

Extracting Ground-Truth Information from MIDI Files: A MIDIfesto

Colin Raffel
ISMIR 2016
August 10th, 2016



IGERT Integrative Graduate
Education and Research Traineeship



The Lakh MIDI Dataset



176,581



45,129

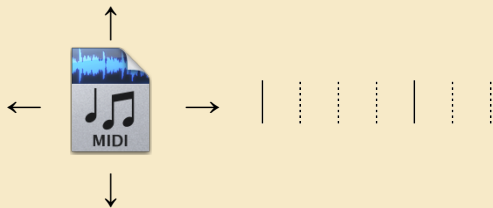
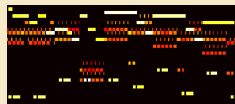
<http://colinraffel.com/projects/lmd>

MIDI Files Abound



Information in MIDI Files

0.0s: F major, 53.2s: D minor, ...

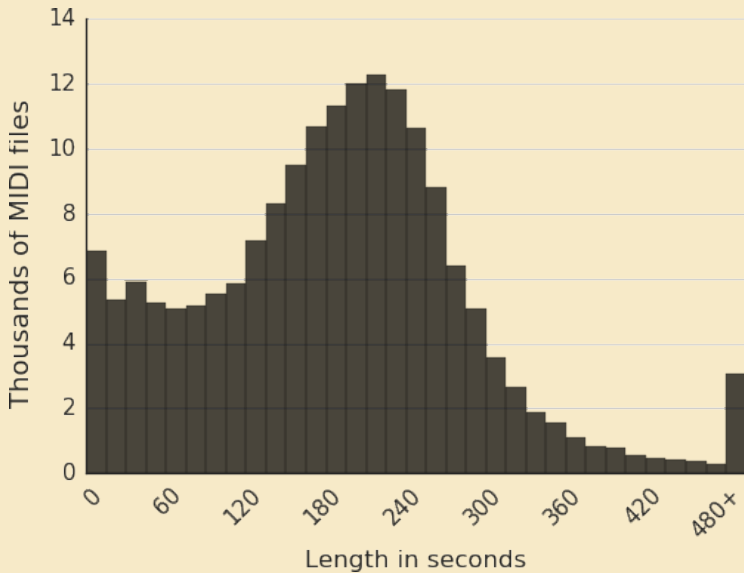


0.0s: 110 bpm, 22.2s: 103 bpm, ...

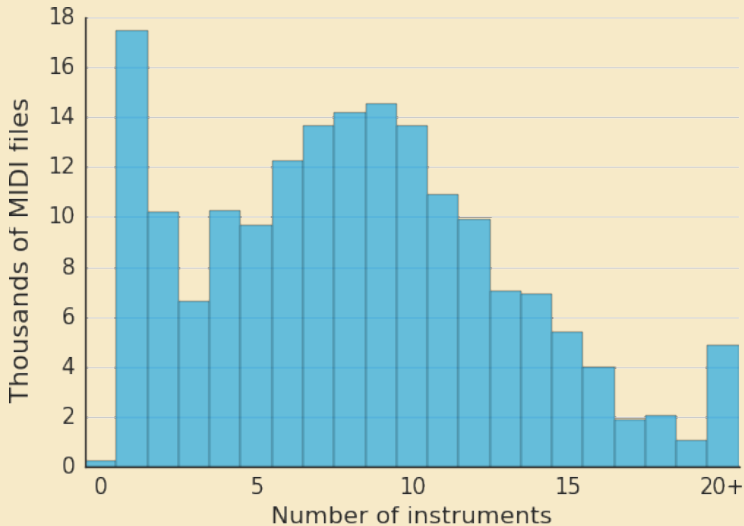
Extracting Data with pretty_midi

```
import pretty_midi
# Load MIDI file into PrettyMIDI object
midi_data = pretty_midi.PrettyMIDI('midi_file.mid')
# Get a beat-synchronous piano roll
piano_roll = midi_data.get_piano_roll(times=midi_data.get_beats())
# Get tempo changes and their times
times, tempi = midi_data.get_tempo_changes()
# Retrieve key change events
key_signatures = midi_data.key_signature_changes
# Align the MIDI data to a new timebase
midi_data.adjust_times(original_times, new_times)
# Synthesize the resulting MIDI data at 22 kHz using fluidsynth
audio_data = midi_data.fluidsynth(fs=22050)
```

