

The Harmonix Set: Beats, Downbeats, and Functional Segment Annotations of Western Popular Music

Oriol Nieto¹, Matthew McCallum¹, Matthew E. P. Davies², Andrew Robertson³, Adam Stark⁴, Eran Egozy⁵

¹Pandora Media, Inc, ²INESC TEC, Porto, Portugal, ³Ableton AG, Berlin, Germany, ⁴MI·MU, London, UK, ⁵MIT, Cambridge, MA, USA



onieto@pandora.com

HARMONIX®



Abstract

Largest set with human annotations for **912** pop tracks with the following music information:

- ▶ **Beats**
- ▶ **Downbeats**
- ▶ **Functional Segments**
- ▶ Automatic Onset Detection (for alignment)
- ▶ MusicBrainz IDs
- ▶ YouTube URLs (new!)

Goal: Foster research in more holistic/multi-task analysis.

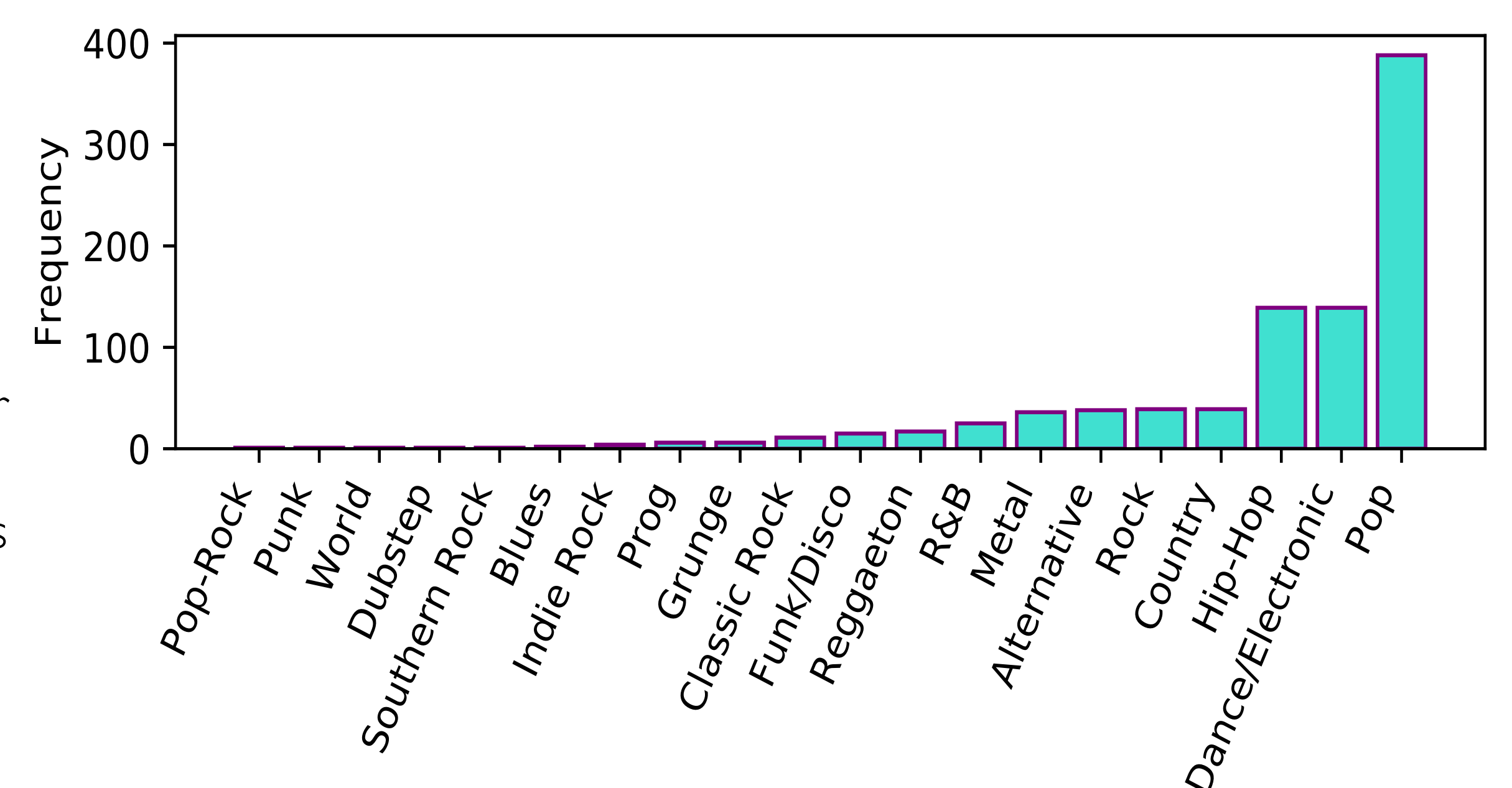
Data & Annotations

Data Gathering:

