

TOTAL VARIATION IN POPULAR RAP VOCALS (2009-2023)

Extension of the analysis by Georgieva, Ripollés, & McFee

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1. Introduction

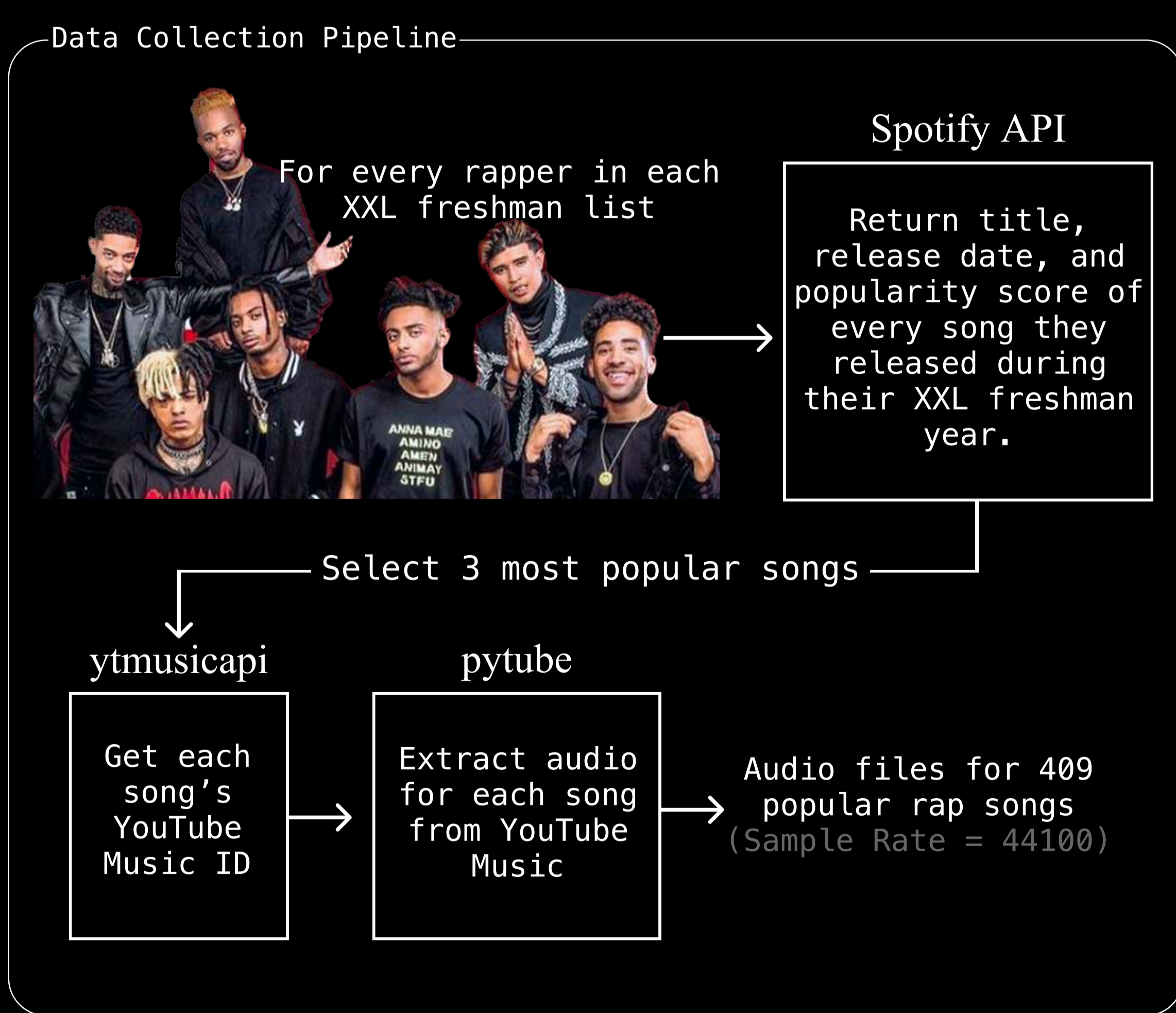
- We present an analysis of fundamental frequency (F0) variation in rap vocals from 2009-2023.
- It is a continuation of the 2023 analysis by Georgieva, Ripollés & McFee.
- They analyzed data from the genre's inception through 2010.
- They found rap to be an outlier with large F0 variation that was decreasing over time.
- Our analysis also observes rap's large F0 variation, but with a decelerated decline in recent years.

2. Background

- Rap music has evolved dramatically since 2010.
- The internet has democratized music production.
- New audiences have resulted in new sub-genres.
- Many artists create music with the goal of cultivating general internet virality.
- Lyricism is no longer seen as the defining metric of quality.

3. Dataset

We select songs using XXL hip-hip magazine's "Freshman Class": An annual list featuring the hottest up-and-coming rappers.



