

Künstliche Intelligenz

Praxisphase

Matthias Lang - Akademie für Tonkunst Darmstadt - 02.03.2024

On the menu today...

- 12 verschiedene Anregungen mit KI zu experimentieren
- 3 Schwierigkeitslevel
- In Kleingruppen (2-3 Personen)
- Ablauf:
 - Vorstellung der einzelnen Optionen
 - Individuelles Experimentieren (mit Ansprechpartner*innen hier im kl. Saal)
 - 12:00 Gemeinsamer Austausch von Arbeiten und Ideen

On the menu today...

github.com/langMatthias/ai-intro



The background features a dark blue gradient with three distinct wavy layers. The top layer is a very dark navy blue, the middle layer is a medium-dark blue, and the bottom layer is a bright navy blue. These layers create a sense of depth and motion.

Schwierigkeitsgrad: Leicht

Mozarts Würfelspiel

- Mozarts Würfelspiel kennenlernen
- Entwickeln eigener Regeln
- Erweiterung des Konzepts

ZAHLEN TAFEL.							
TABLE de CHIFFRES.							
A	B	C	D	E	F	G	H
12	96	22	1+1	+1	108	122	11
3	32	6	128	69	1+6	46	134
4	69	95	158	19	153	35	110
5	40	17	113	85	161	2	159
6	1+8	74	163	43	80	97	36
7	104	157	27	167	154	64	118
8	152	60	171	53	99	133	21
9	119	94	114	50	140	86	169
10	98	1+2	42	156	75	129	63
11	3	87	165	61	135	47	147
12	54	130	10	103	28	37	106

Erster Theil.

Premiere Partie.



github.com/langMatthias/ai-intro

TABLE de MUSIQUE.

5.

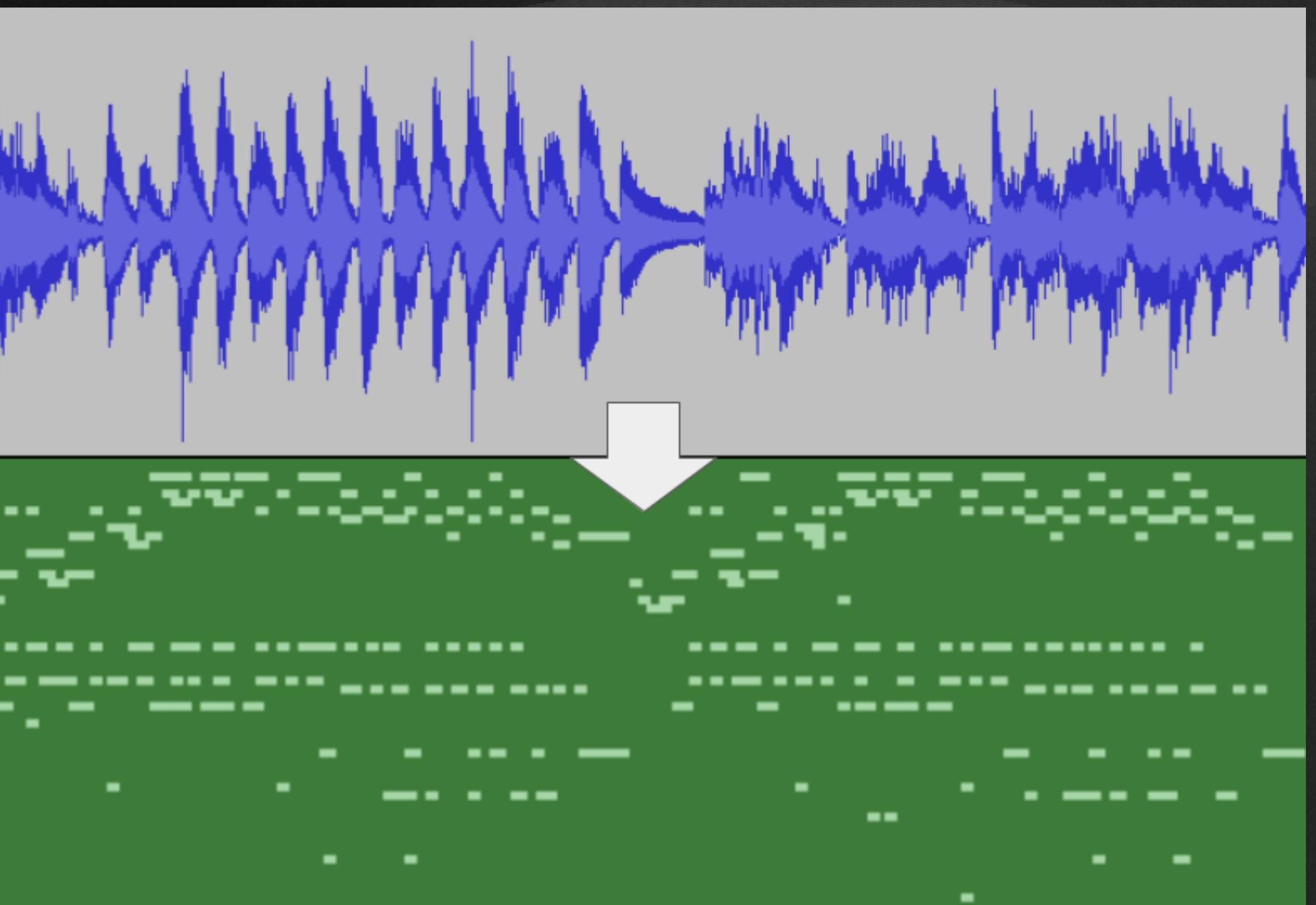
The musical score consists of eight staves of music. Each staff begins with a treble clef and a key signature of one sharp. Measures are numbered sequentially from 1 to 24 above each staff. The music features various note values, including eighth and sixteenth notes, and rests. Measure 1 starts with a eighth-note followed by a sixteenth-note. Measure 2 starts with a sixteenth-note followed by an eighth-note. Measure 3 starts with an eighth-note followed by a sixteenth-note. Measure 4 starts with a sixteenth-note followed by an eighth-note. Measure 5 starts with an eighth-note followed by a sixteenth-note. Measure 6 starts with a sixteenth-note followed by an eighth-note. Measure 7 starts with an eighth-note followed by a sixteenth-note. Measure 8 starts with a sixteenth-note followed by an eighth-note. Measure 9 starts with an eighth-note followed by a sixteenth-note. Measure 10 starts with a sixteenth-note followed by an eighth-note. Measure 11 starts with an eighth-note followed by a sixteenth-note. Measure 12 starts with a sixteenth-note followed by an eighth-note. Measure 13 starts with an eighth-note followed by a sixteenth-note. Measure 14 starts with a sixteenth-note followed by an eighth-note. Measure 15 starts with an eighth-note followed by a sixteenth-note. Measure 16 starts with a sixteenth-note followed by an eighth-note. Measure 17 starts with an eighth-note followed by a sixteenth-note. Measure 18 starts with a sixteenth-note followed by an eighth-note. Measure 19 starts with an eighth-note followed by a sixteenth-note. Measure 20 starts with a sixteenth-note followed by an eighth-note. Measure 21 starts with an eighth-note followed by a sixteenth-note. Measure 22 starts with a sixteenth-note followed by an eighth-note. Measure 23 starts with an eighth-note followed by a sixteenth-note. Measure 24 starts with a sixteenth-note followed by an eighth-note.

