

Renaissance Counterpoint in Theory and Practice: A Case Study

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Research Question

How well do theoretical treatises accurately reflect musical practice in the Renaissance?

(Specifically with regard to counterpoint and voice-leading)

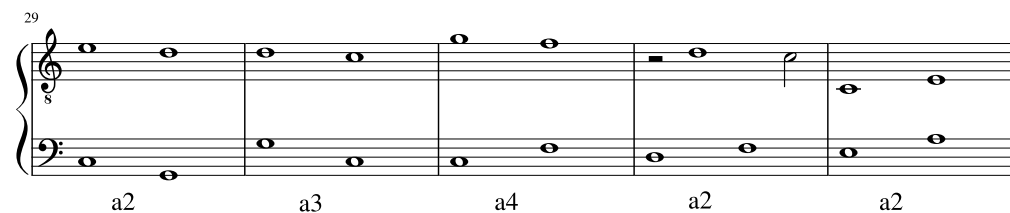
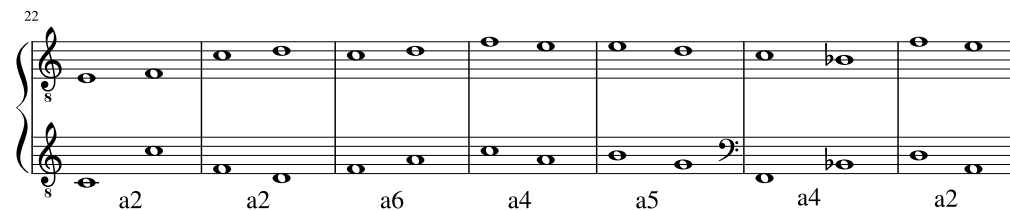
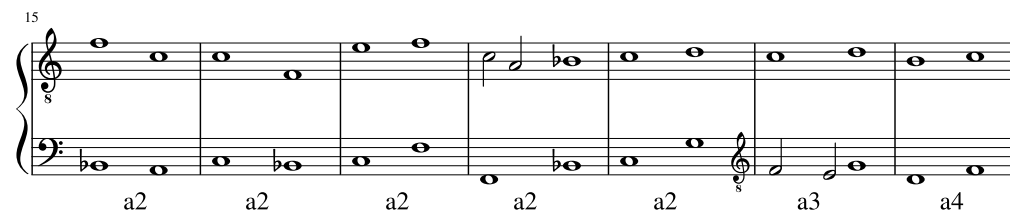
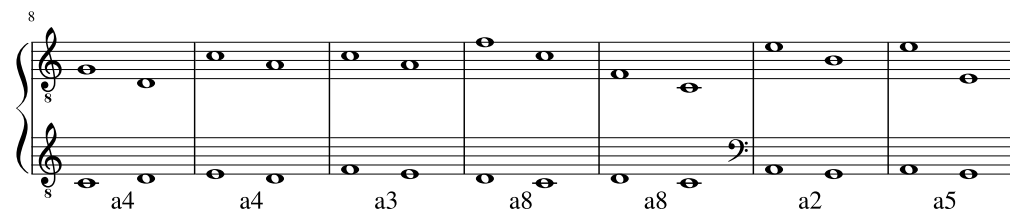
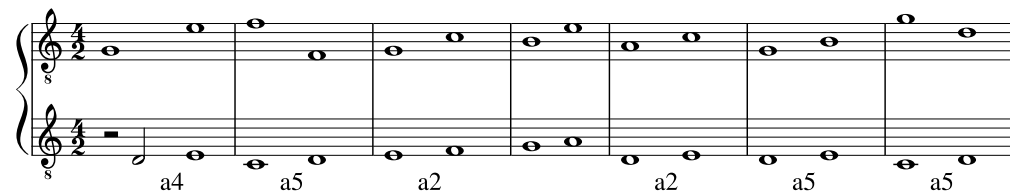
Choosing a Renaissance Treatise

Nicola Vicentino:

‘Ancient Music Adapted to Modern Practice’ (1555)

- Hundreds of examples of two-part counterpoint
- Specifies the minimum number of voices for each

Vicentino (1558); Book II, Chapter 29, “*On Various Steps and Leaps Placed Above and Below, Ascending and Descending Together.*”



Choosing a Renaissance Composer

- Palestrina widely held as exemplar of Renaissance contrapuntal style
- Masses written for between 3 and 8 voices

(masses conveniently already symbolically encoded!)

Narrowing the Scope of “Contrapuntal Practice”

- Only examples moving to perfect intervals
- Any example in **two-part counterpoint** with **no rhythmic interpretation** given

Total (‘Good’ and ‘Bad’): 95 examples

Narrowing the Scope of “Contrapuntal Practice”

- Only examples moving to perfect intervals
- Any example in **two-part counterpoint** with **no rhythmic interpretation** given

~~Total (‘Good’ and ‘Bad’): 95 examples~~

Only prohibitions: 54 examples

Corpus Analysis

- Palestrina's 104 masses (707 movements)
- Vertically “slice” the music at any new attack (salami slicing)

Example of “Salami Slicing”

