

Mid-level Harmonic Audio Features for Musical Style Classification

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OVERVIEW

- **Music style classification** has been pursued computationally to organize large collections of digital music.
- Existing methods rely mostly on timbral or rhythmic mid-level features, which are suitable for classifying top-level genres (e.g., rock or pop), but less prone to discriminate sub-genres within **Western classical music**.
- **Harmonic features** focus on low-level and short-term properties and do not consider **perceptual qualities**.
- *Can harmonic features within the perceptually-inspired **Tonal Interval Vector** space enhance music style classification — period and composer — within Western classical music?*

NOVEL FEATURES

Distance between audio segments

Voice leading parsimony and shared interval content

Tonal dispersion

Modulations and harmonic unity

TIV Entropy

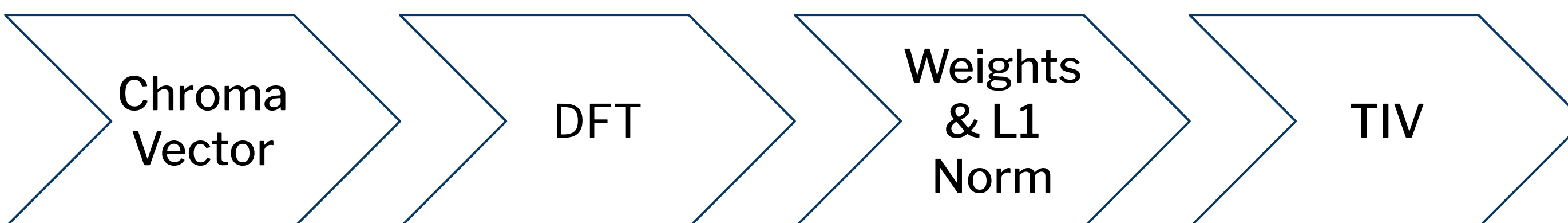
Periodicity and sparseness

Harmonic Rhythm

Harmonic change peak interval and magnitude

TONAL INTERVAL VECTORS

- Represent pitch configurations (e.g., notes, chords and keys) on a **6-dimensional complex space**.



- Provide an indicator of **dissonance** and **descriptors of intervallic content**.