Audio 2 MIDI

- Onsets & Frames Modell zur Transkription von Klavier-Aufnahmen zu MIDI
- Convolutional Neural Networks (CNNs) und Long short-term memory (LSTM) Architekturen



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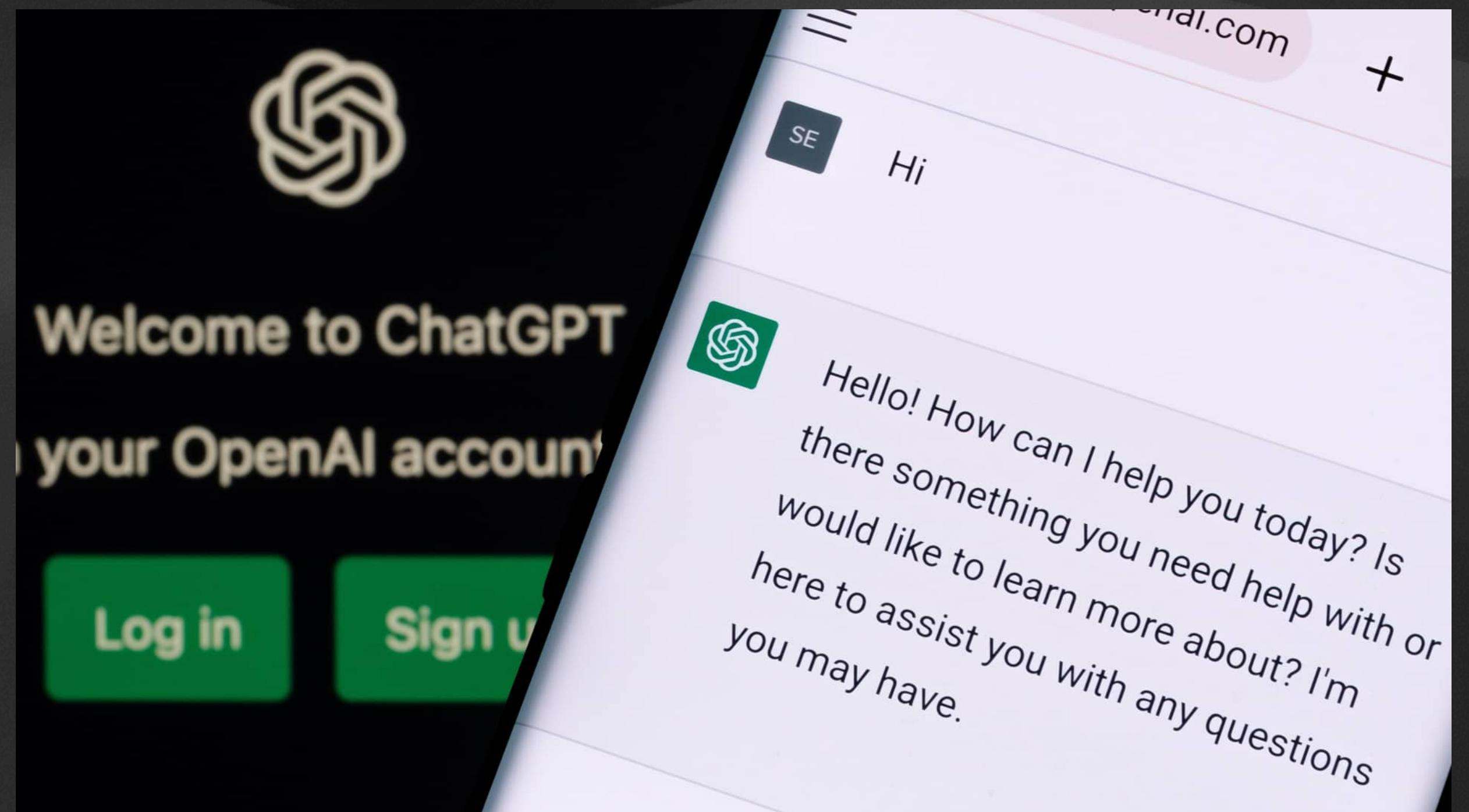


ChatGPT

- Erste Schritte mit ChatGPT
- Kann man ChatGPT auch zur Komposition verwenden?
- Wie sehen gute Prompts aus?