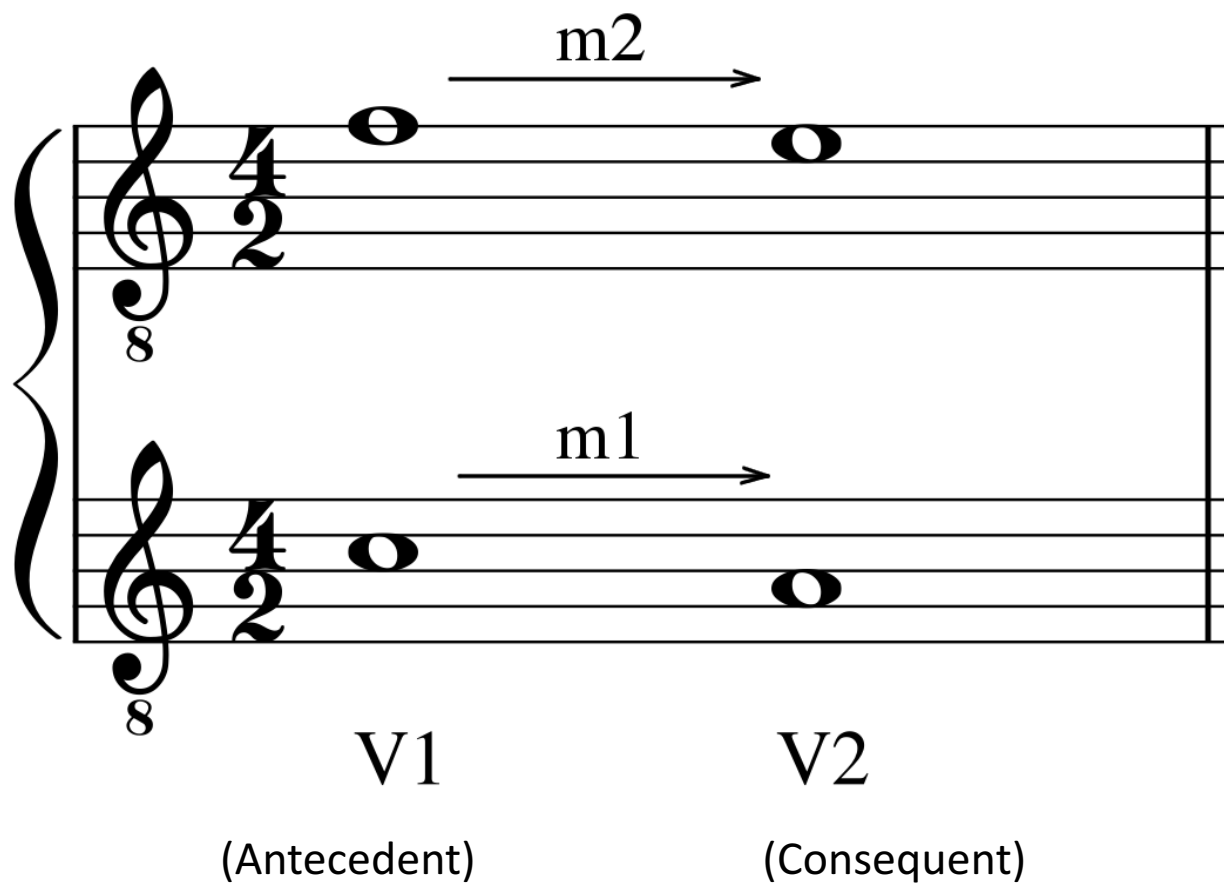
measures: 1 2 3 4 5

The musical score is written for four voices: Cantus, Alto, Tenor, and Bass, in 4/2 time. The score is divided into five measures by vertical dashed lines. The Cantus part begins with a whole note in measure 1, followed by a whole note in measure 2, and then a half note in measure 3. In measure 4, the Cantus part features a red arrow pointing to the right, indicating a melodic line. In measure 5, the Cantus part features a red arrow pointing to the right, indicating a melodic line. The Alto part begins with a whole note in measure 1, followed by a whole note in measure 2, and then a half note in measure 3. In measure 4, the Alto part features a red arrow pointing to the right, indicating a melodic line. In measure 5, the Alto part features a red arrow pointing to the right, indicating a melodic line. The Tenor part begins with a whole note in measure 1, followed by a whole note in measure 2, and then a half note in measure 3. In measure 4, the Tenor part features a red arrow pointing to the right, indicating a melodic line. In measure 5, the Tenor part features a red arrow pointing to the right, indicating a melodic line. The Bass part begins with a whole note in measure 1, followed by a whole note in measure 2, and then a half note in measure 3. In measure 4, the Bass part features a red arrow pointing to the right, indicating a melodic line. In measure 5, the Bass part features a red arrow pointing to the right, indicating a melodic line.

Corpus Analysis

- Palestrina's 104 masses (707 movements)
- Vertically “slice” the music at any new attack (salami slicing)
- For each pair of voices in texture, look at a sliding 2-slice window and calculate all horizontal and vertical intervals (2-gram)

2-gram



String Representation: "V1, m1, m2, V2"

Computational Analysis

- Each 2-gram gets entered into a large table with the following information attached:
 - The 2 voices (parts) participating in the 2-gram
 - Pitches that generate the 2-gram
 - Mass and movement title
 - Beat and measure position
 - The resulting type of motion (contrary, oblique, etc.)
 - Total number of voices in the texture... at that moment*

Assumptions

- Compound vertical intervals reduced to their simple counterparts (horizontal intervals were not)

(Voice leading is preserved, and in most cases we can know whether a given interval was greater than an 8ve or not)

Assumptions

- Compound vertical intervals reduced to their simple counterparts (horizontal intervals were not)
- Examples written with particular pitch classes can be thought of as equally 'bad' if transposed (i.e. focus on interval content)

Vicentino's Voice Leading Rules for 5+ voices

The image displays two systems of musical notation, each consisting of two staves (treble and bass clef) in 4/2 time. The notation illustrates Vicentino's Voice Leading Rules for 5+ voices, showing intervals between notes in the upper and lower staves across five measures.

System 1 (Top):

- Measure 1: Upper staff intervals: -P4, P5, P8; Lower staff intervals: M2, P5, P8.
- Measure 2: Upper staff intervals: -M2, P4, P5; Lower staff intervals: -M3, P4, P5.
- Measure 3: Upper staff intervals: M3, P4, P5; Lower staff intervals: M2, P4, P5.
- Measure 4: Upper staff intervals: -M3, P5, P8; Lower staff intervals: m3, P5, P8.
- Measure 5: Upper staff intervals: m3, M6, P5; Lower staff intervals: P4, P5, P8.

System 2 (Bottom):

- Measure 1: Upper staff intervals: -m3, m3, P8; Lower staff intervals: -P8, P8, P8.
- Measure 2: Upper staff intervals: M3, m3, P5; Lower staff intervals: P8, P5, P8.
- Measure 3: Upper staff intervals: -P4, P8, P8; Lower staff intervals: P5, P5, P8.
- Measure 4: Upper staff intervals: -m3, m6, P8; Lower staff intervals: -P5, P5, P8.
- Measure 5: Upper staff intervals: M2, P4, P1; Lower staff intervals: P5, P5, P8.

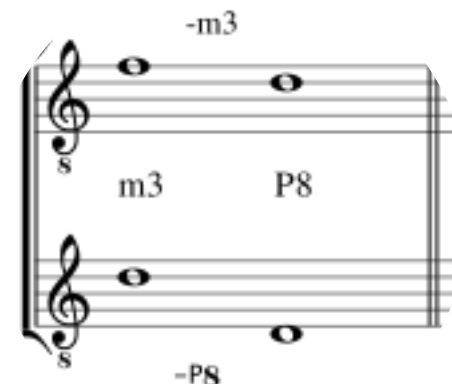
Vicentino's Voice Leading Rules for 5+ voices

The image displays musical notation for two systems of staves, illustrating Vicentino's Voice Leading Rules for 5+ voices. The notation includes intervals labeled above and below the notes, such as P5, P8, P4, P5, M3, -M3, m3, M2, -M2, -P4, -m3, -P8, P8, P5, -P5, P5, P1, and M6.

The first system consists of two staves. The top staff has intervals labeled above the notes: -P4, -M2, M3, -M3, and m3. The bottom staff has intervals labeled below the notes: M2, -M3, M2, m3, and P4. The second system also consists of two staves. The top staff has intervals labeled above the notes: -m3, M3, -P4, -m3, and M2. The bottom staff has intervals labeled below the notes: P8, P5, P8, P8, m6, P8, P4, and P1. A circular inset highlights the first measure of the first system, showing the intervals m3 and P8 between the two staves.

Instances of single “a 5” rule:

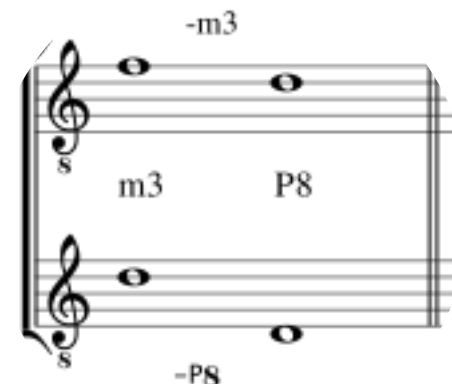
m3 -P8 -m3 P8



	Ante	Lower	Upper	Consq	Voicepair	TotalVox	UpperNote	LowerNote	BeatPos	Motion	Measure	Title
306.0	m3	-P8	-m3	P8	1,3	5	C5	A4	0.0	Sim_Descend	42	Ascendo_ad_Patrem_Agnus_II_5.mid
130.0	m3	-P8	-m3	P8	0,4	5	F5	D4	1.0	Sim_Descend	17	Aspice_Domine_Agnus_I_5.mid
331.0	m3	-P8	-m3	P8	1,3	5	C5	A4	1.5	Sim_Descend	42	Aspice_Domine_Agnus_I_5.mid
335.0	m3	-P8	-m3	P8	1,7	7	F4	D4	3.5	Sim_Descend	42	Confitebor_tibi_Agnus_I_8.mid
83.0	m3	-P8	-m3	P8	0,7	8	F5	D4	1.5	Sim_Descend	11	Confitebor_tibi_Sanctus_8.mid
842.0	m3	-P8	-m3	P8	2,7	8	F4	D4	0.0	Sim_Descend	116	Confitebor_tibi_Sanctus_8.mid
842.0	m3	-P8	-m3	P8	4,7	8	F5	D4	0.0	Sim_Descend	116	Confitebor_tibi_Sanctus_8.mid
225.0	m3	-P8	-m3	P8	6,7	8	F4	D4	0.5	Sim_Descend	29	Confitebor_tibi_Sanctus_8.mid
597.0	m3	-P8	-m3	P8	2,4	5	F4	D4	2.5	Sim_Descend	75	De_Beata_Marie_Virginis_(III)_Credo_5.mid
367.0	m3	-P8	-m3	P8	4,7	7	F5	D4	3.5	Sim_Descend	46	Fratres_Ego_Enim_Accepi_Agnus_8.mid
411.0	m3	-P8	-m3	P8	0,3	7	F5	D4	1.5	Sim_Descend	52	Fratres_Ego_Enim_Accepi_Kyrie_8.mid
192.0	m3	-P8	-m3	P8	2,4	4	C4	A3	0.0	Sim_Descend	25	In_illo_tempore_Agnus_5.mid
80.0	m3	-P8	-m3	P8	1,4	5	E-4	C4	0.0	Sim_Descend	11	Jam_Christus_astra_ascenderat_Agnus_II_5.mid
100.0	m3	-P8	-m3	P8	0,2	4	B-4	G4	2.0	Sim_Descend	13	Nasce_la_gioia_mia_Benedictus_6.mid
98.0	m3	-P8	-m3	P8	3,5	6	F4	D4	1.0	Sim_Descend	13	Nasce_la_gioia_mia_Sanctus_6.mid
688.0	m3	-P8	-m3	P8	0,2	4	B-4	G4	0.0	Sim_Descend	86	O_Regem_coeli_Gloria_4.mid
282.0	m3	-P8	-m3	P8	3,5	6	C4	A3	1.0	Sim_Descend	36	Octavi_toni_Credo_6.mid
580.0	m3	-P8	-m3	P8	2,3	5	F4	D4	2.0	Sim_Descend	73	Octavi_toni_Gloria_6.mid
366.0	m3	-P8	-m3	P8	1,2	4	B-4	G4	3.0	Sim_Descend	46	Panem_nostrum_Kyrie_5.mid
680.0	m3	-P8	-m3	P8	1,2	4	B-4	G4	0.0	Sim_Descend	83	Sacerdos_et_pontifex_Gloria_5.mid
603.0	m3	-P8	-m3	P8	0,3	4	F5	D4	1.5	Sim_Descend	76	Salvum_me_fac_Sanctus_5.mid
957.0	m3	-P8	-m3	P8	1,4	5	F4	D4	2.5	Sim_Descend	120	Sicut_lilium_inter_spinas_Gloria_5.mid
45.0	m3	-P8	-m3	P8	0,2	3	C5	A4	2.5	Sim_Descend	6	Tu_es_Petrus_(1887)_Credo_6.mid
144.0	m3	-P8	-m3	P8	2,4	5	F4	D4	0.0	Sim_Descend	19	Vestiva_i_colli_Gloria_5.mid
44.0	m3	-P8	-m3	P8	0,5	6	F5	D4	2.0	Sim_Descend	6	Viri_Galilaei_Kyrie_6.mid

