

corpus analysis & hooks

Jan Van Balen

in this talk

audio description and
corpus analysis of
popular music

in this talk

~~audio description and~~
corpus analysis of
popular music

in this talk

- I. audio corpus analysis
 - what is it about?
 - some history
 - 2 examples

in this talk

I. audio corpus analysis

what is it about?

some history

2 examples

II. analyzing hooks

hooks

choruses

hooked & #hookedonmusic

results!

I. audio corpus analysis

corpus analysis

using statistical & computational methods
to learn new things about music

Alan Lomax - 1972

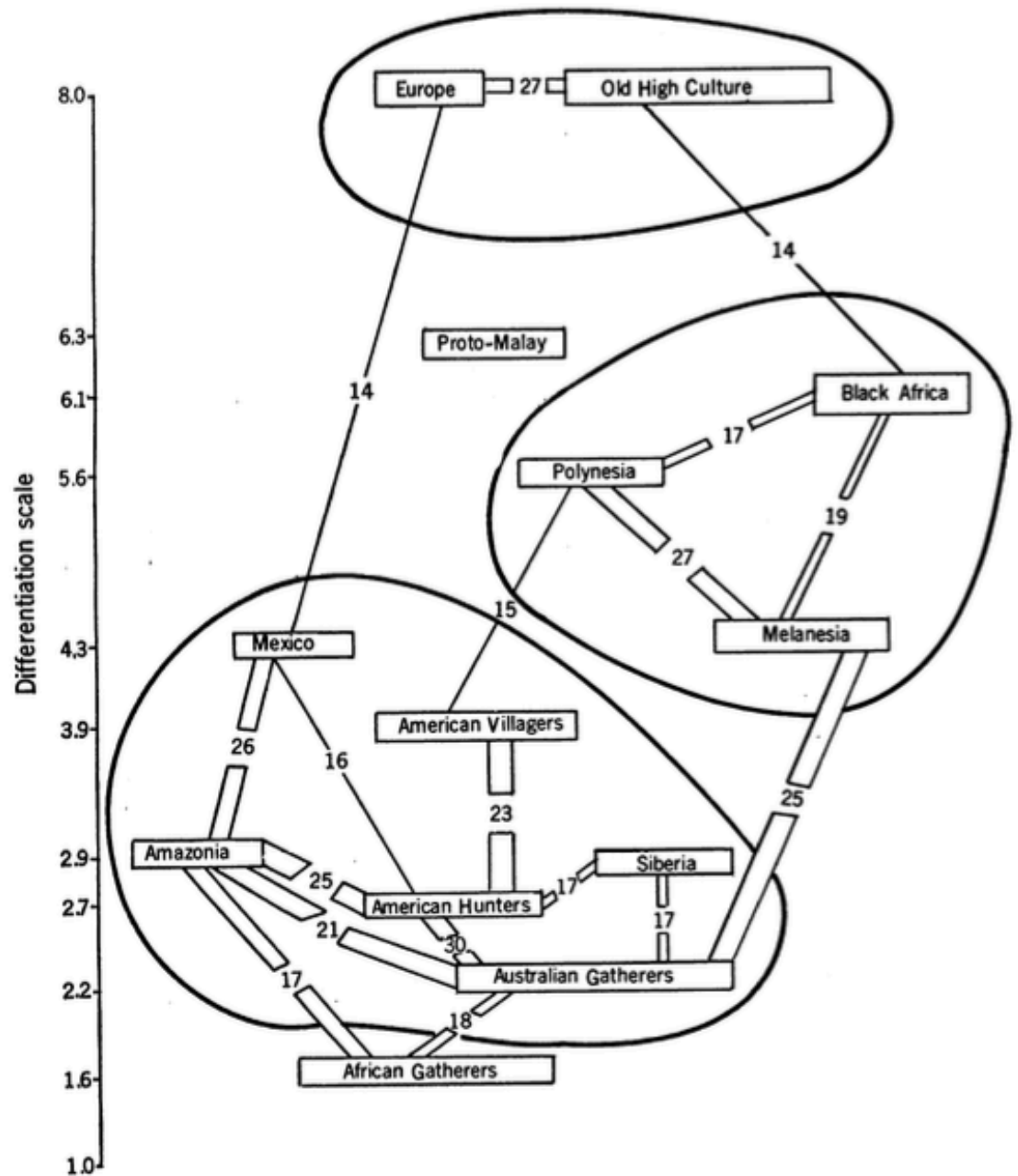
Communication

Embellishment	Little			Little	Some	Little			Much	
Leader/Group	Group	L/G			L/G	G/L	L/G	Group	Solo	
Variation	Little		Little		Little			Much	Much	
Interval size	Wide	Narrow	Wide			Mid			Mid	Narrow
Enunciation	Slurred				Mid	Slurred	Precise	Slurred	Precise	
Wordy/Nonsense	Nonsense		Nonsense / wordy		Nonsense	Wordy/nons	Mid		Wordy	

Integration

Division of labor †	Female	Male	Female					Male	
Solidarity index	Nonsolidary			Solidary				Nonsolidary	
Community organization	None	Clan	None	Clan		Ramage	Clan	None	
Tonal blend	Good	Medium	Poor	Good		Good		Med-poor	
Vocal organization	Integrated	Diffuse	Unison		Integrated			Solo	
Vocal width	Very wide	Narrow	Mid	Wide				Narrow	
Rasp	Little	Great		Little		Great		Mid	Great

