

Search Effectiveness

IN COMPUTATIONAL RESEARCH



Evaluating results

- **Effectiveness** of measures
- **Efficiency** of obtaining results
- **Accuracy** of results
- **Methods** of communicating results
- **Cultural** considerations
- Establishing **validity**

Search-effectiveness

- ISMIR paper (2004), Craig Sapp, Yi-Wen Liu, Eleanor Selfridge-Field
- Compared 12 levels of pitch precision and simple rhythmic profiles across 7 encoded (monophonic) repertoires
- **Objectives:**
 - Large quantity of data (100,000 musical incipits)
 - Many levels of pitch and rhythm included
 - Differentiated anchored and unanchored searches
 - Compared results of pitch-only and pitch+rhythm searches

What we thought at the start

- That precision in enharmonic spelling would benefit results
- Seeking optimal length for efficient queries
- Best technique for one repertory might not work for another
- Use of monophonic incipits only would make results easy to compare
- Separate search tools (not *Themefinder*) would be needed

The Repertories

Dataset	Genre	Encoding	No. of incipits
US RISM	Chamber, 17 th -18 th c.	Plaine & Easie	55,490
Renaissance	motets	DARMS	18,946
Classical	Inst., vocal	MIDI	10,718
Essen-European	Folksongs (German civ.)	EsAC	6,230
Polish 16th c	Religious songs	EsAC	6,060
Essen-Asian	Folksongs (China)	EsAC	2,241
Luxembourg	folksongs	EsAC	612

Levels of pitch specificity

- Levels investigated
 - Enharmonic pitch-class (base-40); **pch**
 - Musical interval: **mi**
 - Twelve-tone pitch-class: **12p**
 - Twelve-tone interval: **12i**
 - Scale-degree: **sd**
 - Pitch/refined contour: **prc**
 - Pitch/gross contour: **pgc**
 - Rhythmic contour: **rgc**