- ▶ Goal: Improve rhythm-action games
- ▶ Most tracks in 4/4
- ▶ Strong emphasis on dance music

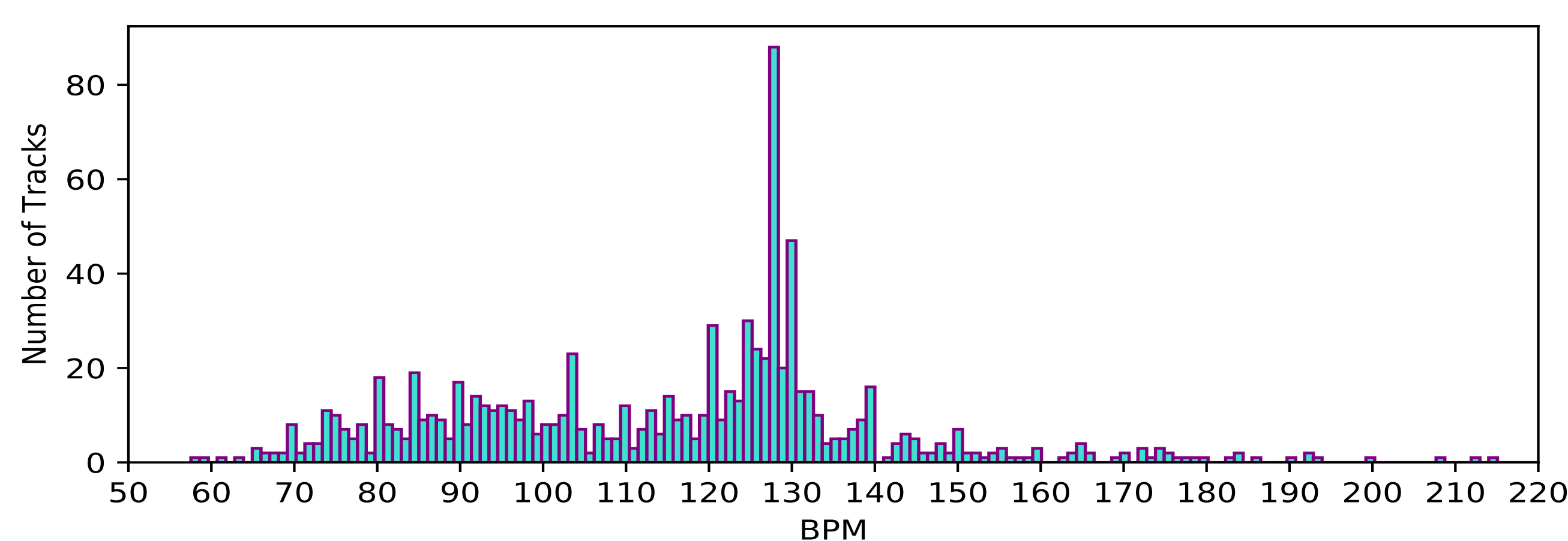
Annotation Methodology:

- ▶ By trained professional musicians (1 per track; verified once by same annotator)
- ▶ Logic/Reaper to produce MIDI outputs to be converted to JAMS [1]