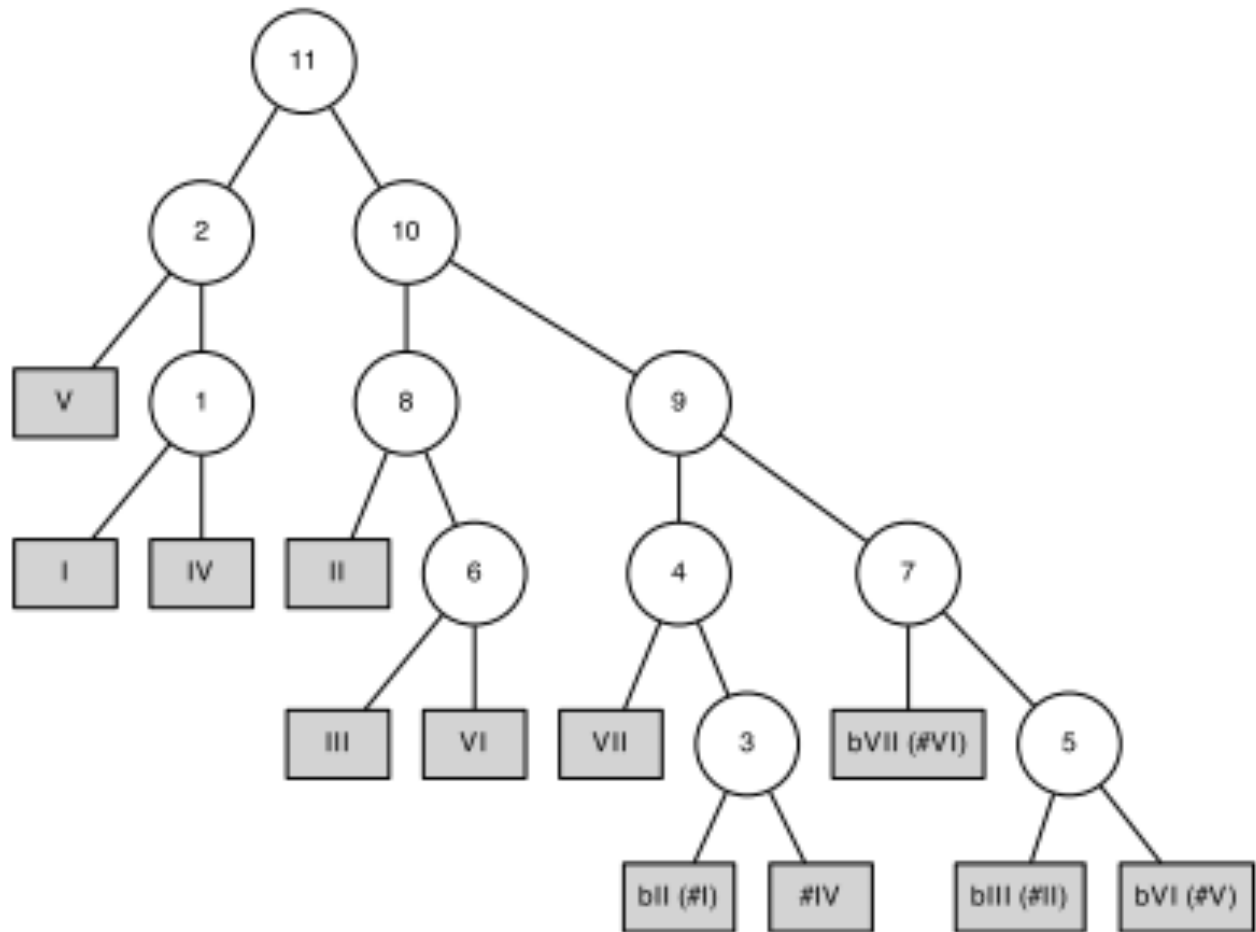
Alan Lomax 1972



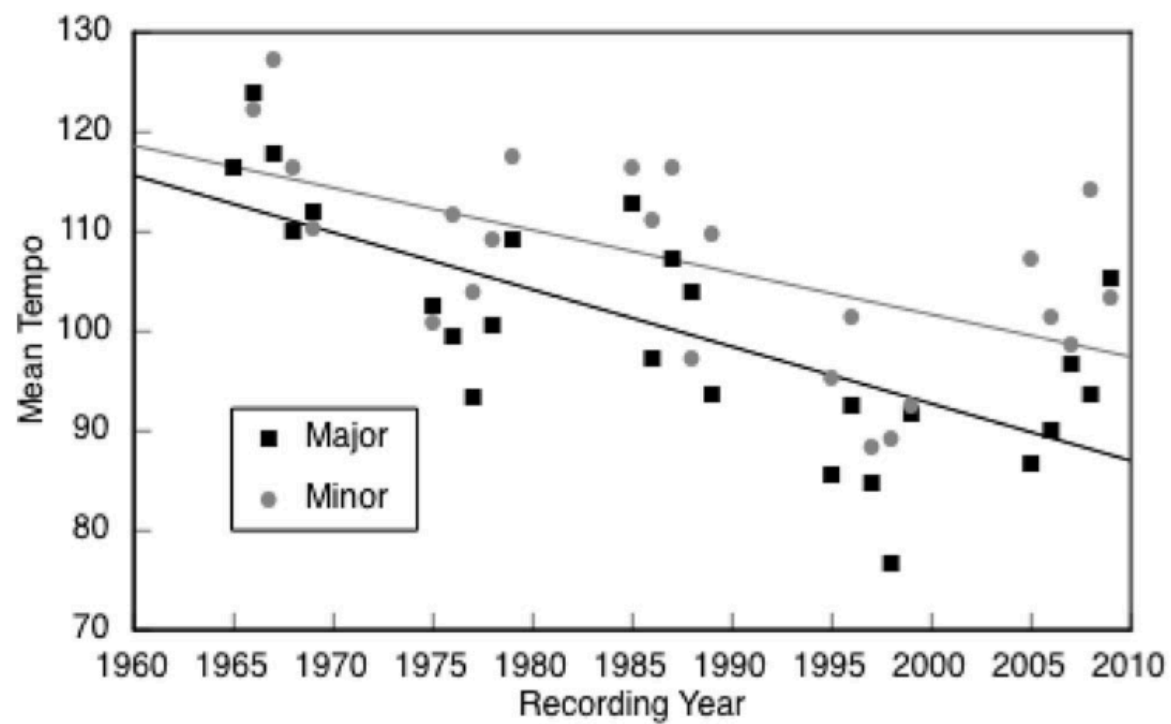
de Clercq & Temperley - 2011

Ant \ Cons												
	I	bII	II	bIII	III	IV	#IV	V	bVI	VI	bVII	VII
I	0	25	132	94	44	1052	2	710	104	302	470	16
bII	31	0	0	0	2	0	0	0	0	0	0	12
II	120	1	0	2	20	58	0	97	0	24	10	0
bIII	50	6	6	0	0	64	2	2	67	0	41	0
III	16	0	39	0	0	46	0	6	0	60	3	4
IV	1,162	14	30	98	45	0	4	514	57	72	90	4
#IV	7	0	0	6	0	10	0	0	0	0	0	0
V	788	0	36	6	17	392	4	0	6	191	48	0
bVI	208	0	1	20	0	22	6	22	0	10	78	0
VI	144	0	87	0	32	260	0	124	21	0	3	0
bVII	386	0	0	11	2	188	2	26	114	6	0	0
VII	18	0	0	0	12	0	4	0	0	3	0	0

Burgoyne - 2013

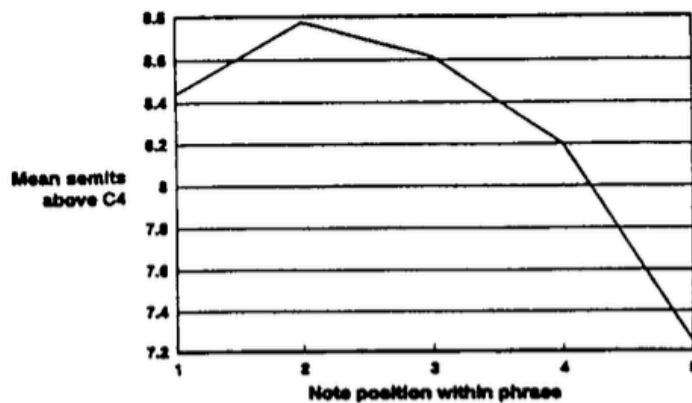


Schellenberg - 2012

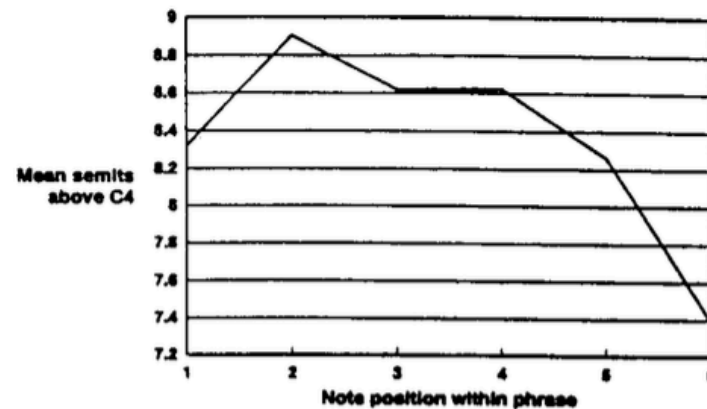


Huron - 1996

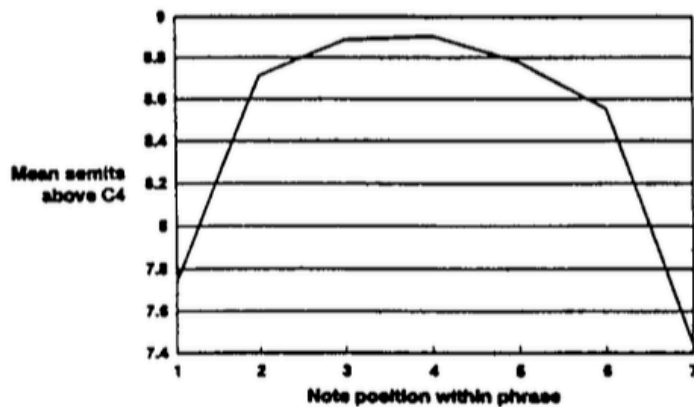
5-note phrases (n=1158)