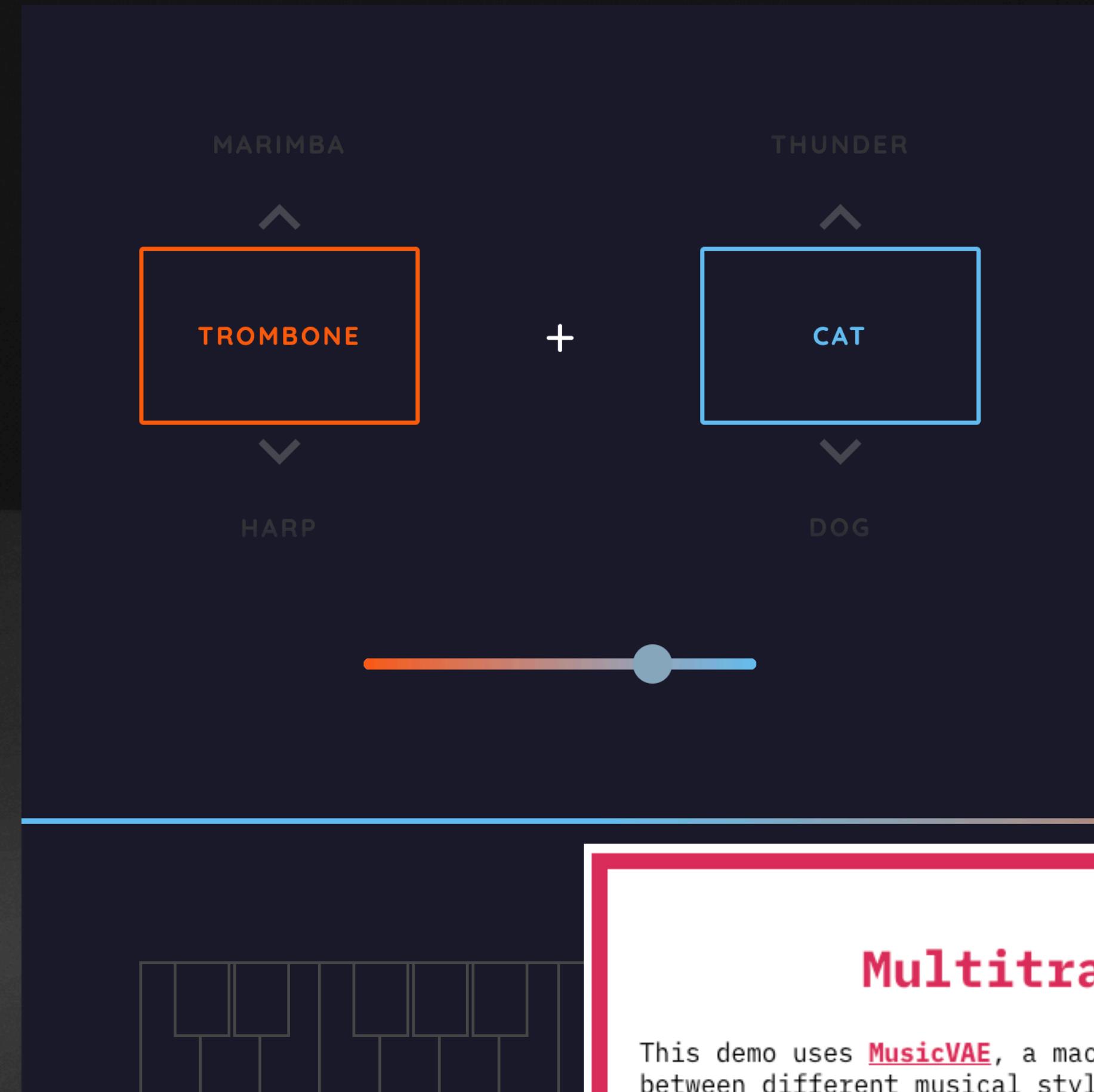


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Interpolation

- Erkundung des latenten Raums des Tools Synth
- Interpolation zwischen musikalischen Stilen mit dem MusicVAE-Modell



Multitrack Interpolation

This demo uses [MusicVAE](#), a machine learning model that is able to interpolate between different musical styles. Try it below!

Ready to play!

PLAY PLAY FULL INTERPOLATION SAVE AS MIDI

Style 1 Style 2

RANDOM RANDOM
LOAD MIDI LOAD MIDI

A screenshot of the Multitrack Interpolation demo. It features two sections for selecting styles, each with a 'RANDOM' button and a 'LOAD MIDI' button. Between the sections is a large horizontal slider. Above the sections are three red buttons: 'PLAY', 'PLAY FULL INTERPOLATION', and 'SAVE AS MIDI'. Below the sections are the labels 'Style 1' and 'Style 2'.

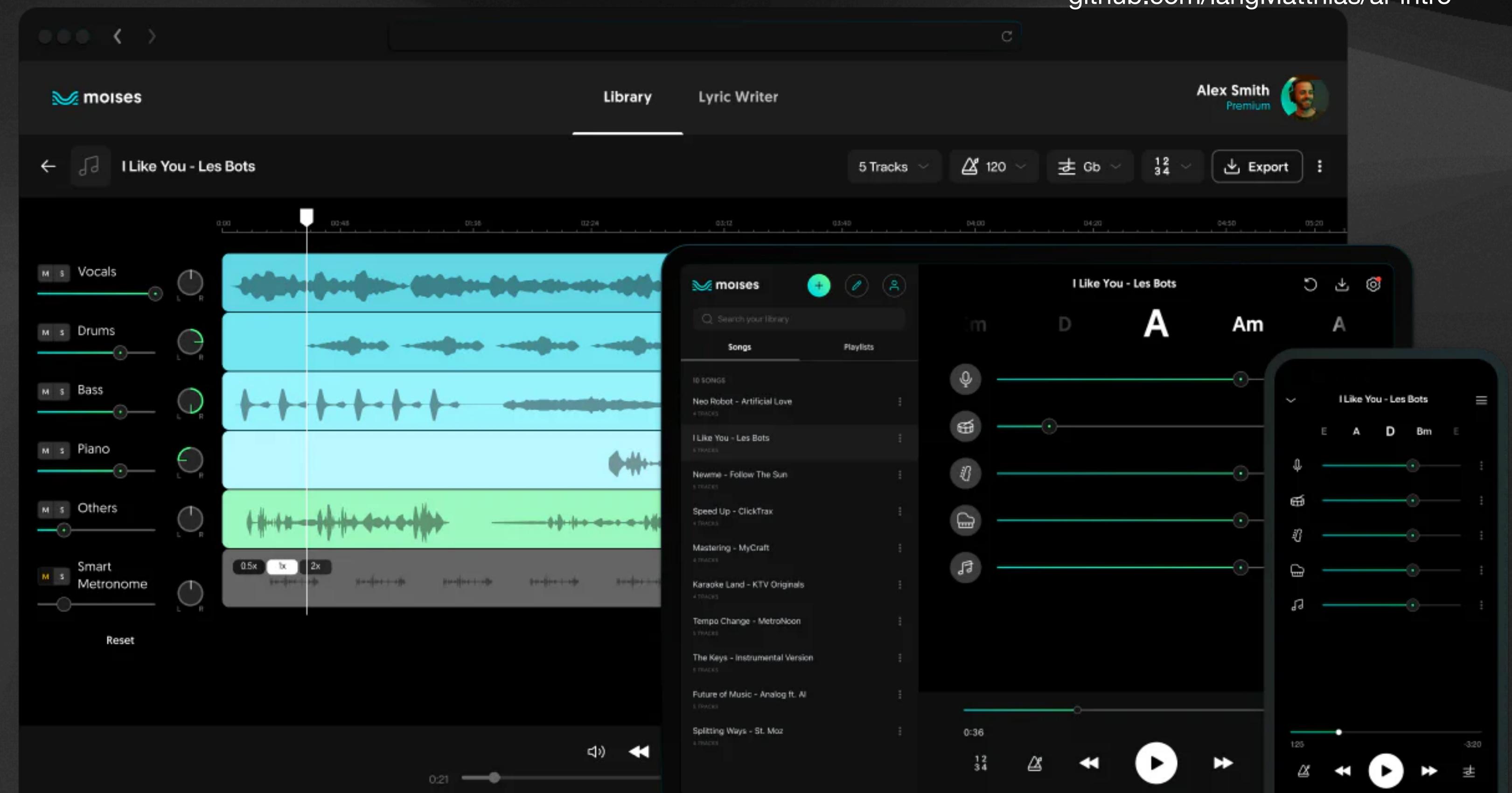
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Track Separation

- Aufteilen von Musikstücken in ihre einzelnen Bestandteile

- Unterschiedliche Tools:

- Moises
- MVSep-MDX23
- u.a.