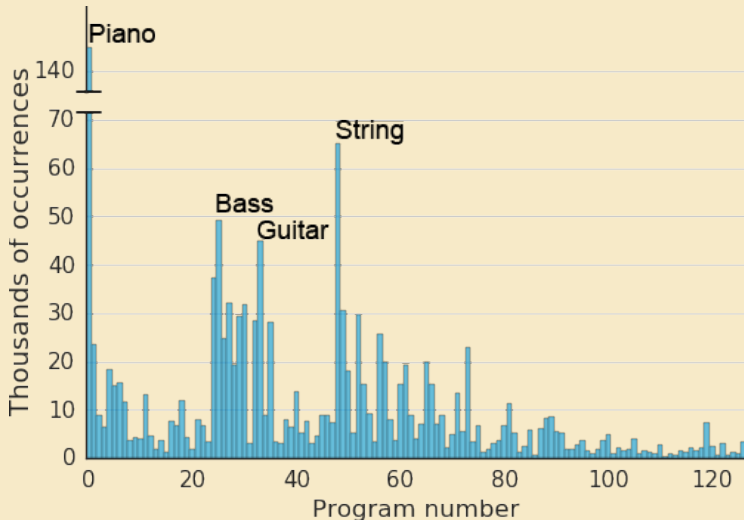
Length



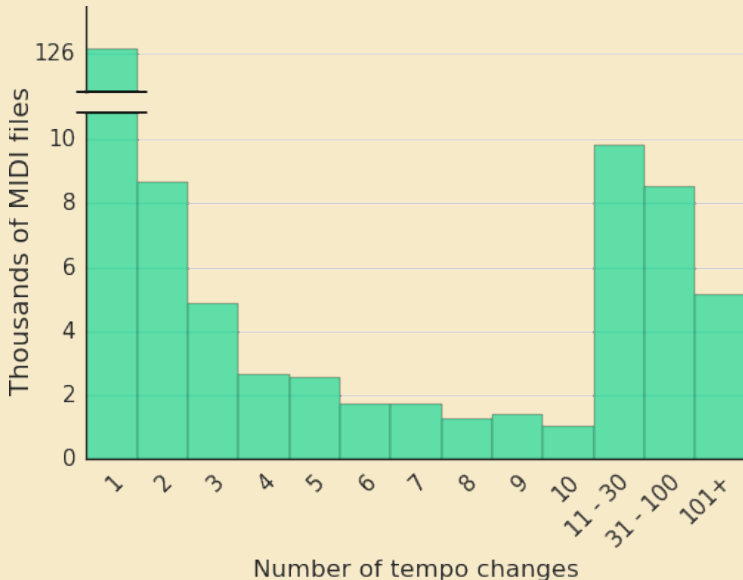
Number of Program Changes



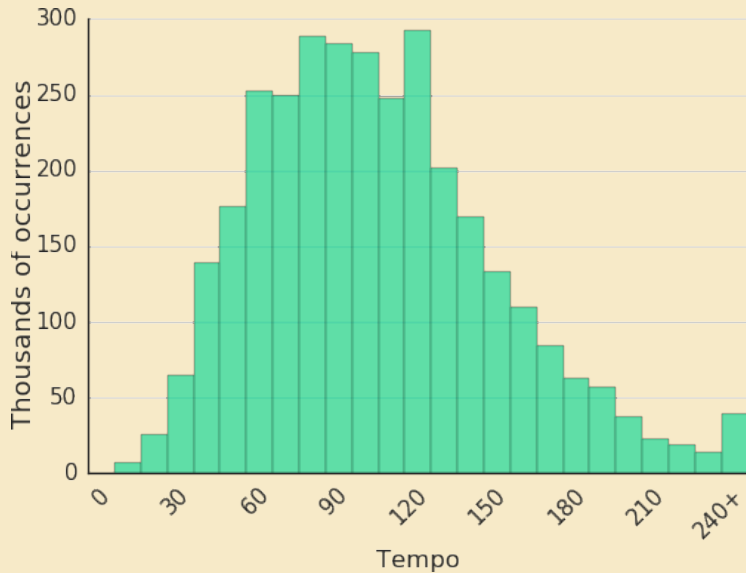
Program Numbers



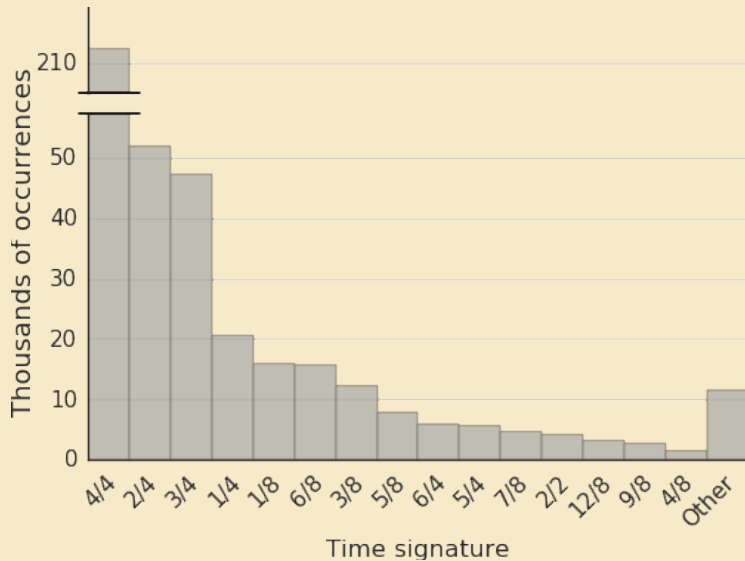
Number of Tempo Changes



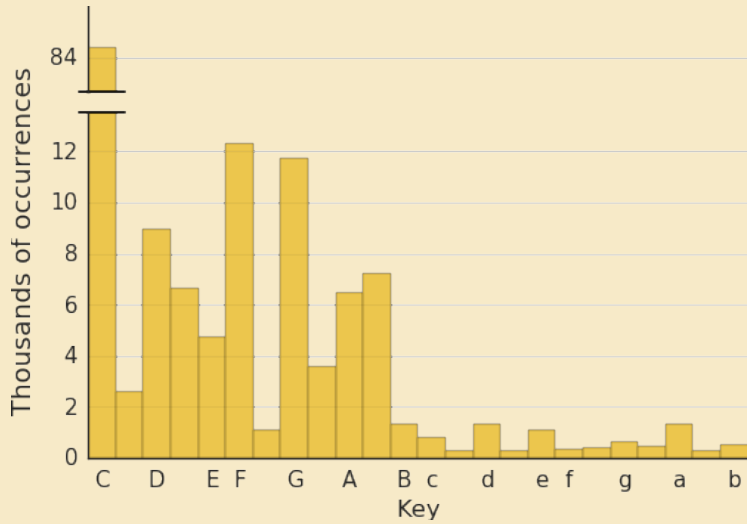
Tempos



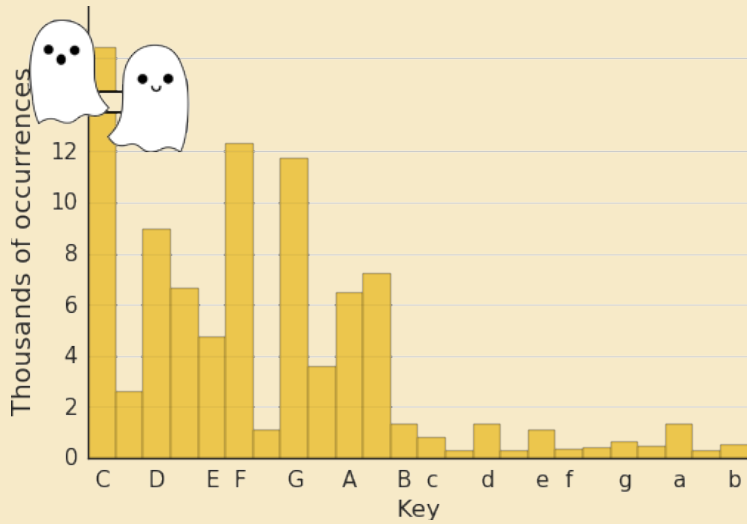
Time Signatures



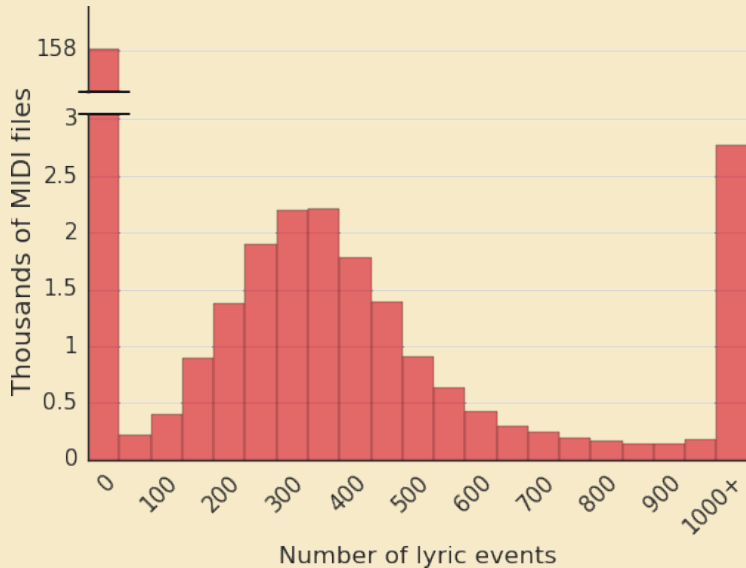
Key Numbers



Key Numbers

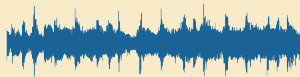
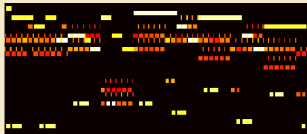