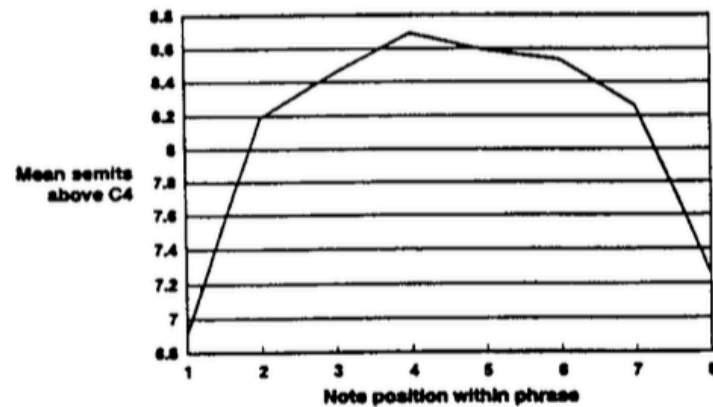
6-note phrases (n=4564)



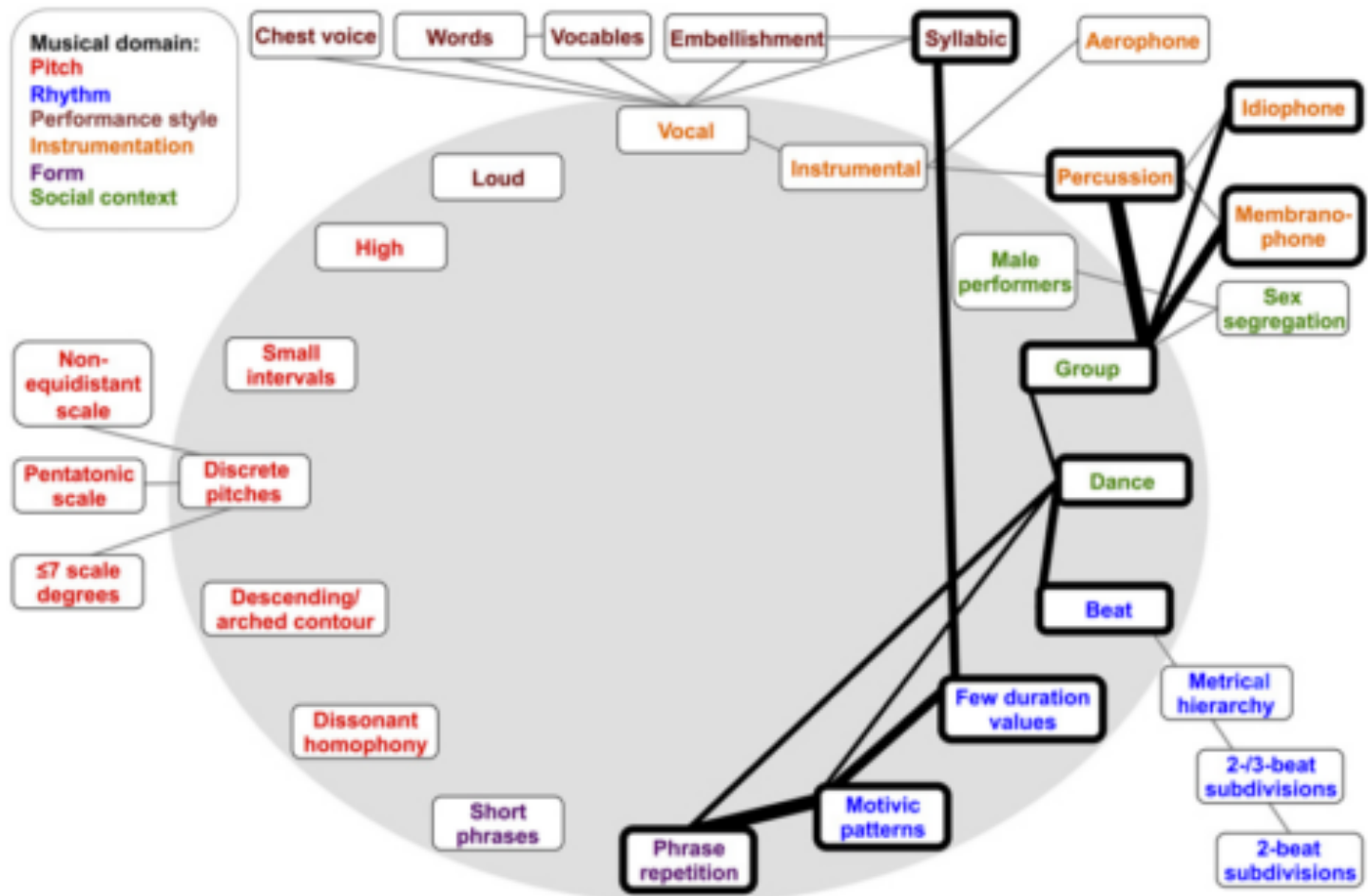
7-note phrases (n=6364)



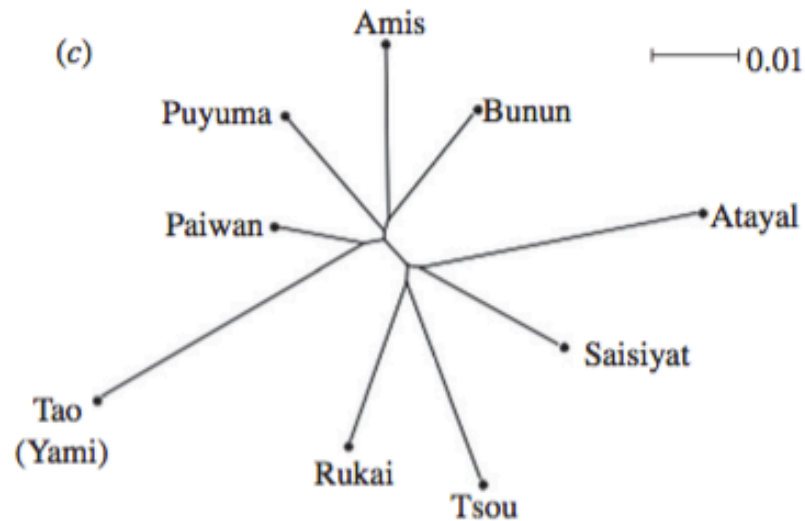
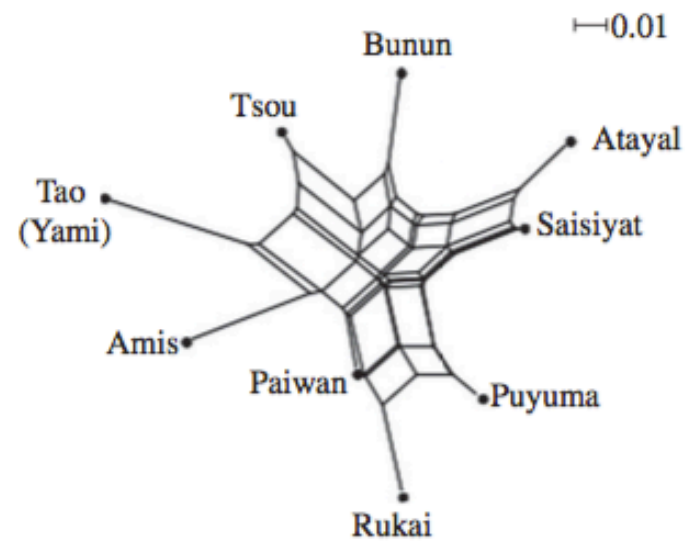
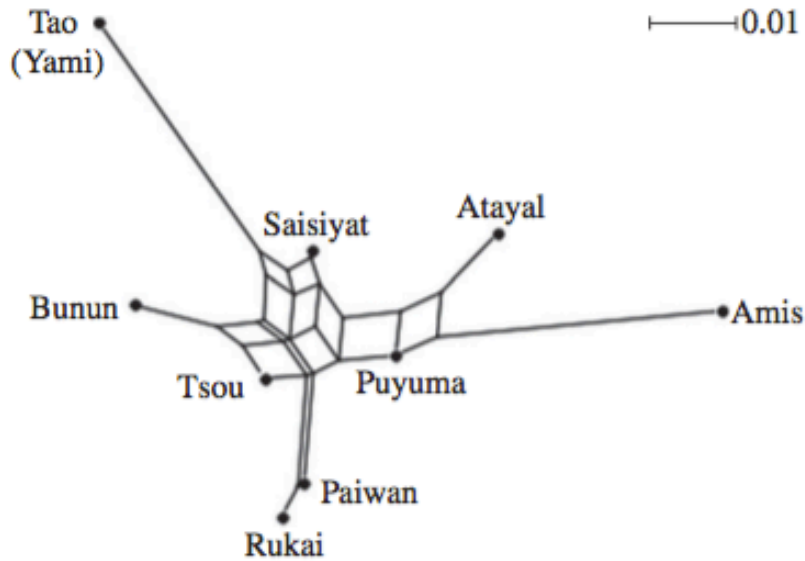
8-note phrases (n=8532)