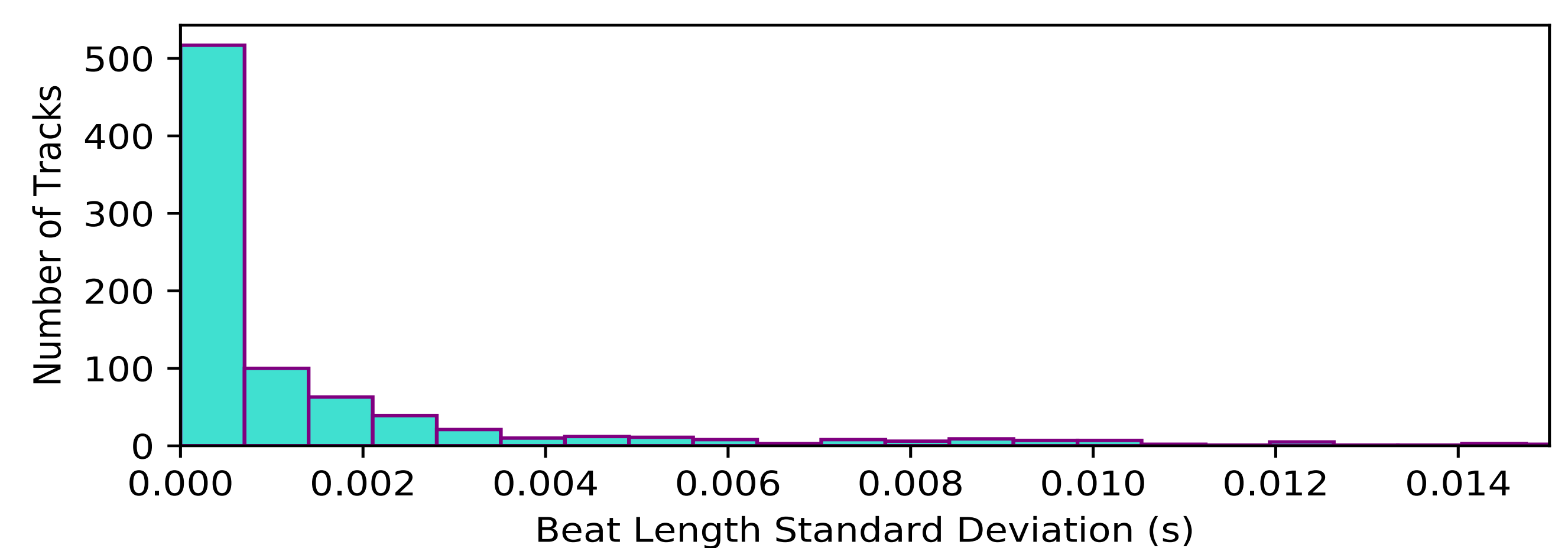


Stats on The Harmonix Set

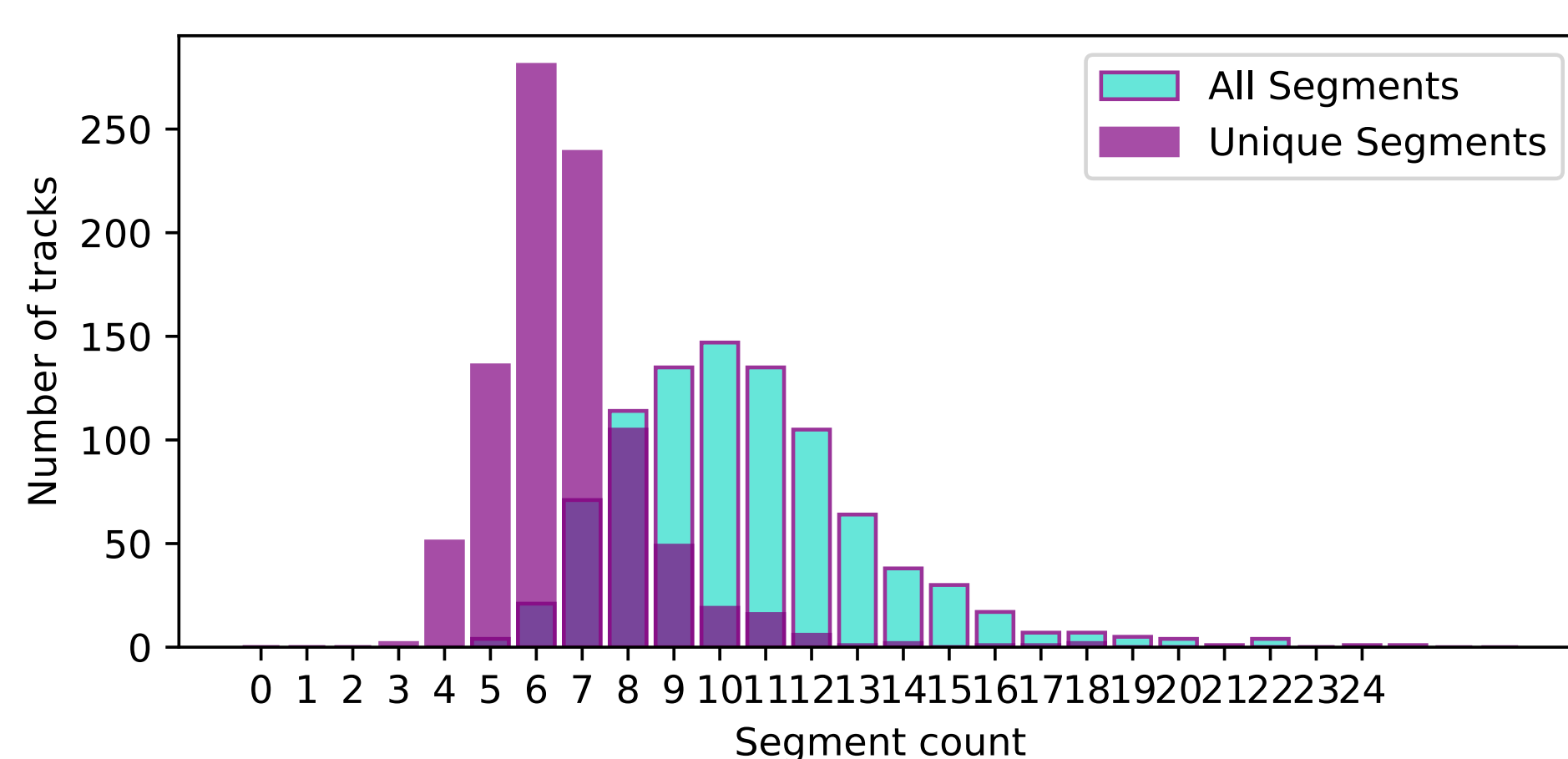
BPM Distribution: Peak at 128 (most common in EDM [2])