Instances of single “a 5” rule:

m3 -P8 -m3 P8



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144.0	m3	-P8	-m3	P8	2,4	5	F4	D4	0.0	Sim_Descend	19	Vestiva_i_colli_Gloria_5.mid
44.0	m3	-P8	-m3	P8	0,5	6	F5	D4	2.0	Sim_Descend	6	Viri_Galilaei_Kyrie_6.mid

Nasce la Gioia, Benedictus:

Open 5th (G-D)

Dm

musical score for 'Nasce la Gioia, Benedictus'. The score is in 3/4 time and features four staves. The vocal parts (Soprano, Alto, Tenor, Bass) and piano accompaniment are shown. The lyrics are: 'nit, qui ve-nit, be - ne - di - ctus qui ve - nit, be - ne - di - ctus qui ve - nit, be - ne - di - ctus'. Annotations include a blue circle around the G4-D5 interval in the Soprano part, a blue circle around the G4-D5 interval in the Tenor part, and a red dashed box around the Dm chord in the piano part. A red arrow points from the Dm chord to the piano part.



O Regem Coeli, Gloria:

musical score for 'O Regem Coeli, Gloria'. The score is in 3/4 time and features four staves. The vocal parts (Soprano, Alto, Tenor, Bass) and piano accompaniment are shown. The lyrics are: 'Qui se - des ad de - xte - ram Pa - tris, Qui se - des ad de - xte - ram Pa - tris, mi - se - re - re no - ram Pa - tris, mi - se - re - re'. Annotations include a blue circle around the G4-D5 interval in the Soprano part, a blue circle around the G4-D5 interval in the Tenor part, and a red dashed box around the Dm chord in the piano part. A red arrow points from the Dm chord to the piano part.

Dm



Octaves (all G)

What Do We Need to Consider?

- 8 voice texture allows for greater number of intervallic relationships than is afforded by a 3 voice texture
- Uneven distribution of vocal textures in corpus:

Number of voices	Percent of movements	Percent of all intervals
8	4.2	3.2
7	0.7	1.0
6	22.6	11.6
5	37.1	24.5
4	34.5	42.1
3	0.9	16.0
2	0	1.6

Vicentino's Voice Leading Rules for 5+ voices

The image displays two systems of musical notation, each consisting of two staves (treble and bass clef) in 4/2 time. The notation illustrates Vicentino's Voice Leading Rules for 5+ voices, showing intervals between notes across five measures.

System 1 (Top):

- Measure 1: Intervals are $-P4$ (top) and $P5$ (bottom).
- Measure 2: Intervals are $-M2$ (top) and $P4$ (bottom).
- Measure 3: Intervals are $M3$ (top) and $P5$ (bottom).
- Measure 4: Intervals are $-M3$ (top) and $P5$ (bottom).
- Measure 5: Intervals are $m3$ (top) and $M6$ (bottom).

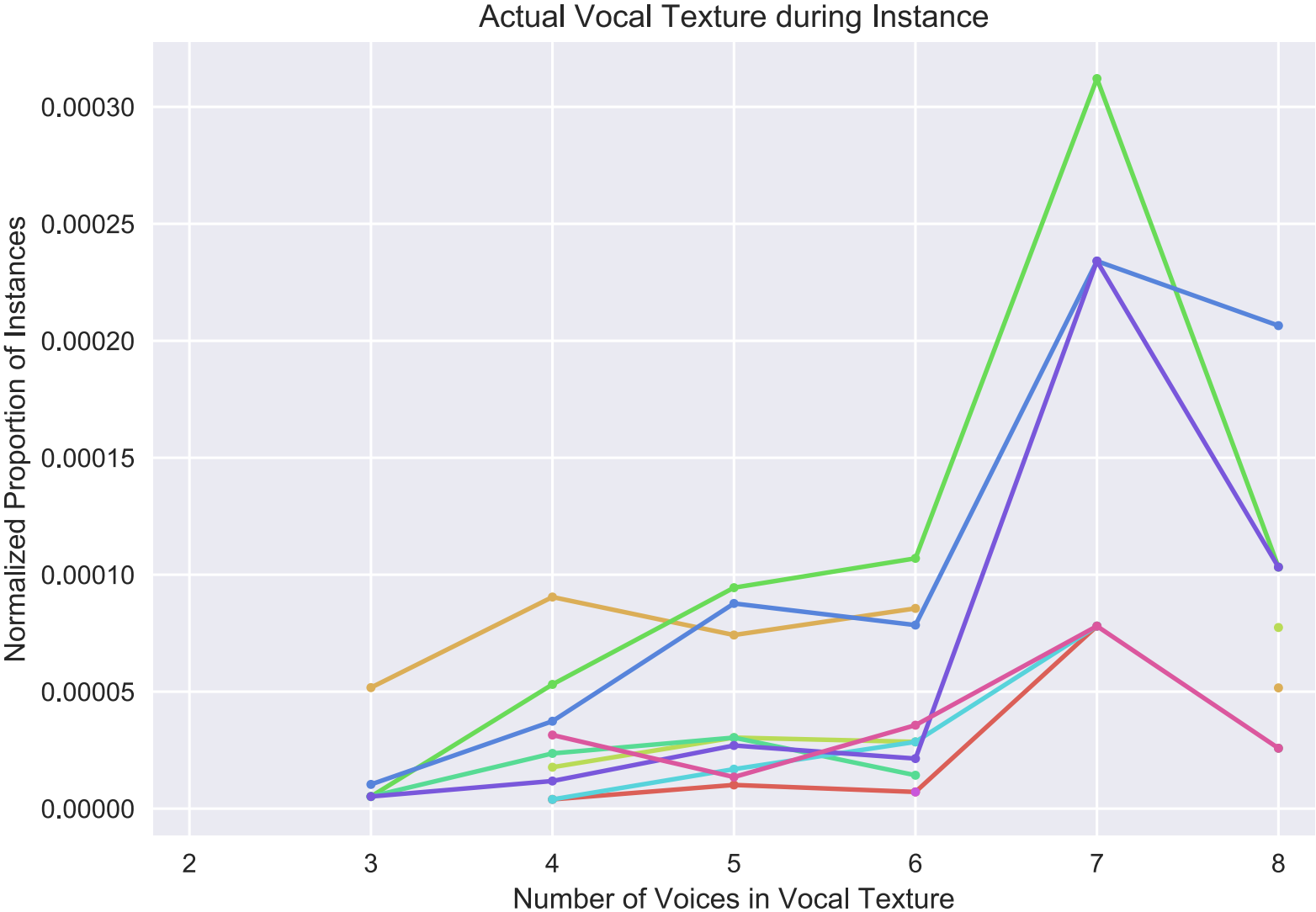
System 2 (Bottom):

- Measure 1: Intervals are $-m3$ (top) and $m3$ (bottom).
- Measure 2: Intervals are $M3$ (top) and $m3$ (bottom).
- Measure 3: Intervals are $-P4$ (top) and $P8$ (bottom).
- Measure 4: Intervals are $-m3$ (top) and $m6$ (bottom).
- Measure 5: Intervals are $M2$ (top) and $P4$ (bottom).