Savage - 2015



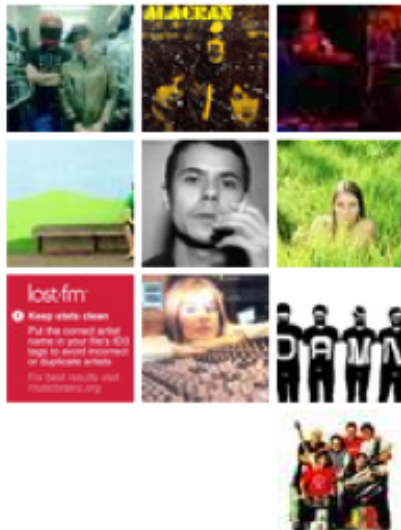
Brown - 2013



- intermezzo -

- intermezzo -

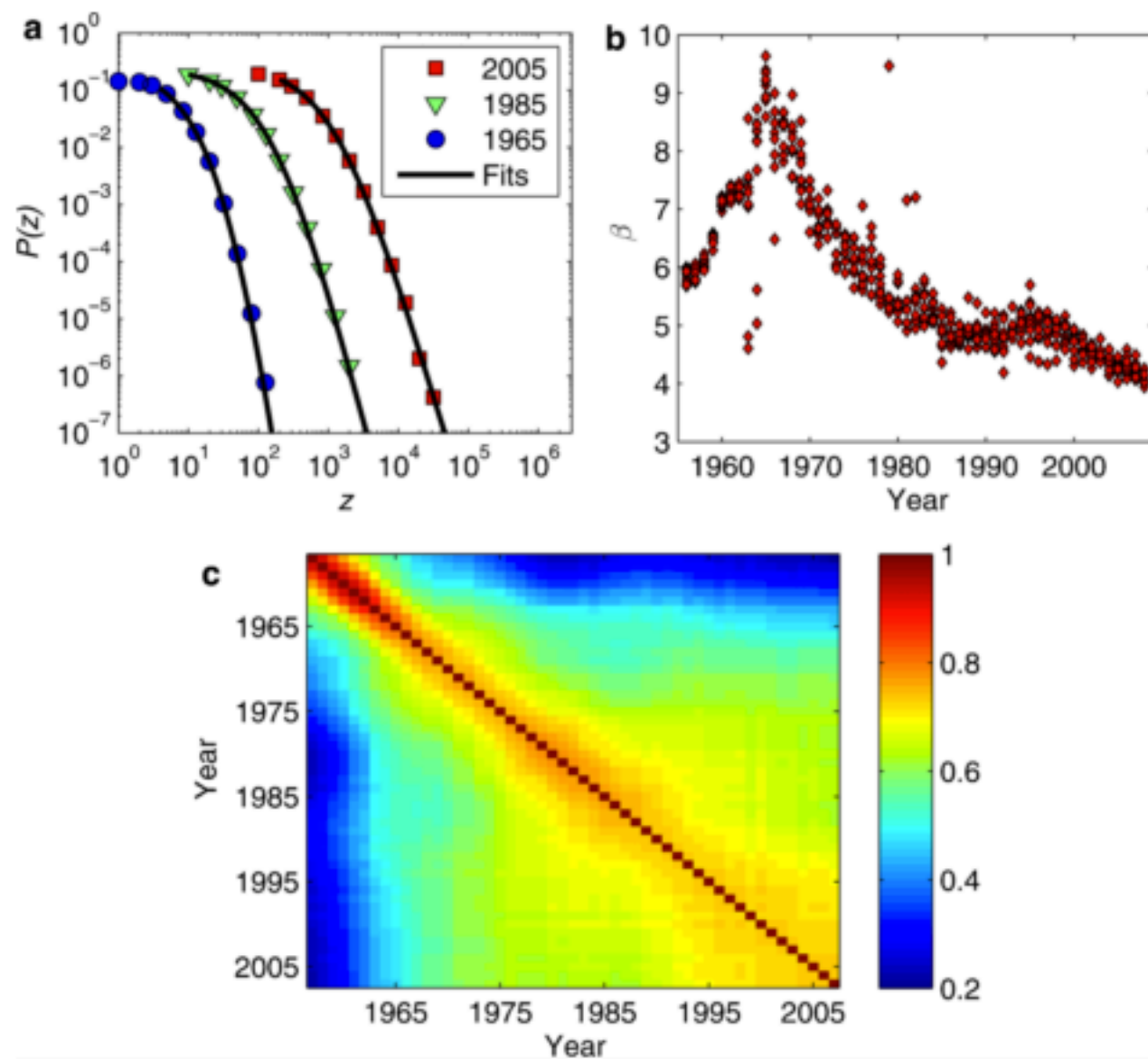
Recommended Artists (see all)



- ▶ Grafton Primary
- ▶ Alacran
- ▶ Bumblebeez
- ▶ Andrea Echeverri
- ▶ Colder
- ▶ Muscles
- ▶ Damn Arms
- ▶ Fabiana Cantilo
- ▶ Portishead & Moloko
- ▶ Jarabe de Palo

