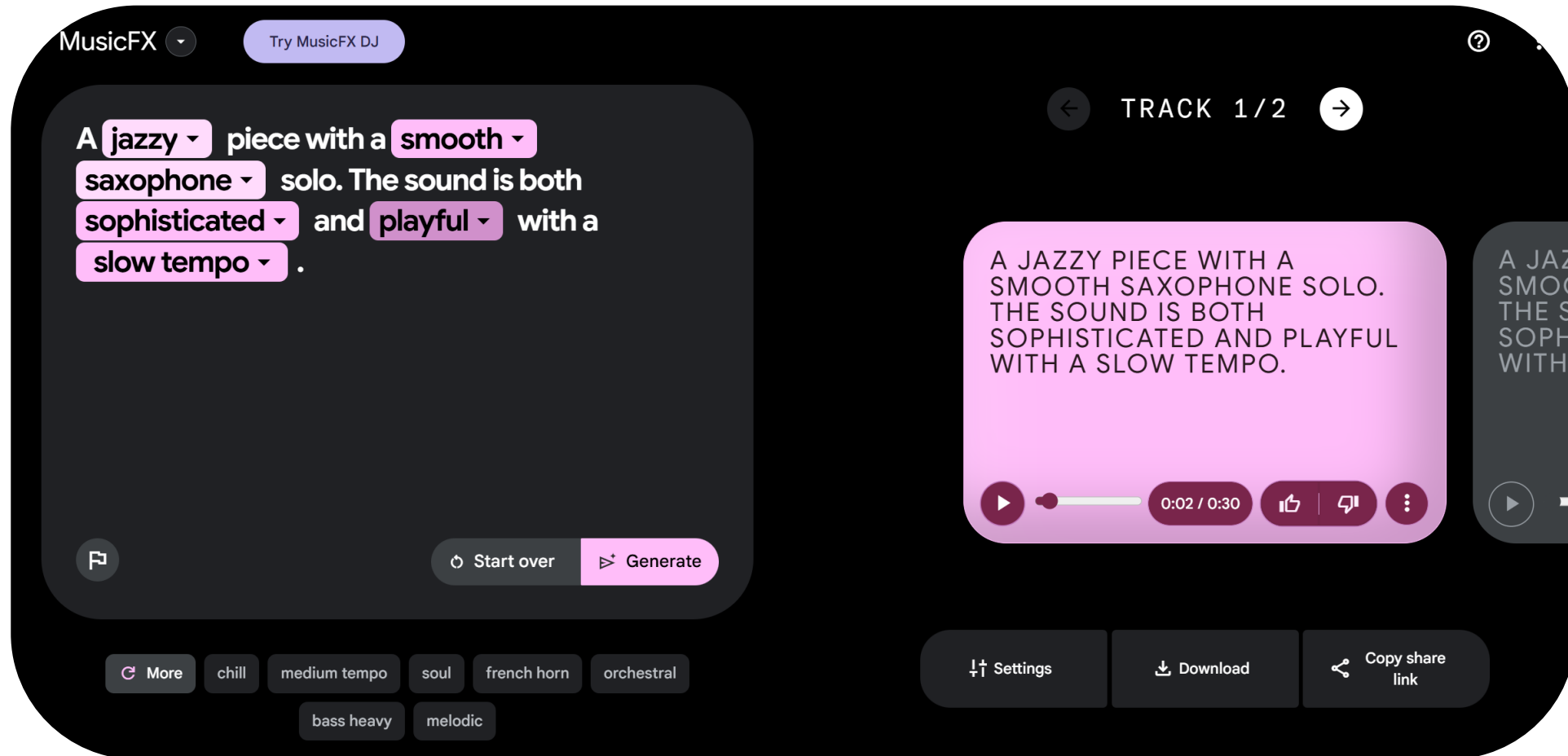
Until when...!?