The notation uses various interval labels: $P5$, $P8$, $P4$, $M3$, $-M2$, $-M3$, $m3$, $M6$, $P5$, $M2$, $-m3$, $m3$, $P8$, $m6$, $P8$, $P4$, $P1$, $-P8$, $P8$, $P5$, $-P5$, and $P5$.

Corpus Results

Voice Leading Patterns Legal in 5+ Voices

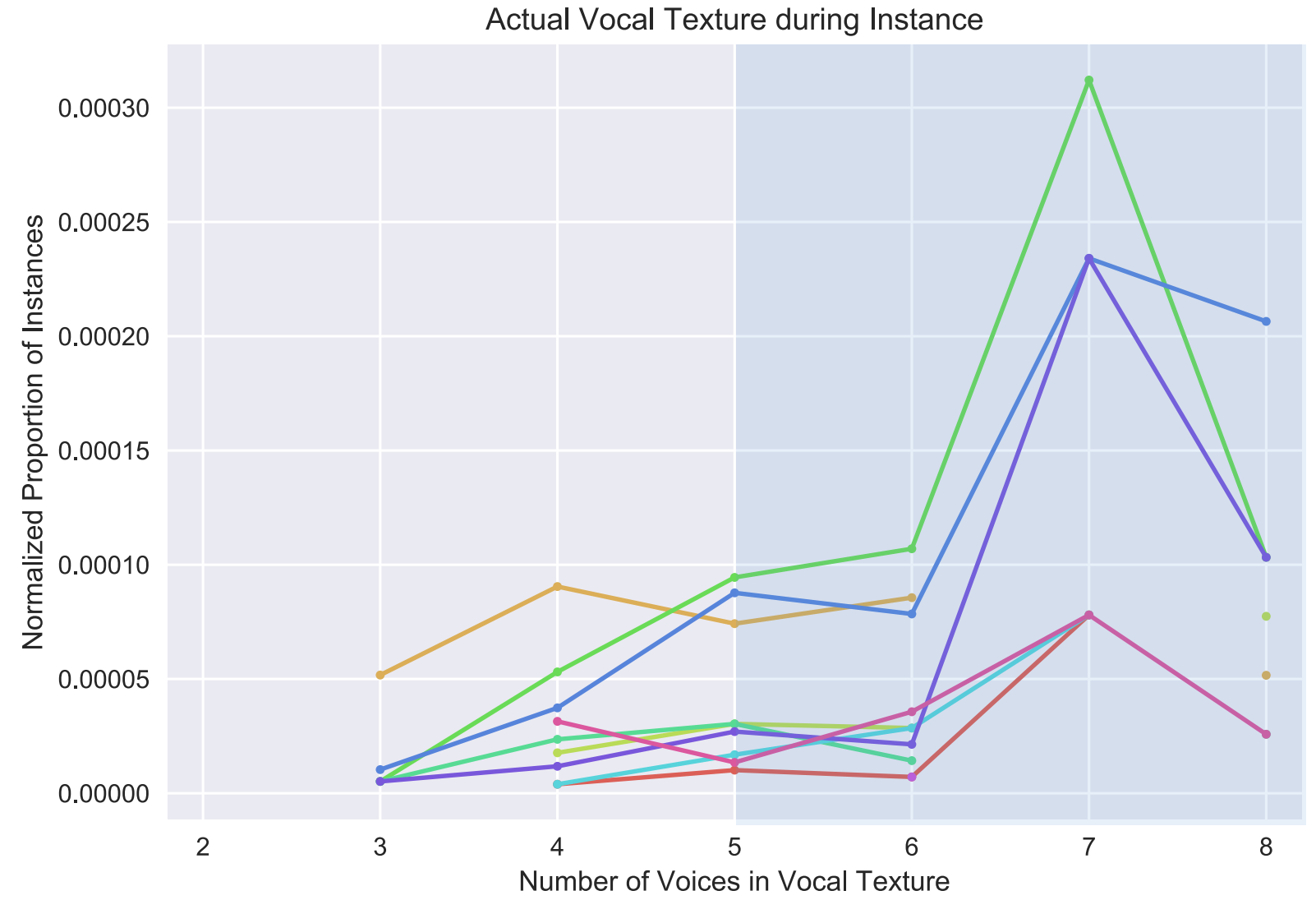


VL Patterns that
never occur:
0/10

VL Patterns that
occur only once:
1/10

Corpus Results

Voice Leading Patterns Legal in 5+ Voices

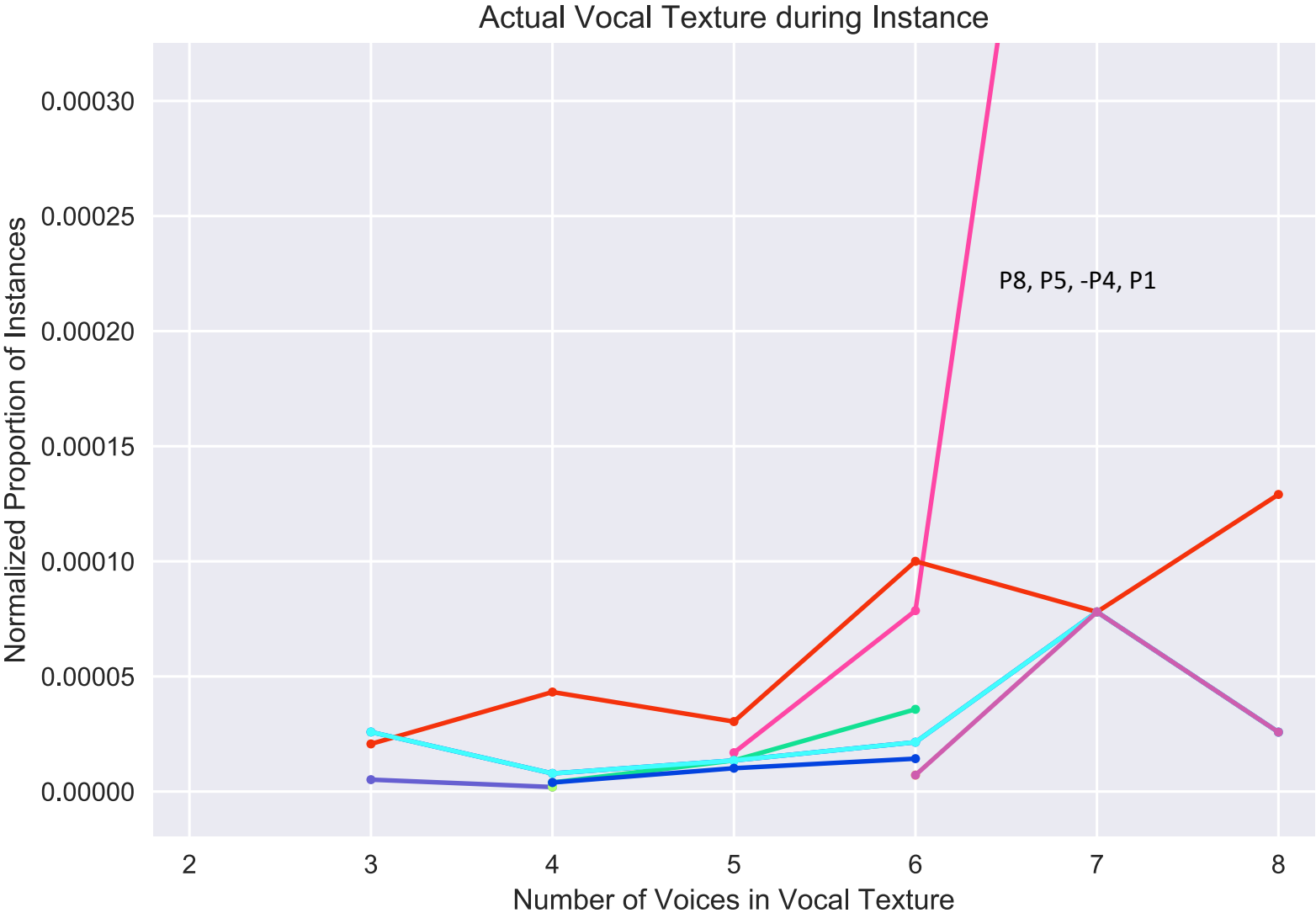


VL Patterns that
never occur:
0/10

VL Patterns that
occur only once:
1/10

Corpus Results

Voice Leading Patterns Legal in 8+ Voices



VL Patterns that
never occur:

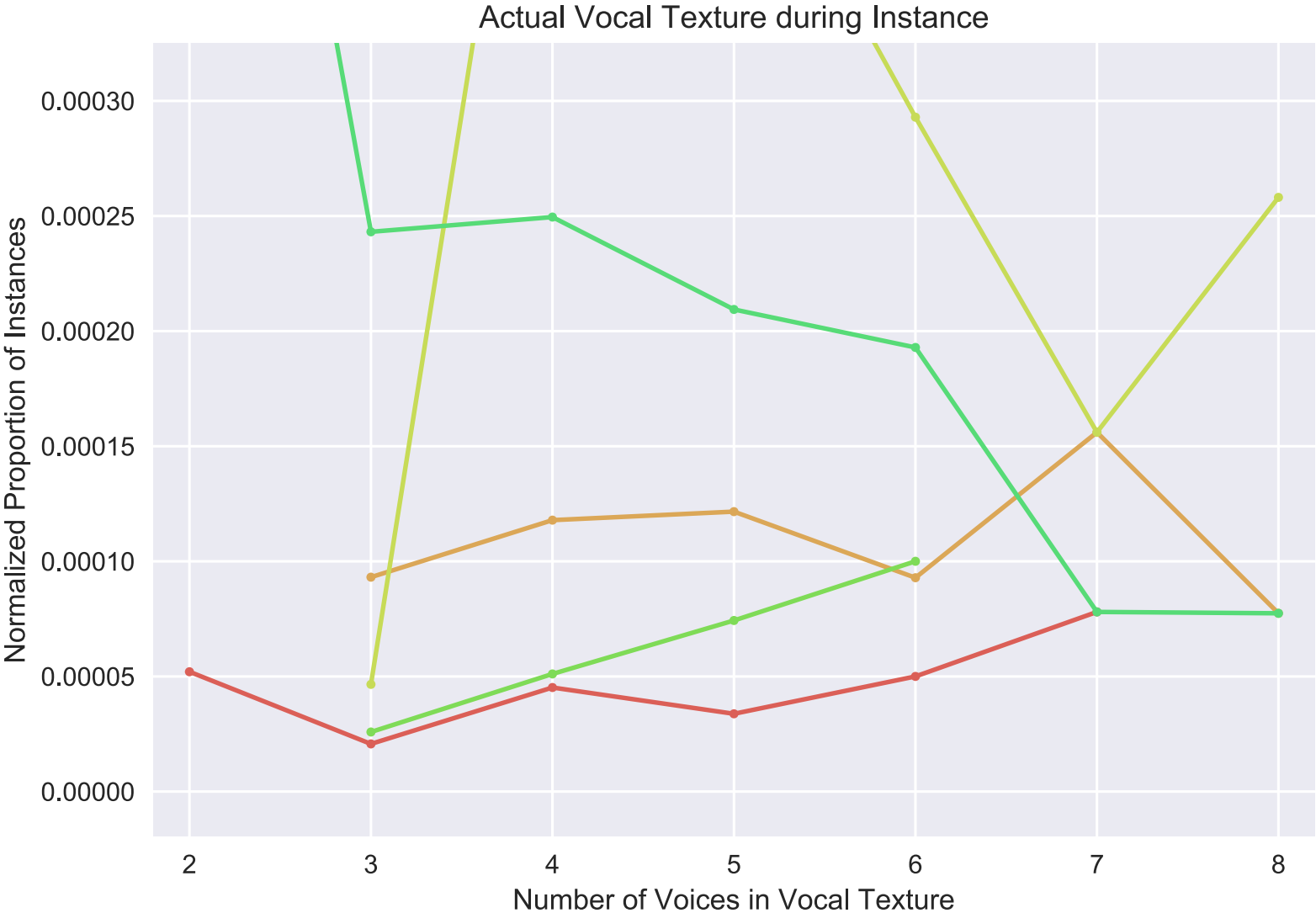
3/13

VL Patterns that
occur only once:

2/13

Corpus Results

Voice Leading Patterns Legal in 3+ Voices



VL Patterns that
never occur:
0/6

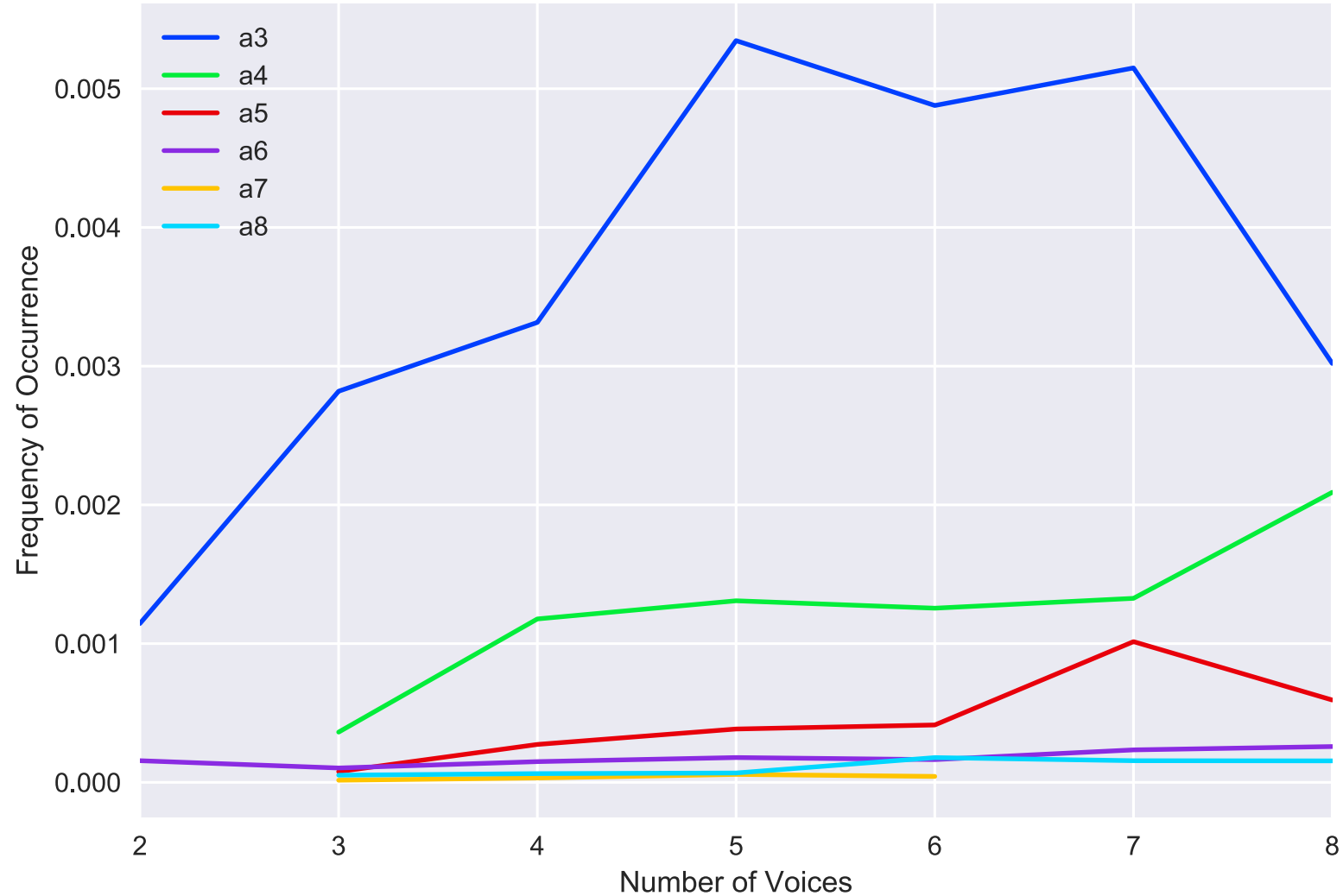
VL Patterns that
occur only once:
0/6

(Pattern with lowest
number of
occurrences: 46!)