Numbers of states required per profile

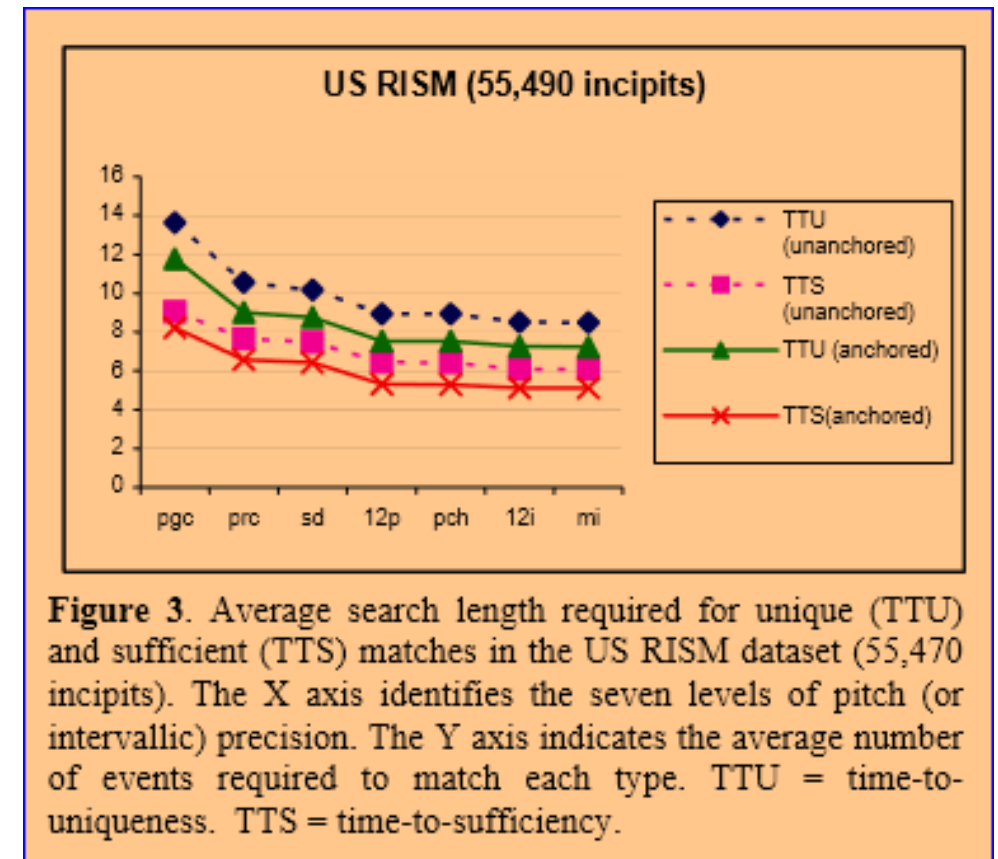
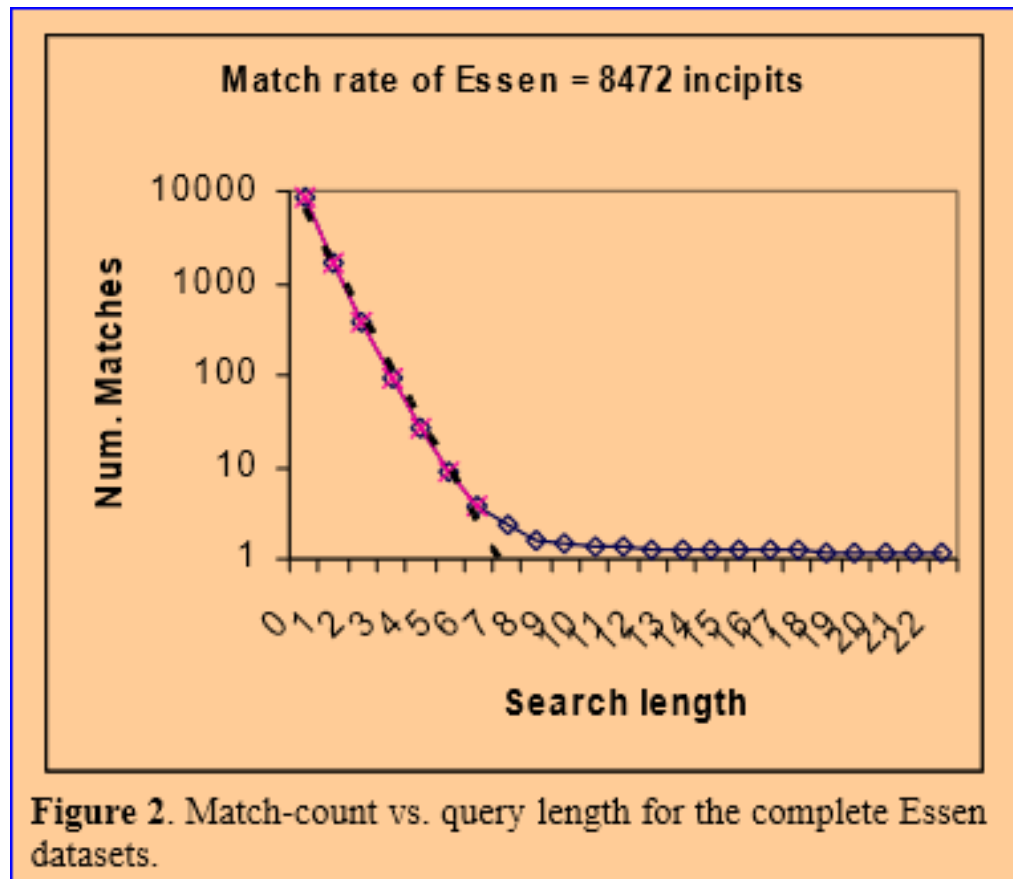
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Search-type	Actual no. of states required		
	Classical	Polish	All
12i	70	40	88
pch	29	26	32
mi	95	52	109

Table 3. Actual numbers of states for various database features.