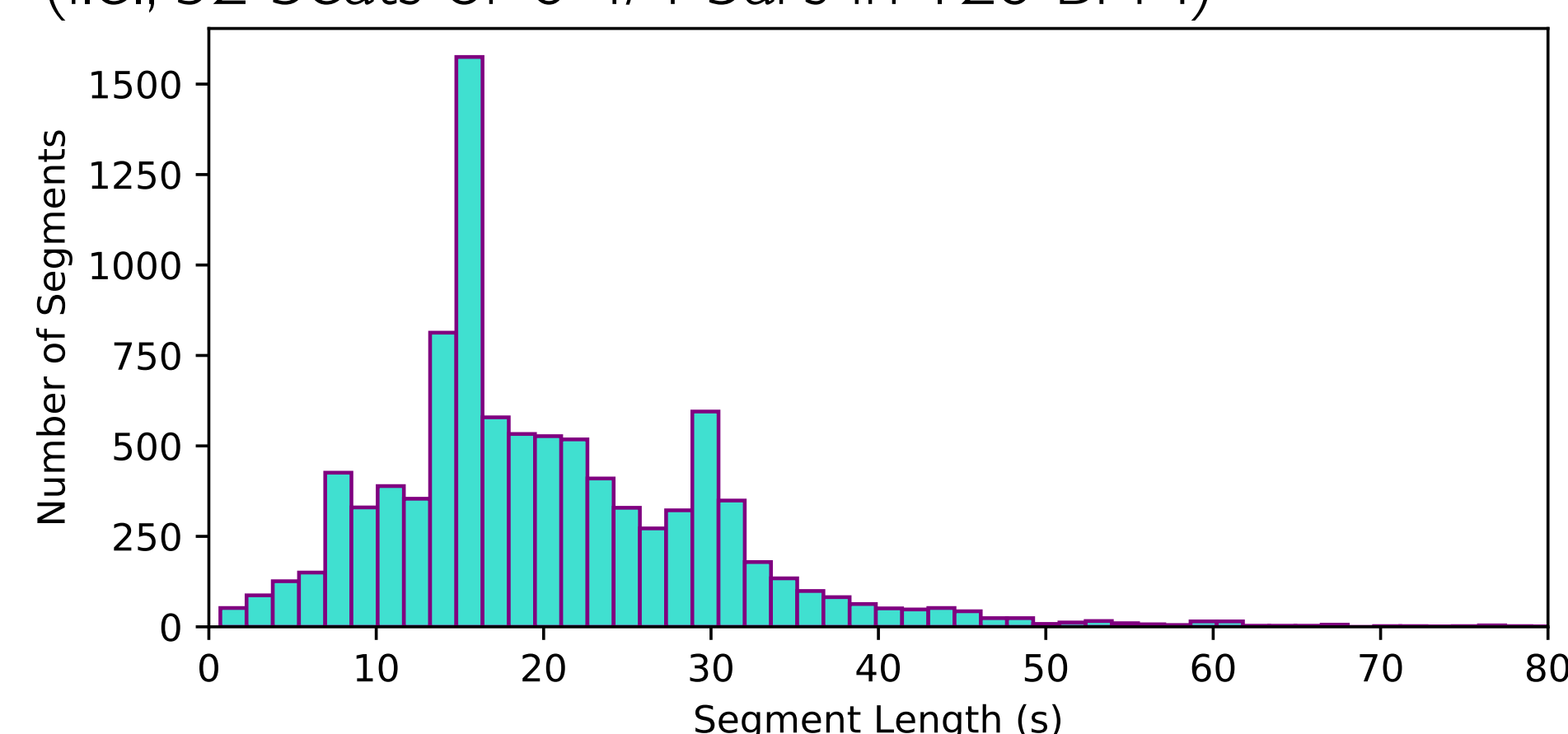
Standard Deviation of Median Inter-Beat Interval (IBI): Steady tempi