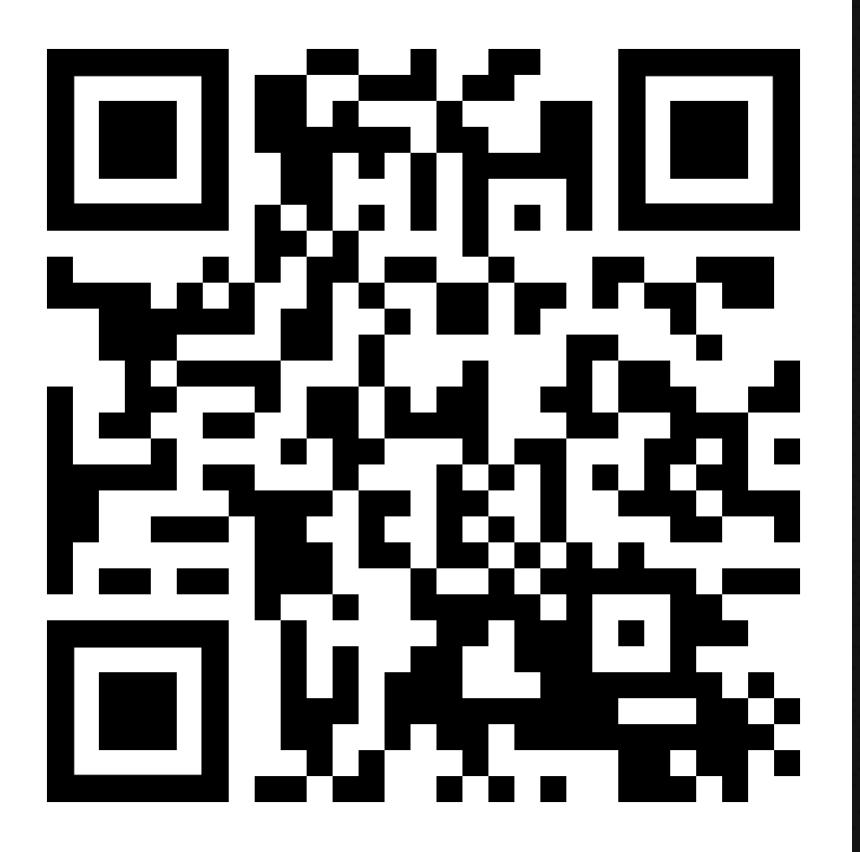


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Music Prompting

- Prompting zur Generierung von Musik
- Unterschiedliche Modelle:
 - MusicLM
 - Suno
 - MusicGen
 - Riffusion
 - Etc.

