

# Pypianoroll: Open Source Python Package for Handling Multitrack Pianoroll

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[Documentation] <https://salu133445.github.io/pypianoroll/>



## >> Core Classes

- # use *symbolic timing*
  - each beat has the same length (*beat\_resolution*)
  - note length can represent a *musically-meaningful* amount of time (such as a 4th or 8th note)
- # save tempo information in the tempo array

### Attributes of a Multitrack object

Attribute	Description
<i>tracks</i>	List of Track objects
<i>beat_resolution</i>	Resolution of a beat (in time step)
<i>tempo</i>	Array that records the tempo value (in bpm) at each time step
<i>downbeat</i>	Array that indicates the locations of downbeats (the first beat of a bar)
<i>name</i>	Name of the multitrack

### Attributes of a Track object

Attribute	Description
<i>pianoroll</i>	Pianoroll matrix
<i>program</i>	Program number according to General MIDI Level 1 specification
<i>is_drum</i>	Whether it is a percussion track
<i>name</i>	Name of the track

## >> Manipulation Utilities

track level	pianoroll level
# <i>append_track</i>	# <i>clip</i>
# <i>merge_tracks</i>	# <i>binarize</i>
# <i>remove_tracks</i>	# <i>transpose</i>
# <i>remove_empty_tracks</i>	# <i>pad_to_multiple</i>
# <i>get_merged_pianoroll</i>	# <i>assign_constant</i>
# <i>get_stacked_pianoroll</i>	# <i>trim_trailing_silence</i>

## >> Evaluation Metrics

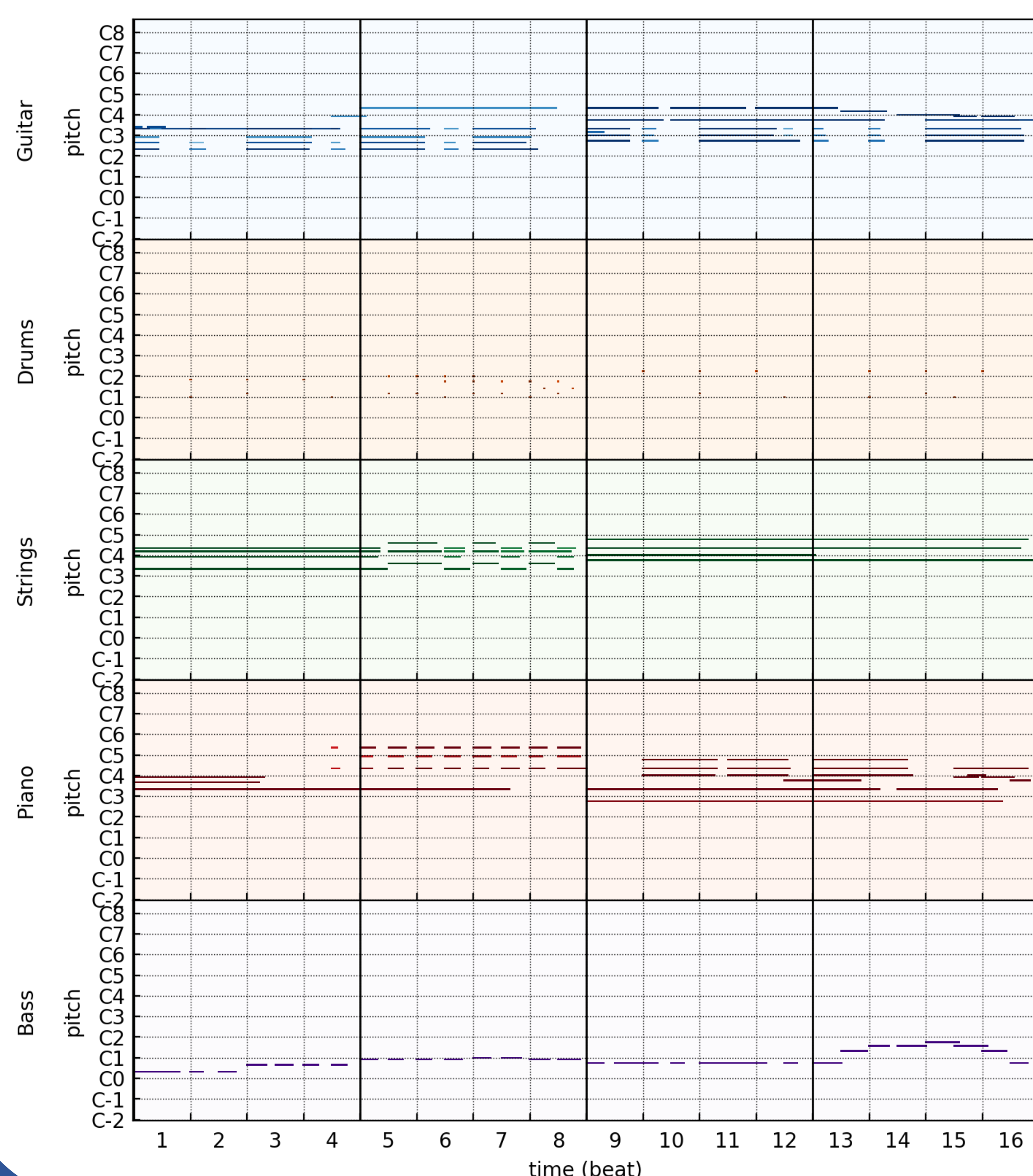
# <i>empty_bar_rate</i>	# <i>n_pitches_used</i>
# <i>qualified_note_rate</i>	# <i>n_pitch_classes_used</i>
# <i>drum_in_pattern_rate</i>	# <i>in_scale_rate</i>
# <i>polyphonic_rate</i>	# <i>tonal_distance</i> [2]