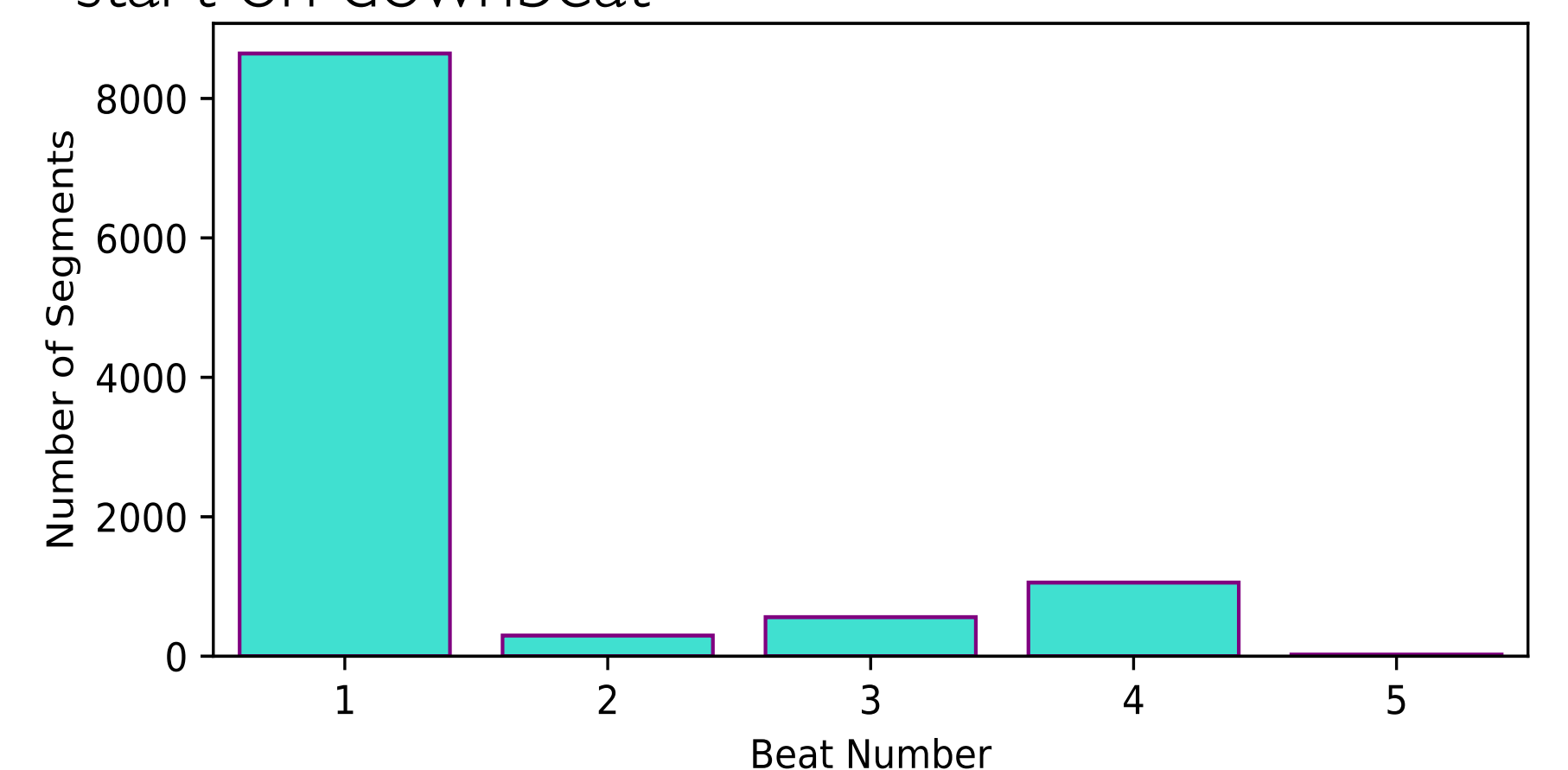
Number of segments per track: normally distributed?



