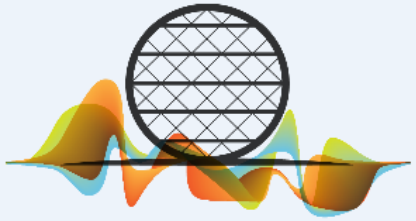
MusPy

A toolkit for symbolic music generation



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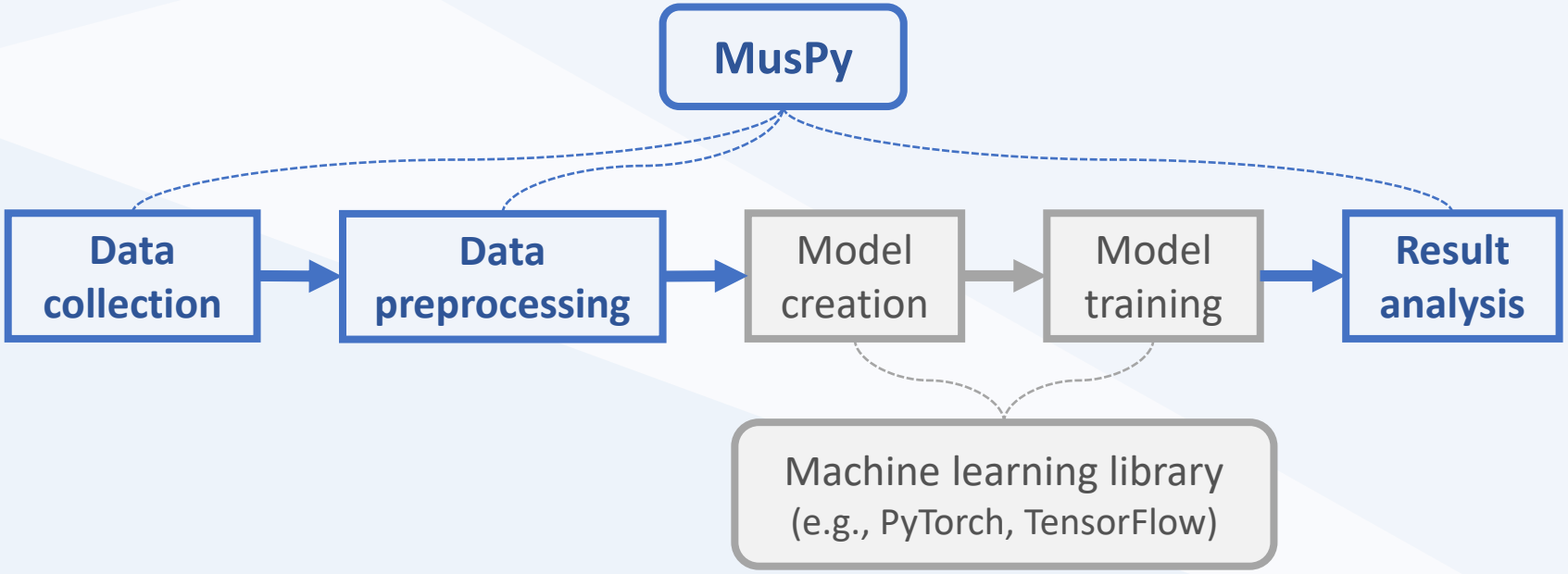
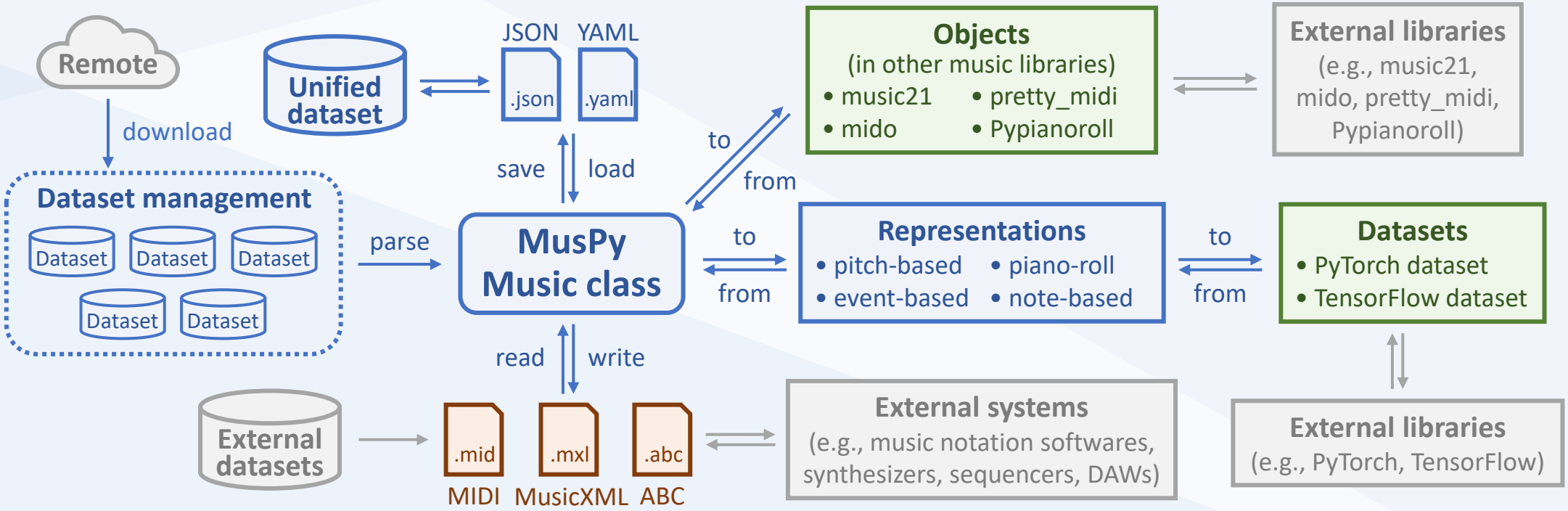
Why MusPy?


