

MuseGAN: Multi-track Sequential Generative Adversarial Networks for Symbolic Music Generation and Accompaniment

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Demo Page <https://salu133445.github.io/musegan/>

**these authors contributed equally to this work*

Outline

- Goals & Challenges
- Data
- Proposed Model
- Results & Evaluation
- Future Works

Source Code <https://github.com/salu133445/musegan>
Demo Page <https://salu133445.github.io/musegan/>

Goals

[Source Code]

<https://github.com/salu133445/musegan>

[Demo Page]

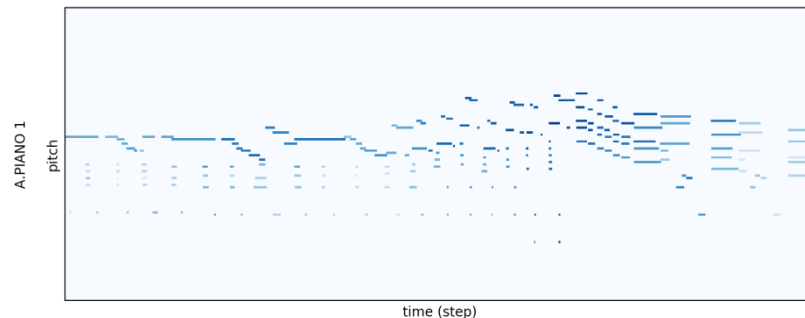
<https://salu133445.github.io/musegan/>

Generate pop music

- of **multiple tracks**



- in **piano-roll** format

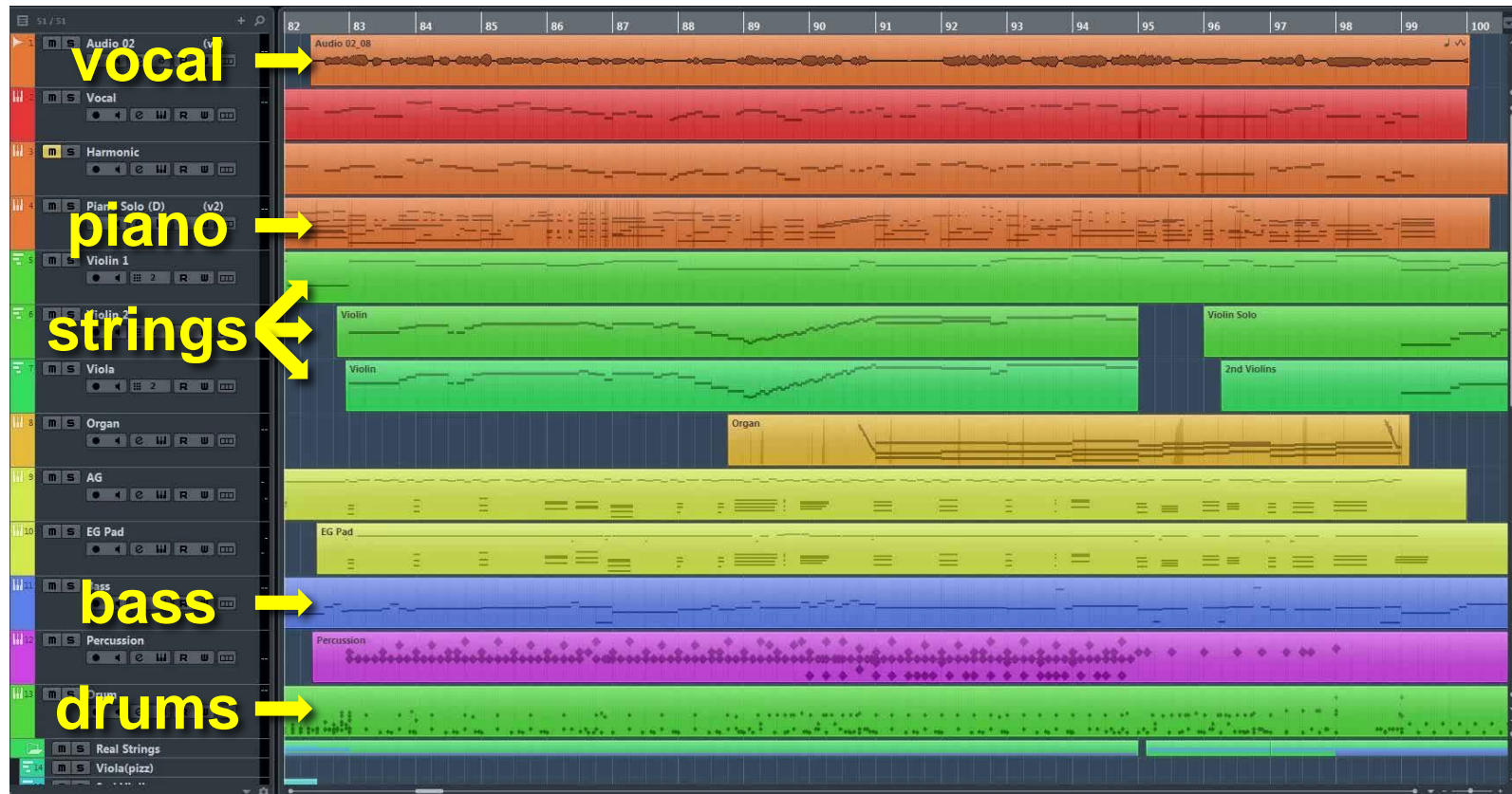


- using **GAN** with **CNNs**

Challenge I

Multi-track GAN

Multitrack Interdependency

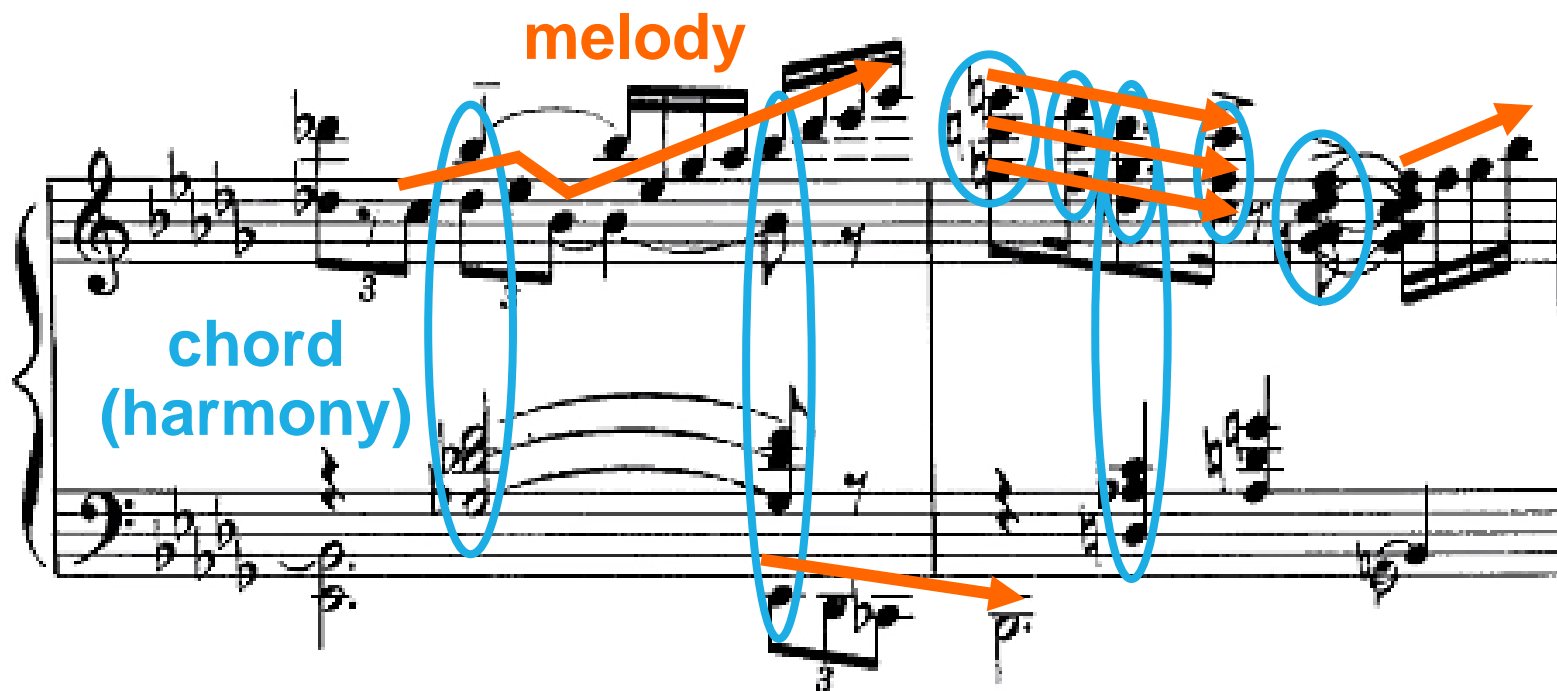


music & clip by *phycause*

Challenge II

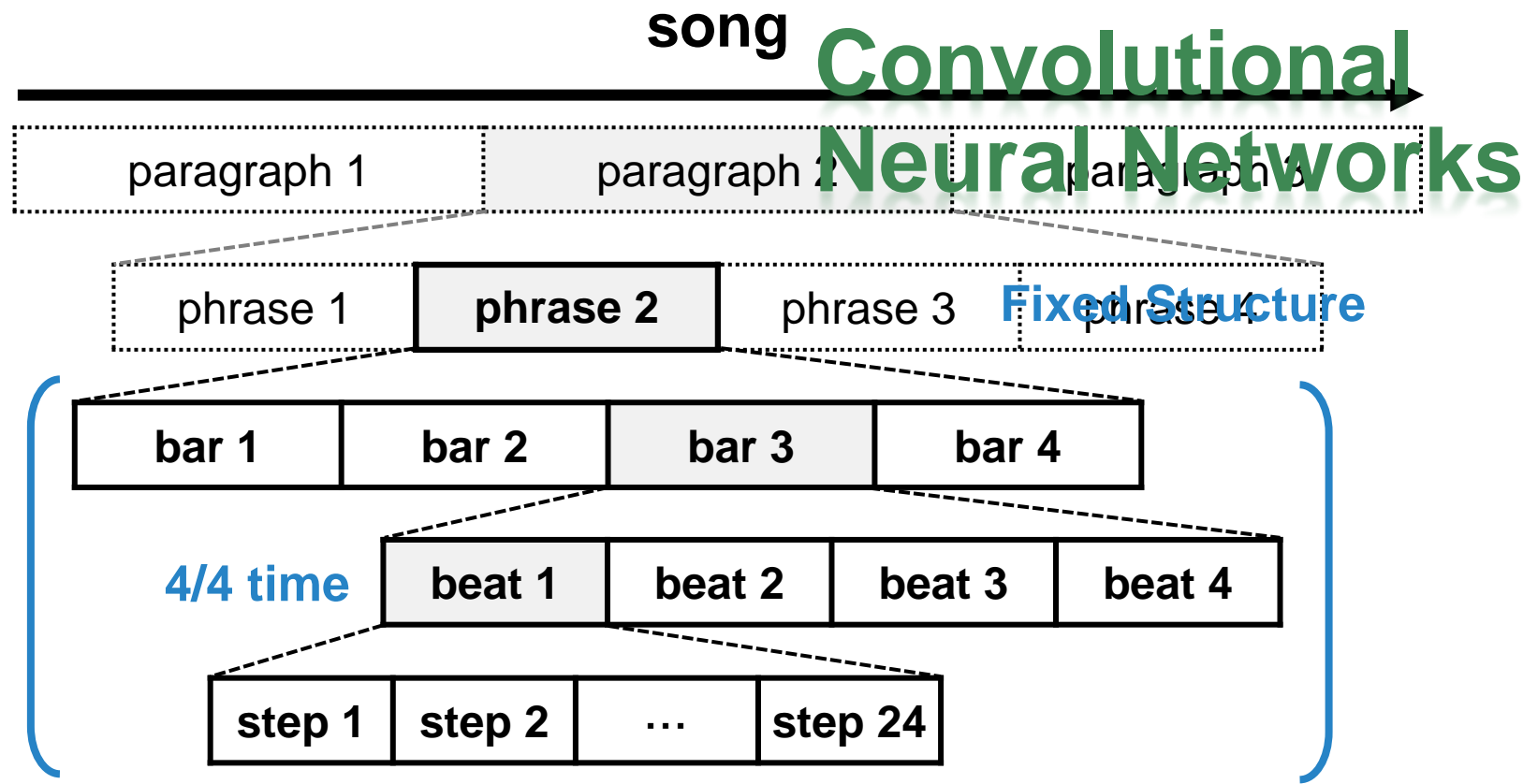
Music Texture

Convolutional Neural Networks



Challenge III

Temporal Structure

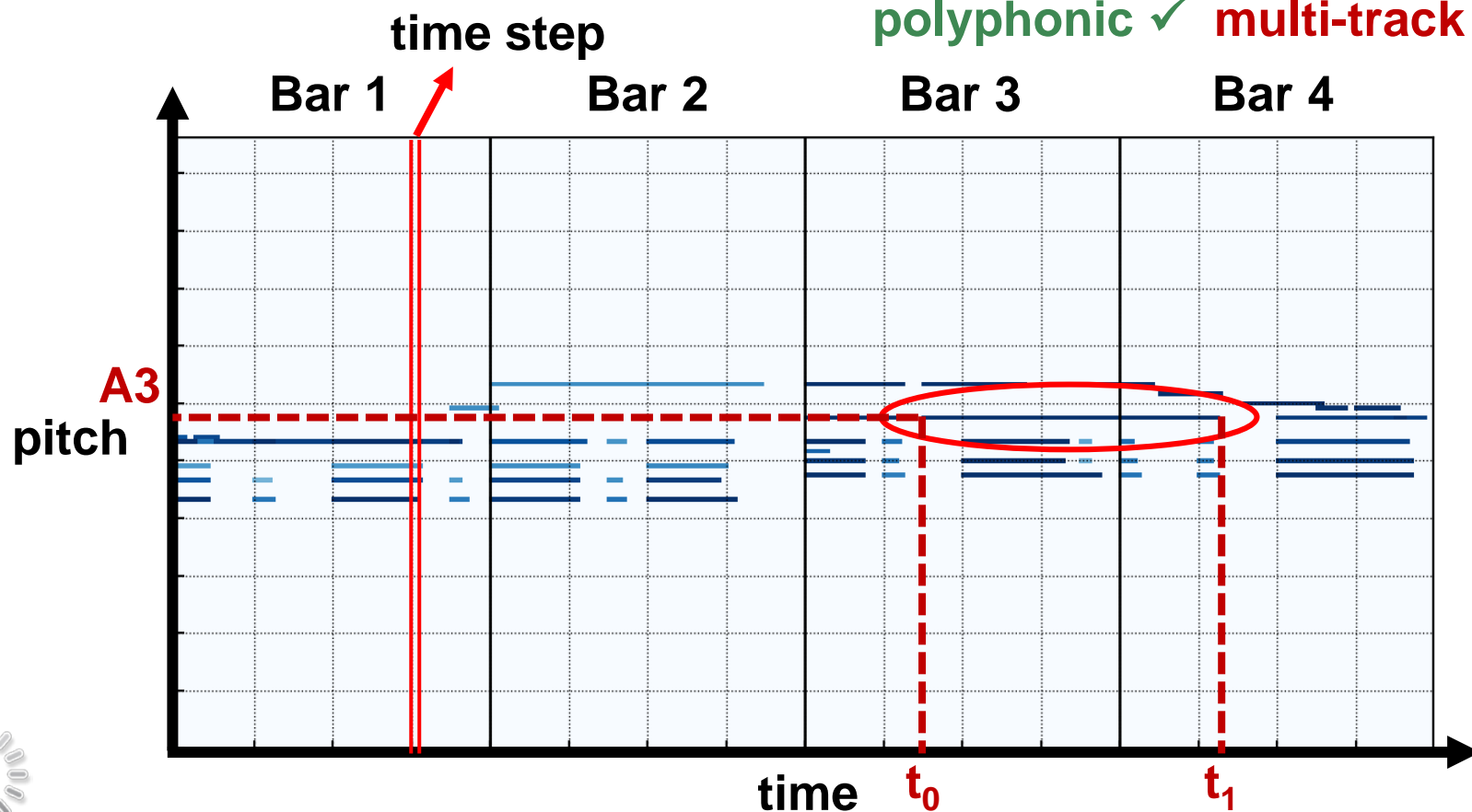


Piano-roll

(with symbolic timing)