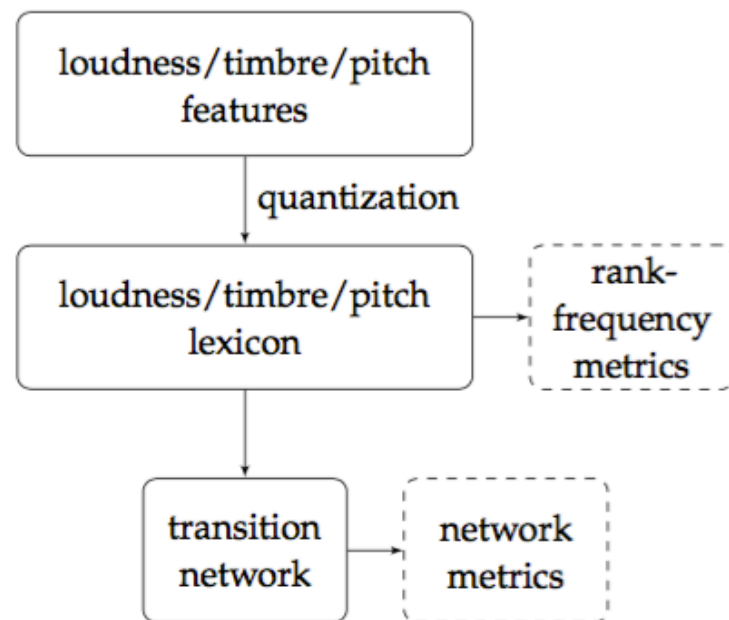


Serra - 2012

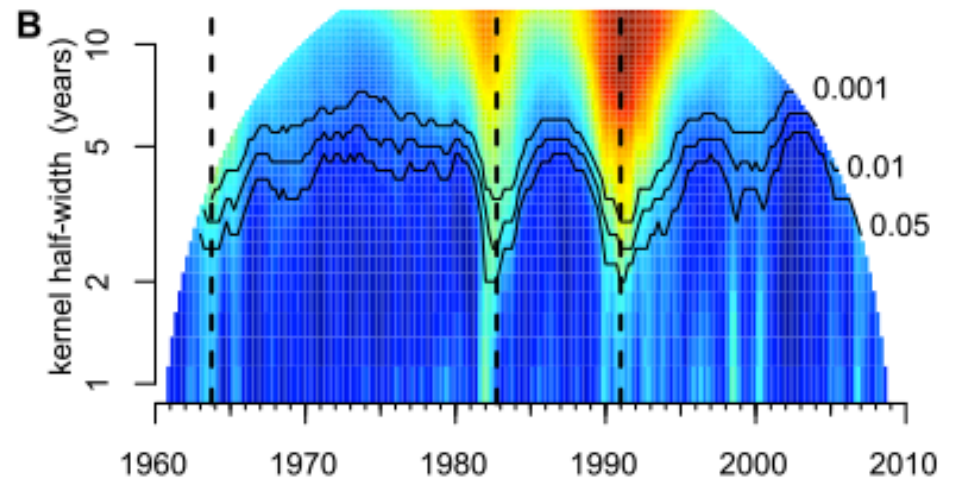
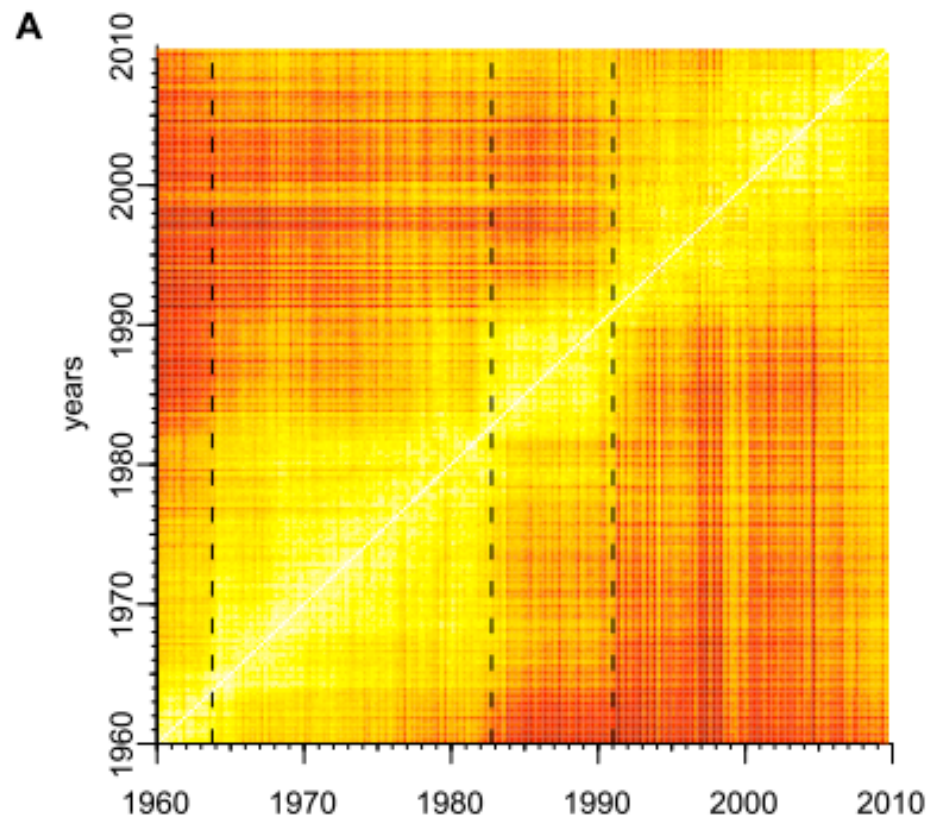


Serra - 2012

Serrà et al.

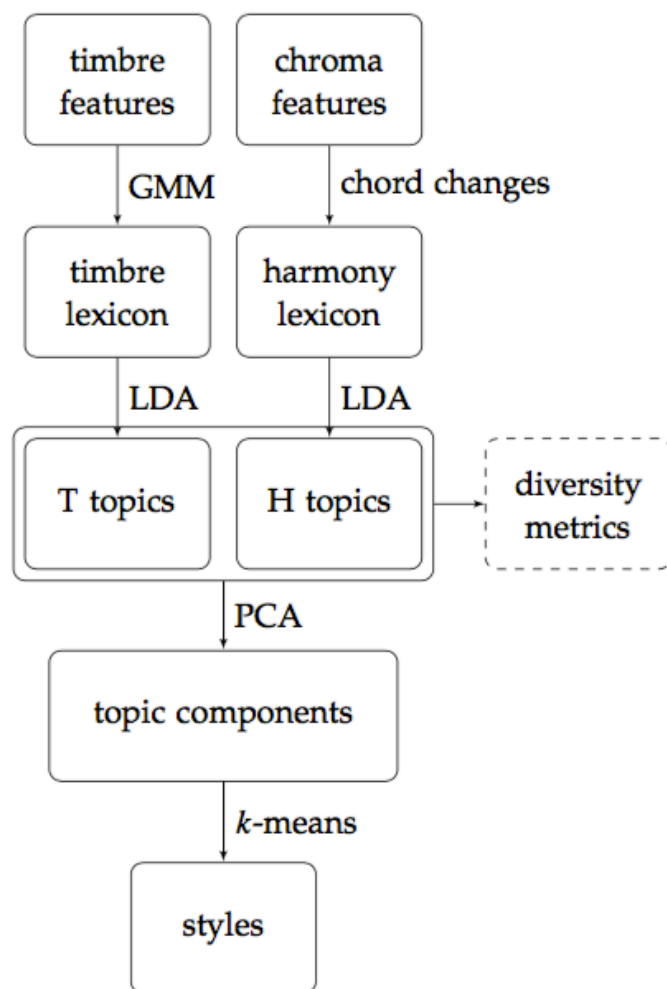


Mauch - 2015

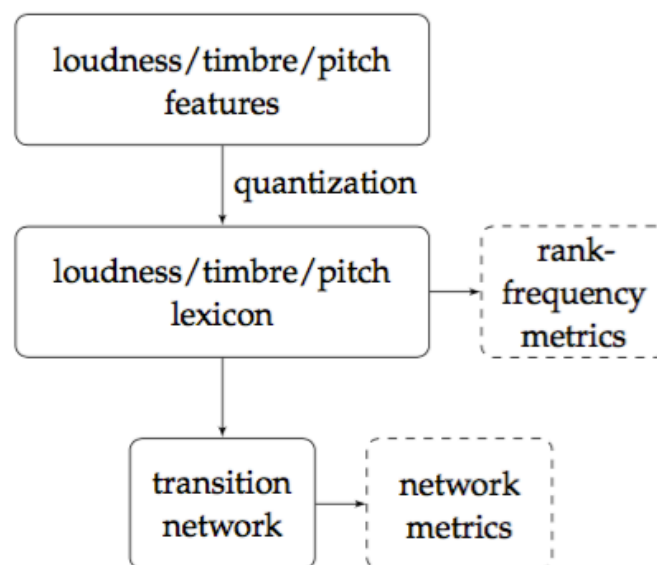


Mauch - 2015

Mauch et al.