MusPy
Data collection
Data preprocessing
Model creation
Model training
Result analysis
Machine learning library
(e.g., PyTorch, TensorFlow)

Overview

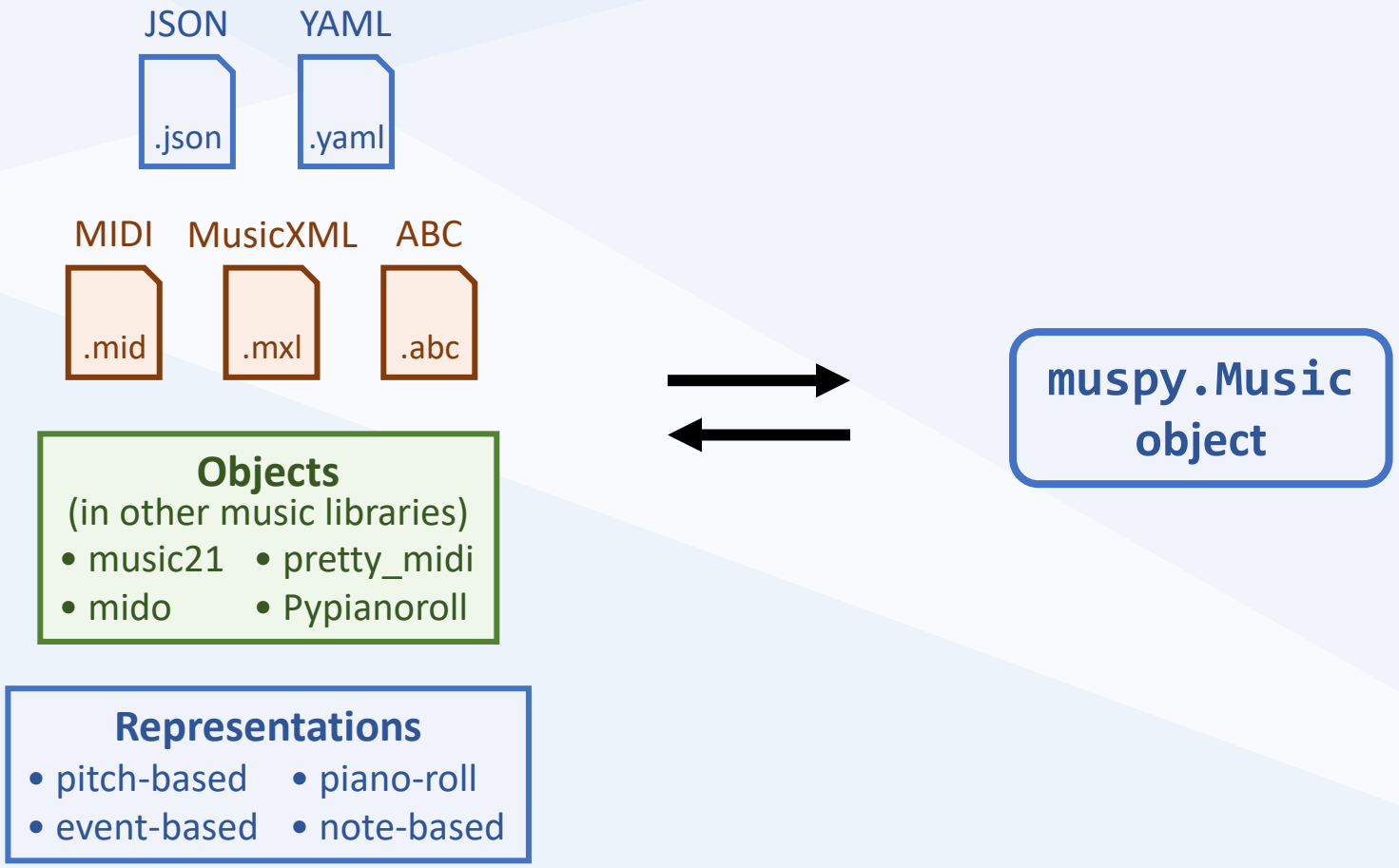

Remote
download
Dataset management
Dataset
Dataset
Dataset
Dataset
Dataset
parse
Unified dataset
JSON
YAML
.json
.yaml
save
load
MusPy Music class
read
write
External datasets
.mid
.mxl
.abc
MIDI
MusicXML
ABC
to
from
Objects
(in other music libraries)
• music21
• mido
• pretty_midi
• Pypianoroll
Representations
• pitch-based
• event-based
• piano-roll
• note-based
External systems
(e.g., music notation softwares, synthesizers, sequencers, DAWs)
External libraries
(e.g., music21, mido, pretty_midi, Pypianoroll)
Datasets
• PyTorch dataset
• TensorFlow dataset
External libraries
(e.g., PyTorch, TensorFlow)

muspy.Music Class

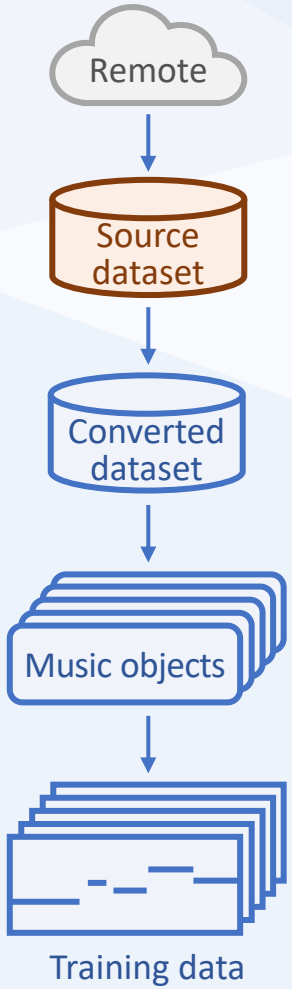

```yaml
metadata:
  schema_version: '0.0'
  title: Für Elise
  creators: [Ludwig van Beethoven]
  collection: Example dataset
  source_filename: example.json
resolution: 4
tempos:
  - {time: 0, qpm: 72.0}
key_signatures:
  - {time: 0, root: 9, mode: minor}
time_signatures:
  - {time: 0, numerator: 3, denominator: 8}
downbeats: [4, 16]
lyrics:
  - {time: 0, lyric: Nothing but a lyric}
annotations:
  - {time: 0, annotation: Nothing but an annotation}
tracks:
  - program: 0
    is_drum: false
    name: Melody
    notes:
      - {time: 0, duration: 2, pitch: 76, velocity: 64}
      - {time: 2, duration: 2, pitch: 75, velocity: 64}
      - {time: 4, duration: 2, pitch: 76, velocity: 64}
      - {time: 6, duration: 2, pitch: 75, velocity: 64}
      - {time: 8, duration: 2, pitch: 76, velocity: 64
      - {time: 10, duration: 2, pitch: 71, velocity: 64}
      - {time: 12, duration: 2, pitch: 74, velocity: 64}
      - {time: 14, duration: 2, pitch: 72, velocity: 64}
      - {time: 16, duration: 2, pitch: 69, velocity: 64}
    lyrics:
      - {time: 0, lyric: Nothing but a lyric}
    annotations:
      - {time: 0, annotation: Nothing but an annotation}
```