Methods:

Match count vs query length, repertory



Results (1)

- Rhythm gc almost as good as Pitch gc for classical
- 7-level of precision search vs joint search (p and r) in Essen-Asian
- Rhythm gc useful for classical music

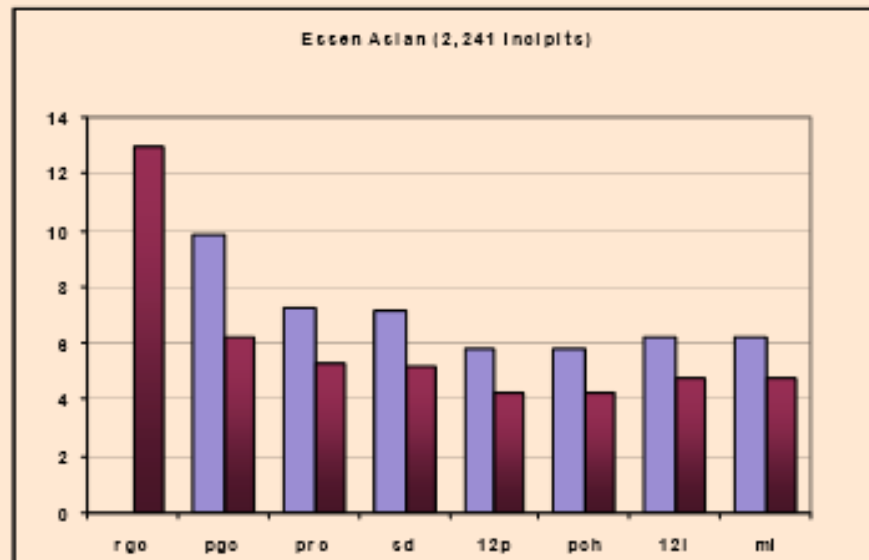


Figure 4a. Pitch-only (seven levels) vs. joint searches with **rgc**. Dark bars show **rgc** alone and successively with each level of pitch precision plotted against the number of events. This view shows results for the Essen-Asian (pentatonic, full-score) dataset. Light bars show seven levels of pitch/interval precision without rhythmic information.

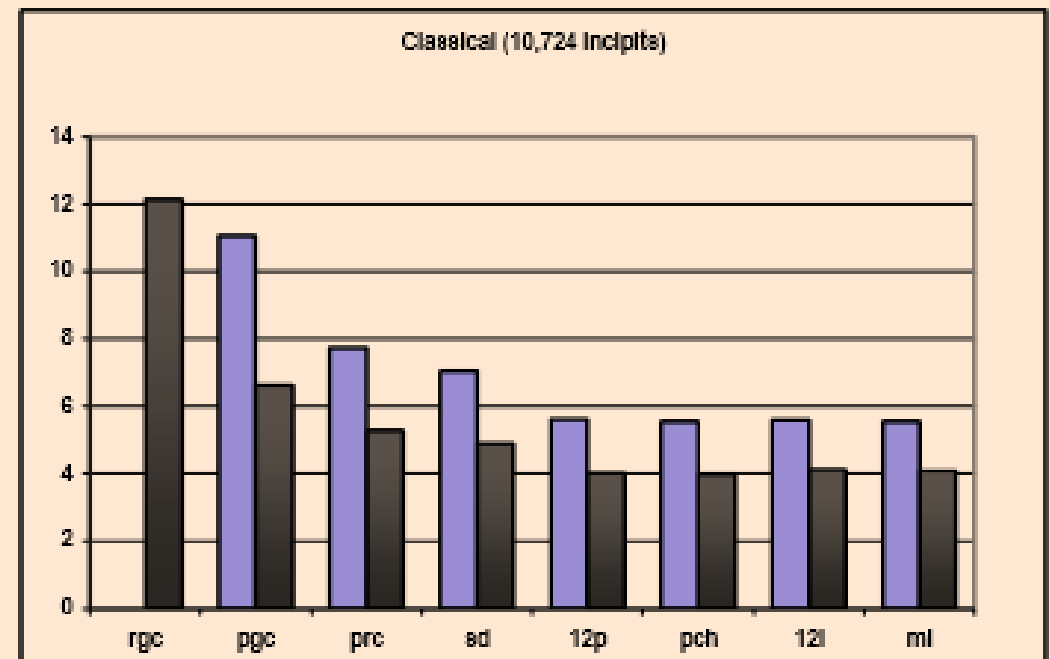


Figure 4b. Pitch-only vs. joint searches with **rgc** as in Figure 4a for the classical theme database.