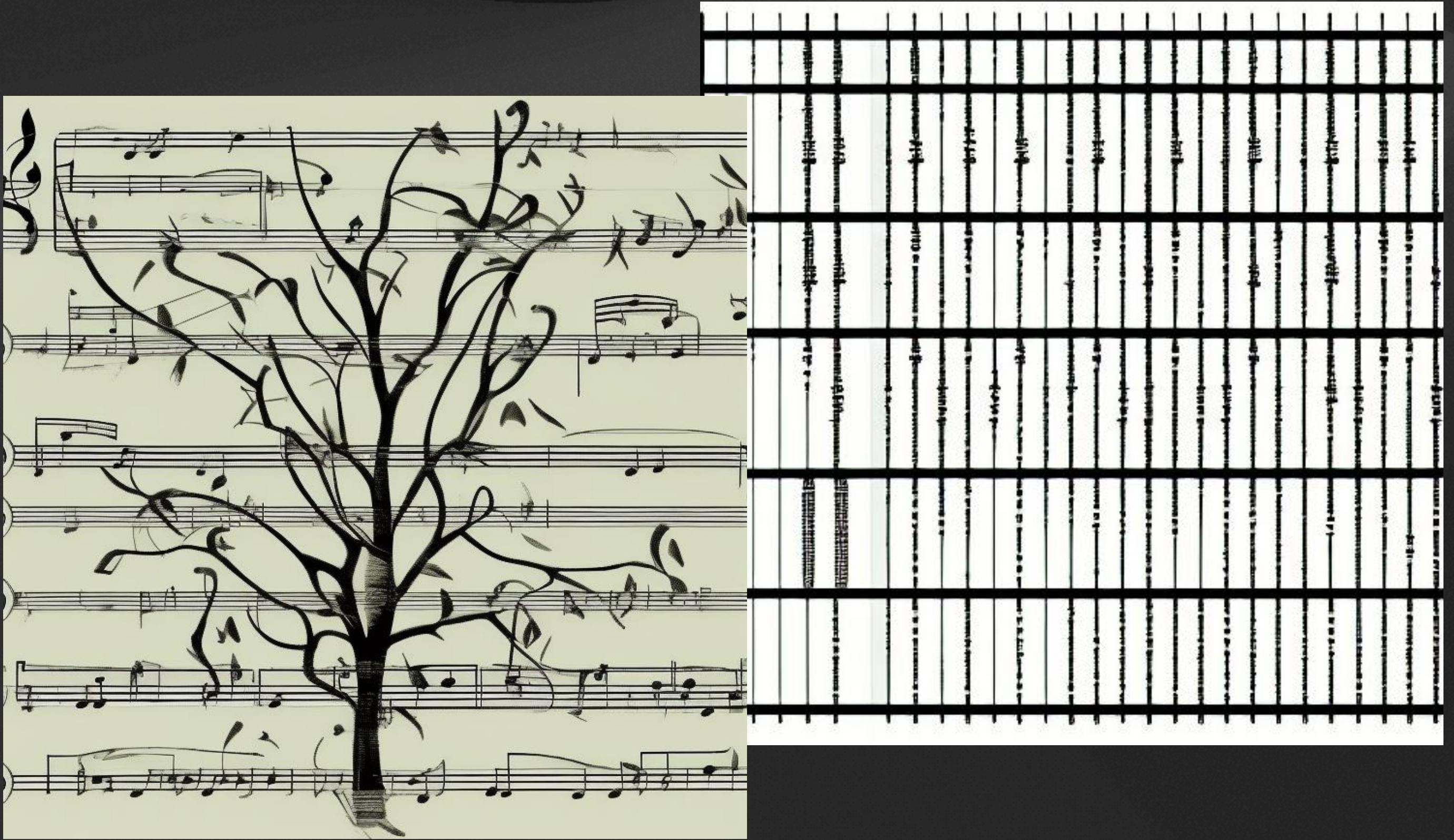


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Graphische Notation

- Nutzung von Bildgeneratoren zur Generierung graphischer Notation
- Unterschiedliche Modelle:
 - Stable Diffusion
 - Dall-E 3
 - Etc.
- Reverse Process



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Train a model on your style!

- Erkundung des musicVAE-Modells
- Auto-Encoder-Struktur
- Trainieren des Modells auf den Stil einer hochgeladenen MIDI-Datei

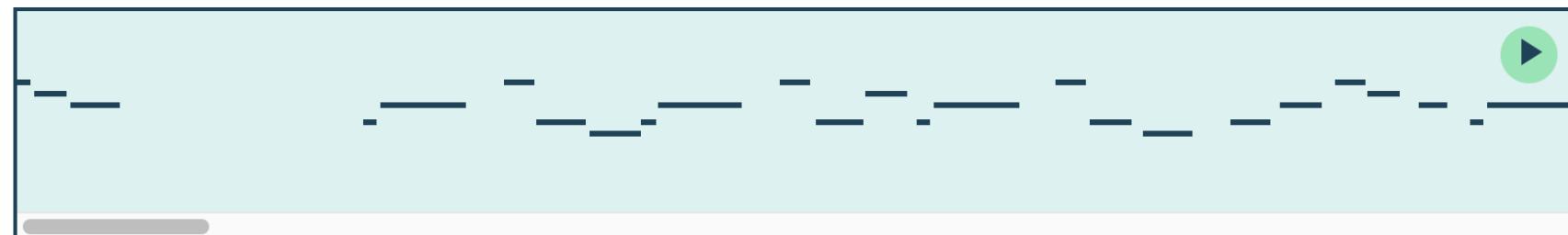


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3

Personalize the model!

The MIDI file you uploaded had several instruments, so this is what we think the melody is. This is what we will be training on.

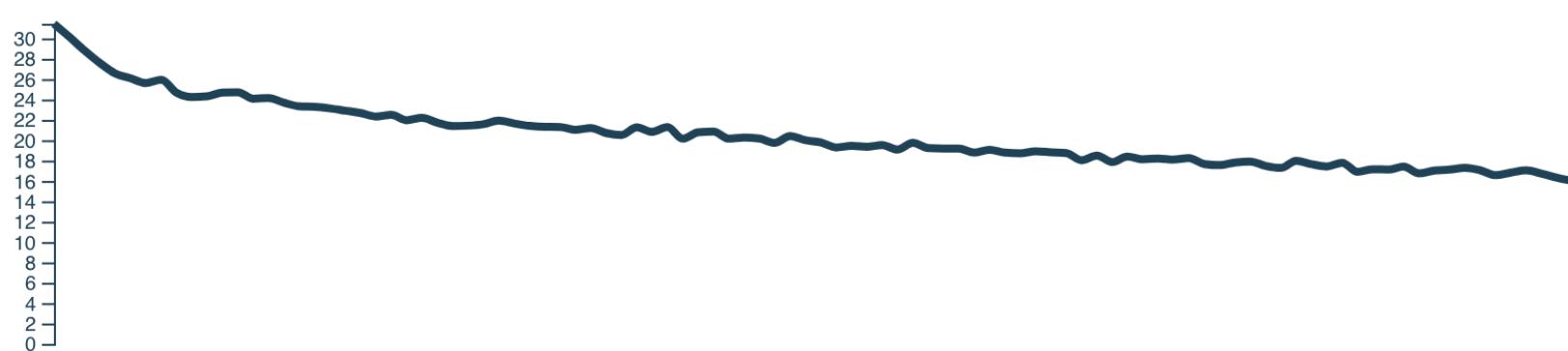


Training complete!

We've now added 4 new MidiMe sliders to Step 1: these super sliders control the features that make the random samples sound like **your** input. Go slide them around and see how the samples change!

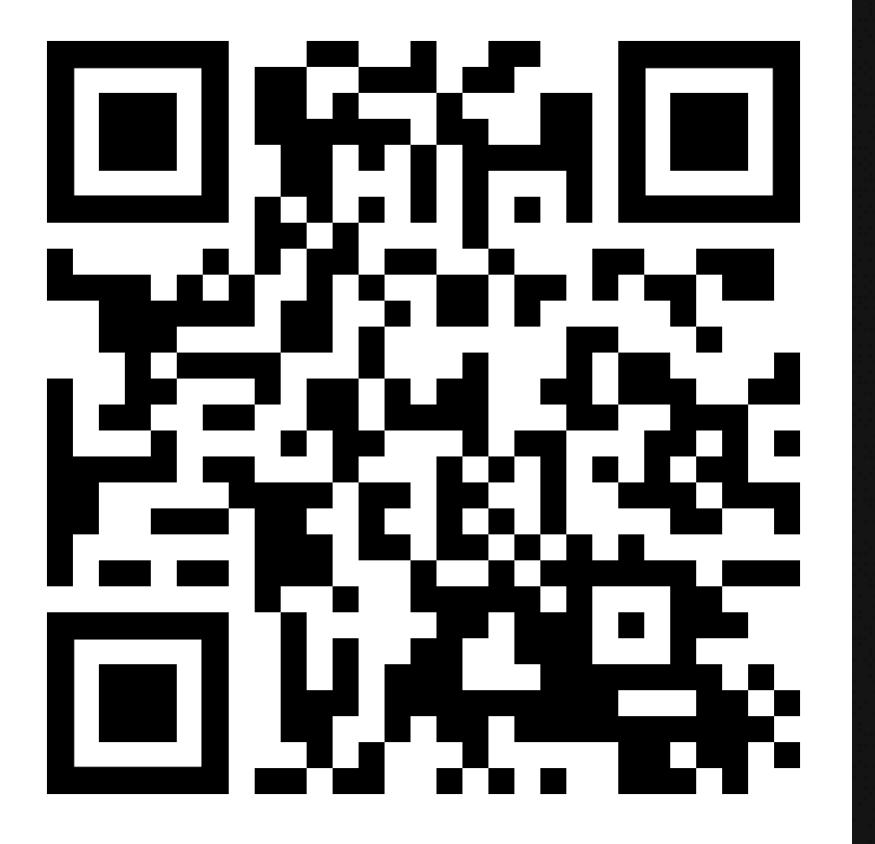
Training step: **100** / 100

To check how well we're training the model, we can track its error reconstructing your uploaded file. We're not looking for it to become exactly 0 -- just to go down and flatten out.



