

Music & the Internet

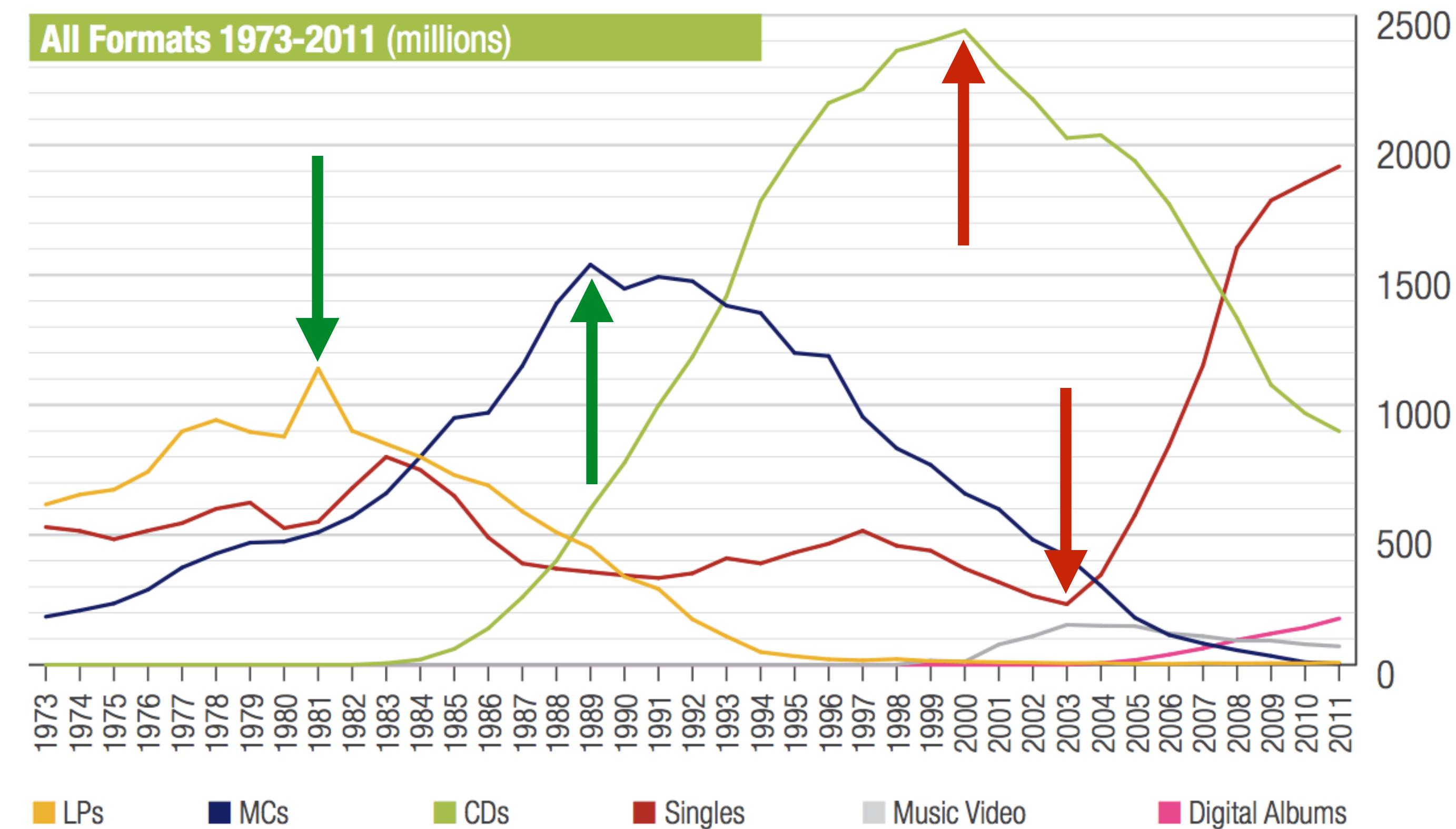
MUMT301

Gabriel Vigliensoni
Schulich School of Music
McGill University

Plan

- Review of the last class
 - Music distribution
 - Internet radio broadcasting
 - On-demand music services presentation
 - HTML, forms, and simple API call

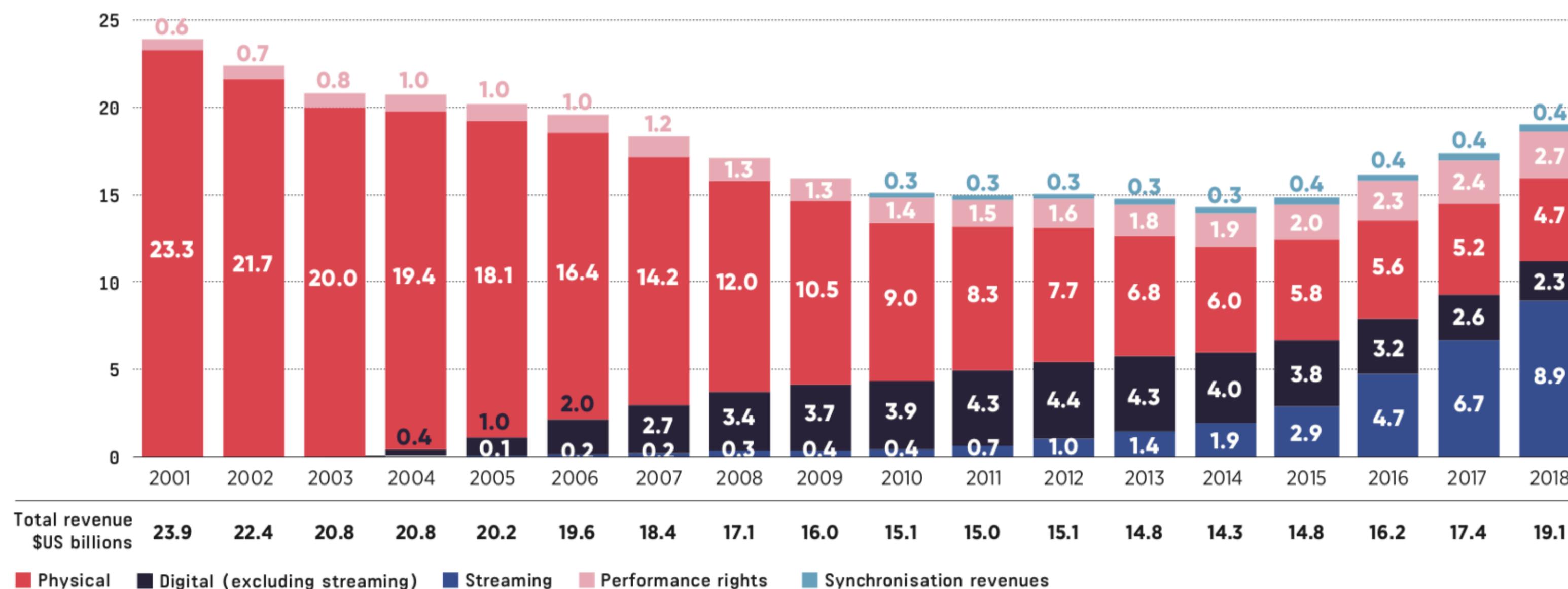
Global music sales by format



Taken from [Record Industry in Numbers 2011 \(IFPI\)](#)