Suno AI v4 (2024)



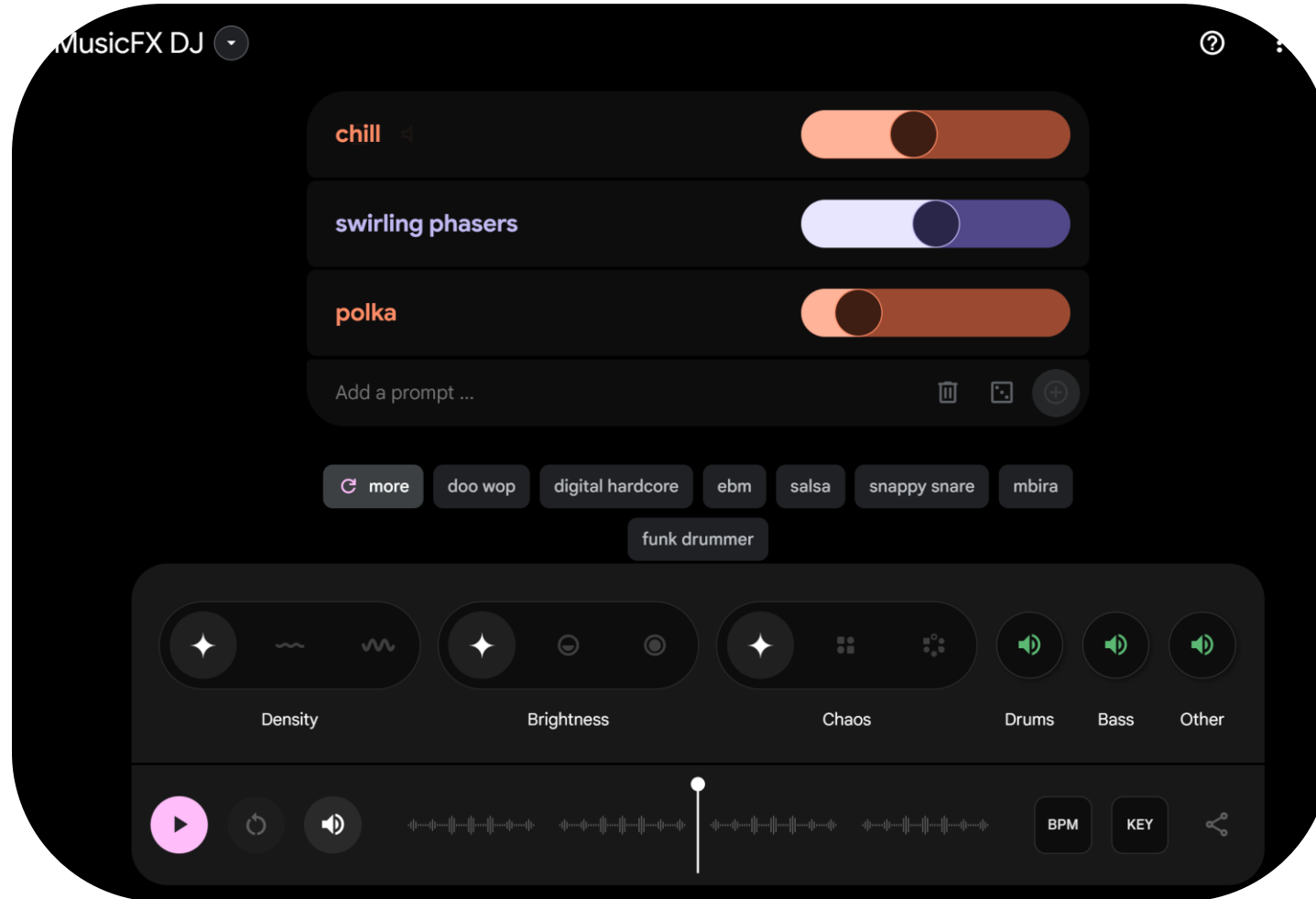
suno.com

Music FX (2024)



aitestkitchen.withgoogle.com/tools/music-fx

Music FX DJ (2024)



aitestkitchen.withgoogle.com/tools/music-fx-dj

Music FX DJ (2024)



youtube.com/live/IUQW5LgBZvQ

MovieGen (2024)