Serrà et al.



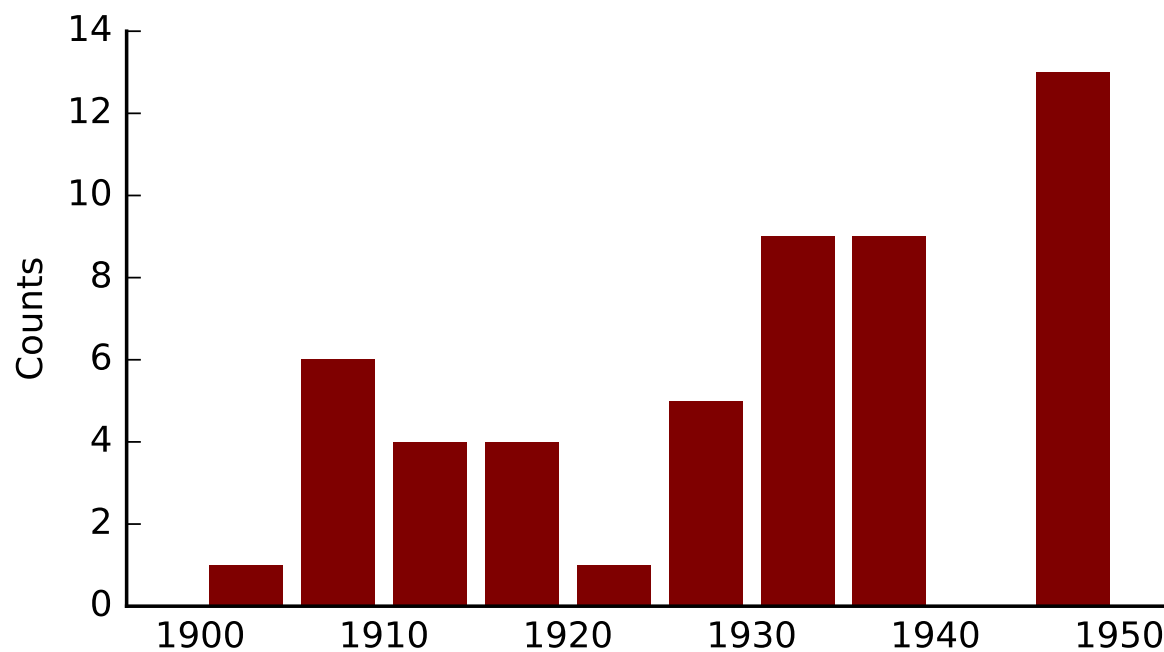
corpus analysis

- research question / hypothesis
- music corpus
- descriptors
 - annotations
 - symbolic data
 - audio data
- analysis method