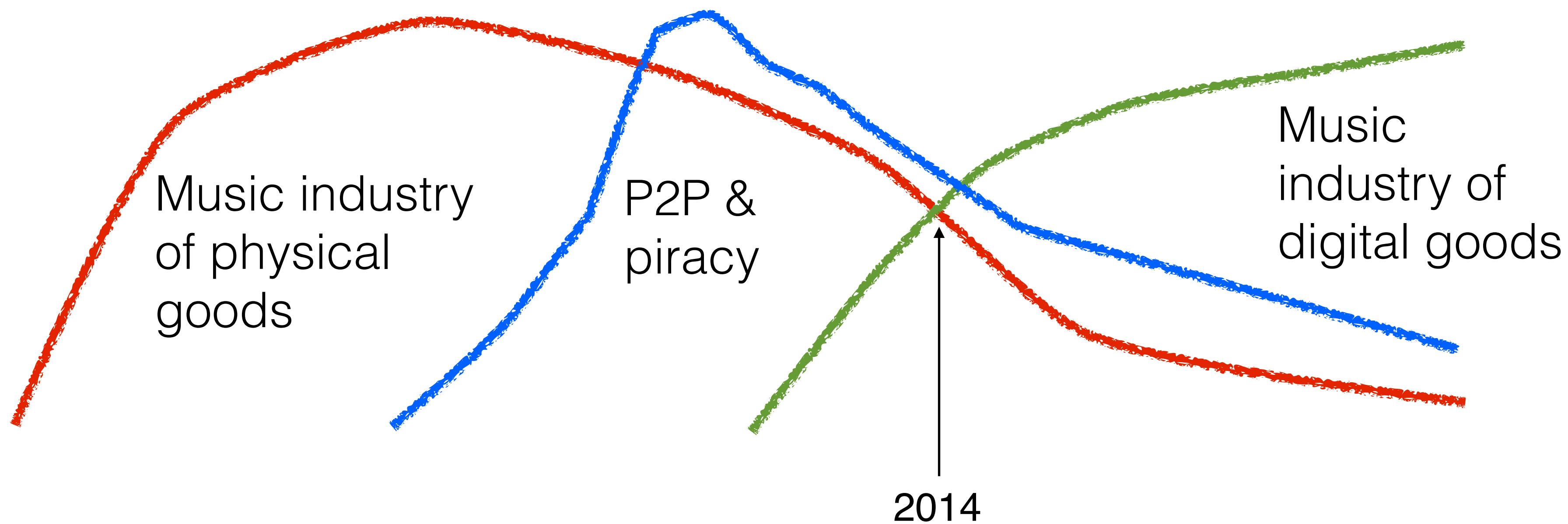
Global recorded music revenues

Global Recorded Music Industry Revenues 2001-2018 (US\$ Billions)



Taken from [Global Music Report 2019: State of the Music Industry](#)

Music industry



Peer to peer (P2P)

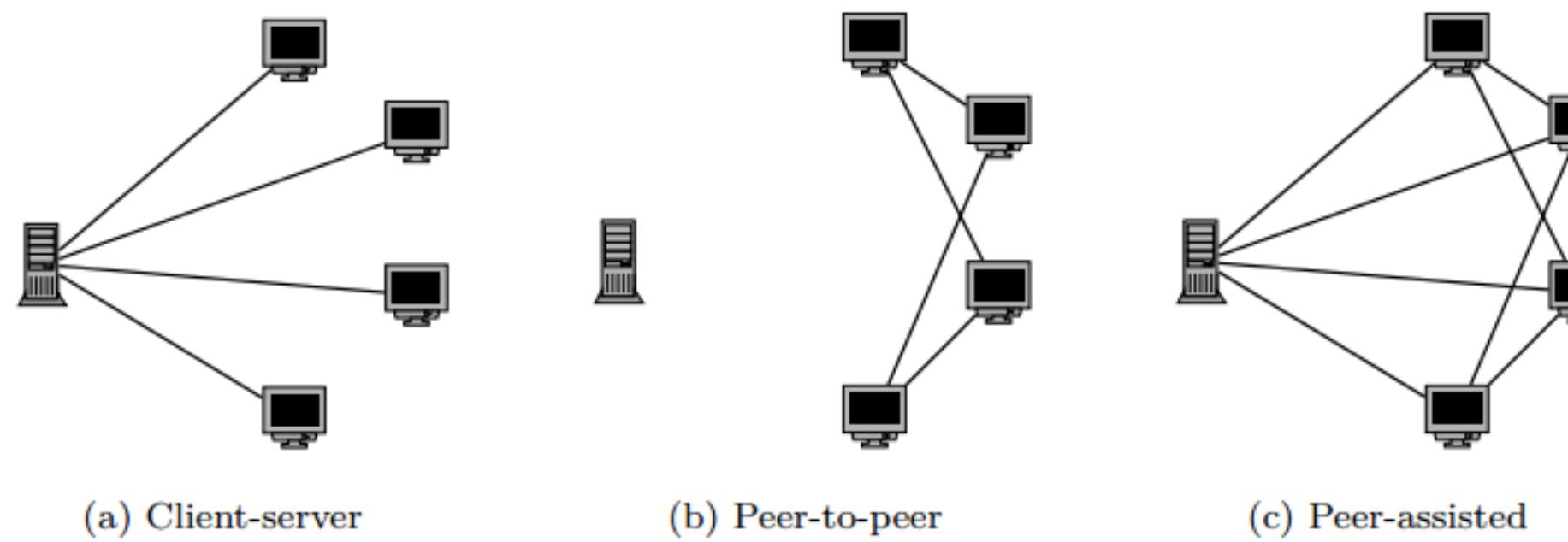
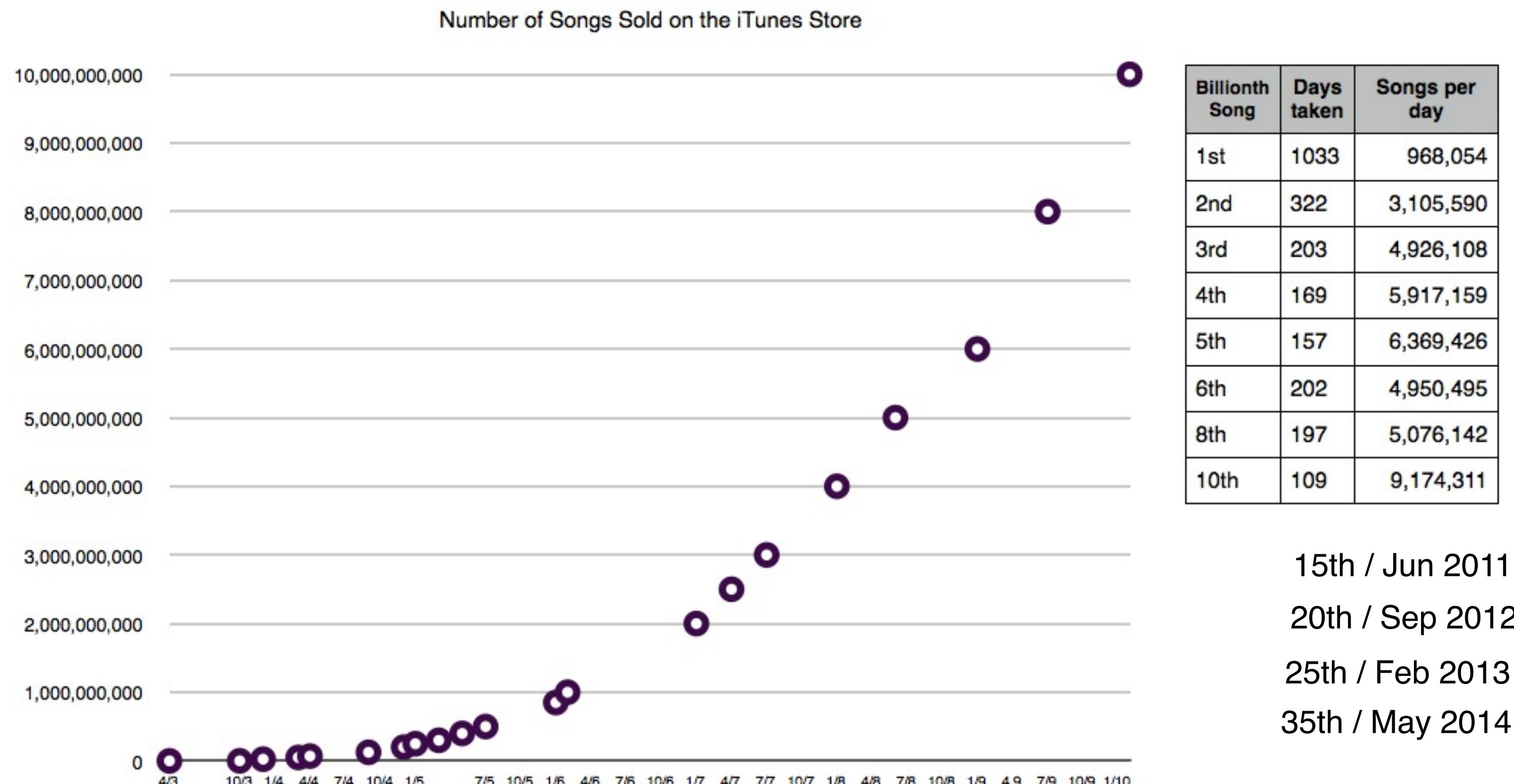


Figure 1.1: Three types of protocols.