- Core class of MusPy
- A universal container for symbolic music
- Serializable to JSON/YAML

I/O Interfaces



Dataset Management




```
# Download and extract the dataset
nes = muspy.NESMusicDatabase(root="data/nes/",
                             download_and_extract=True)

# Convert the dataset to MusPy Music objects
nes.convert()

# Iterate over the dataset
for music in nes:
  do_something(music)

# Convert to a PyTorch dataset
dataset = nes.to_pytorch_dataset(representation="pianoroll")
```

Datasets *(more coming soon!)*

Dataset	Format	Hours	Songs	Genre	Melody	Chords	Multitrack
Lakh MIDI Dataset (LMD) [26]	MIDI	>9000	174,533	misc	△	△	△
MAESTRO Dataset [27]	MIDI	201.21	1,282	classical			
Wikifonia Lead Sheet Dataset [28]	MusicXML	198.40	6,405	misc	✓	✓	
Essen Folk Song Database [29]	ABC	56.62	9,034	folk	✓	✓	
NES Music Database [30]	MIDI	46.11	5,278	game	✓		✓
Hymnal Tune Dataset [31]	MIDI	18.74	1,756	hymn	✓		
Hymnal Dataset [31]	MIDI	17.50	1,723	hymn			
music21 Corpus [24]	misc	16.86	613	misc	△		△
Nottingham Database (NMD) [32]	ABC	10.54	1,036	folk	✓	✓	
music21 JSBach Corpus [24]	MusicXML	3.46	410	classical			✓
JSBach Chorale Dataset [11]	MIDI	3.21	382	classical			✓

Result Analysis Tools

pitch-related metrics

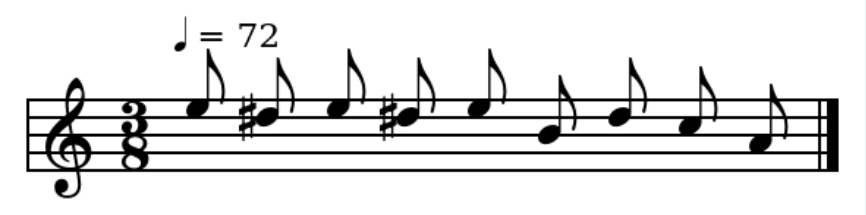
- pitch_range
- n_pitches_used
- n_pitch_classes_used
- polyphony
- polyphony_rate
- pitch_in_scale_rate
- scale_consistency
- pitch_entropy
- pitch_class_entropy

rhythm-related metrics

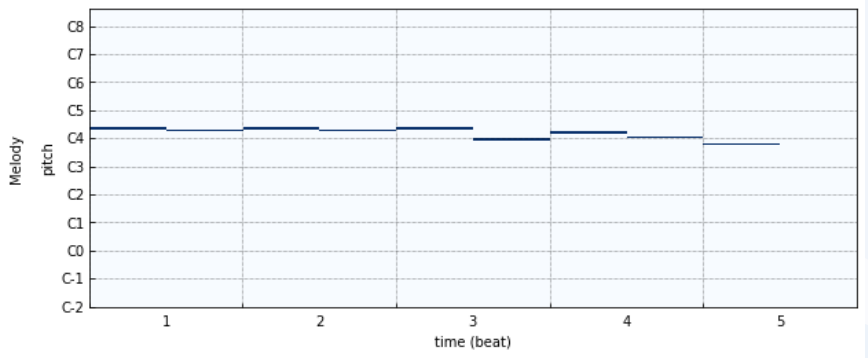
- empty_beat_rate
- empty_measure_rate
- drum_in_pattern_rate
- drum_pattern_consistency
- groove_consistency