Results (2): Anchored vs unanchored searches

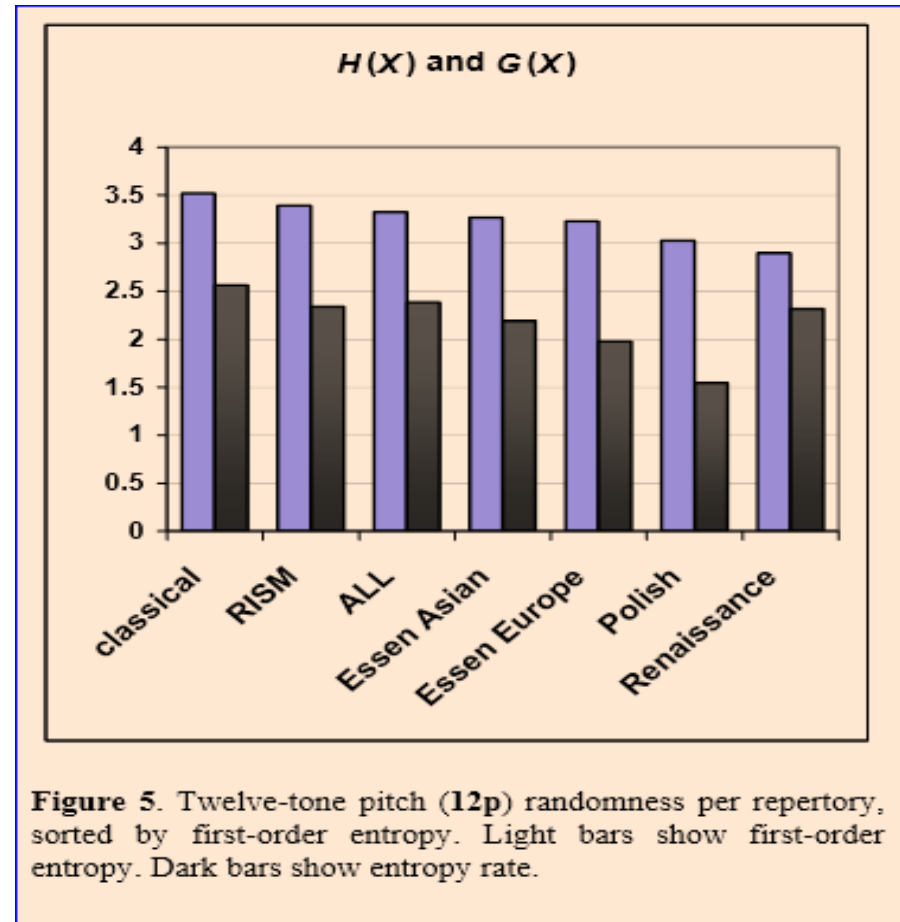
Anchored search		Unanchored search	
Query length	Matches	Query length	Matches
1	1,719.55	1	7,194.33
2	369.83	2	3,179.93
3	91.18	3	883.09
4	26.07	4	221.86
5	8.92	5	55.75
6	3.67	6	15.46
7	2.28	7	5.61
8	1.64	8	2.58
9	1.47	9	1.77
15	1.24	15	1.25
22	1.18	22	1.19

Table 6. Comparison of anchored and unanchored searches, events 1-9, 15, 22 (Essen folksong full scores).