Taken from [Kreitz, G. 2011. Aspects of Secure and Efficient Streaming and Collaboration. PhD Thesis. KTH Computer Science and Communication.](#)

iTunes Store songs sold

- Apple's iTunes Music Store is credited with finally getting people to pay for digital music, unveiled in 2003



https://en.wikipedia.org/wiki/iTunes_Store

Digital music distribution models

- Music stores (buy to own)
- Music tracks are delivered online
- Music locker
- Music streaming via subscription

The musician's POV

- None of the digital music services will let you in directly
- Artists need to be signed to a major (or big indie) record label
- Or use a **digital music distributor** to get in a digital music service

Digital Distributors Comparison

ARI'S TAKE



	CDBABY	DISTROKID	DI+O	LOUDR	MONDOTUNES	REVERBNATION	TUNECORE	SYMPHONIC
# OF OUTLETS	90+	90+	200+	7	200+	90+	90+	200+
COMMISSION	9%	0%	0%	15% originals 30% covers	10%	0%	0%	0%
SIGN UP FEE	single = \$9.95 album = \$49	unlimited songs \$19.99	single = \$9 EP = \$20 album = \$35	unlimited songs \$0	unlimited songs \$39.99	single = \$9.95 album = \$19.95	single = \$9.99 album = \$29.99	\$25 + < 5 songs = \$10.99 (one time) < 10 songs = \$19.99 < 15 songs = \$29.99 16+ songs = \$39.99
YEARLY FEE	\$0	unlimited songs \$19.99	single = \$8 EP = \$20 album = \$25	unlimited songs \$0	unlimited songs \$39.99	single = \$9.95 album = \$49.95	single = \$9.99 album = \$49.99	\$0
ADDING STORES	free	free	free	free	free	free	\$1.98 per store	free
ITUNES WORLDWIDE? (100+ COUNTRIES)	yes	yes	yes	yes	yes	yes	yes	yes
SPEED TO ITUNES (weekdays)	1-2 days	1-2 days	varies	within a week	up to 30 days	1-3 days	1-3 days	weekly
TAKEDOWN COST	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
ITUNES PRE-ORDER	free	N/A	\$41.25	free	\$25	N/A	\$100	free
YOUTUBE MONETIZATION (commission)	30%	20% \$4.95/yr	0% \$79 sign up fee	N/A	20% via AdRev	N/A	10-20%	30%
ITUNES DIGITAL BOOKLET	N/A	N/A	N/A	yes	\$25	no	\$20	yes
PANDORA SUBMISSION	no	no	no	no	no	no	no	yes
CUSTOM LABEL NAME	free	\$16/yr for 2 artists \$60/yr 5+ artists	\$41.25 (one time)	free	\$39.99 one time +\$99/yr for 5+ artists	free	free	write in and ask
ISRC CODES	free	free	free	free	free	free	free	free
UPC CODES	\$5 single \$20 album	free	free	free	free	free	free	free
GET CODES BEFORE UPLOAD	no	yes	yes	no	no	no	yes	yes
SOUNDSCAN REGISTRATION	no	no	\$66-132	no	yes	no	no	no
OPT OUT OF STORES	yes	yes	yes	yes	yes	no	yes	yes
PAYMENT	weekly	immediate	immediate	monthly	monthly	monthly	monthly	quarterly
PAYMENT THRESHOLD	\$10	\$0	\$25	\$10	\$25	\$5	\$0	\$50

<http://aristake.com/?post=92>

Digital Distributors Comparison

ARI'S TAKE



	CDBABY	DISTROKID	DI+O	LOUDR	MONDOTUNES	REVERBNATION	TUNECORE	SYMPHONIC
# OF OUTLETS	90+	90+	200+	7	200+	90+	90+	200+
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ADDING STORES	free	free	free	free	free	free	\$1.98 per store	free
ITUNES WORLDWIDE? (100+ COUNTRIES)	yes	yes	yes	yes	yes	yes	yes	yes
SPEED TO ITUNES (weekdays)	1-2 days	1-2 days	varies	within a week	up to 30 days	1-3 days	1-3 days	weekly
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ITUNES DIGITAL BOOKLET	N/A	N/A	N/A	yes	\$25	no	\$20	yes
PANDORA SUBMISSION	no	no	no	no	no	no	no	yes
CUSTOM LABEL NAME	free	\$16/yr for 2 artists \$60/yr 5+ artists	\$41.25 (one time)	free	\$39.99 one time +\$99/yr for 5+ artists	free	free	write in and ask
ISRC CODES	free	free	free	free	free	free	free	free
UPC CODES	\$5 single \$20 album	free	free	free	free	free	free	free
GET CODES BEFORE UPLOAD	no	yes	yes	no	no	no	yes	yes
SOUNDSCAN REGISTRATION	no	no	\$66-132	no	yes	no	no	no
OPT OUT OF STORES	yes	yes	yes	yes	yes	no	yes	yes
PAYMENT	weekly	immediate	immediate	monthly	monthly	monthly	monthly	quarterly
PAYMENT THRESHOLD	\$10	\$0	\$25	\$10	\$25	\$5	\$0	\$50