II. hooks

chorus analysis – 2013

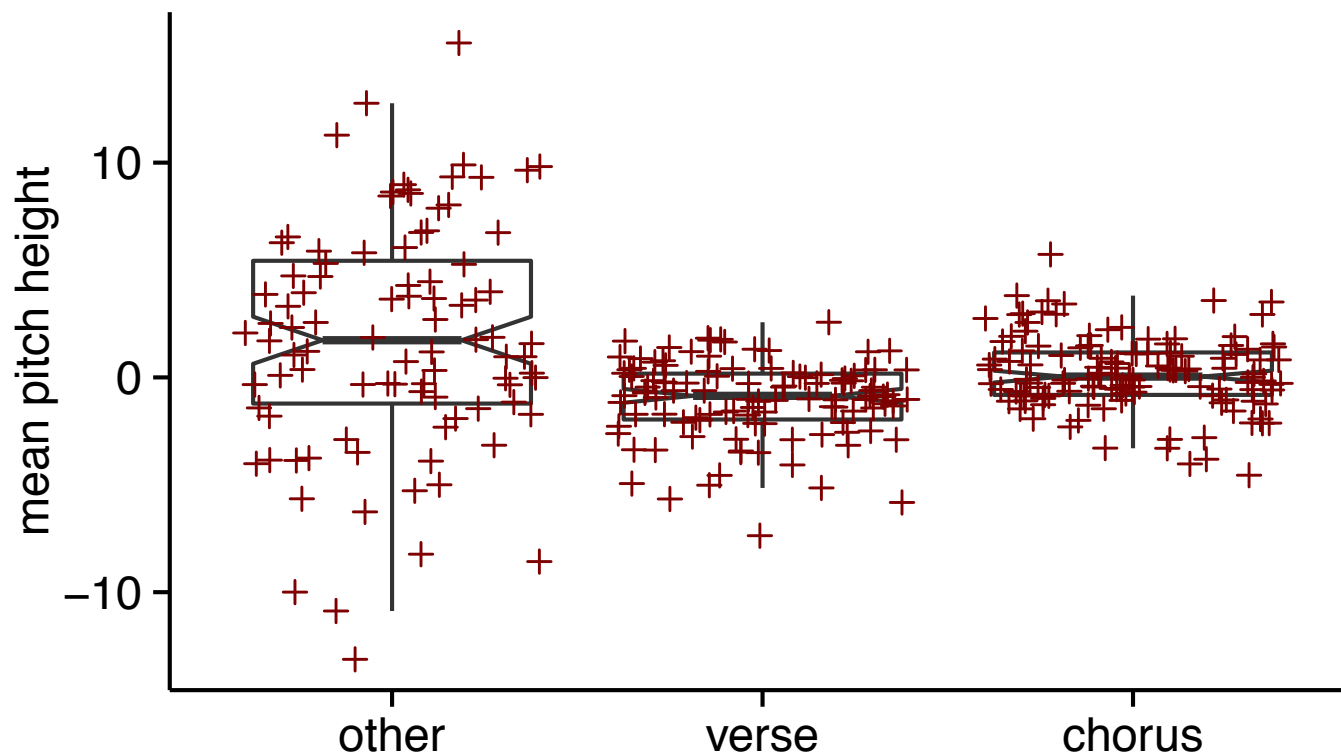
48 songs
1905-1950



chorus analysis – 2013

48 songs

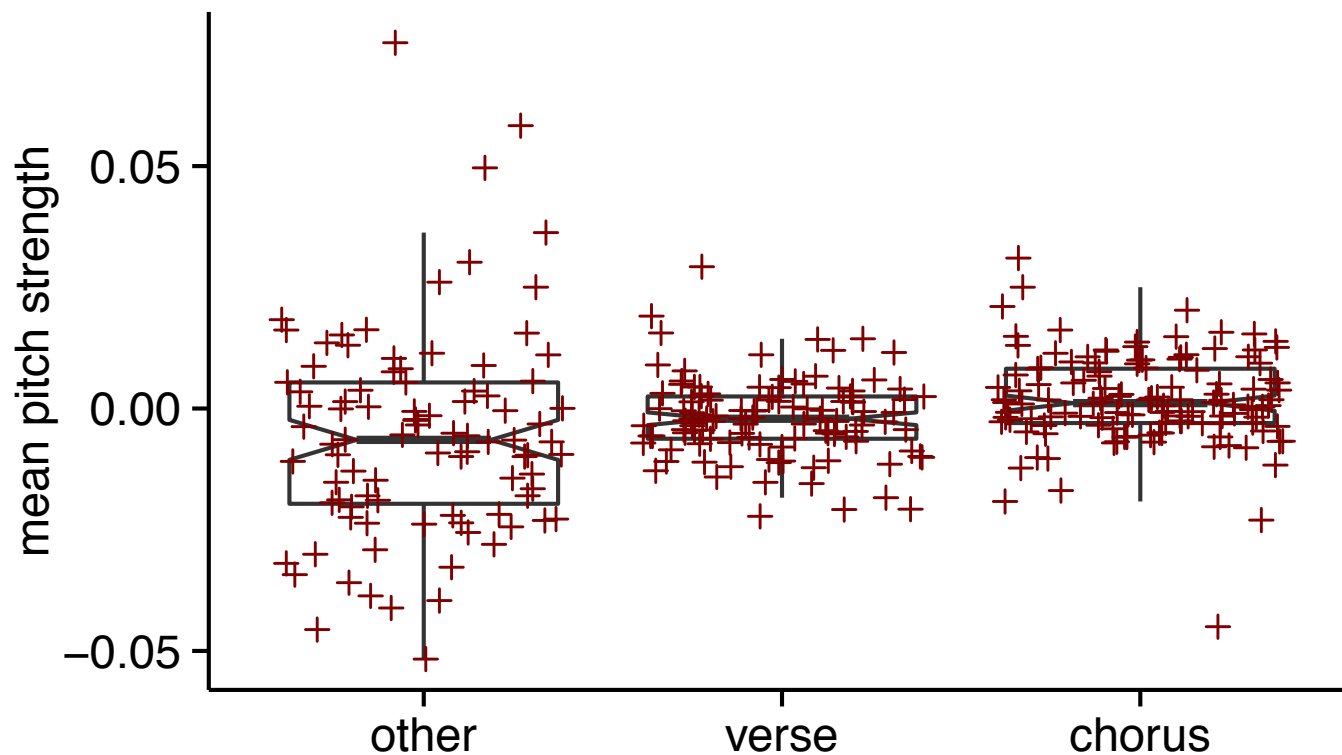
1905-1950



chorus analysis – 2013

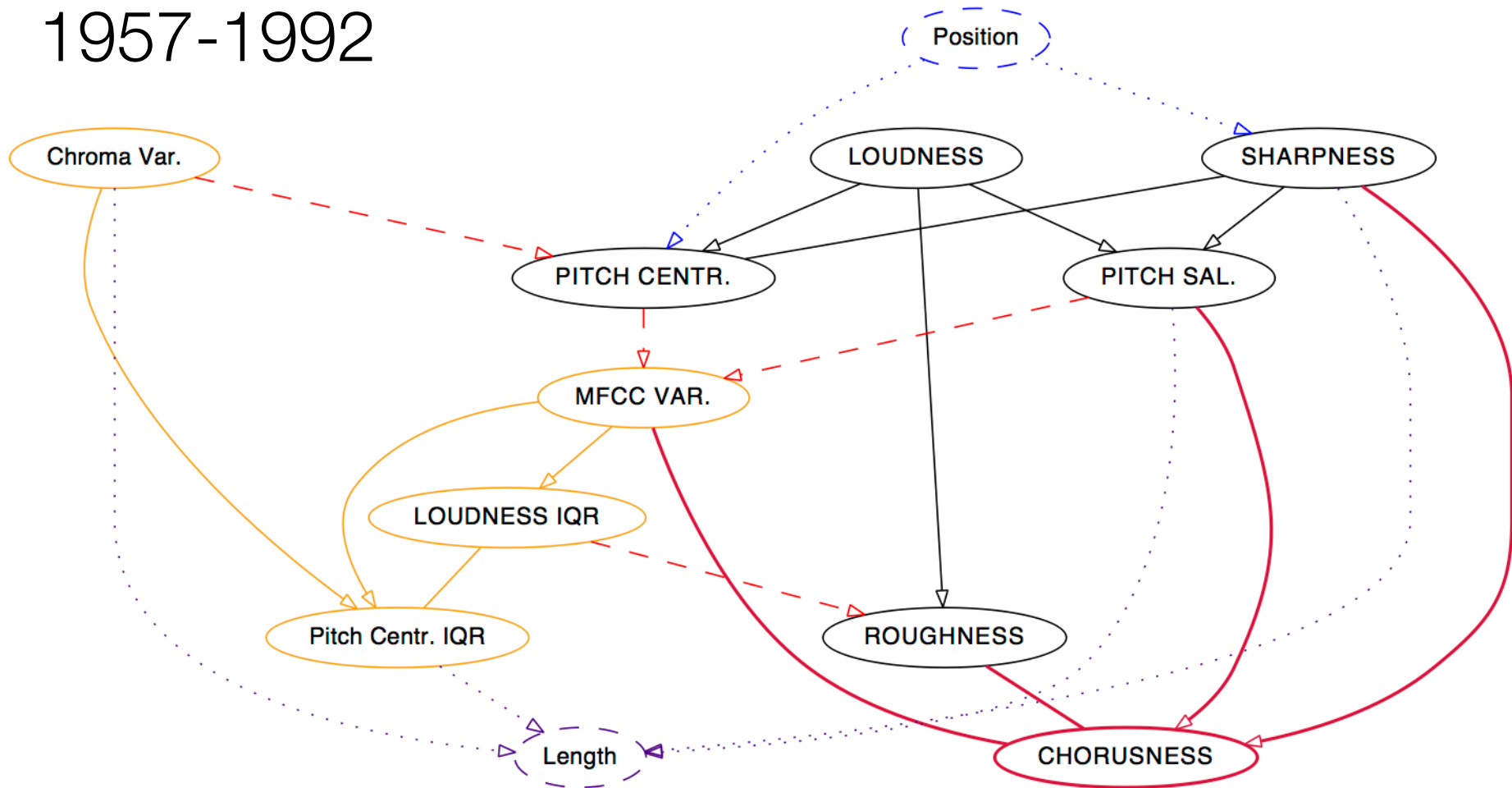
48 songs

1905-1950



chorus analysis – 2013

649 songs
1957-1992



chorus analysis – 2013

649 songs

1957-1992

	β	95% CI	
		LL	UL
Sharpness	0.11	0.10	0.13
MFCC variance	0.12	0.09	0.15
Roughness	0.12	0.08	0.16
Pitch salience ($\times 10$)	0.04	0.03	0.05
Loudness	0.03	-0.01	0.06
Loudness IQR	-0.33	-0.48	-0.18
Pitch centroid	0.10	0.07	0.12