Meta Movie Gen

Learn about the research for the most advanced media foundation AI models and see how Meta is partnering with creators and directors to enable immersive storytelling.

ai.meta.com/research/movie-gen/

Recap

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Hildegard Dodel, Public domain, via Wikimedia Commons.
Taken at Hamamatsu Museum of Musical Instruments, August 2019.
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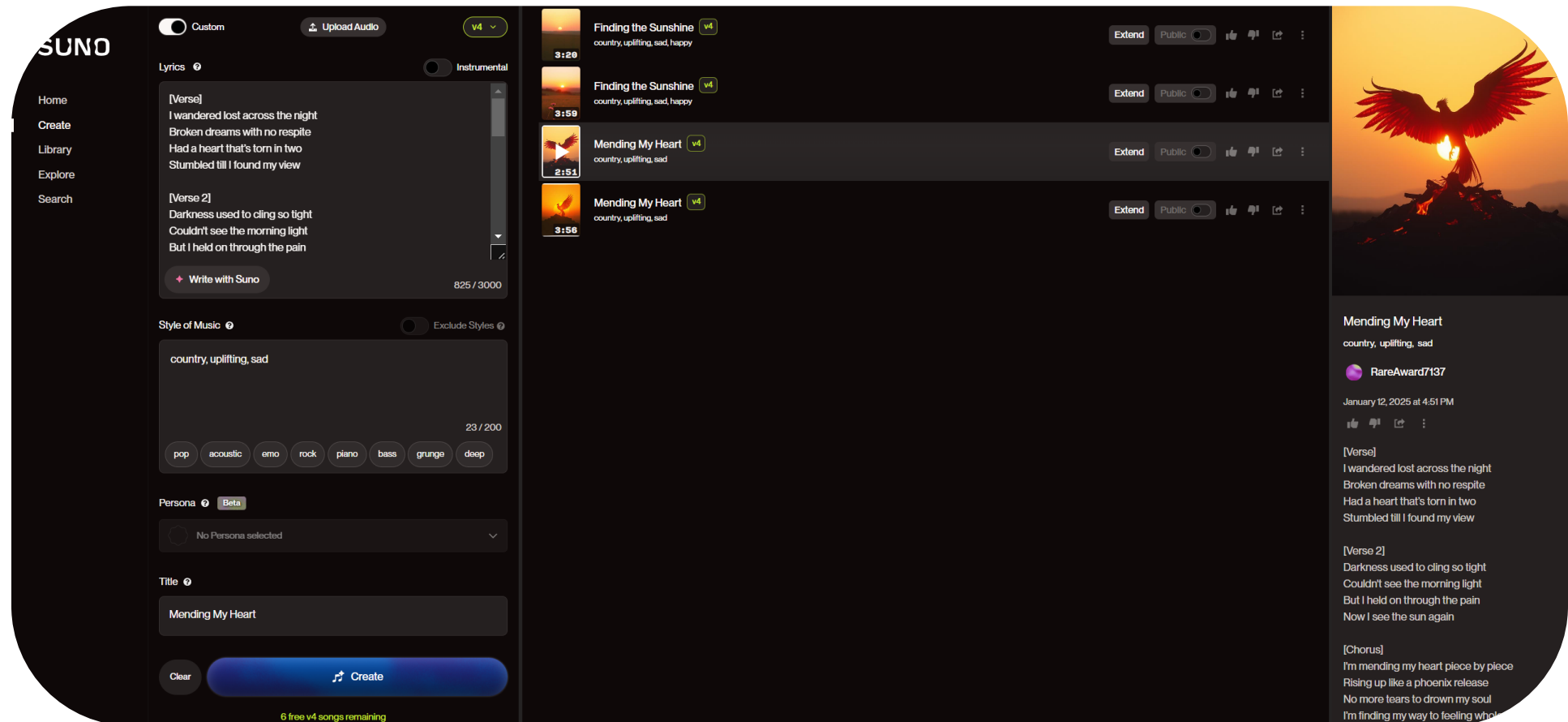