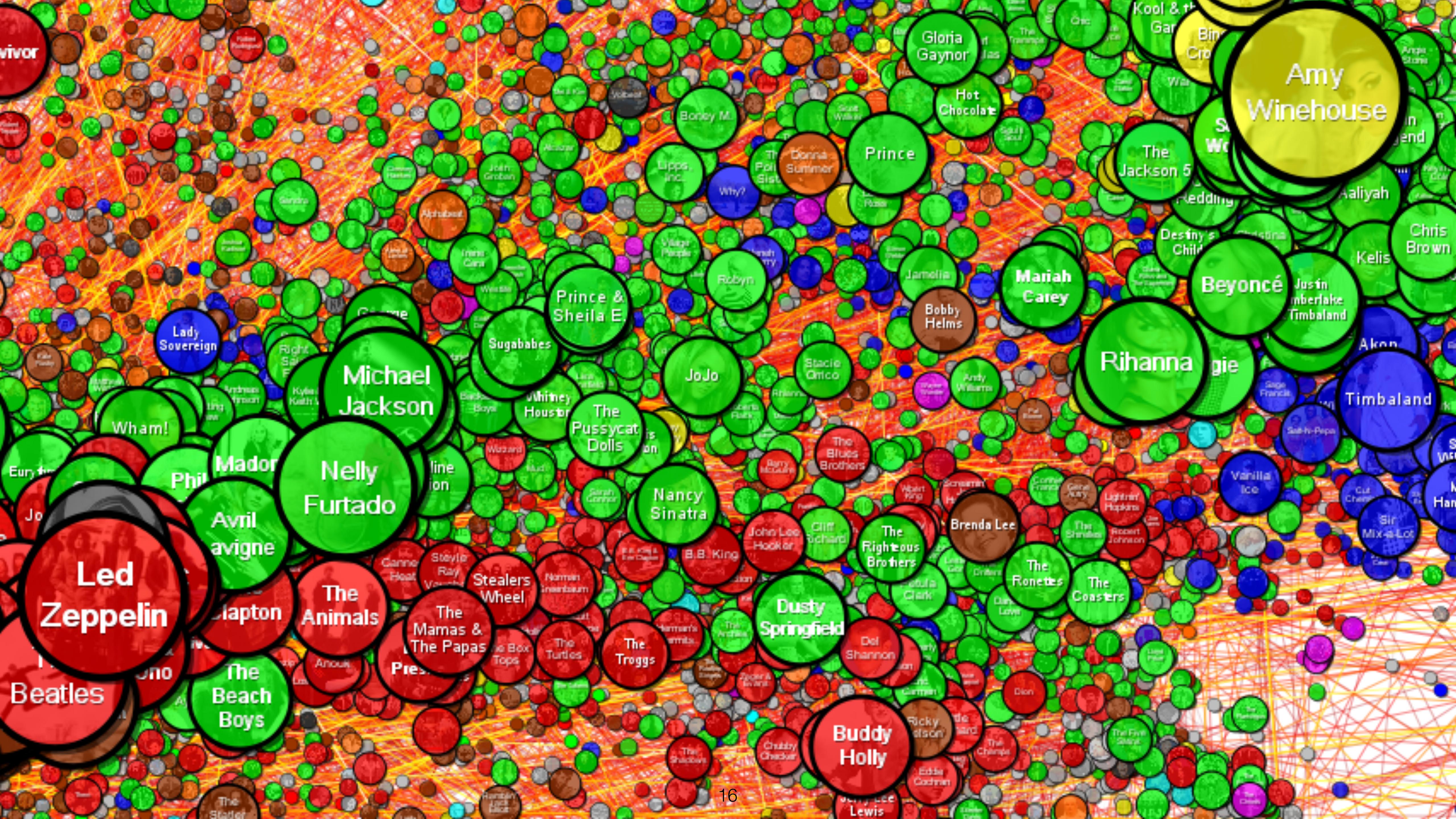
<http://aristake.com/?post=92>

On-demand music services presentation

Automatic music recommendation systems





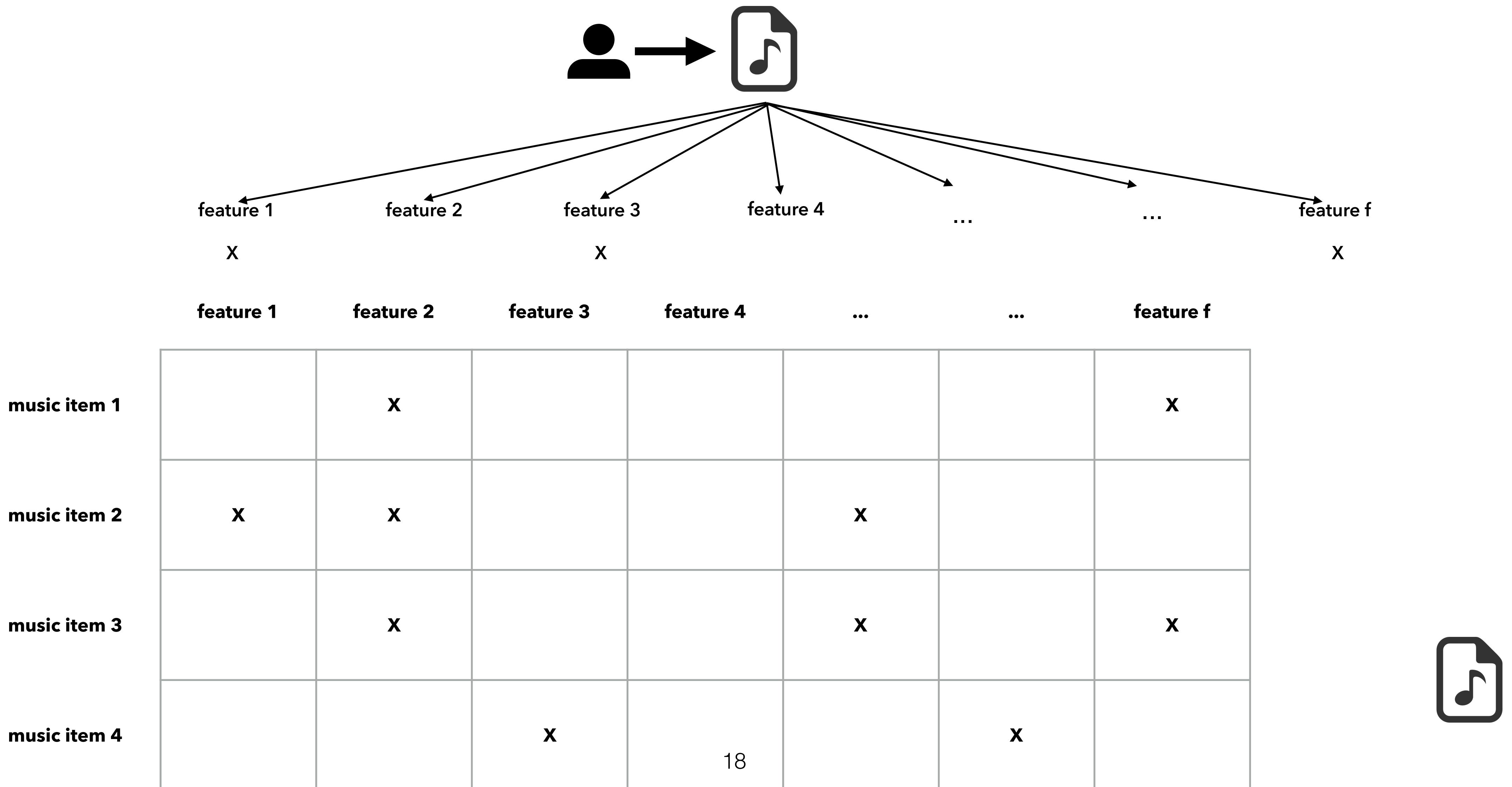


Music recommendation approaches

- Content-based
- Collaborative filtering

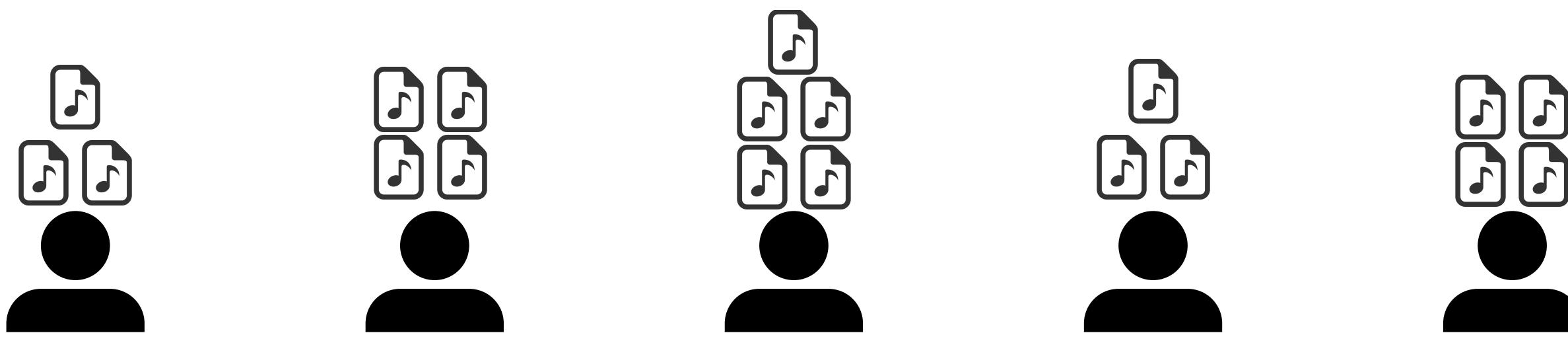
Music recommendation approaches

Content-based



Music recommendation approaches

Collaborative filtering



user/artist	beatles	rolling	bsabbath	metallica	miles	coltrane	autechre	dpunk	reich	bartok
a	5	4			3	2	4		4	5
b	5	4		2				2	3	
c	4		3		3		5	4		
d	5			1	5	4				1
e	5				4		1		1	1