2. Method

Pipeline to calculate TV

demucs
Isolate vocal stems
(Sample Rate = 44100)

↓
librosa.pyin

Determine F0 Contour
(fmin=70,
fmax=900,
frame_length=2048,
hop_length=512,
n_thresholds=5,
no_trough_prob=0.99)

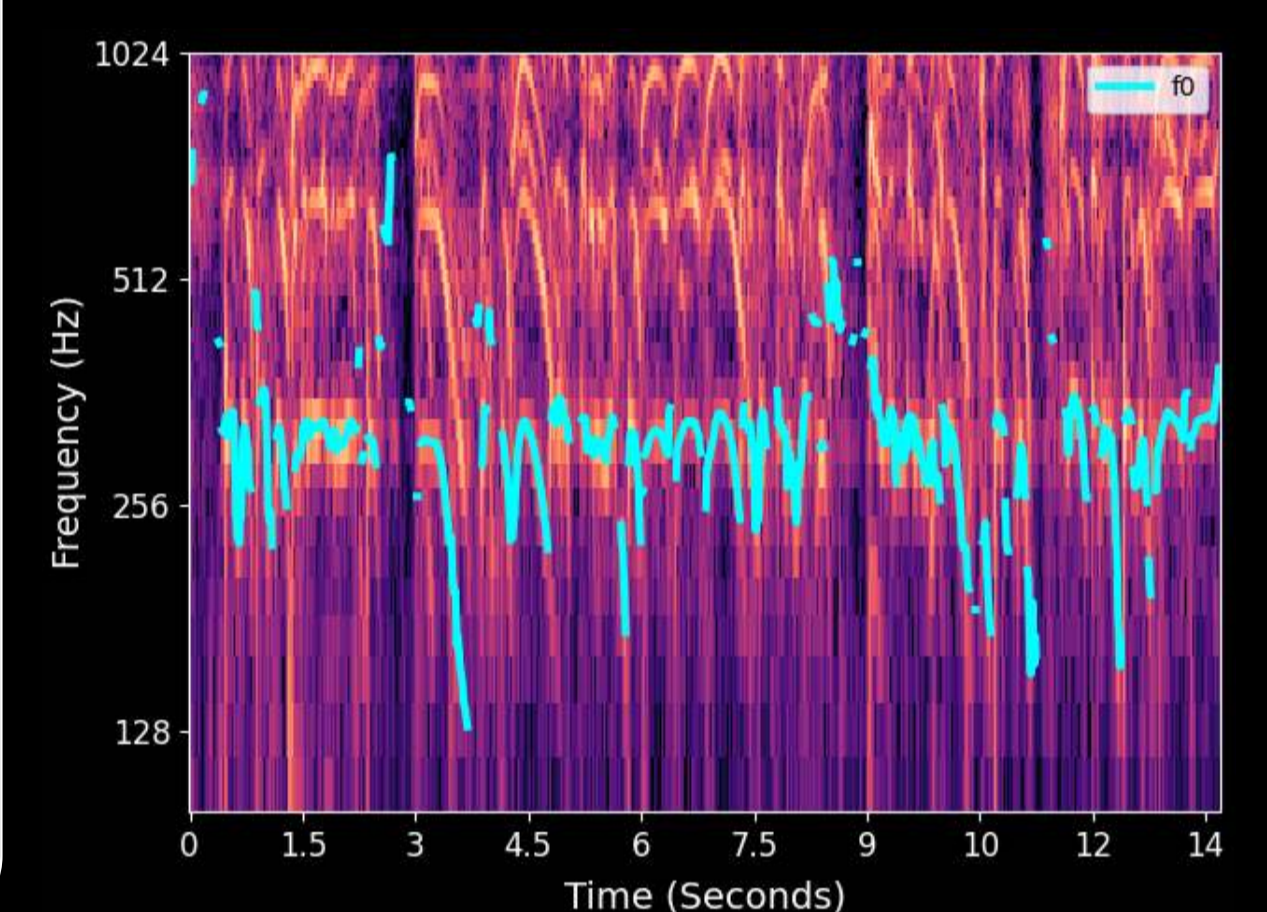
↓
Calculate TV:

$$TV(\mathbf{x}) = \frac{1}{N} \sum_{i=1}^{N-1} |x_{i+1} - x_i|$$

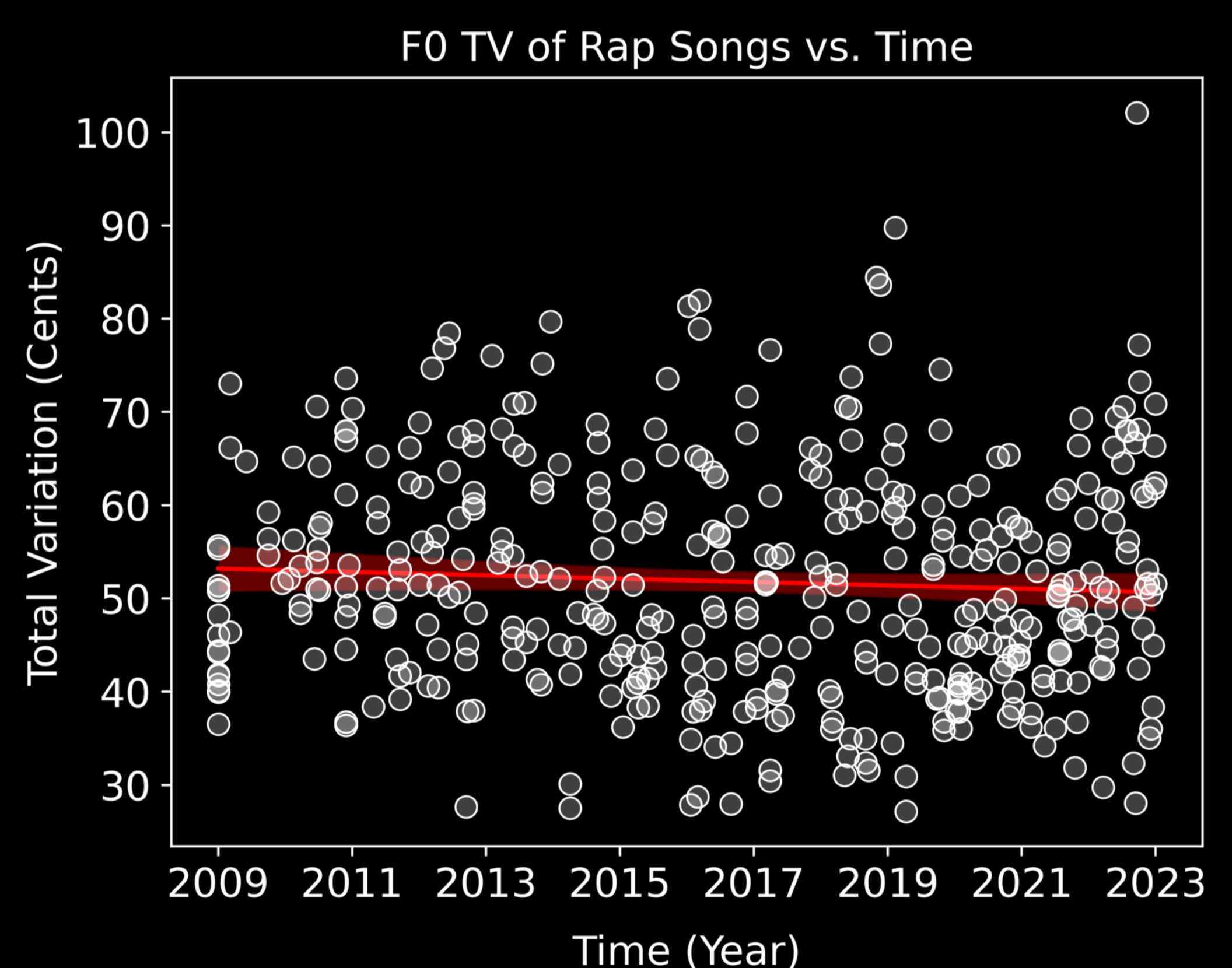
where $\mathbf{x} = (x_1, x_2, \dots, x_N)$
is a song's F0 contour

We determine a song's F0 contour and calculate its Total Variation (TV) with the same method used by Georgieva et al.

For example:
Below is a visualization of the F0 contour from part of Fiveo Foreign's song "Big Drip."
(TV = 74.582)



2. Results



- Linear regression shows a decline over time ($R = -0.061$), but it is not significant ($p = 0.218$).
- The previously observed decline in F0 TV has likely plateaued in the past 14 years.
- We did observe a general increase in the variability of F0 TV values between songs in a given year. (further research is needed)



Follow the QR code on the right to further explore the project and hear snippets of each song.

(Website requires Google Chrome and does not support mobile)

REFERENCES:

- [1] E. Georgieva, P. Ripollés, and B. McFee, "Total variation in vocals over time," in IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), New Paltz, NY, USA, 2023.
- [2] M. Waugh, "'every time i dress myself, it go motherfuckin'viral': Post-verbal flows and memetic hype in young thug's mumble rap," Popular Music, vol. 39, no. 2, pp. 208-232, 2020.
- [3] M. Ohriner, "Analysing the pitch content of the rapping voice," Journal of New Music Research, vol. 48, no. 5, pp. 413-433, 2019.
- [4] A. Bradley and A. DuBois, The anthology of rap. Yale University Press, 2017.