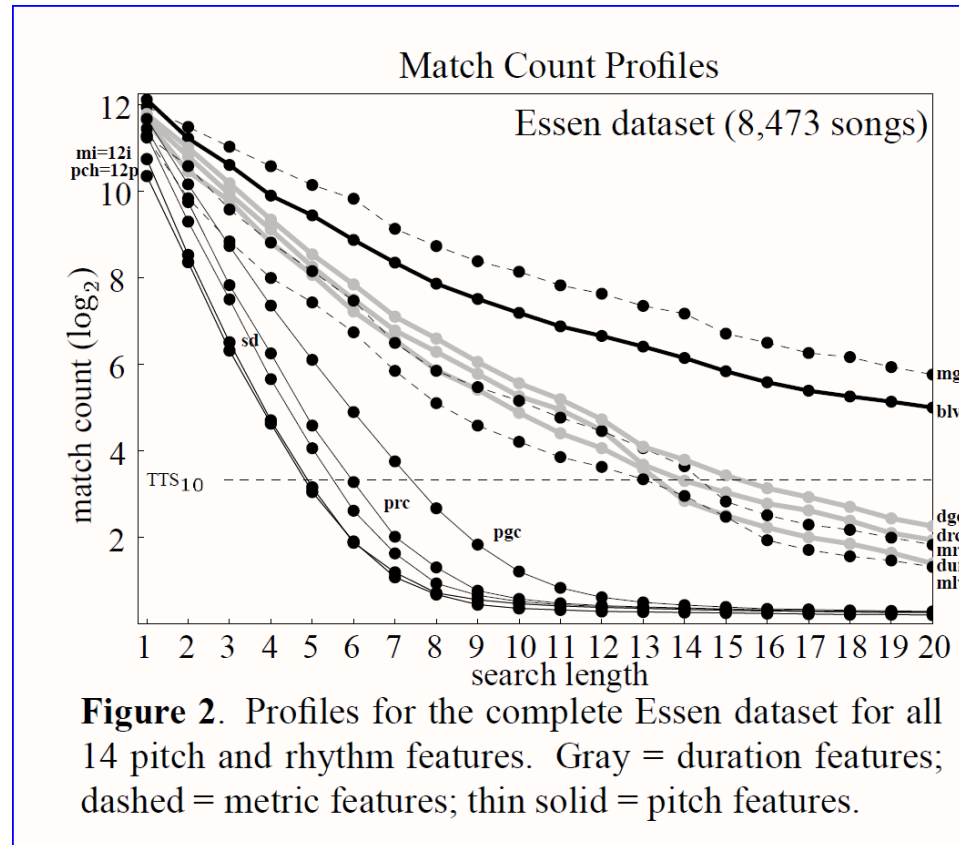
		Incipit only	Full work
Anchored search	TTU (mi)	6.87619	8.74826
	Failure rate	0.669%	0.0354%
Unanchored search	TTU (mi)	7.926	10.2858
	Failure rate	1.07%	0.0472%

Table 7. Comparison of TTU (computed by interval) for incipits and for the full works from which they originate (results are based on the Essen folksong datasets.)

Results (3): Tone randomness



Match-count profiles (Essen data)