Corpus Results

Voice Leading Patterns Grouped By “Rule Class”

Vocal Texture During Realizations of Vicentino Rules



Parallel and Direct Perfect Intervals

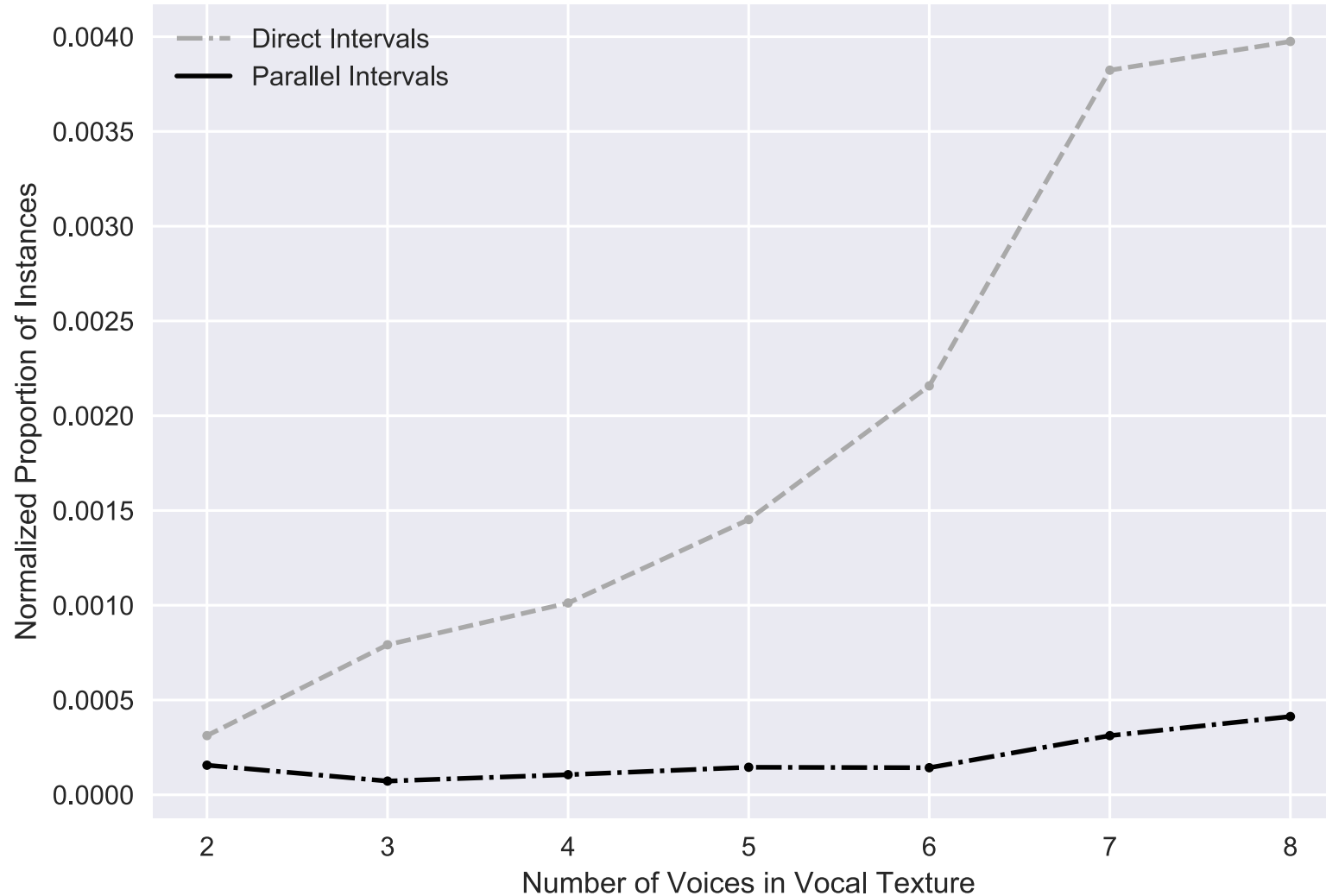
- Parallel and direct perfect intervals represent instances of so-called “hard” and “soft” rules, respectively
- Modern formulations of this rule vary
- The most common version:
 - Two voices must not move in similar motion into a perfect interval unless the upper-most voice moves by step.

Vicentino's Guidelines in Prose

- Clear prohibition against parallel octaves and fifths
- No direct instruction on both voices leaping into perfect interval.

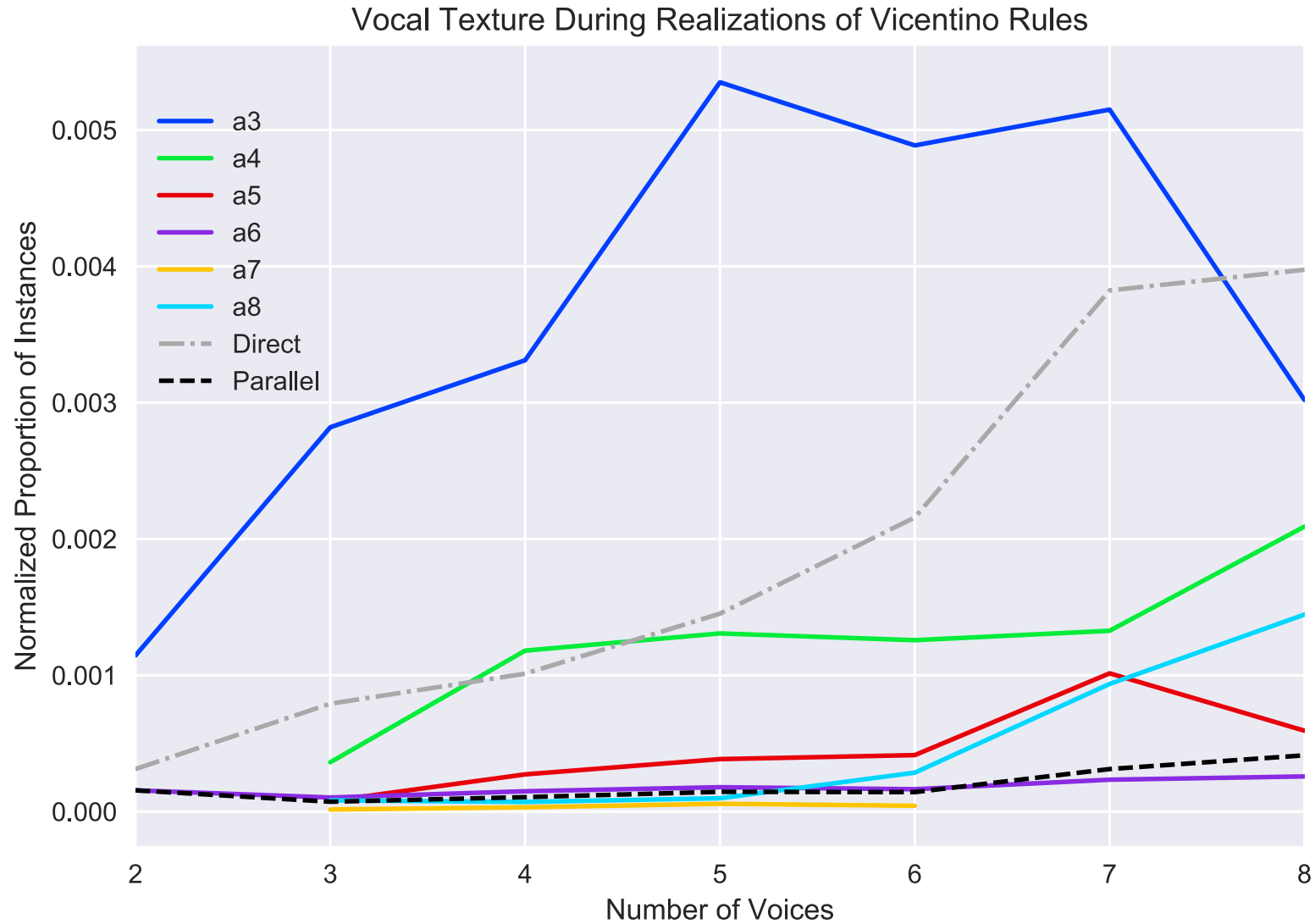
Parallel and Direct Perfect Intervals

Vocal Texture During Instances of Parallel and Direct Intervals



- Instances of Direct Intervals:
1,609
- Instances of Parallel Perfect Intervals:
154

Parallel and Direct Perfect Intervals



Conclusion

- By the present definitions, it appears Palestrina's voice leading is not exactly consistent with the specific guidelines offered by Vicentino
- However, there is a general trend where "poorer" progressions become increasingly rare, and more likely to be "hidden" in thicker textures
- No such thing as a "hard" rule? (Even parallels occur)

Thank You!