Data Representation

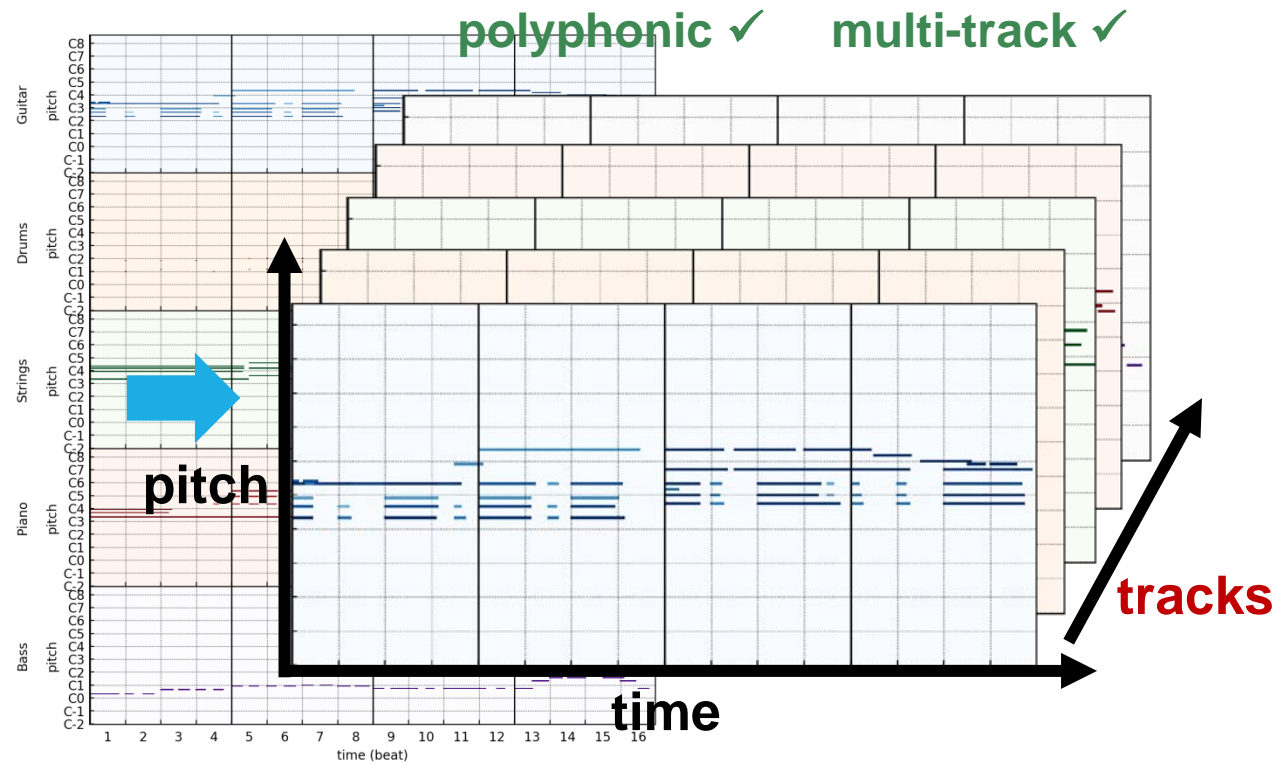
polyphonic ✓ multi-track ✗



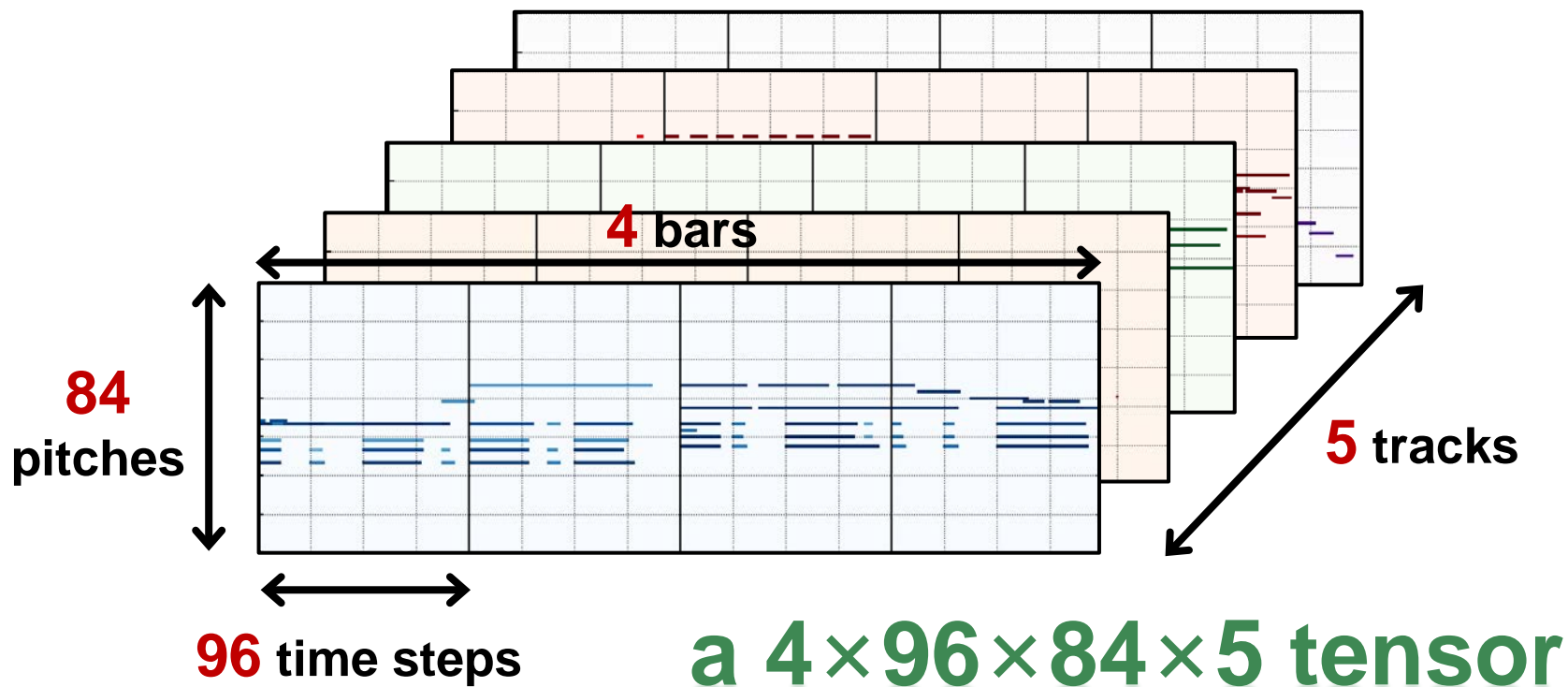
Multi-track Piano-roll

(with symbolic timing)

Data Representation



Data Representation



Data

[Dataset]

<https://salu133445.github.io/musegan/dataset>

[Pypianoroll]

<https://salu133445.github.io/pypianoroll/>

LPD (Lakh Pianoroll Dataset)

NEW!!

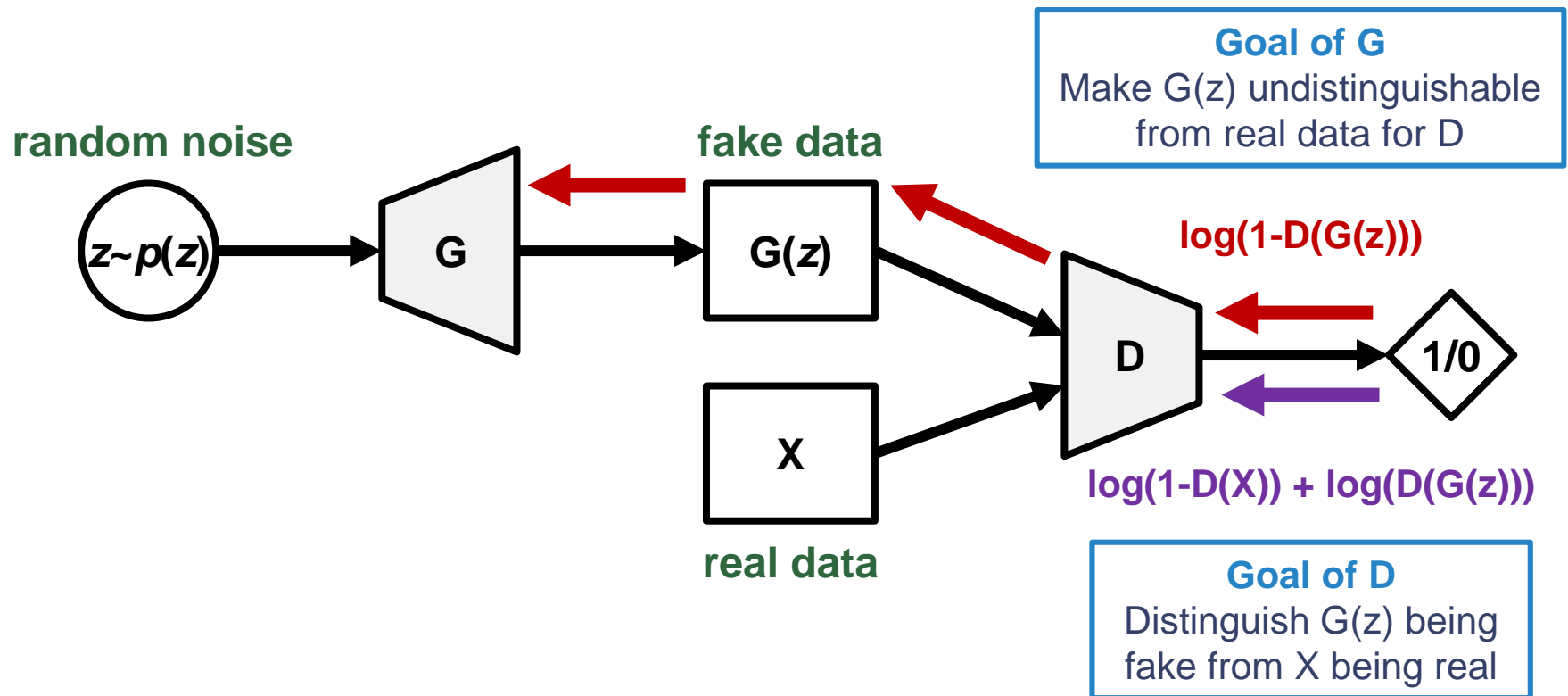
- **>170,000** multi-track piano-rolls
- Derived from Lakh MIDI Dataset
- Mainly pop songs