Audio rendering

score visualization

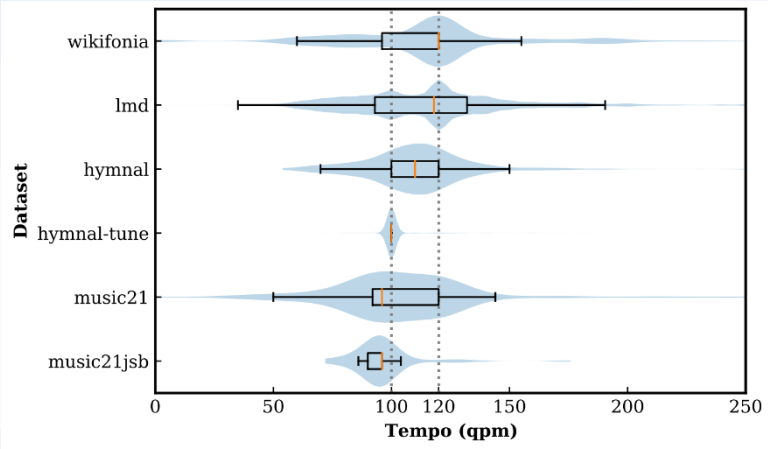


piano-roll visualization

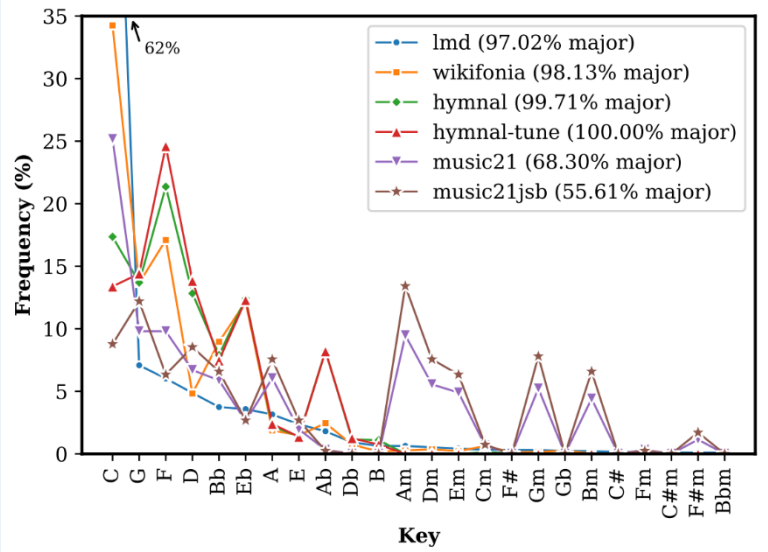


Dataset Analysis

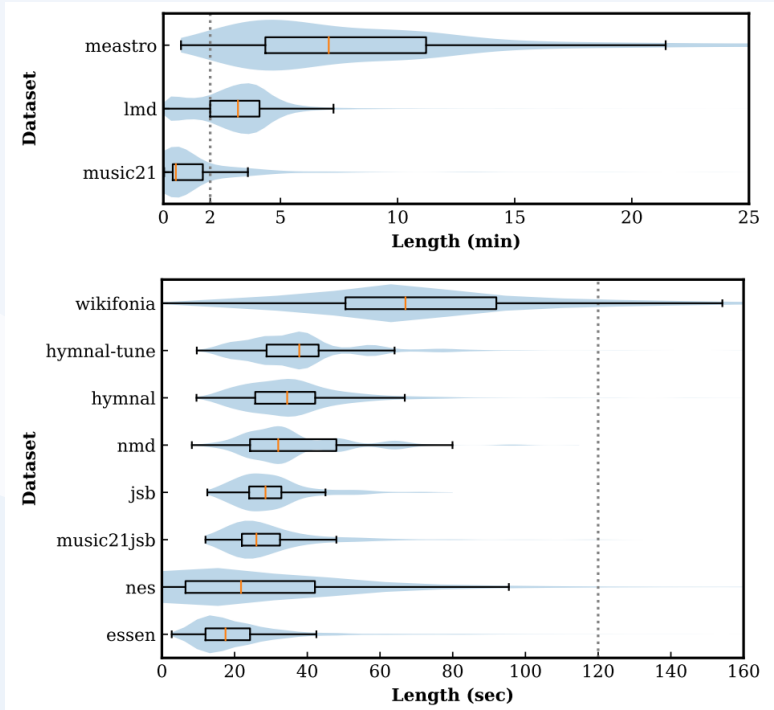
Tempo distributions



Key distributions

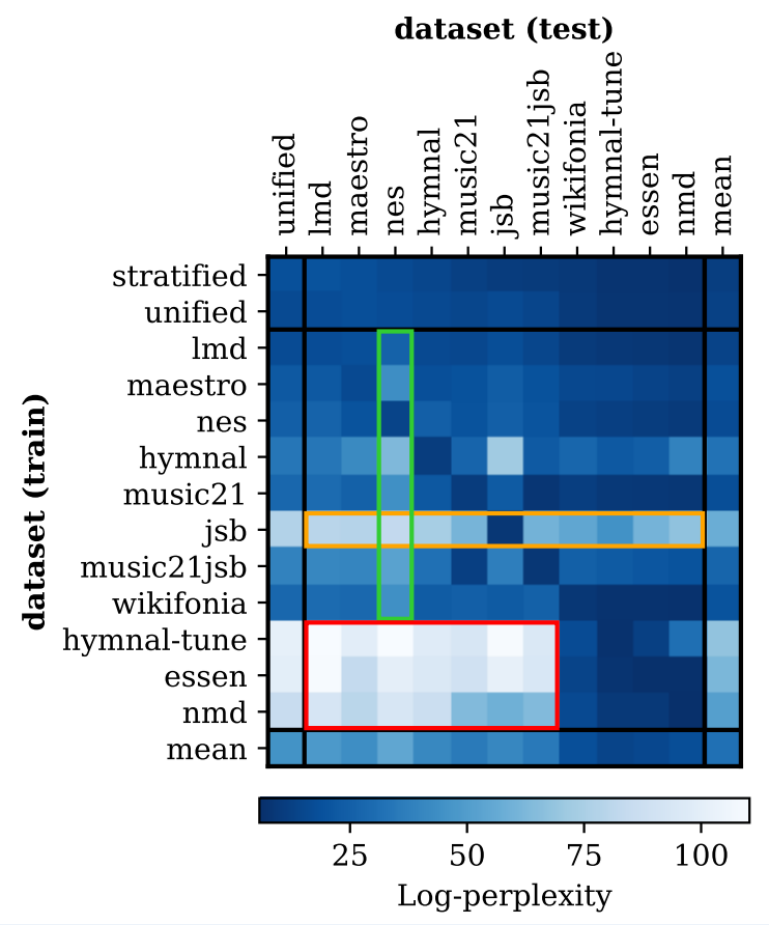