chorus analysis – 2013

649 songs

1957-1992

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hooks

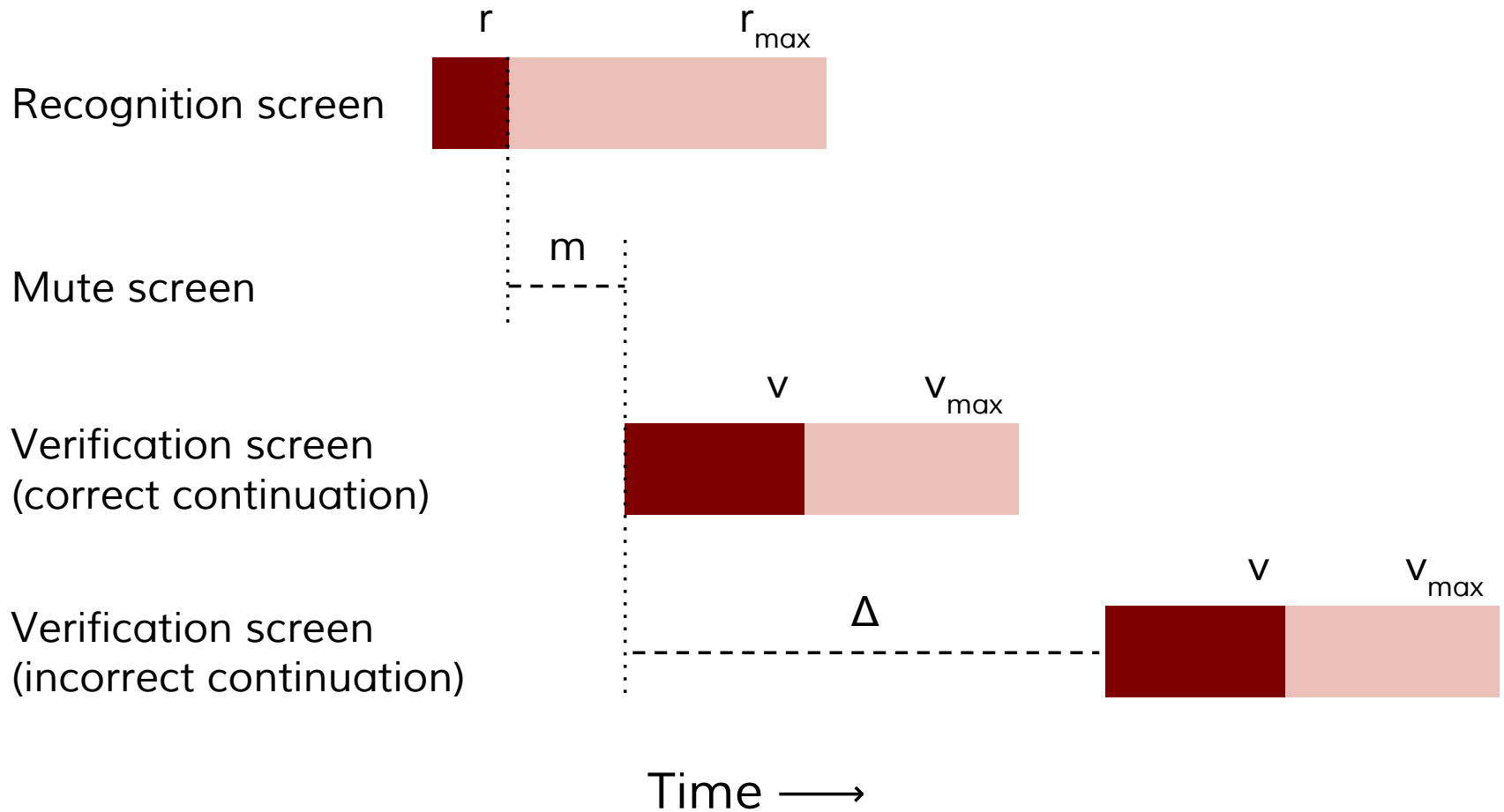
hooked



hooked



hooks



hooked

167,000+ data points

1986 players

1591 songs

HOOKED ON MUSIC



Select a game



RECOGNISE THAT TUNE?



WHAT'S THE HOOK?



TIME TRIAL



IN A ROW

#hookedonmusic

3 million data points

100,000+ players

1500 song sections

300 songs

what makes music recognizable?

musical expectation

veridical expectations

expectations related to a particular work

schematic expectations

broad generalizations from years of
music listening

second order features

typicality w.r.t reference corpus

song-based second-order features

corpus = fragments from the same song
~ veridical expectedness

corpus-based second-order features

corpus = fragments from other songs
~ schematic expectedness

recognizability

973 participants

1715 segments

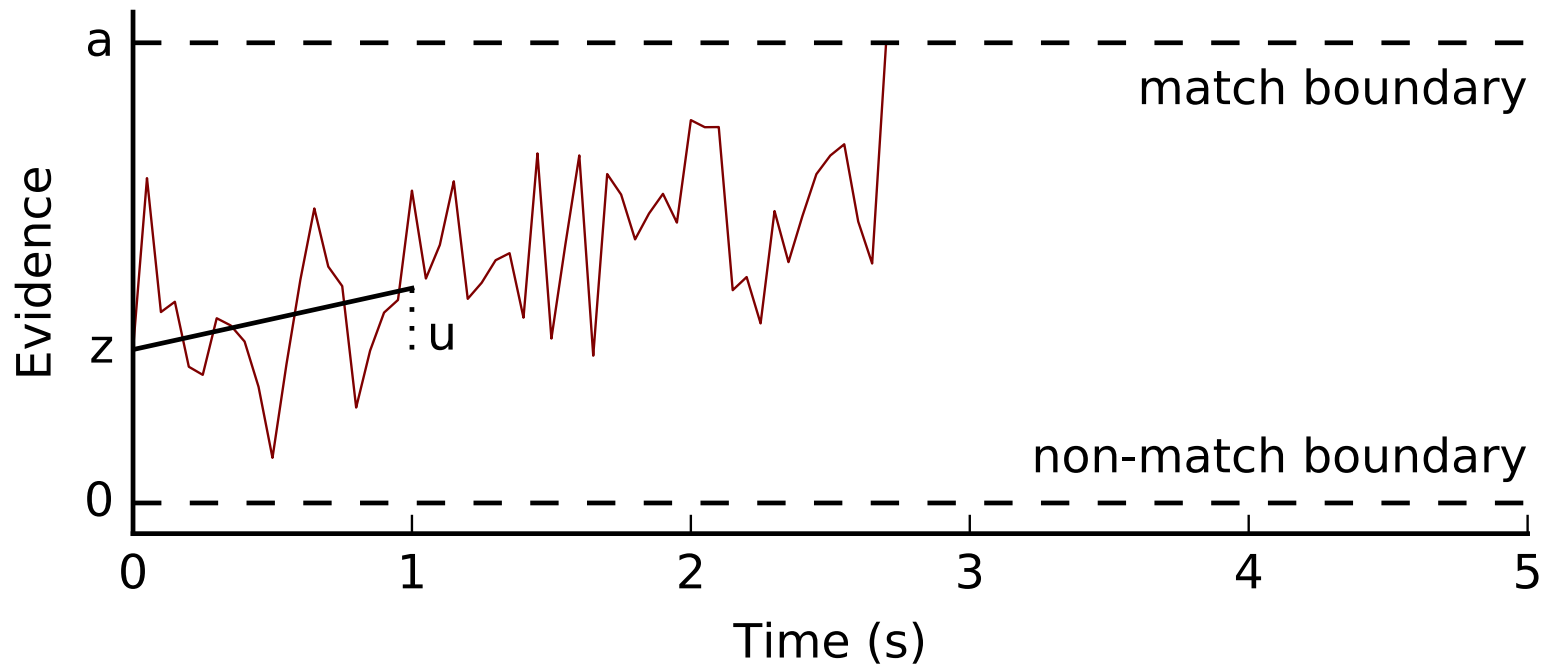
321 songs

recognizability

973 participants

1715 segments

321 songs



hooks

audio features vs. symbolic features

	audio	symbolic	audio + symbolic
R_{marginal}^2	.06	.07	.10
$R_{\text{conditional}}^2$.46	.47	.47

hooks

top predictors at $\alpha = 0.005$

hooks

top predictors at $\alpha = 0.005$
- timbre repetition

hooks

top predictors at $\alpha = 0.005$

- timbre repetition
- vocal prominence



hooks

top predictors at $\alpha = 0.005$

- timbre repetition
- vocal prominence
- 6 kinds of conventionality
ex.: melodic range



what's next

less focus on

melody

harmony

more focus on

rhythm

timbre

Thank you!

recommendations

1. make methods explicit
2. data should be a representative sample
3. features are reliable for the entire corpus
4. features are informative
5. a strategy to avoid overfitting