Pypianoroll (Python package)

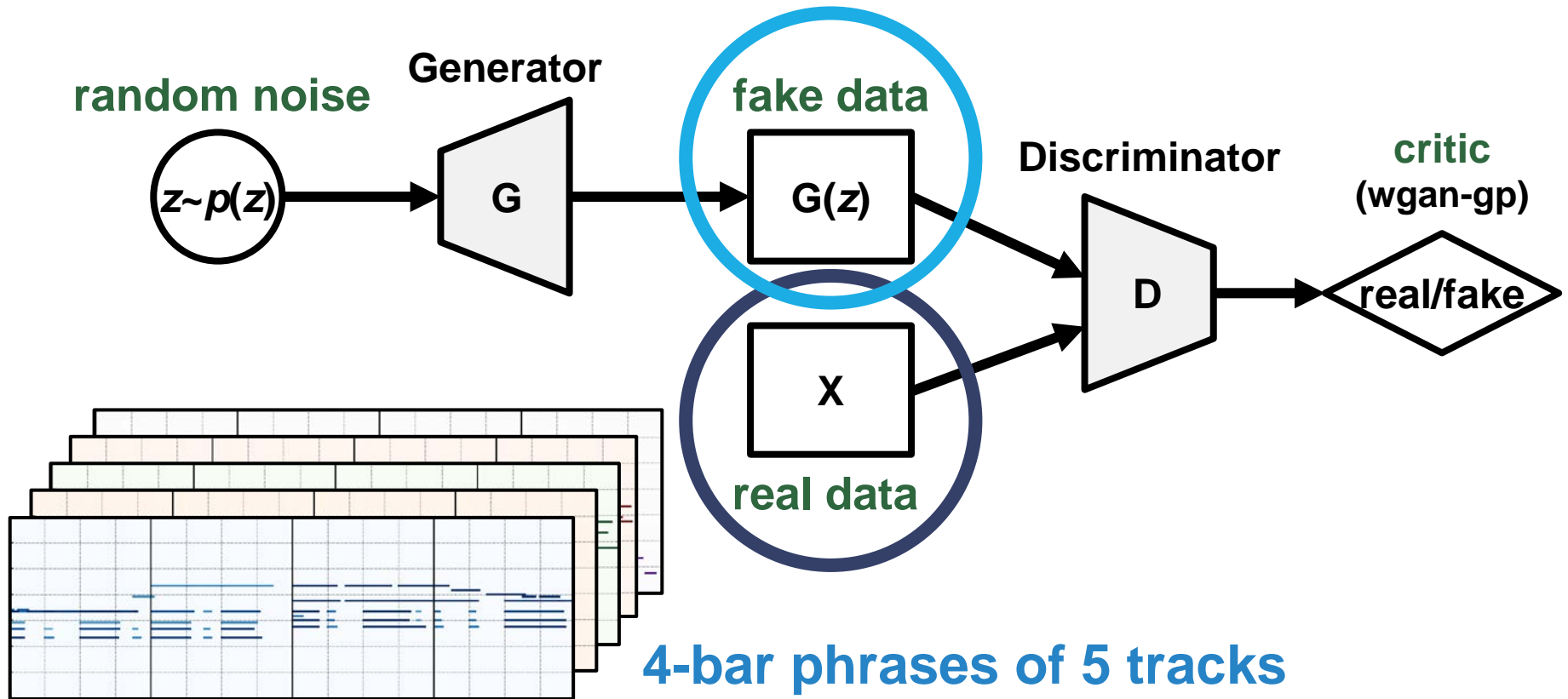
NEW!!

- Manipulation & Visualization
- Efficient Save/Load
- Parse/Write MIDI files
- On **PYPI** (pip installable)