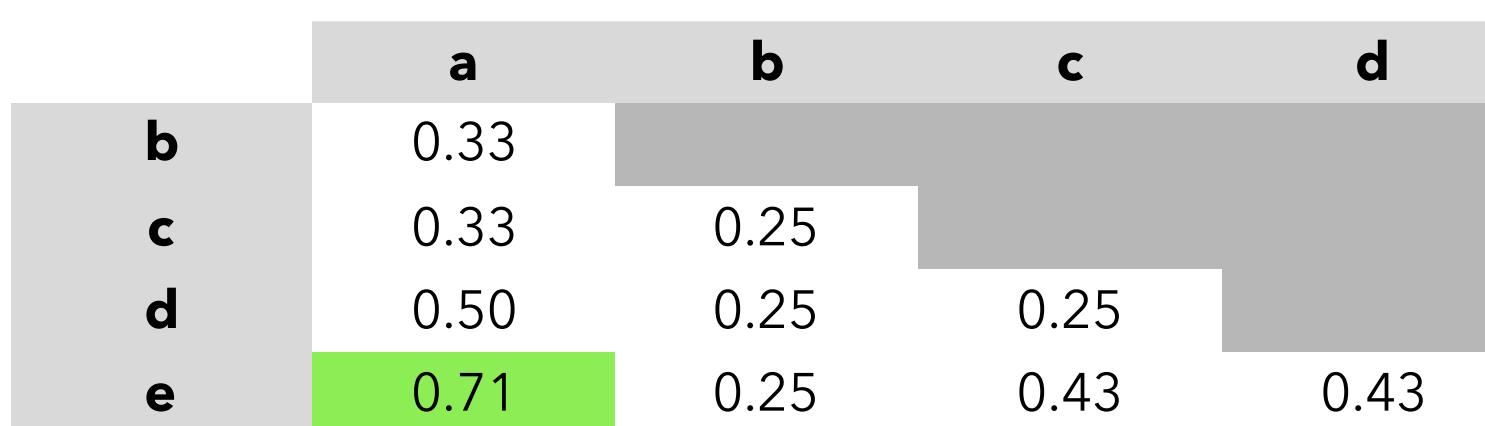
Music recommendation approaches

Collaborative filtering

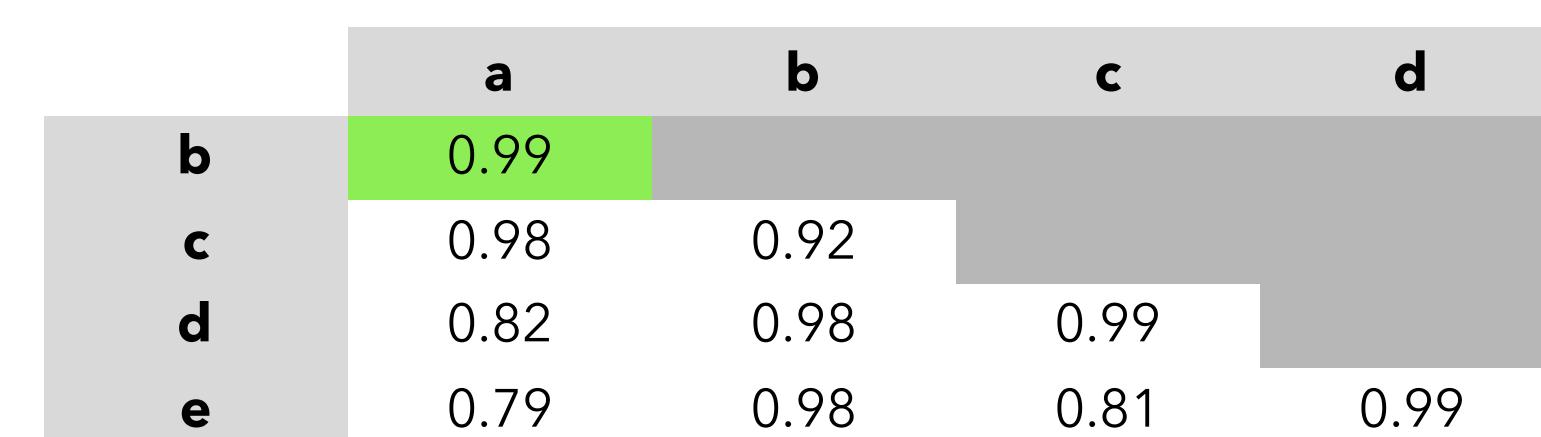
User similarity

user/artist	beatles	rolling	bsabbath	metallica	miles	coltrane	autechre	dpunk	reich	bartok
a	5	4	3	3	3	2	4	3	4	5
b	5	4	2	2	5	3	3	2	3	2
c	4	4	3	1	3	3	5	4	5	3
d	5	4	2	1	5	4	3	2	2	1
e	5	3	2	1	4	3	1	1	1	1

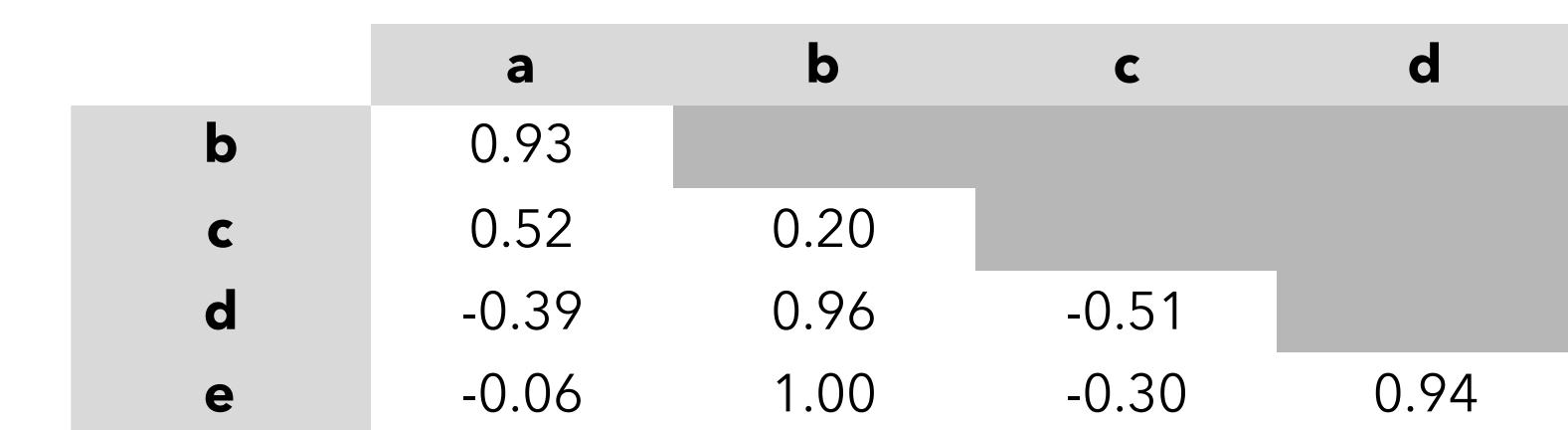
Jaccard similarity
Intersection of sets



Cosine vector similarity
Angle of vectors in space



Pearson correlation
Distance of points in space



Music recommendation approaches

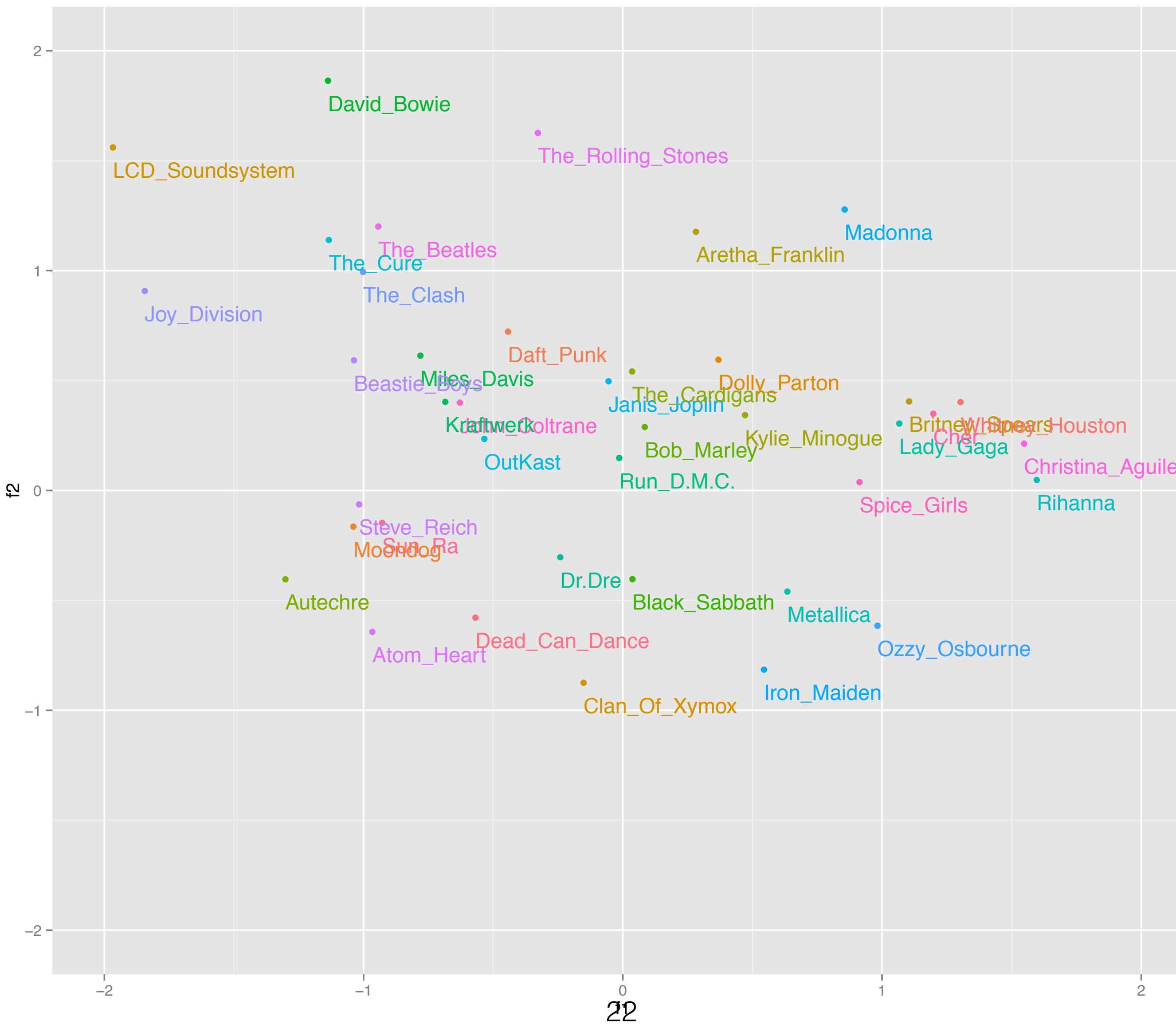
Collaborative filtering

Model-based

		factor 1	-0.188	-0.015	-0.006	0.069	-0.472	-0.353	0.238	0.078	0.168	0.481
		factor 2	-0.074	-0.001	-0.002	-0.014	-0.042	0.036	0.171	0.035	0.083	-0.186
factor 1	factor 2	user/artist	beatles	rolling	bsabbath	metallica	miles	coltrane	autechre	dpunk	reich	bartok
0.440	0.001	a	5	4	3	2	3	2	4	3	4	5
-0.009	-0.010	b	5	4	3	2	4	3	3	2	3	4
0.315	0.118	c	4	4	3	2	3	3	5	4	3	4
-0.634	0.115	d	5	4	3	1	5	4	3	3	2	1
-0.092	-0.229	e	5	3	2	1	4	3	1	2	1	1