Length distributions

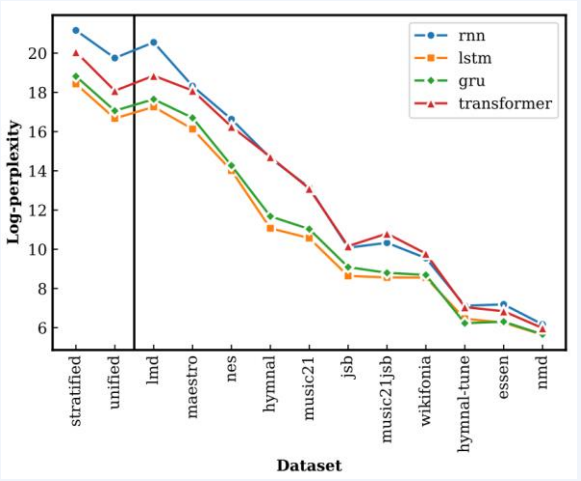


Experiments

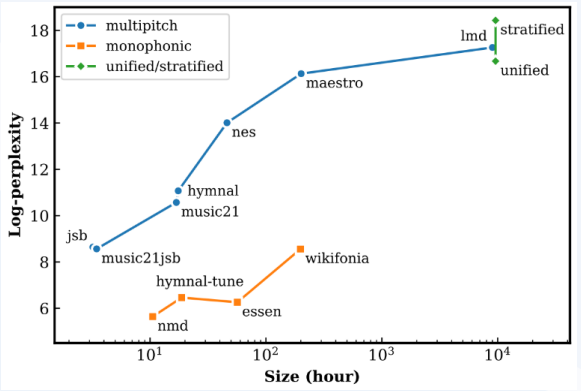
Cross-dataset generalizability



Perplexities



Perplexities vs dataset size



Thank you!

```
pip install muspy
```

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