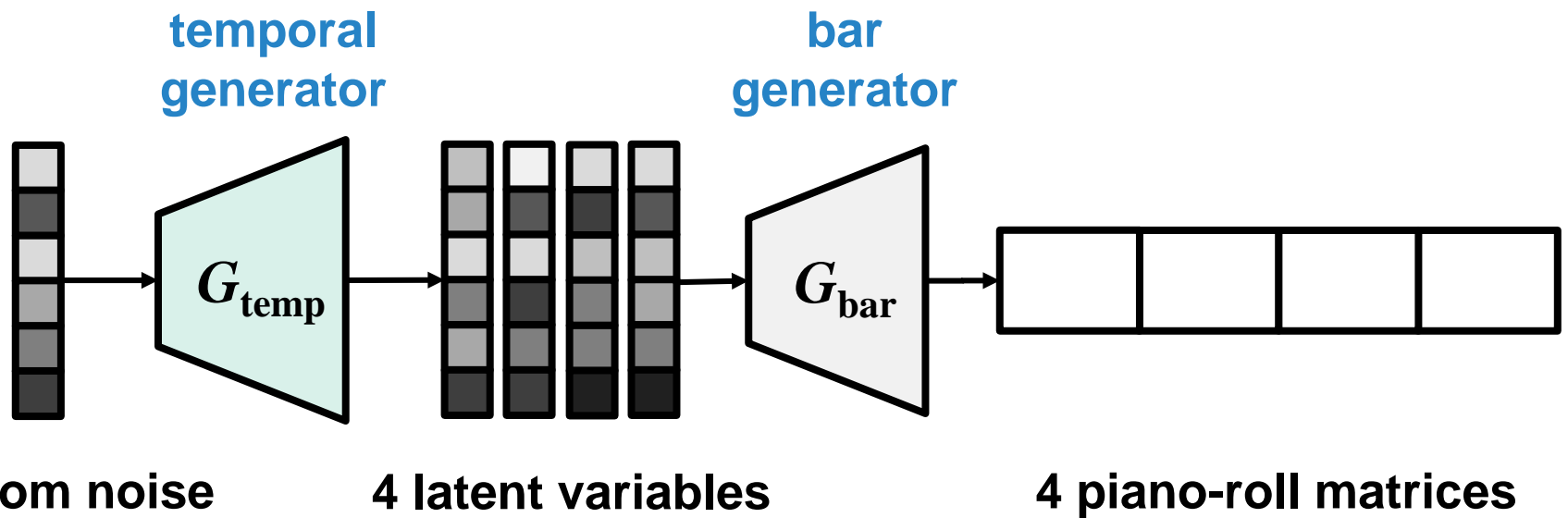
Generative Adversarial Networks



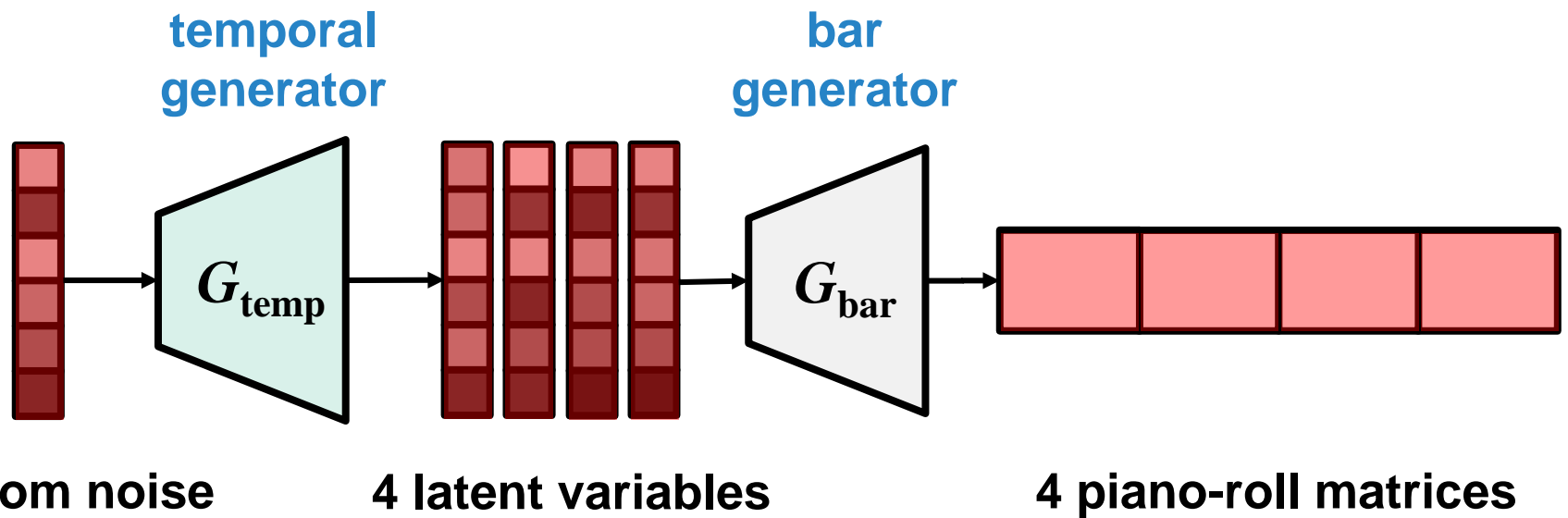
Generative Adversarial Networks



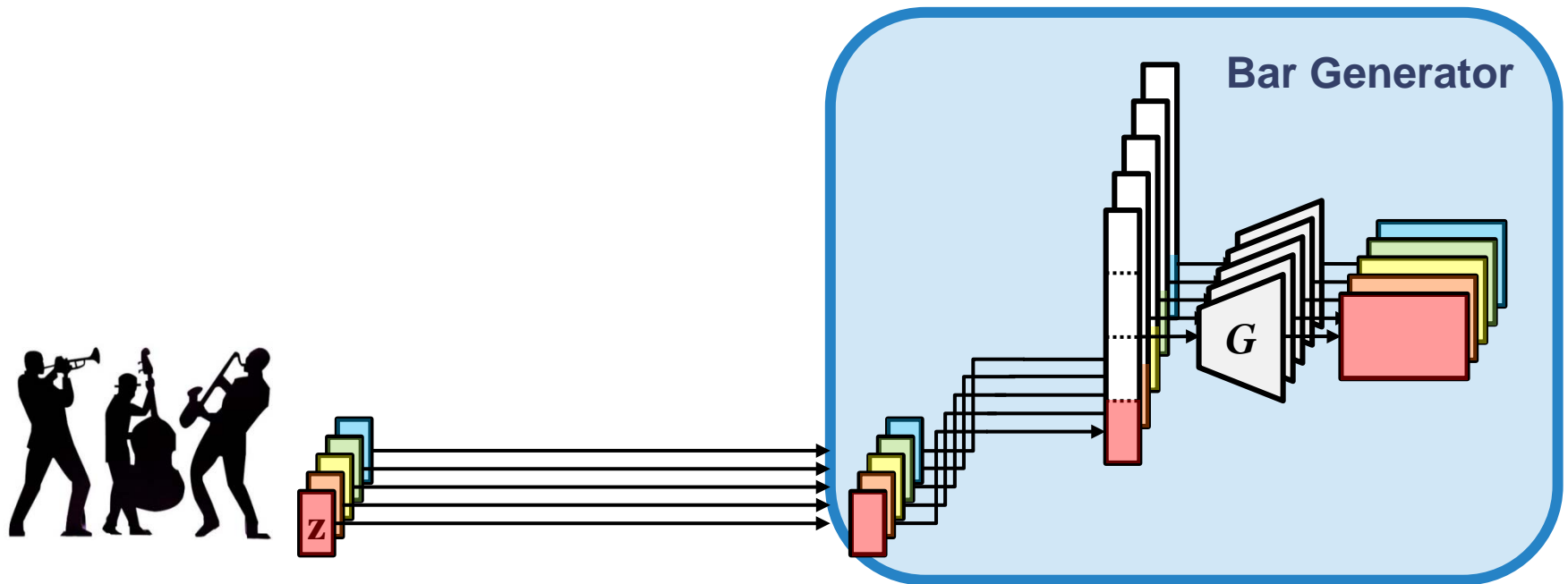
MuseGAN – An Overview



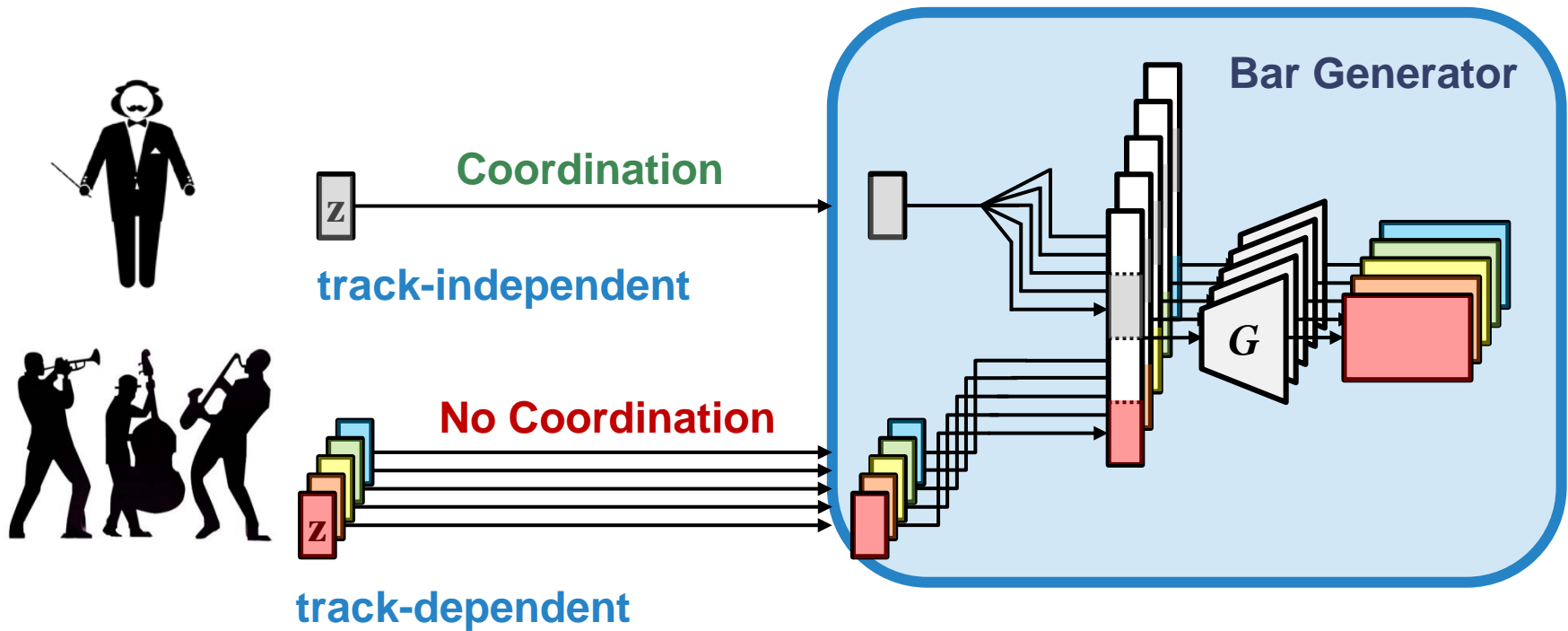
MuseGAN – An Overview