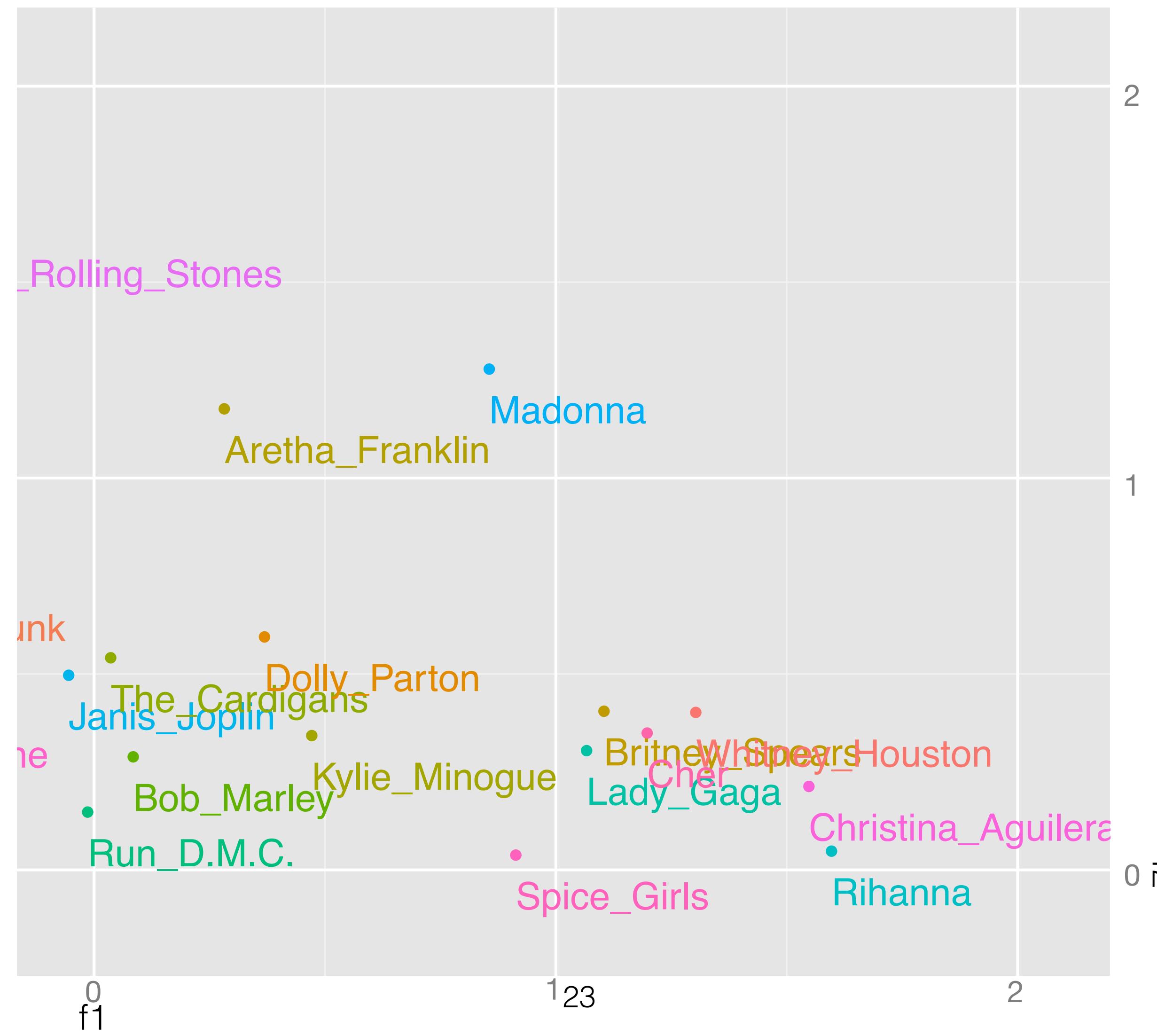
Music recommendation approaches

Latent factors models



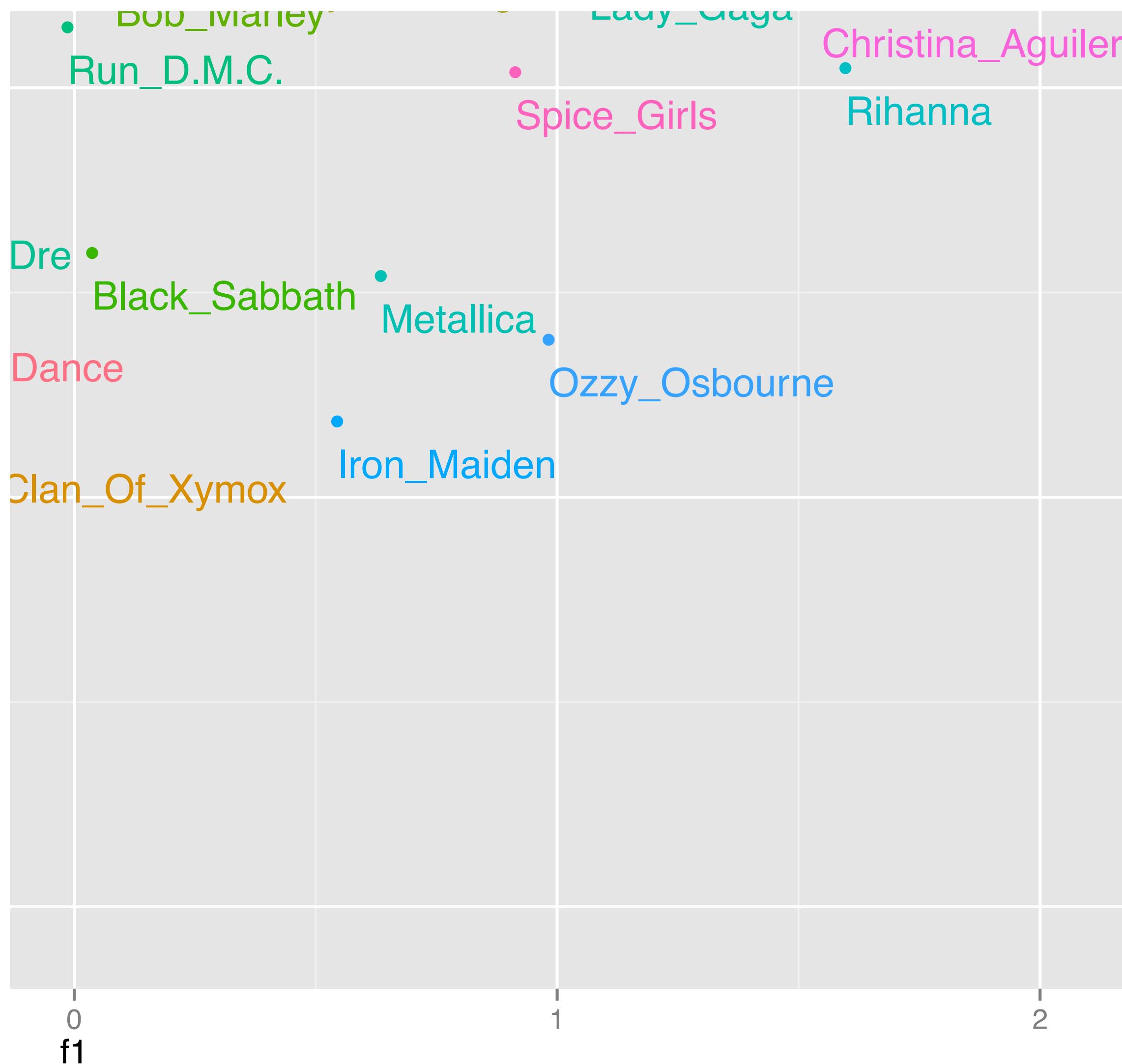
Music recommendation approaches

Latent factors models



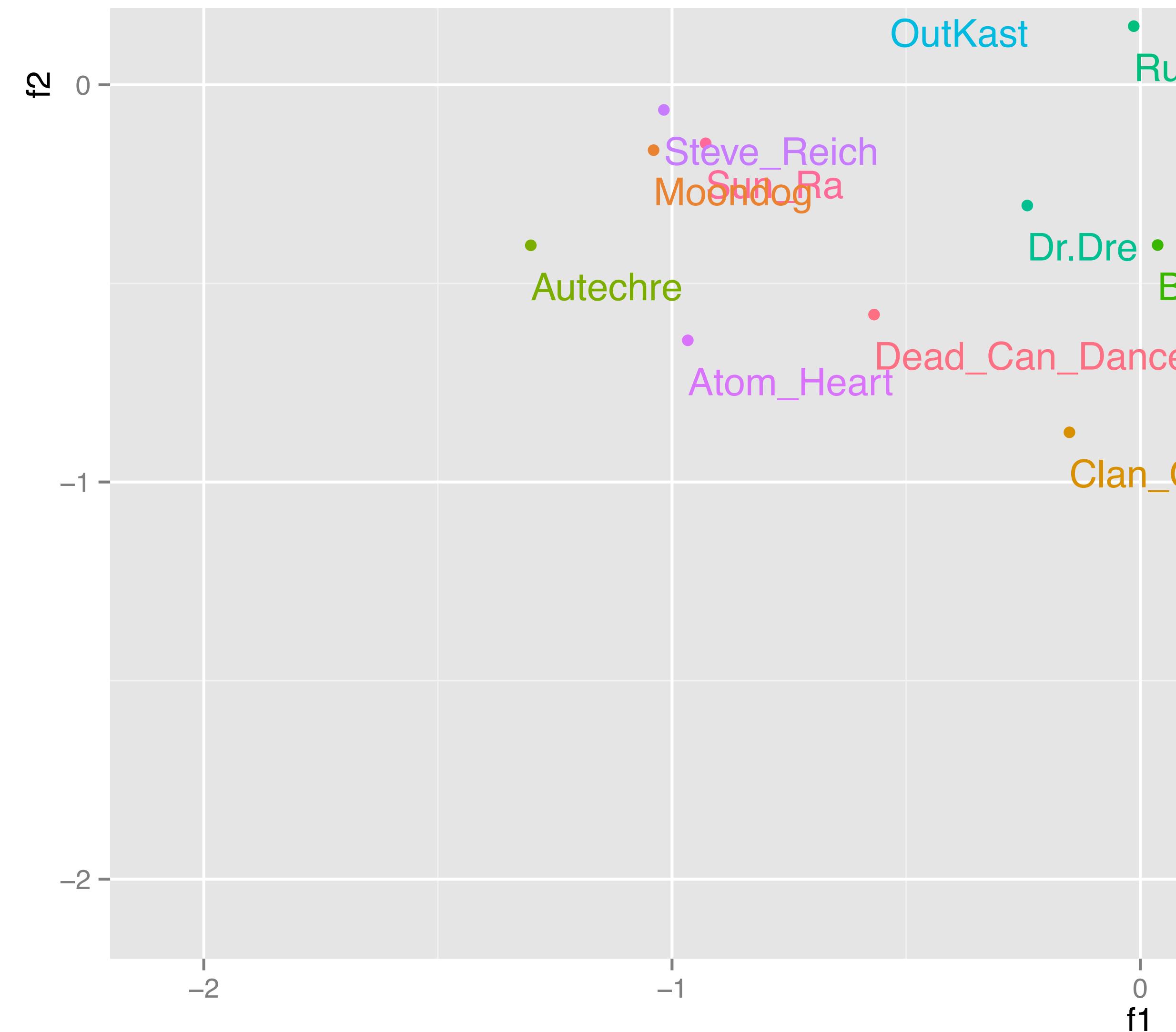