Musikalische Interaktion

- Gemeinsame Improvisation mit dem A.I. Duet Tool
- Conditioning des PerformanceRNN-Modells



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A.I. Duet

A piano that responds to you.

 PLAY

 How it works

The background features a dark blue gradient with three distinct wavy layers. The top layer is a very dark navy blue, the middle layer is a medium-dark blue, and the bottom layer is a bright navy blue. These layers create a sense of depth and motion.

Schwierigkeitsgrad: Mittel

Einführung in Python-Programmierung



github.com/langMatthias/ai-intro

- Programmieren von Mozarts Würfelspiel in der Programmiersprache Python
- Zufall in Programmen
- Verändern und Generieren von Noten mit der music21 Library
- Experimentieren mit Colab Notebooks

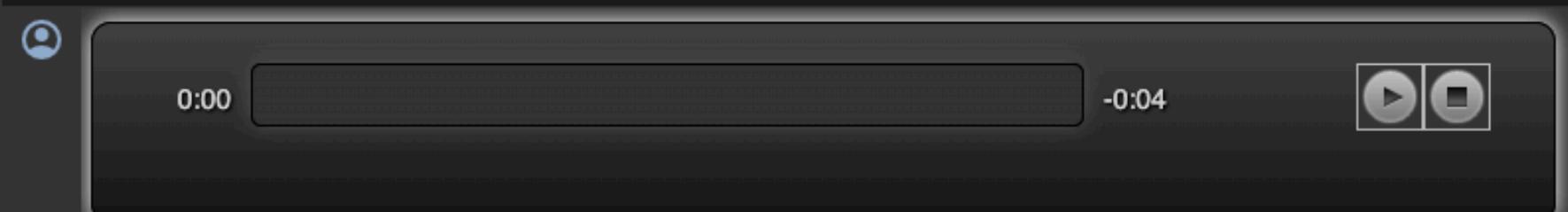
```
[ ] def create_score(measures, time_signature=None):
    """
    Erstellt eine music21 Score aus einer Liste an music21 Takten.
    Damit die Noten korrekt in Notations-Software angezeigt werden, kann hier auch die Taktart angegeben werden (z.B. '3/8' für Mozarts Würfelspiel)
    """
    score = music21.stream.Score()
    part = music21.stream.Part()

    #TODO

    score.append(part)
    if time_signature is not None:
        score.parts[0].getElementsByClass('Measure')[0].timeSignature = music21.meter.TimeSignature(time_signature)
    return score
```

Nun können wir unsere ersten Test-Takte zu einer Score kombinieren. Ergänze den folgenden Codeblock und finden einen Weg, dir die generierte Score anzuhören.

```
❶ # creating a music21 Score from our test_selection
test_score = #TODO
# Listening to the test_score
#TODO
```



Music Prompting 2

- Generierung von MIDI-Daten durch Prompting
- Experimentieren mit Colab Notebooks



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MusicGen

This is your private demo for [MusicGen](#), a simple and controllable model for music generation presented at: ["Simple and Controllable Music Generation"](#).

Input Text

Condition on a melody (optional) File or Mic
 file mic
 File
Audio hier ablegen
- oder -
Hochladen