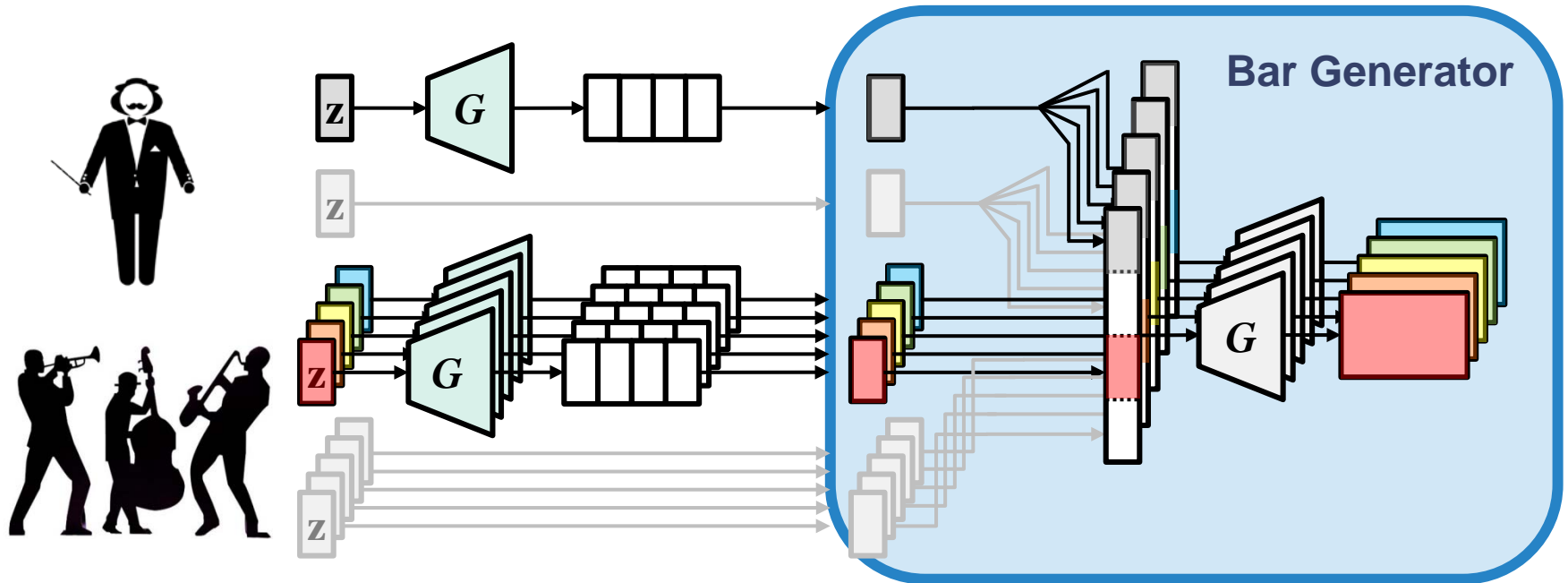
Generator



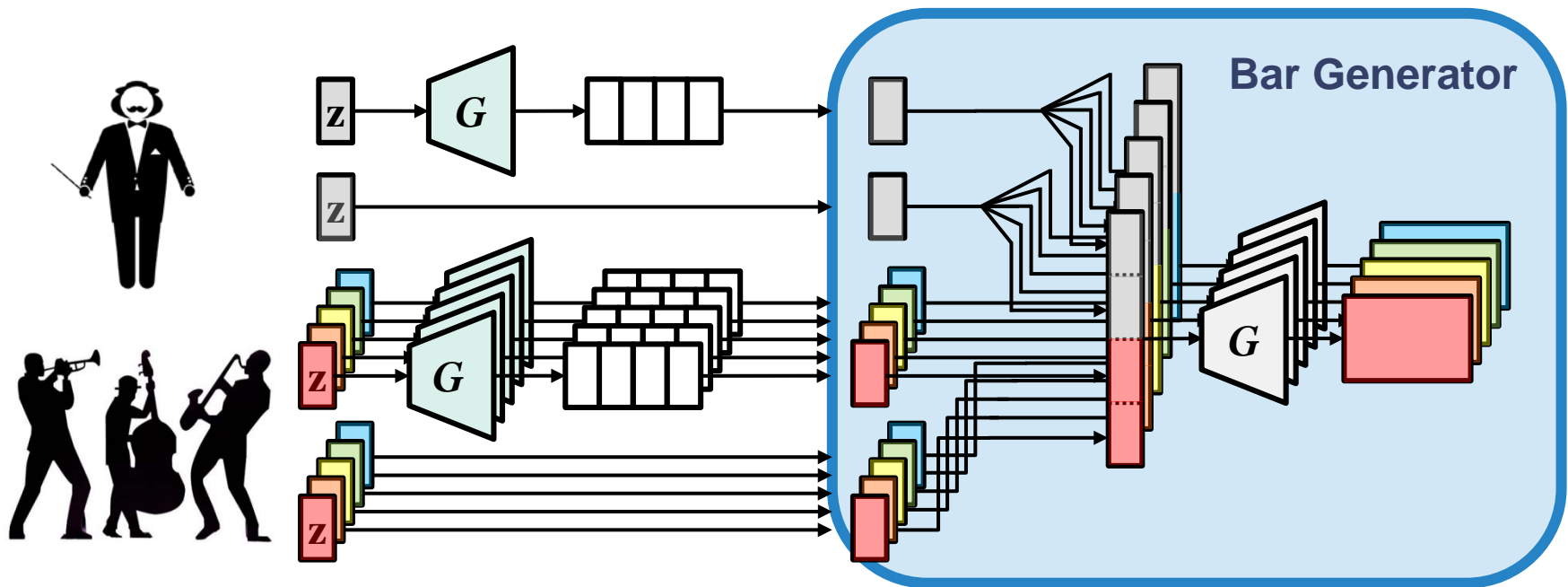
Generator



Generator



MuseGAN



Generator

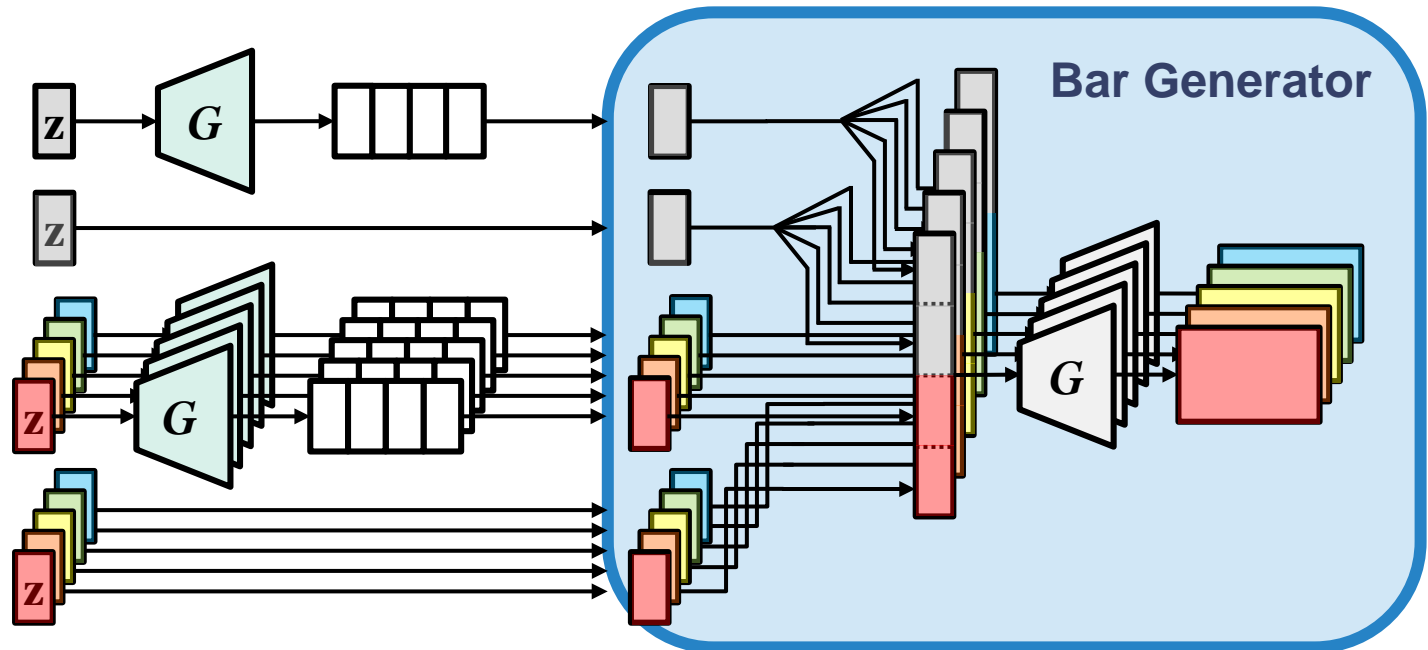
		Time	
		Dependent	Independent
Track	Dependent	Melody	Groove
	Independent	Chords	Style