Number of Lyrics

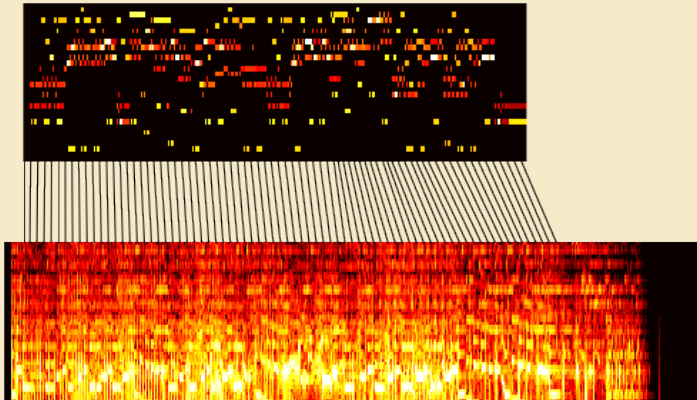


Matching

```
artist: 'Tori Amos'  
release: 'LIVE AT MONTREUX'  
title: 'Smells Like Teen Spirit'  
id: 'TRKUYPW128F92E1FC0'  
duration: 216.4502  
sample_rate: 22050  
audio_md5: '8'  
7digitalid: 5764727  
year: 1992
```



Aligning



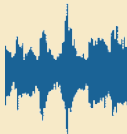
Testing Key Reliability



C major




C major



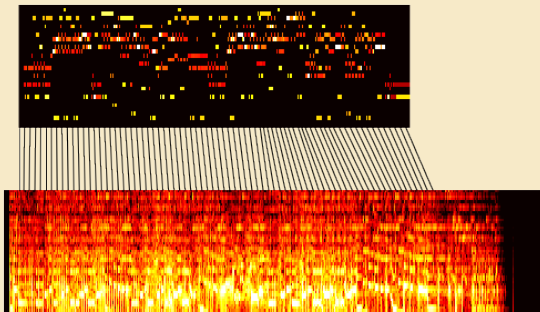
G major



Key Results

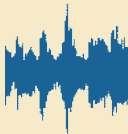