15.8s
Loading model... - 0.0%

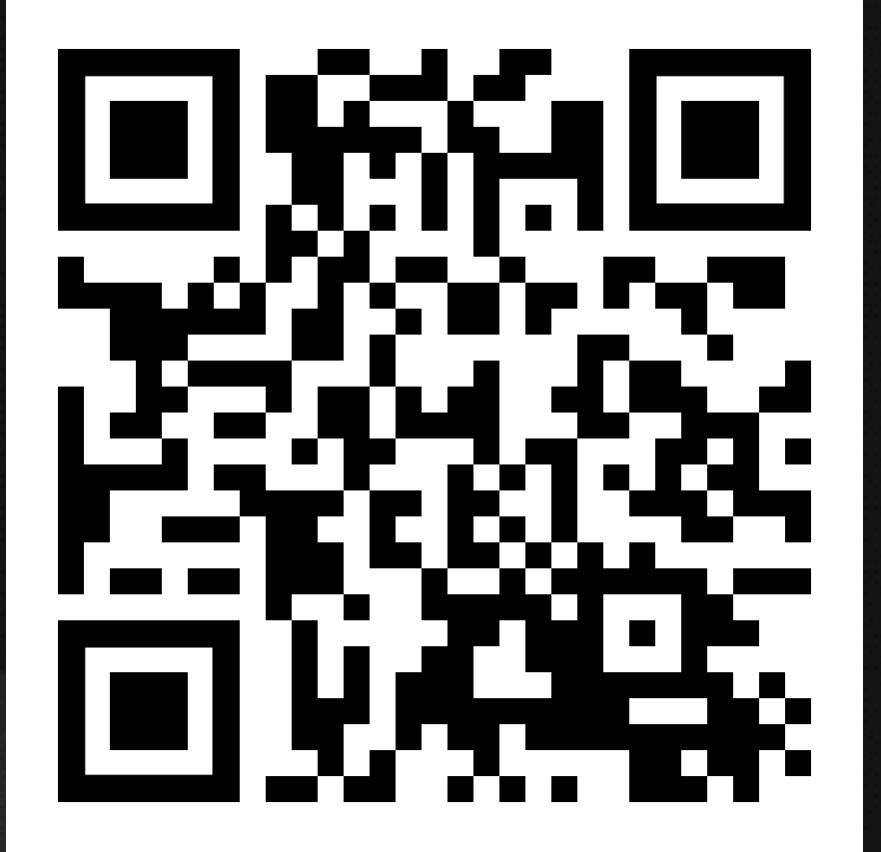
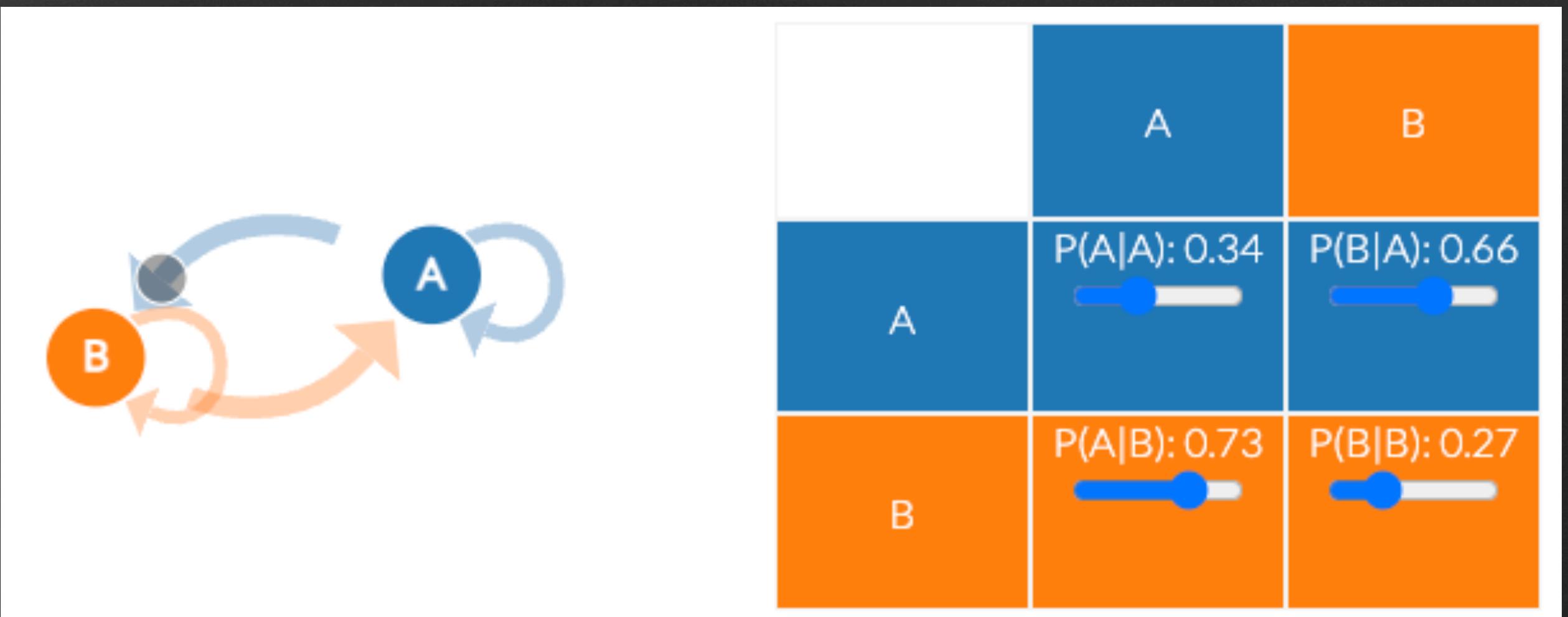
15.8s
Loading model... - 0.0%

Submit **Interrupt**

The screenshot shows the MusicGen web interface. On the left, there is an "Input Text" field containing the text "music prompt". In the center, there is a section for "Condition on a melody (optional) File or Mic", which includes a radio button for "file" (selected), a "File" input field, and options to "Audio hier ablegen" or "Hochladen". Two progress bars at the bottom indicate "Loading model... - 0.0%" for both the top and bottom sections. At the bottom, there are two buttons: "Submit" and "Interrupt". The overall theme is dark with light-colored text and UI elements.

Markov Chains

- Implementierung von Markov-Ketten um Tonhöhen zu generieren
- Anpassung der Übergangs-Wahrscheinlichkeiten an MIDI-Daten
- Experimentieren mit Colab Notebooks



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MIDI Continuation

- MIDI Composer (Transformer-Modell)
- Fortführung eines MIDI-Prompts
- Experimentieren mit Colab Notebooks
- Magenta Studio
- Open MuseNet
- Audio Continuation



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The screenshot displays five separate windows from the Magenta Studio interface, each representing a different mode for generating or continuing MIDI data:

- CONTINUE:** This window shows options for "Type" (Drums or Melody), "Input Clip" (Choose Track or Choose Clip), and "Variations" (4), "Length" (2 Bars), "Temperature" (1.0). A "Generate" button is present.
- DRUMIFY:** This window shows "Type" (Drums), "Input Clip" (Choose Track or Choose Clip), and a "Temperature" slider set to 1.0. A "Generate" button is present.
- GENERATE 4 BARS:** This window shows "Type" (Drums), "Output Location" (Choose Track or Choose Clip), and "Variations" (8), "Temperature" (1.0). A "Generate" button is present.
- GROOVE:** This window shows "Type" (Drums), "Input Clip" (Choose Track or Choose Clip), and a "Temperature" slider set to 1.0. A "Generate" button is present.
- INTERPOLATE:** This window shows "Type" (Drums), "Input Clips" (Choose Track, Choose Clip A, Choose Clip B), and "Steps" (3), "Temperature" (1.0). A "Generate" button is present.