Chords

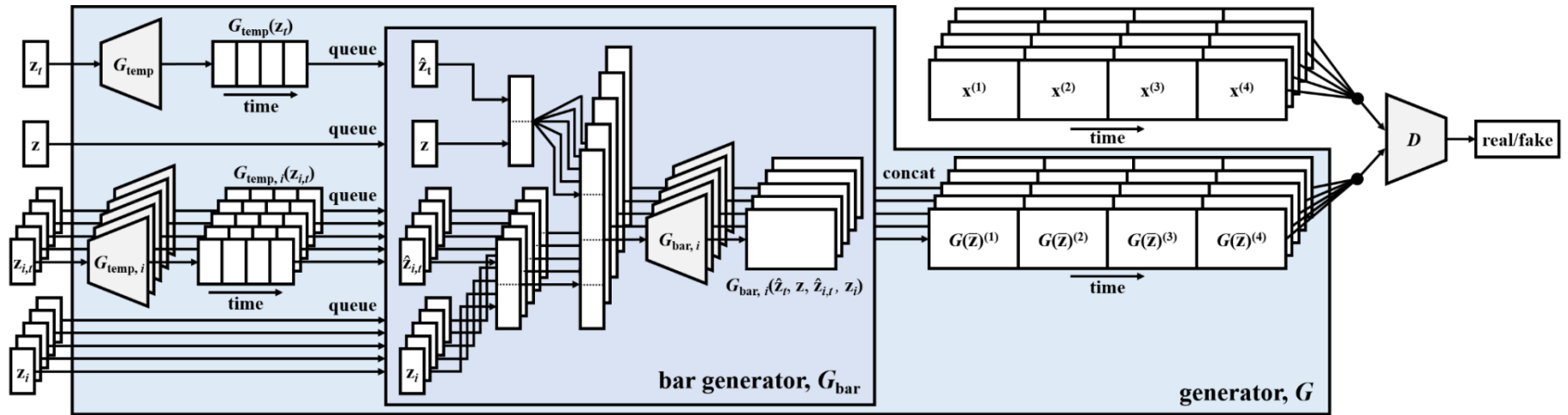
Style

Melody

Groove



MuseGAN



Results

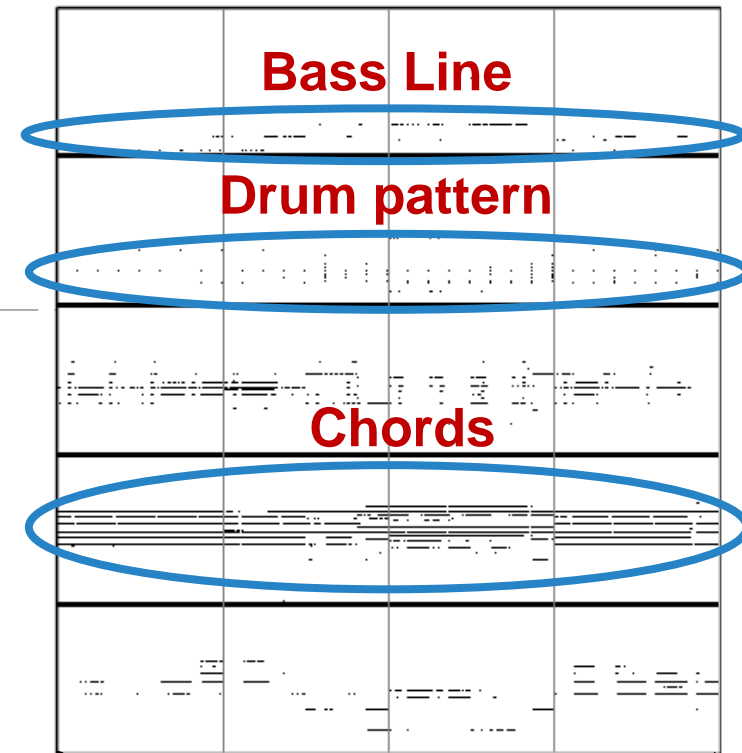
Sample 1



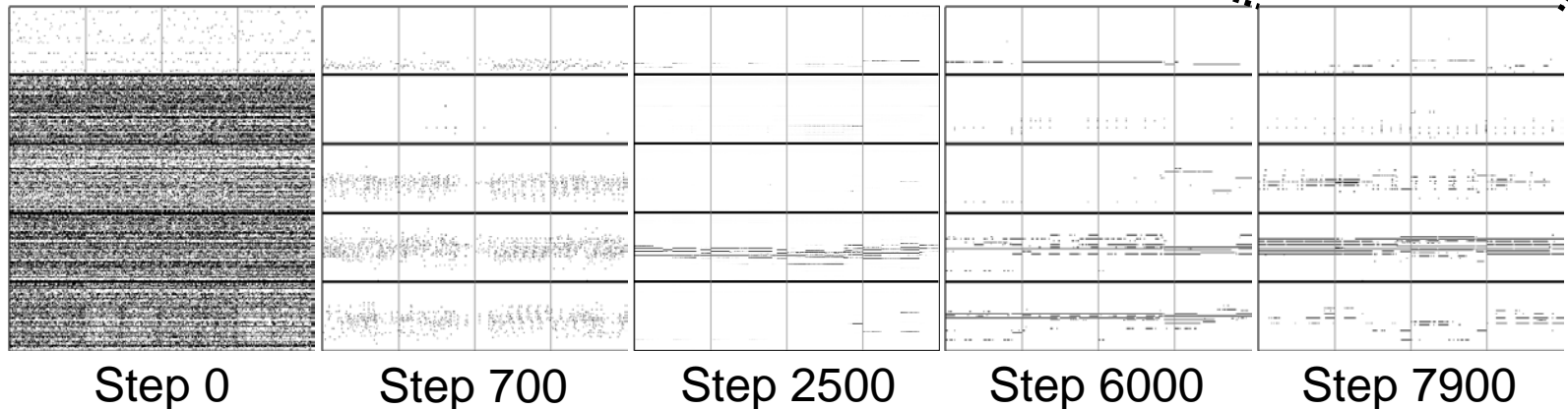
Sample 2



More Samples on Demo Page
<https://salu133445.github.io/musegan/>

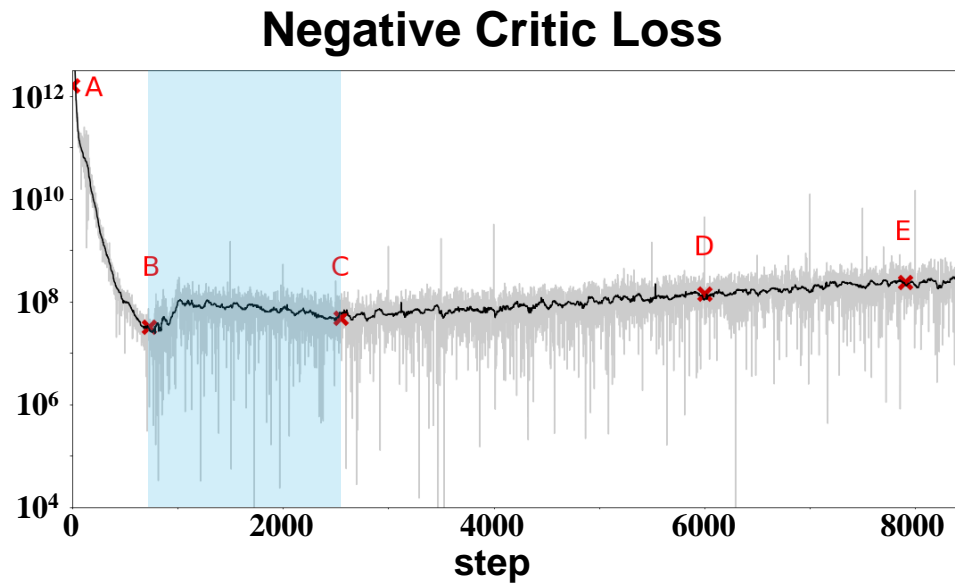


Bass
Drums
Guitar
Strings
Piano

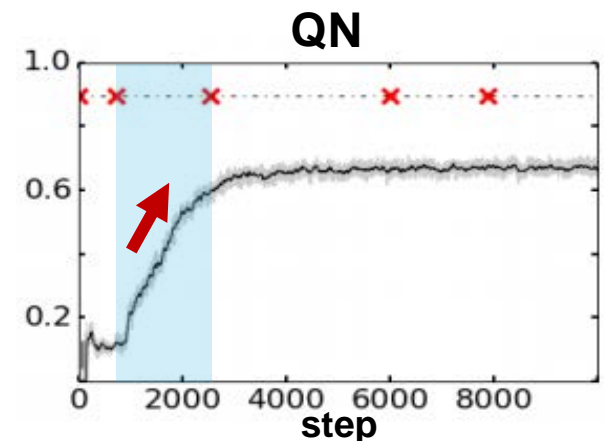
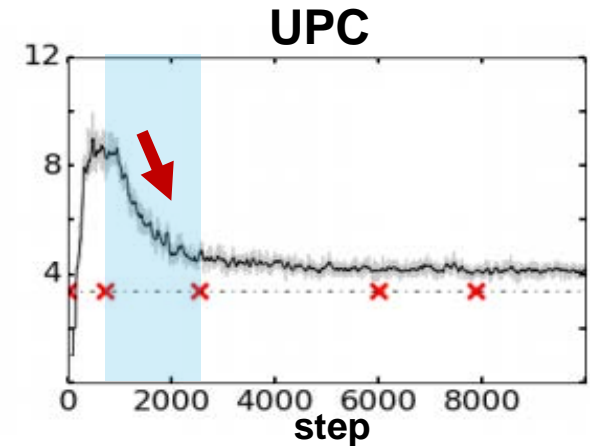


Monitor the Training

Objective Metrics



UPC	number of used pitch classes per bar
QN	ratio of qualified notes



User Study

from scratch		H	R	MS	C	OR
non-pro	jam	2.83	3.29	2.88	2.84	2.88
	comp	3.12	3.36	2.95	3.13	3.12
	hybrid	3.15	3.33	3.09	3.30	3.16
pro	jam	2.31	3.05	2.48	2.49	2.42
	comp	2.66	3.13	2.68	2.63	2.73
	hybrid	2.92	3.25	2.81	3.00	2.93