Special thanks to Peter Schubert and Julie Cumming for their expertise

Extra-special thanks to Cory McKay for presenting my research on my behalf!

Questions or comments? Email: claire.arthur@mcgill.ca



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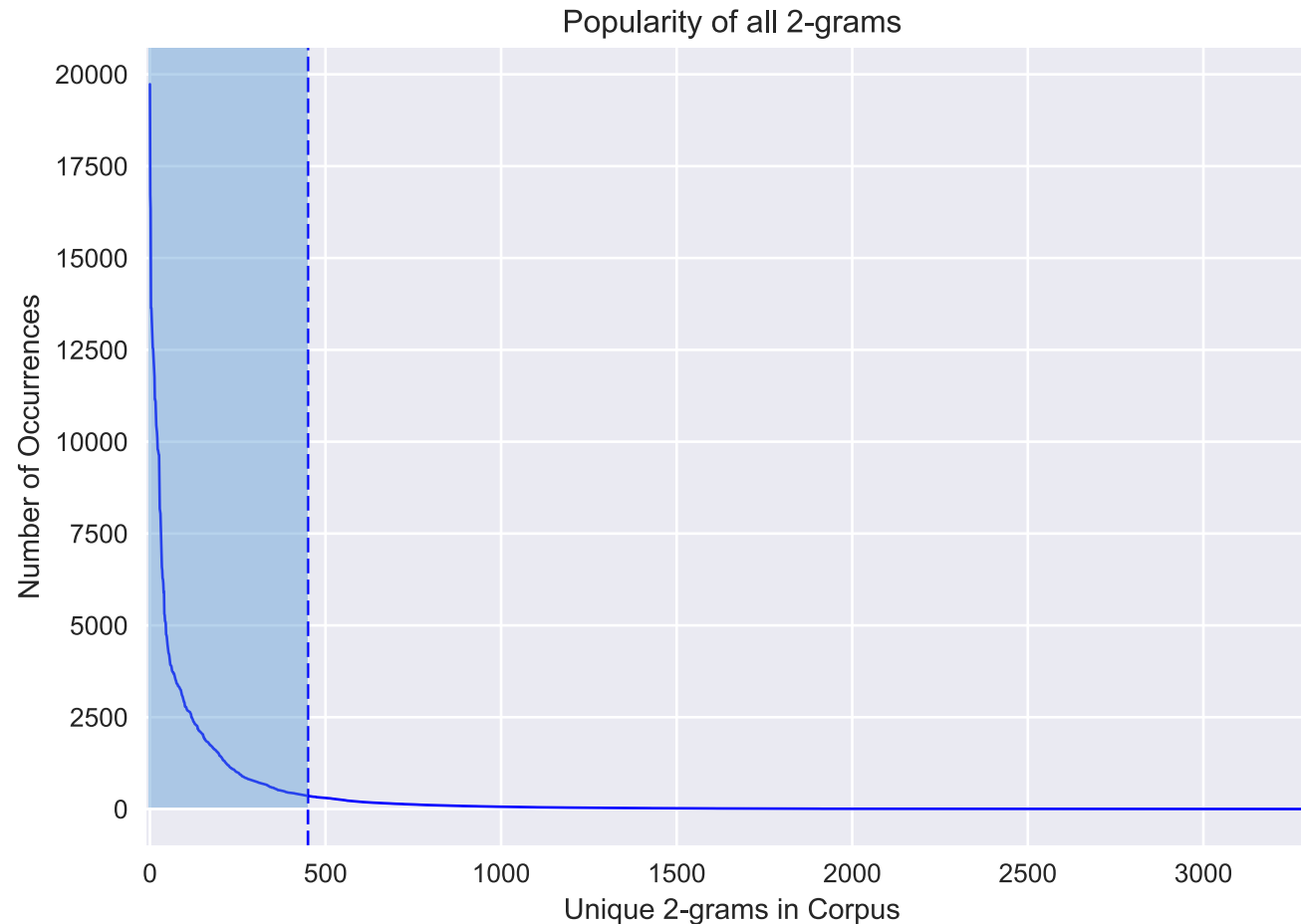
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Which Patterns are Most/Least Common?

- Although there are 3,326 unique voice-leading patterns, **450 of them** account for the voice-leading **in 90% of the corpus**



Vicentino's Voice Leading Rules for 5+ voices

The image displays two systems of musical notation, each consisting of two staves. The notation illustrates Vicentino's Voice Leading Rules for 5+ voices. Intervals are labeled above and below the notes, and specific voice leading patterns are highlighted with red dashed boxes.

System 1 (Top):

- Staff 1 (Treble Clef):
 - Measure 1: -P4 (above), P5 (below)
 - Measure 2: -M2 (above), P4 (below)
 - Measure 3 (boxed): M3 (above), P4 (below)
 - Measure 4: -M3 (above), P5 (below)
 - Measure 5: m3 (above), M6 (below)
- Staff 2 (Bass Clef):
 - Measure 1: M2 (below)
 - Measure 2: -M3 (below)
 - Measure 3 (boxed): M2 (below)
 - Measure 4: m3 (below)
 - Measure 5: P4 (below)

System 2 (Bottom):

- Staff 1 (Treble Clef):
 - Measure 1 (boxed): -m3 (above), m3 (below)
 - Measure 2: M3 (above), m3 (below)
 - Measure 3: -P4 (above), P8 (below)
 - Measure 4: -m3 (above), m6 (below)
 - Measure 5: M2 (above), P4 (below)
- Staff 2 (Bass Clef):
 - Measure 1 (boxed): -P8 (below), P8 (below)
 - Measure 2: P8 (below)
 - Measure 3: P5 (below)
 - Measure 4: -P5 (below)
 - Measure 5: P5 (below)

Vicentino's Voice Leading Rules for 8+ voices:

Measures 8-13 of a musical score in 4/2 time, showing voice leading rules for 8+ voices. The notation includes interval labels above and below the staves.

Measure	Interval 1 (Top)	Interval 2 (Top)	Interval 3 (Top)	Interval 4 (Top)	Interval 5 (Top)	Interval 6 (Top)	Interval 7 (Bottom)	Interval 8 (Bottom)
8	-P4	m3	P1	-P5	M3	P1	-M2	P8
9	-P5	M3	P1	-P4	P8	P1	-m3	M3
10	m3	M3	P1	-P4	M3	P1	P5	m3
11	-P4	P8	P1	-P5	M3	P1	P5	m3
12	-M3	M3	P1	-P5	M3	P1	P8	m3
13	-P5	m3	P1	-P5	M3	P1	m6	P8

Measures 7-13 of a musical score in 4/2 time, showing voice leading rules for 8+ voices. The notation includes interval labels above and below the staves.

Measure	Interval 1 (Top)	Interval 2 (Top)	Interval 3 (Top)	Interval 4 (Top)	Interval 5 (Top)	Interval 6 (Top)	Interval 7 (Bottom)	Interval 8 (Bottom)
7	P4	P5	P1	-P8	M3	P1	P8	M3
8	-P8	M3	P1	-P8	m3	P1	M3	m3
9	-P8	m3	P1	-P4	m3	P1	m3	-M2
10	-P4	m3	P1	P8	m3	P8	m3	m3
11	P8	m3	P8	-P5	m6	P8	-M3	-M3
12	-P5	m6	P8	-P5	m3	P8	-M3	-M3
13	-P5	m3	P8	-P5	m3	P8	-M3	-M3

Examples of Direct Perfect Intervals

The first system of musical notation consists of two staves in 4/2 time. The top staff is in treble clef and the bottom staff is in bass clef. Both staves have an '8' below the first measure, indicating an octave. The intervals are labeled as follows:

Measure	Interval 1	Interval 2
1	m3	P5
2	M3	P1
3	M3	P1
4	M3	P5
5	m3	P5
6	M6	P5
7	M6	P5
8	P4	P5
9	m3	P8

The bottom staff has labels below each measure: a2, a8, a8, a2, a7, a7, a5, a7, a8.