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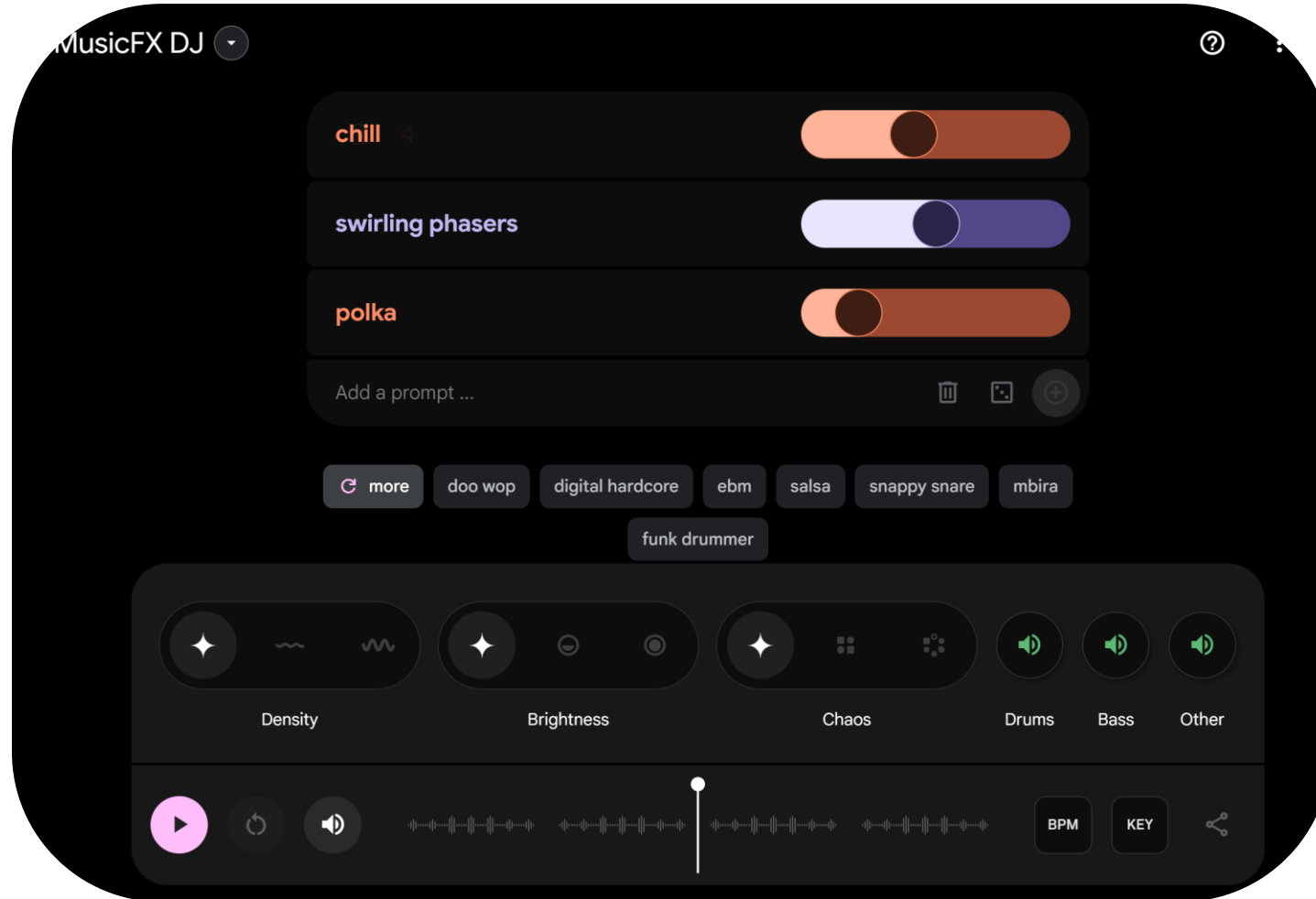
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suno.com

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Next Lecture

AI & ML Fundamentals