H: harmonious

R: rhythmic

MS: musically structured

C: coherent

OR: overall rating



composer

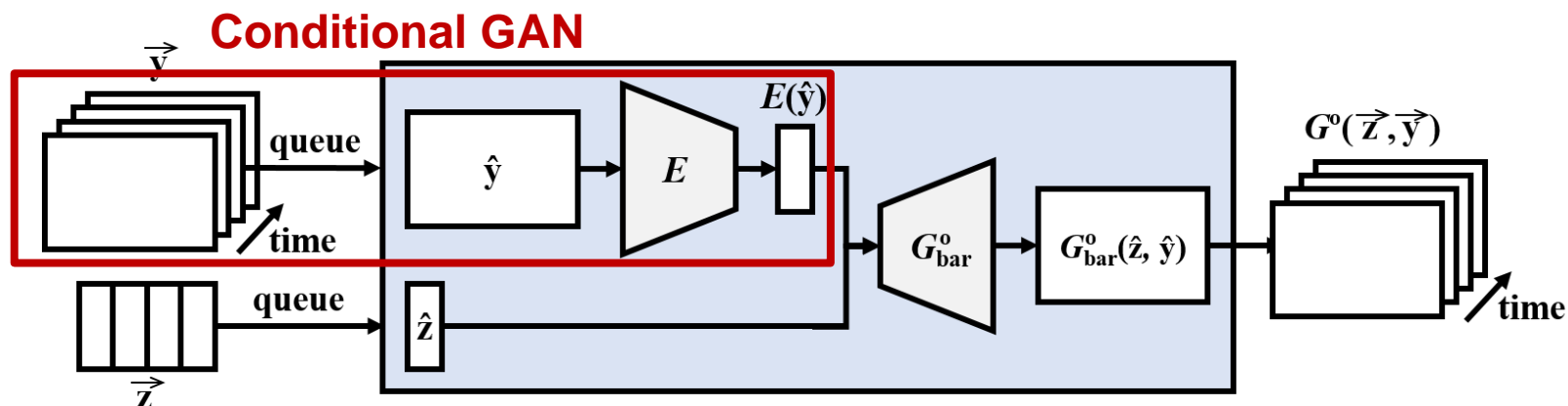


jamming



hybrid

Accompaniment System



Generation from Scratch **nothing \rightarrow 5-track**

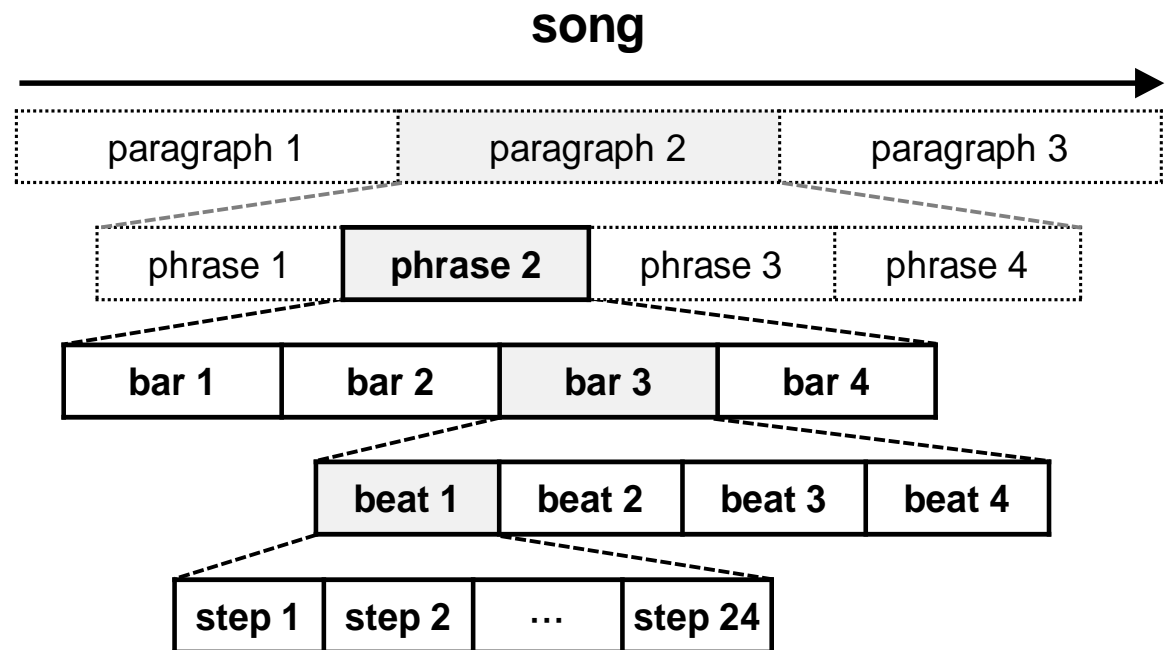
Accompaniment System **single-track \rightarrow 5-track**

Summary

- **MuseGAN**
 - a novel GAN for multi-track sequence generation
 - multi-track, polyphonic music
 - human-AI cooperative scenario
- **Lakh Pianoroll Dataset (LPD)** (new dataset!!)
- **Pypianoroll** (new package!!)

Future Works

Full Song Generation

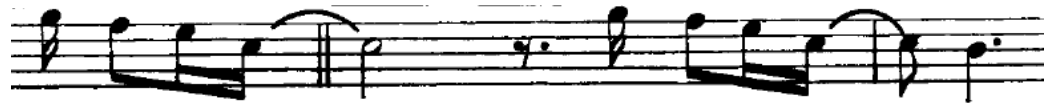


Hierarchical Temporal Structure

Future Works

Cross-modal Generation

- Music + Video
- Music + Lyrics
- Video + Text



We are the world, — we are the chil - dren,



MIR

Music
Information
Research

Analysis

- **music** → **features**
- e.g. chord recognition, beat/downbeat detection, music transcription, source separation

Retrieval

- **query** → **music**
- e.g. query by humming, similarity search, music recommendation, playlist generation

Generation

- **X** → **music**
- e.g. generation, accompaniment, style transfer, mashup, remix

MACLab

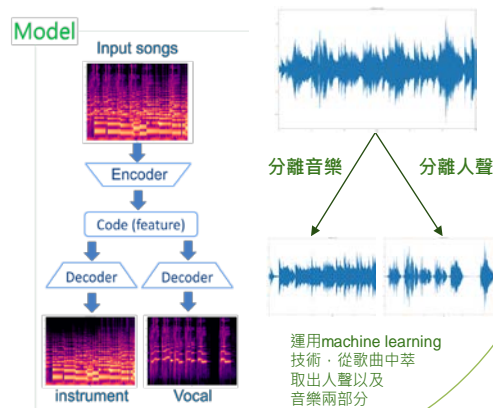
Research Center for
IT Innovation,
Academia Sinica

[Lab Website]

<http://mac.citi.sinica.edu.tw/>

Music and Audio Computing Lab

人聲分離

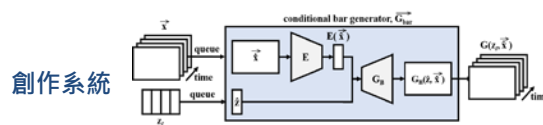


音樂生成

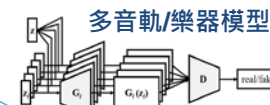
MIDI音樂格式



創作系統



伴奏系統



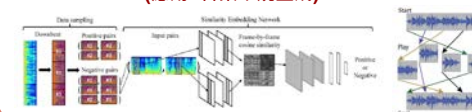
請搜尋
MuseGAN
MidiNet

音樂精彩段落擷取



音樂拼圖遊戲

(應用: 音樂串燒生成)



demo: <https://remyhuang.github.io/>

Lab Director
Dr. Yi-Hsuan Yang

AAAI 2018



New Orleans

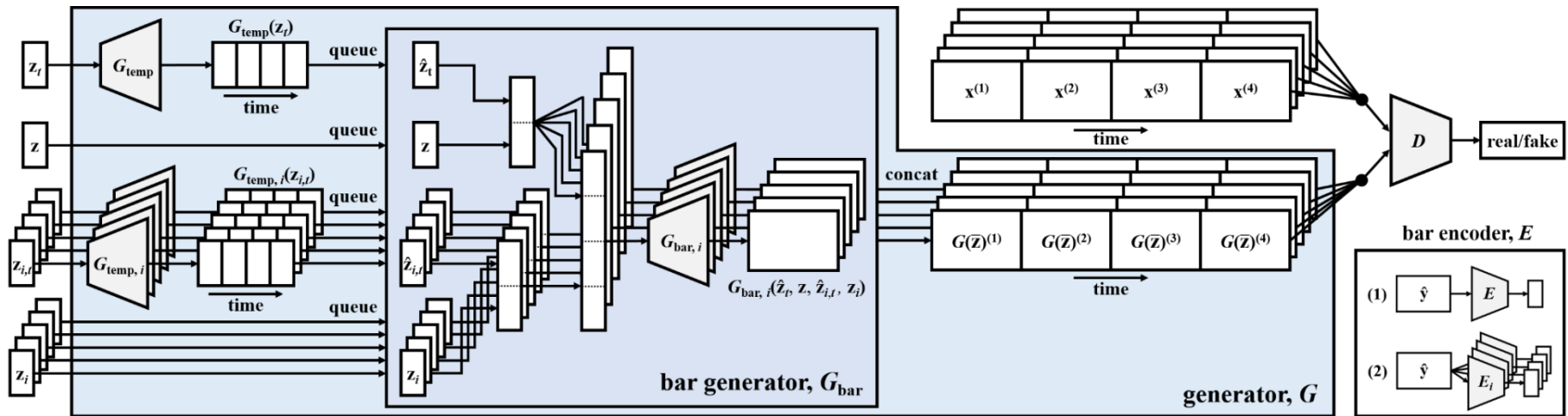


Mardi Gras



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Q&A

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