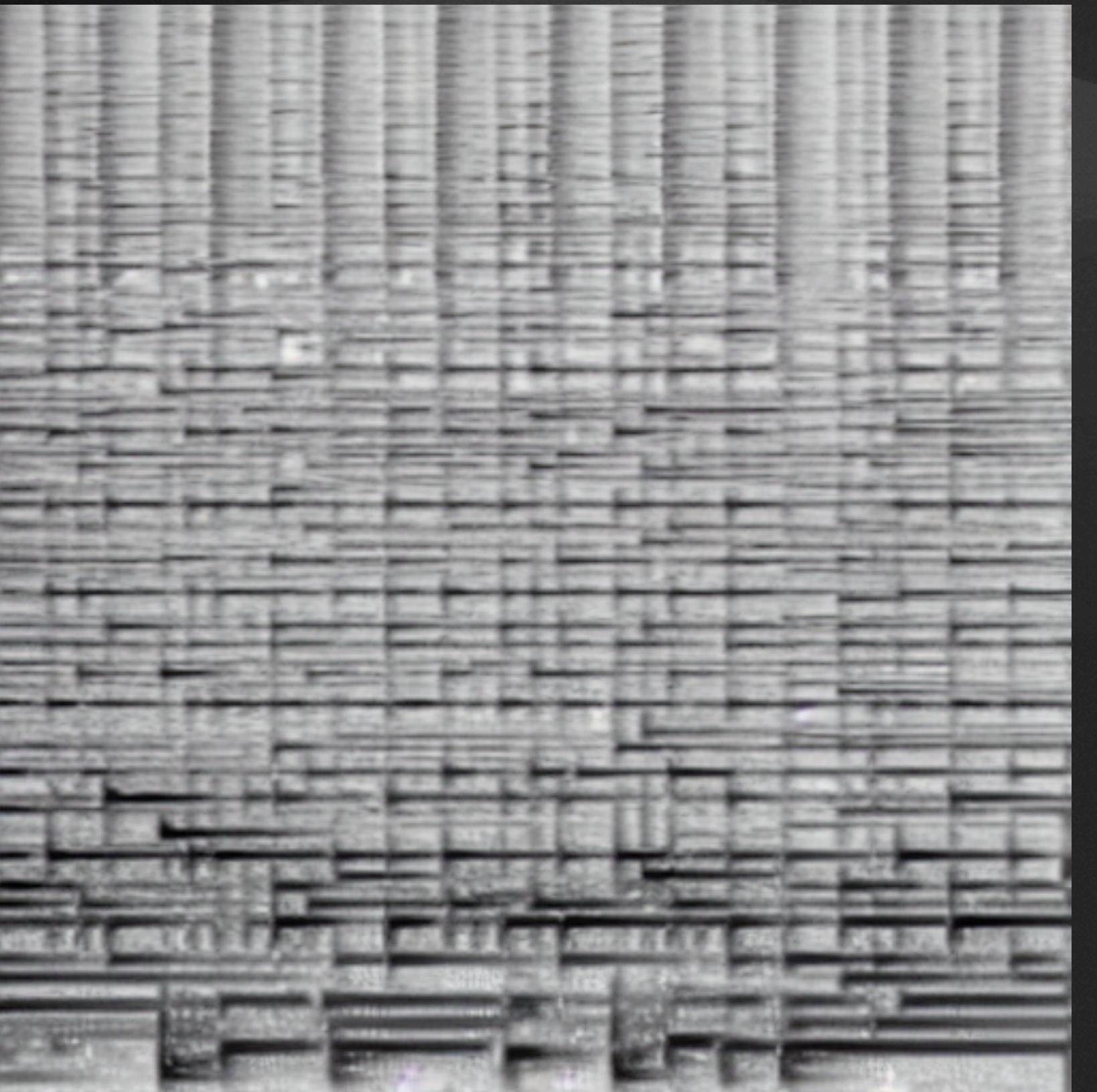
Schwierigkeitsgrad: Schwer

MeloDiff

- Riffusion-Modell
- Arbeit mit Spektrogrammen
- Nutzen von Diffusion zur Audio-Generierung
- Veränderung von Audio-Dateien/Spektrogrammen durch Prompting

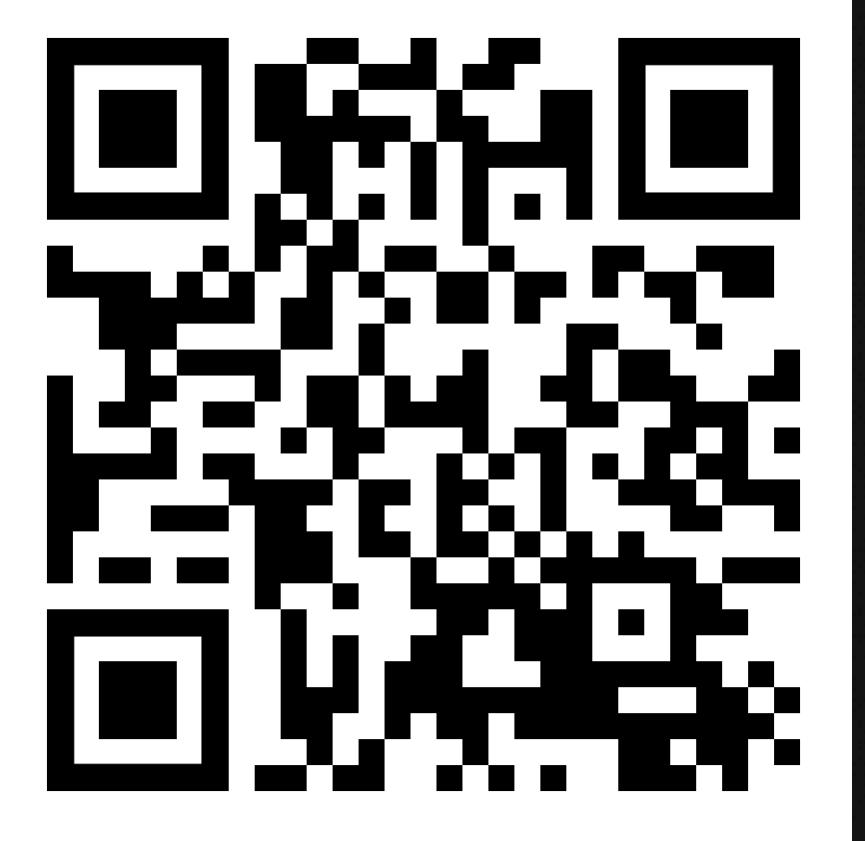


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Music Generation with RNNs

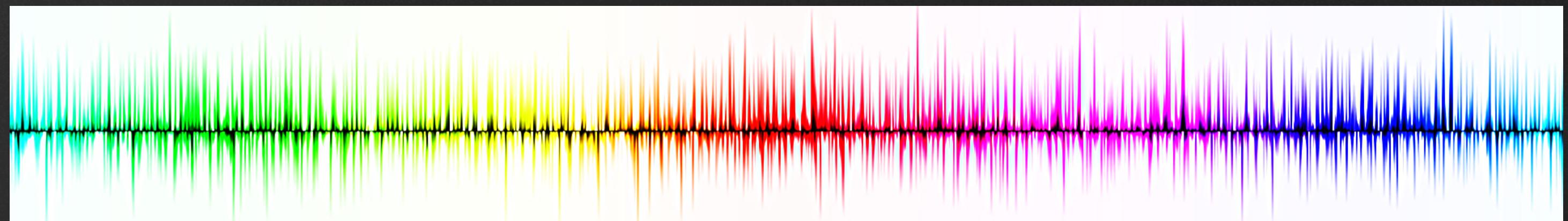
- Einführung in Tensorflow
- Grundlagen von rekurrenten neuronalen Netzen (RNNs)
- Vorhersage des nächsten Tones in ABC-Notation
- MIT - Introduction to Deep Learning



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Bis um 12 Uhr