Music recommendation approaches

Latent factors models



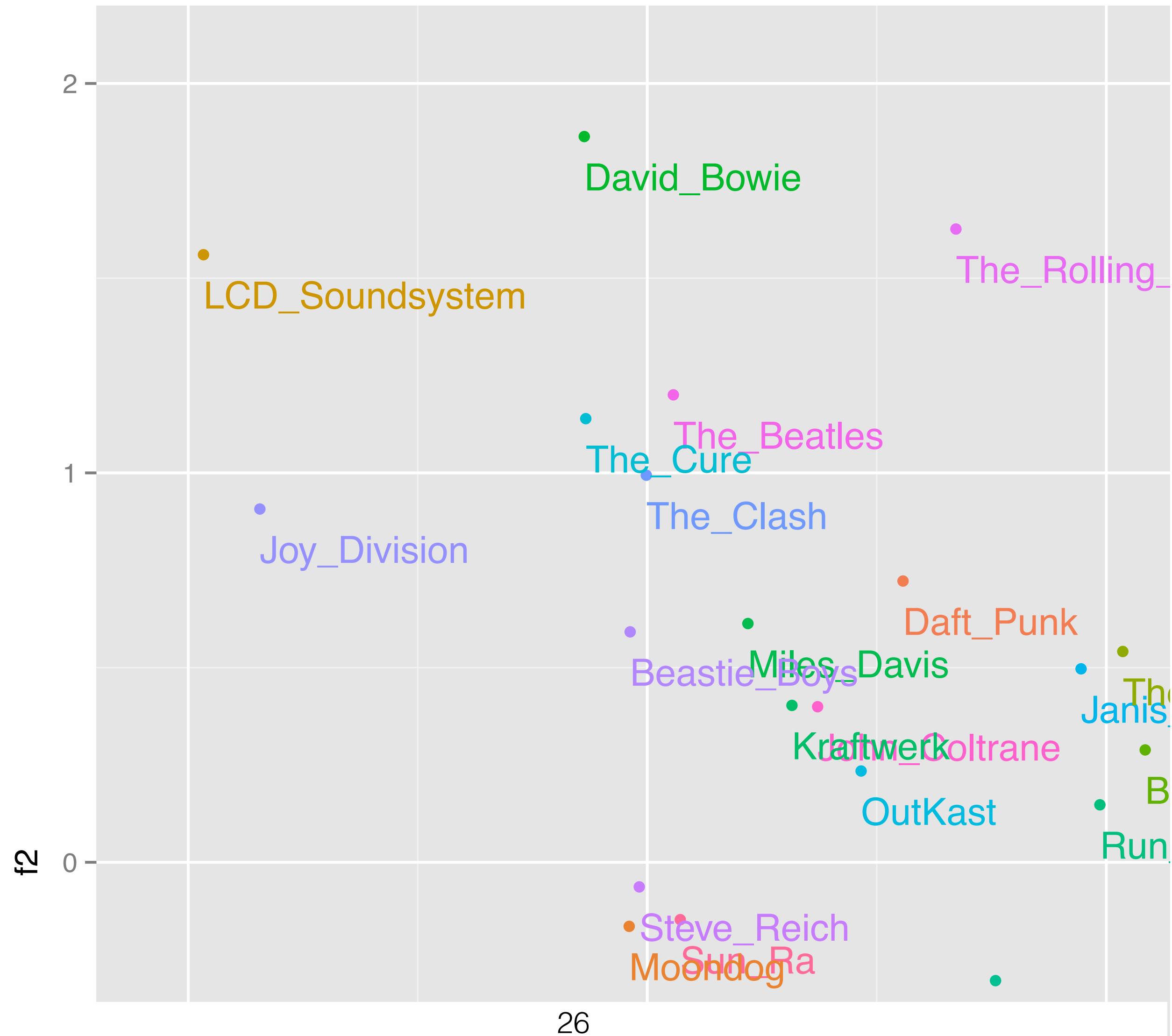
Music recommendation approaches

Latent factors models



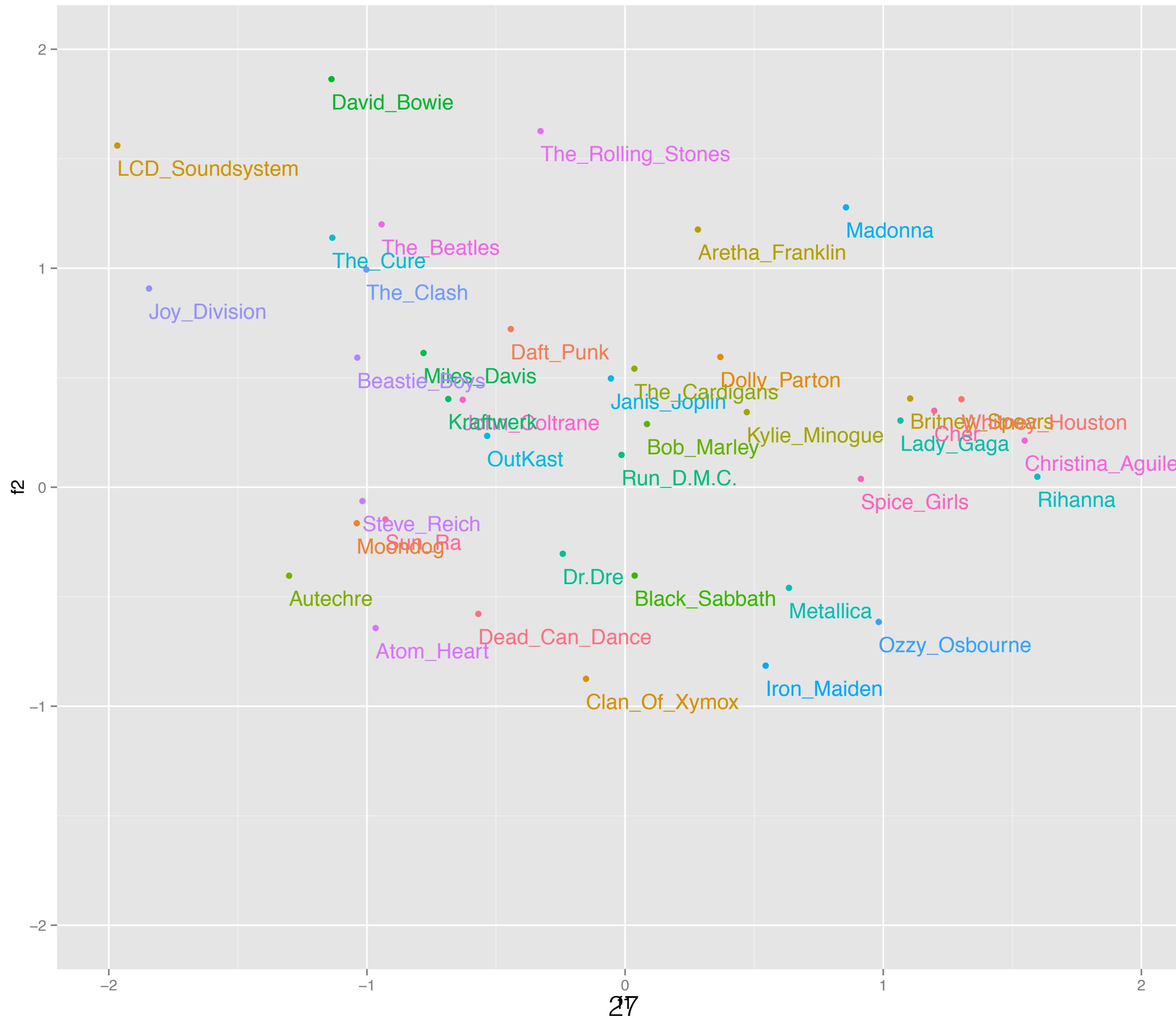
Music recommendation approaches

Latent factors models