Source	Score	Comparisons
MIDI, all keys	0.400	223
MIDI, C major only 	0.167	146
MIDI, non-C major	0.842	77
Audio content-based	0.687	151
Human agreement	0.857	145

Testing Beat Reliability

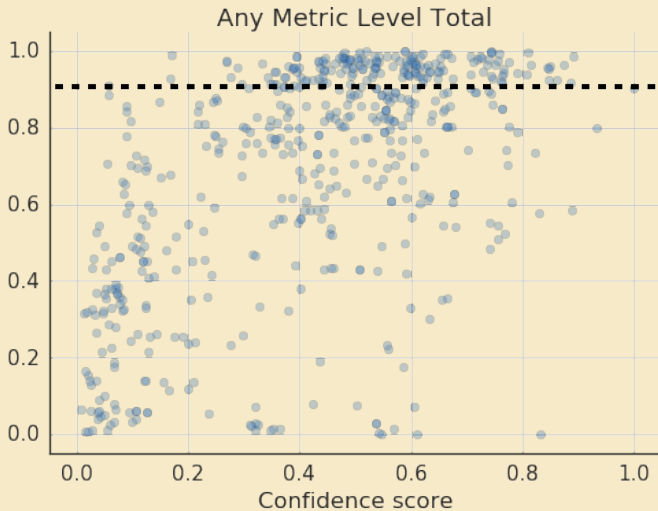


Confidence: 0.87

Testing Beat Reliability



Beat Reliability



The MIDI Conspiracy



imgflip.com

Pointers

<http://colinraffel.com/projects/lmd>

<http://github.com/craffel/pretty-midi>

<http://github.com/craffel/midi-ground-truth>

craffel@gmail.com