Repertory characteristics

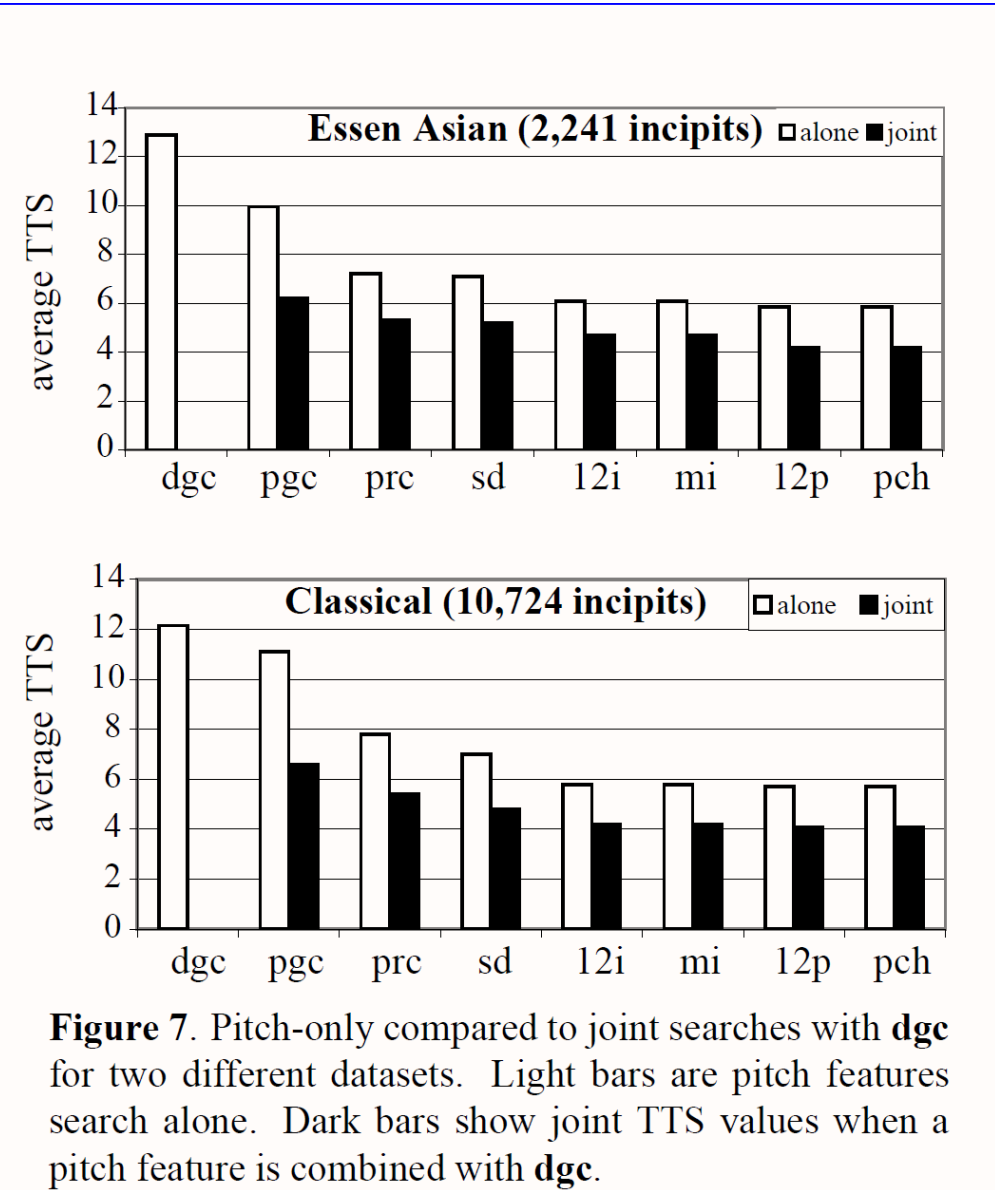
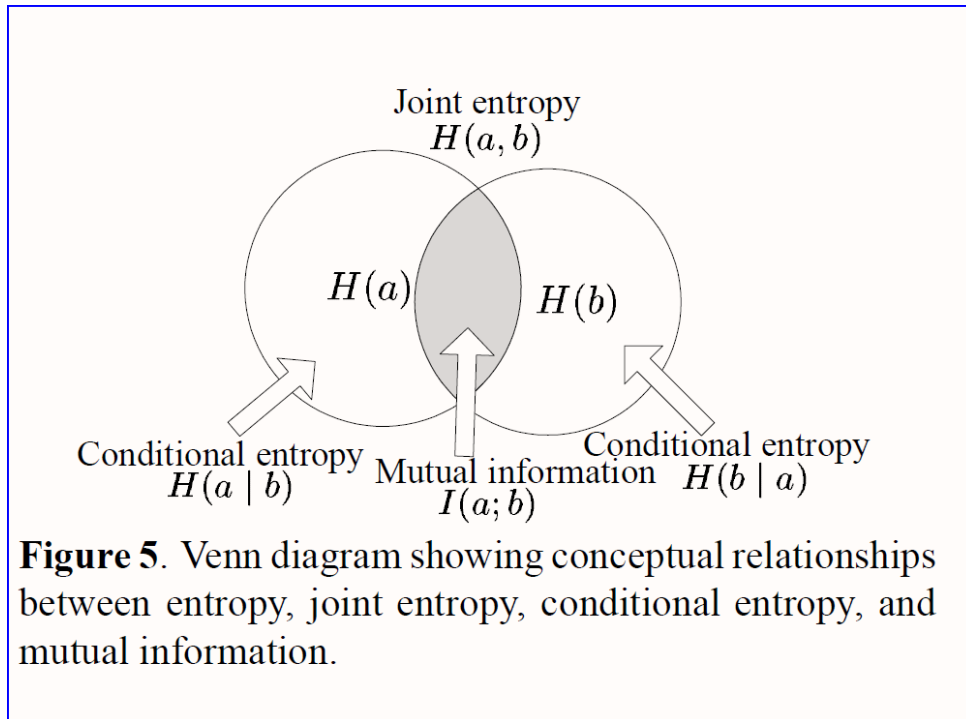