Segment length distribution: Peak at 15 seconds (i.e., 32 beats or 8 4/4 bars in 128 BPM)

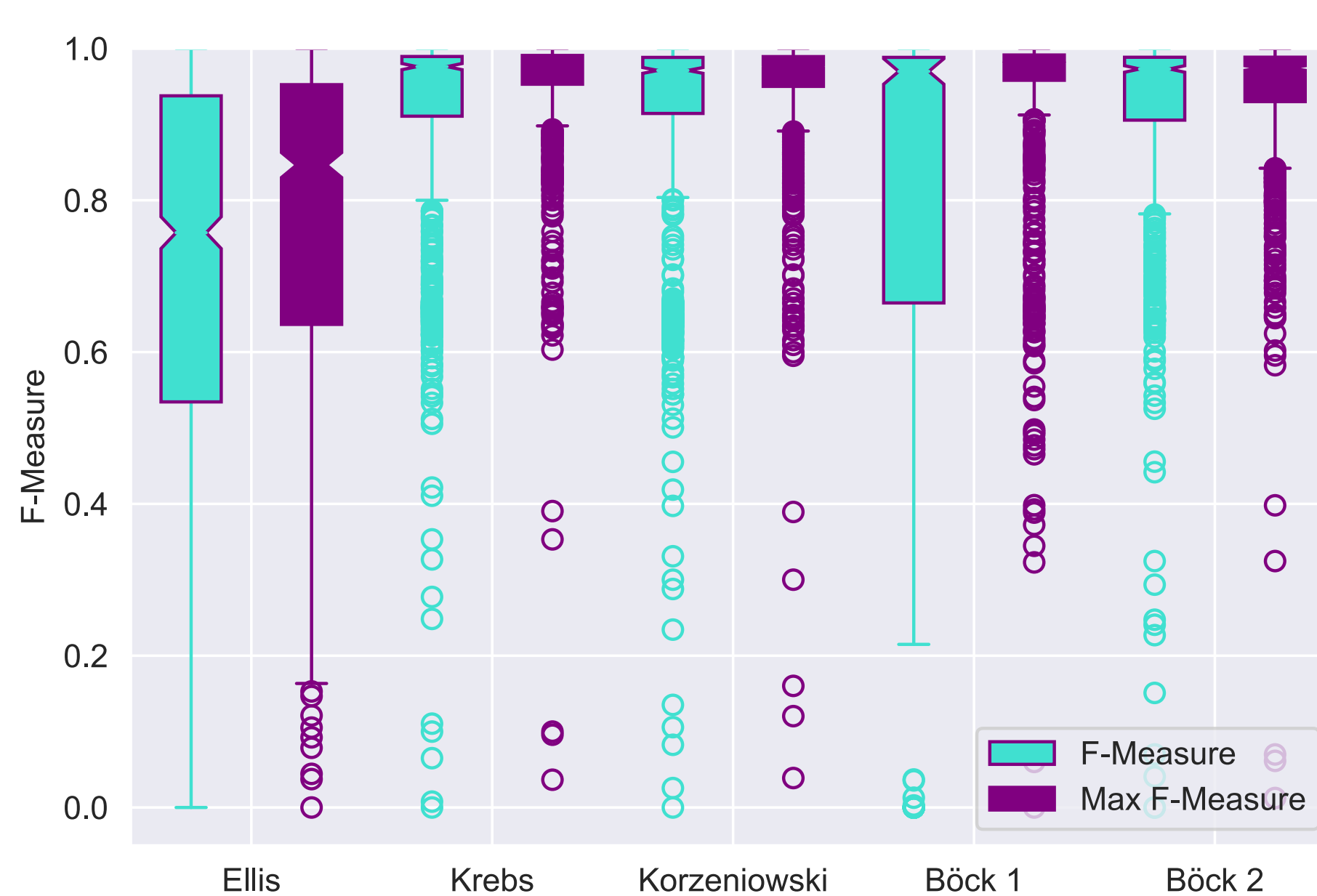


Segment count based on bar placement: 81% start on downbeat

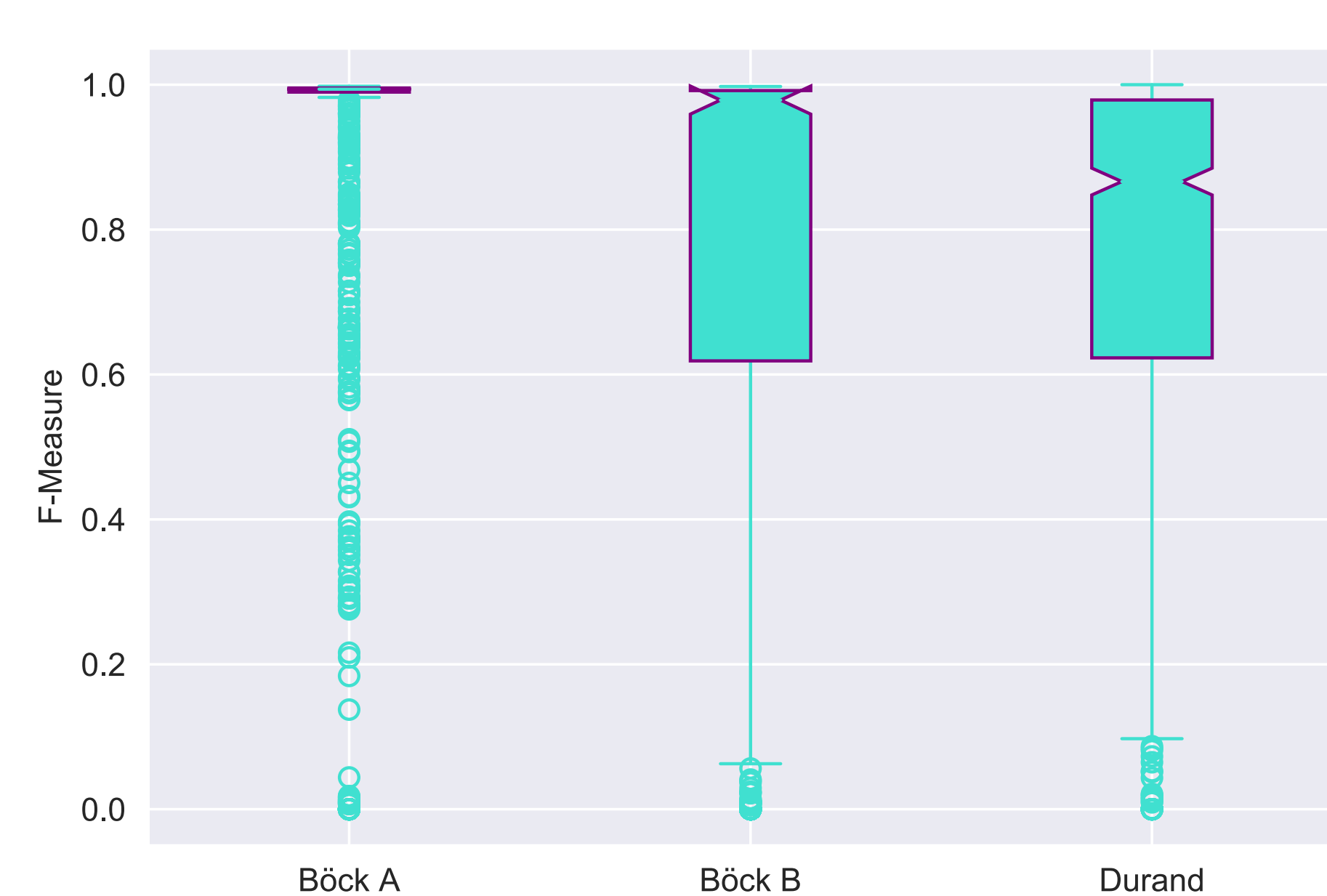


Experiments on The Harmonix Set

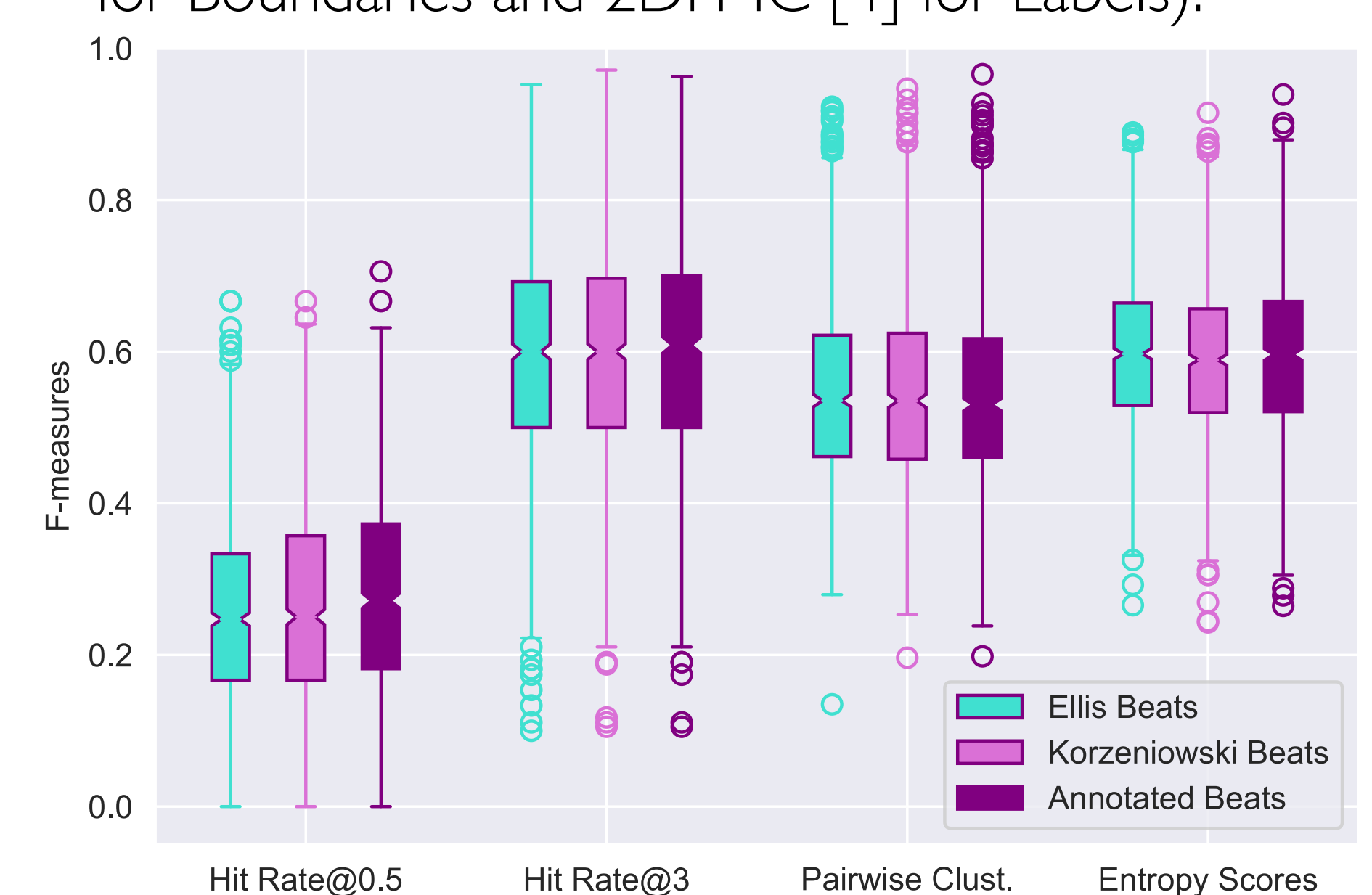
Beat Tracking:



Downbeat Prediction:



Structural Segmentation (Structural Features [3] for Boundaries and 2DFMC [4] for Labels):



Full Paper



References

- [1] Humphrey, J.E., Salamon, J., Nieto, O., Forsyth, J., Bittner, R., Bello, J.P., JAMS: A JSON Annotated Music Specification for Reproducible MIR Research. ISMIR, 2014.
- [2] Moelants, D., Hype vs. Natural Tempo: a Long-term Study of Dance Music Tempi. ICMPC, 2008.
- [3] Serrà, J., Müller, M., Grosche, P., & Arcos, J. L. Unsupervised Music Structure Annotation by Time Series Structure Features and Segment Similarity. IEEE Transactions on Multimedia, Special Issue on Music Data Mining, 2014.
- [4] Nieto, O., Bello, J.P., Music Segment Similarity Using 2D-Fourier Magnitude Coefficients. ICASSP, 2014.

Dataset + Code: <https://github.com/urinieto/harmonixset>