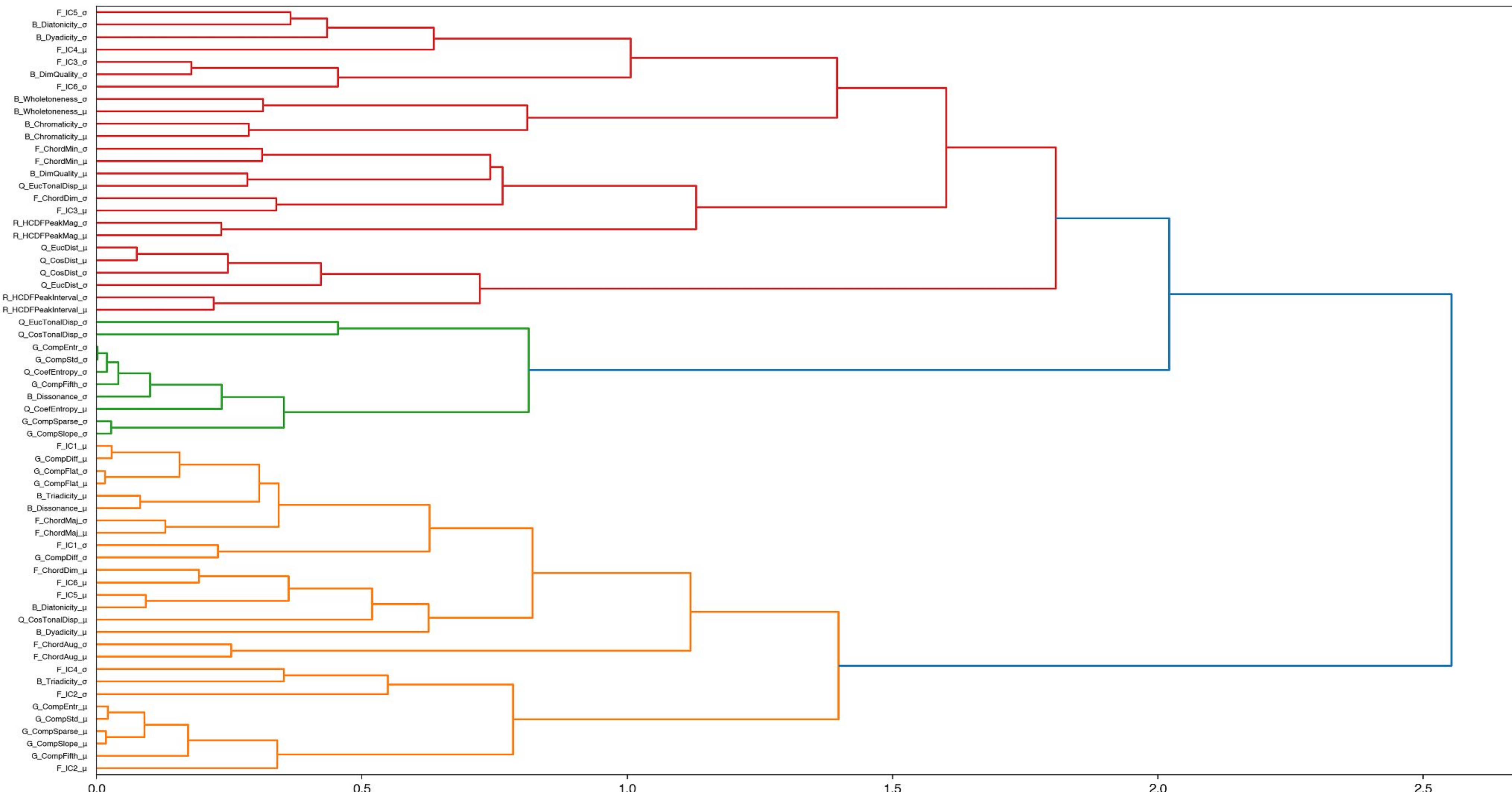
EVALUATION

Dataset	No. Classes	Items per class
Cross-Era-Full	4	400
Cross-Era-Piano	4	200
Cross-Era-Orchestra	4	200
Cross-Comp-5	11	100
Cross-Comp-11	5	100

- Comparison with state-of-art **template-based** and **tonal complexity** harmonic features

RESULTS

		Cross-Era-Piano	Cross-Era-Orchestra	Cross-Era-Full	Cross-Comp-11	Cross-Comp-5
Tonal	Template-based (F)	69.82	75.25	70.51	37.41	50.01
	Tonal Complexity (G)	65.84	71.68	65.51	29.74	43.32
	Combined (F, G)	67.77	75.23	71.16	36.97	48.86
TIV	TIV Basic (B)	66.84	74.80	70.13	37.84	54.75
	TIV Complexity (Q)	57.99	69.87	62.18	29.61	43.16
	Harm. Rhythm (R)	21.26	28.31	21.65	7.77	16.47
	B, Q	65.59	76.68	71.50	37.82	53.40
	B, Q, R	65.47	77.19	71.63	37.83	53.75
Combined	F, G, B, Q, R	64.39	76.70	73.78	38.25	49.72
Combined (no R)	F, G, B, Q	64.78	76.56	74.04	37.89	50.44



- Conceptually similar features groups, such as **Template-based** and **TIV Basic**, lead to similar classification results.
- The **novel features capture complementary information**, such that their combination improves upon individual groups.
- **Template-based** and **TIV Basic** features have **high correlation**.
- **Tonal Complexity** and **TIV Complexity** are also **correlated** (green cluster).
- **Red** cluster contains **TIV Complexity** features but no **Tonal Complexity** features.