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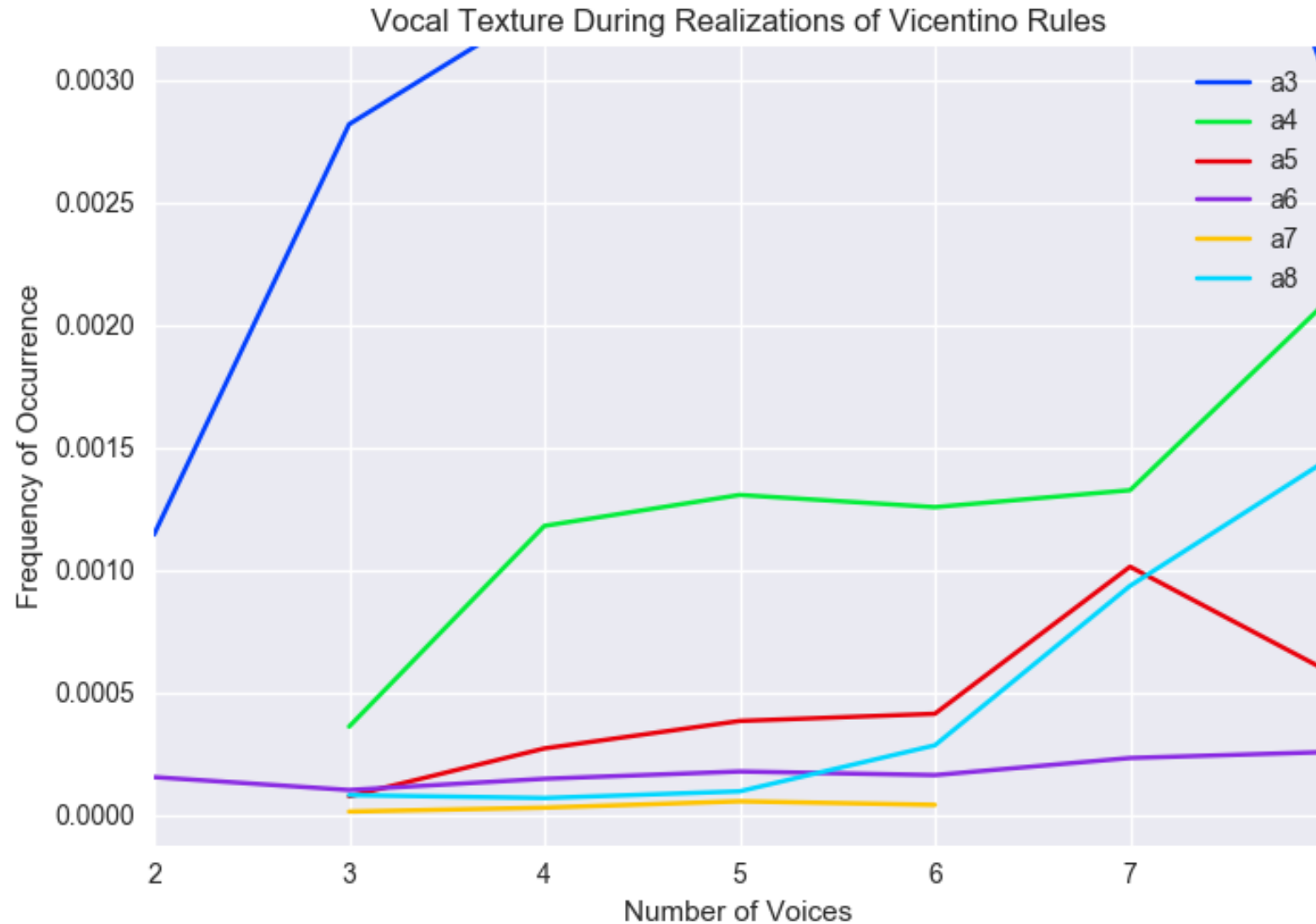
The second system of musical notation consists of two staves in 4/2 time. The top staff is in treble clef and the bottom staff is in bass clef. Both staves have an '8' below the first measure, indicating an octave. The intervals are labeled as follows:

Measure	Interval 1	Interval 2
1	m3	P8
2	M3	P8
3	m3	P8
4	M3	P5
5	m3	P5
6	M3	P8
7	m3	P8
8	M6	P8
9	m6	P8

The bottom staff has labels below each measure: a4, a4, a5, a3, a5, a6, a8, a7, a5.

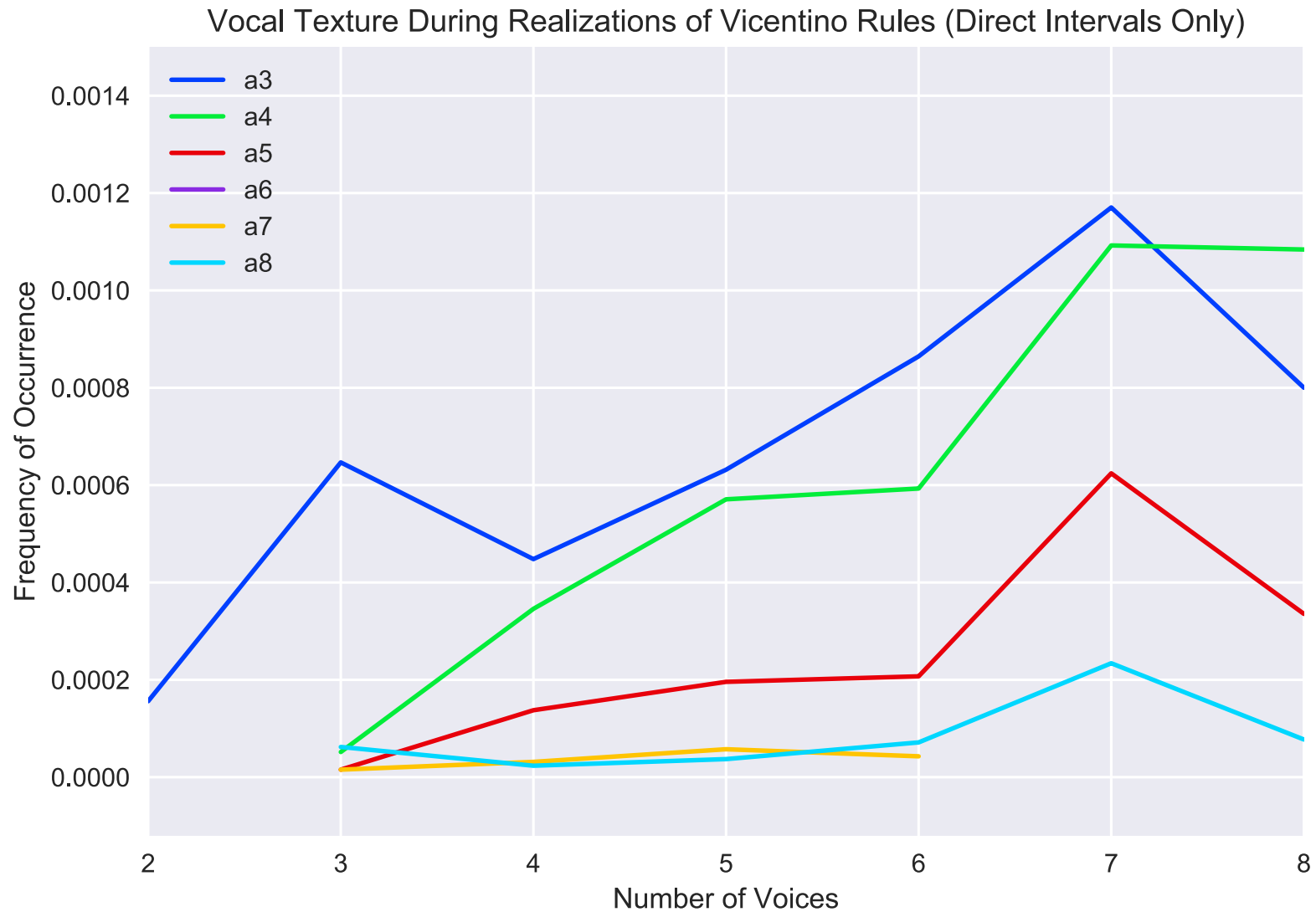
Corpus Results

Voice Leading Patterns Grouped By “Rule Class”



Corpus Results

Voice Leading Patterns Grouped By “Rule Class”



Out of 1,612 total
direct intervals...

...1,483 accounted for
by Vicentino's rules

Corpus Results

Voice Leading Patterns Grouped By “Rule Class”

Vocal Texture During Realizations of Vicentino Rules (Remaining Rules Only)