Figure 7. Pitch-only compared to joint searches with **dgc** for two different datasets. Light bars are pitch features search alone. Dark bars show joint TTS values when a pitch feature is combined with **dgc**.

Entropy



TTS values as opposed to choosing a different rhythm feature. Note in particular in Figure 8 that the 6-state **pgc-blv** joint feature is almost identical in entropy-rate to **12i** alone which has about 20 states.

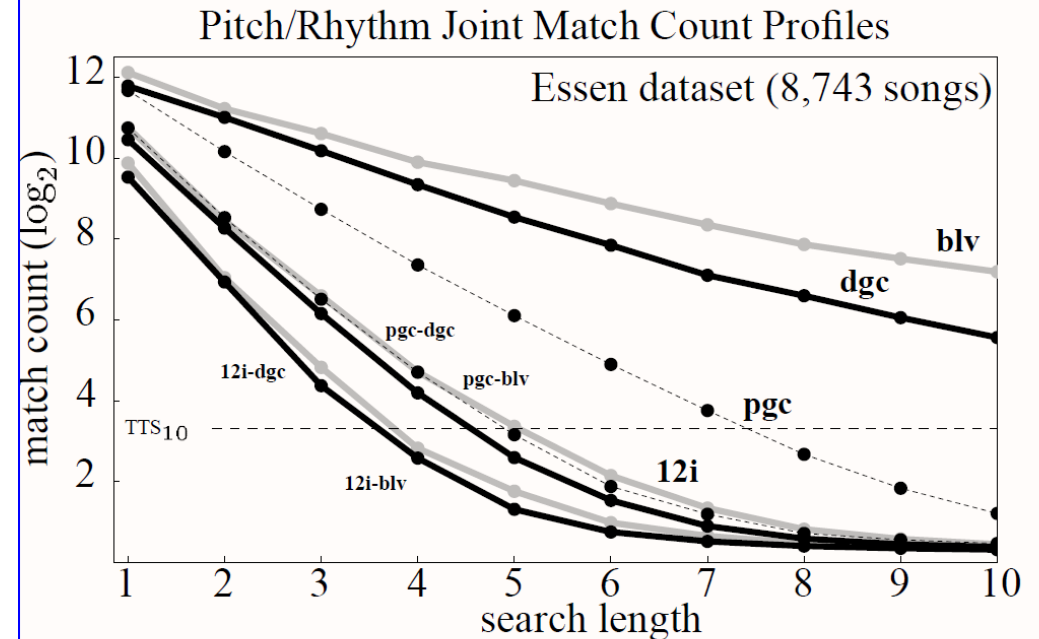


Figure 8. Effects of combining pitch and rhythm searches on match count profiles.