(designed for evaluating *generative system* [1])

## >> Content Analysis Utilities

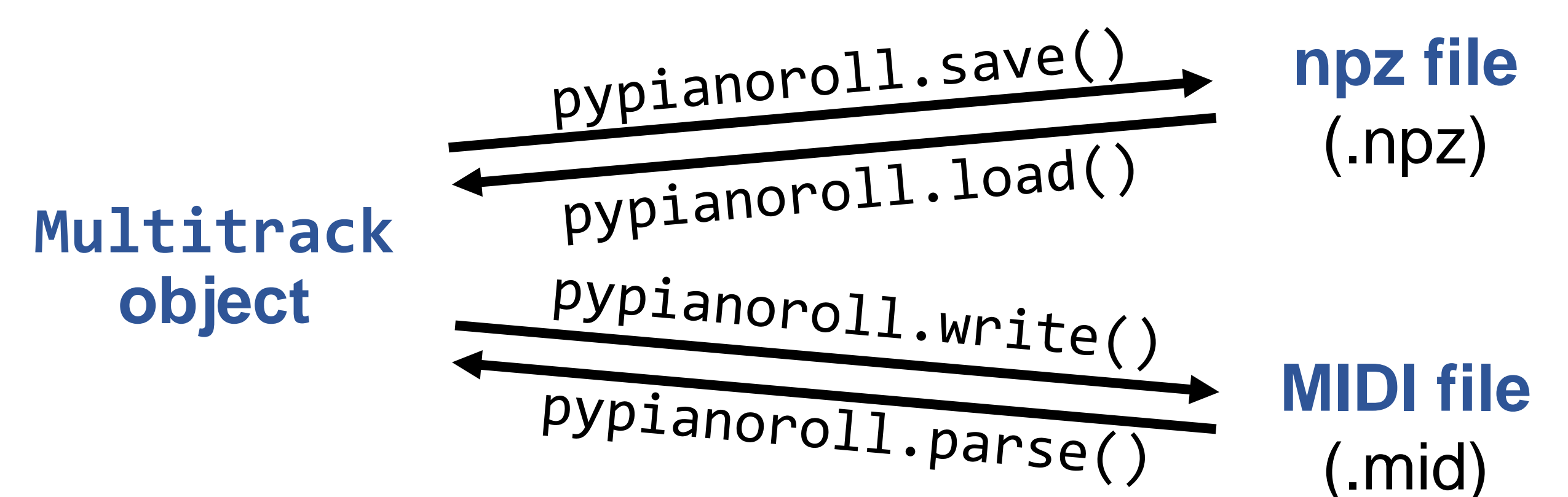
# <i>key detection</i>	(future plan)
# <i>melody recognition</i>	
# <i>chord recognition</i>	
# <i>chord-related feature extraction</i>	(may contribute to applications like lead sheet arrangement [3])

## >> Visualization



## >> Data I/O

(use compressed column storage to save space)



(use *pretty\_midi* [4] for MIDI I/O)

(plan to support MusicXML format in the future)

## >> References

- [1] H.-W. Dong, W.-Y. Hsiao, L.-C. Yang, and Y.-H. Yang. MuseGAN: Symbolic-domain music generation and accompaniment with multi-track sequential generative adversarial networks. In *Proc. AAAI*, 2018.
- [2] C. Harte, M. Sandler, and M. Gasser. Detecting harmonic change in musical audio. In *Proc. ACM Workshop on Audio and Music Computing Multimedia*, 2006.
- [3] H.-M. Liu and Y.-H. Yang. Lead sheet generation and arrangement by conditional generative adversarial network. In *Proc. ICMLA*, 2018.
- [4] C. Raffel and D. P. W. Ellis. Intuitive analysis, creation and manipulation of MIDI data with *pretty\_midi*. In *ISMIR Late Breaking and Demo Papers*, 2014.