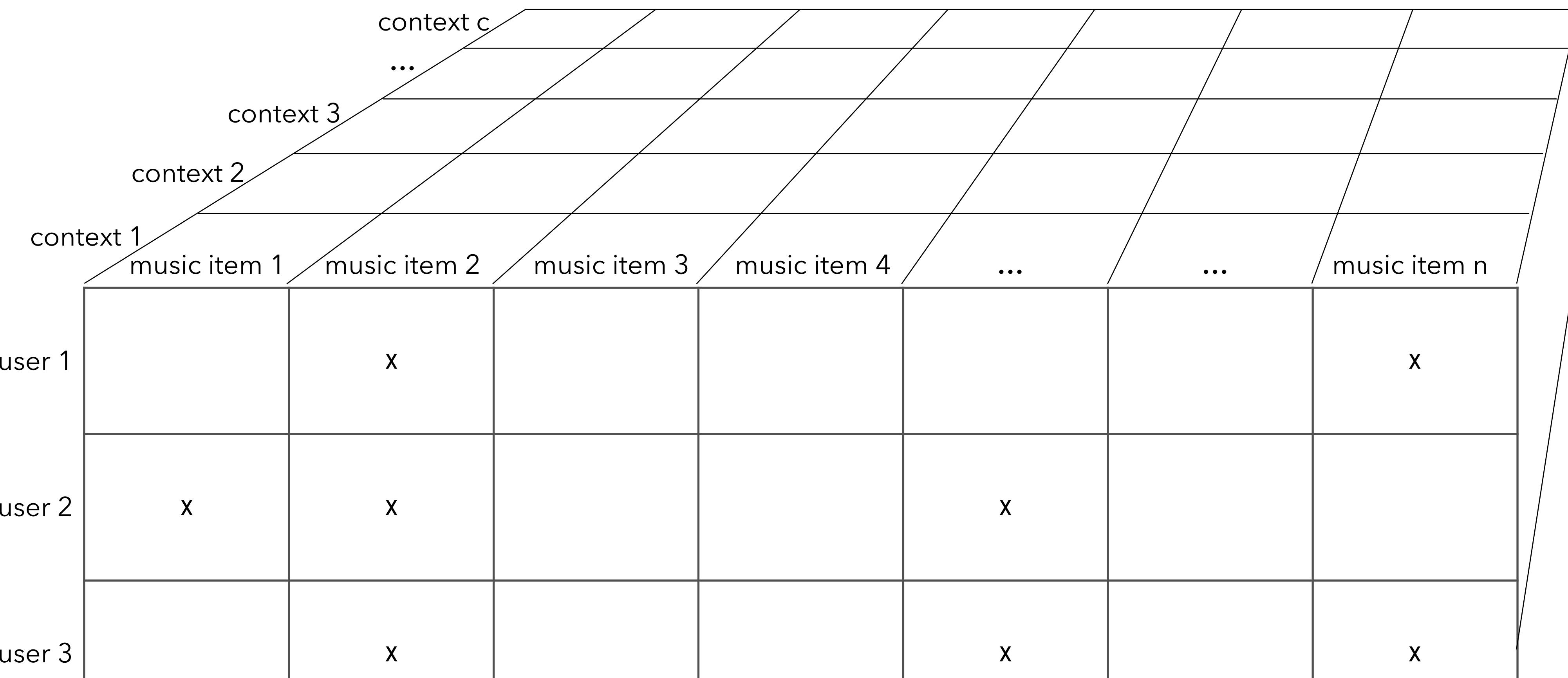
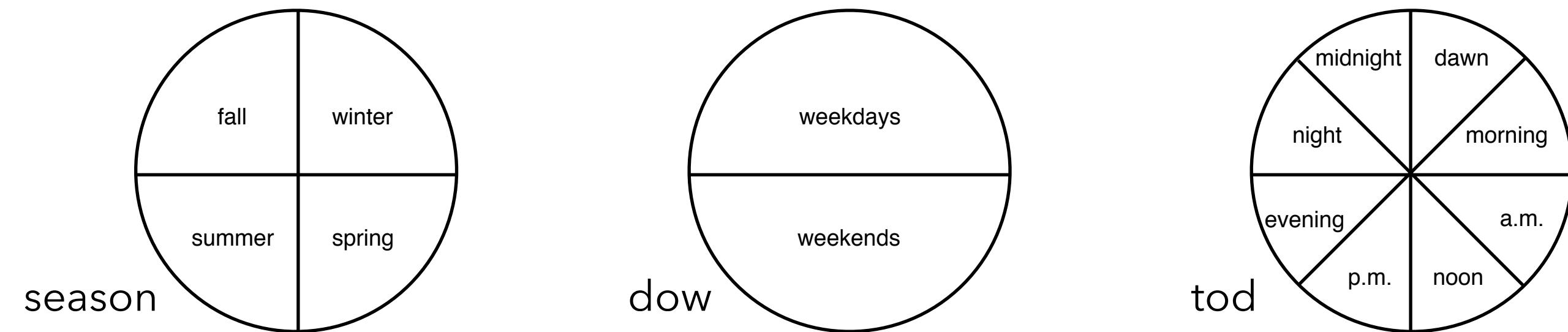
Music recommendation approaches

Latent factors models



Music recommendation approaches

Incorporating context into the model



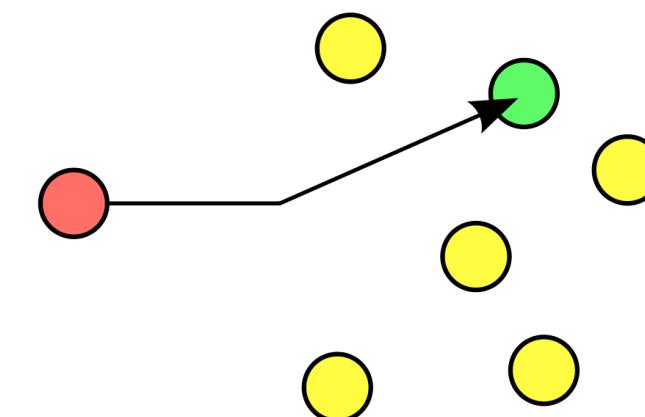
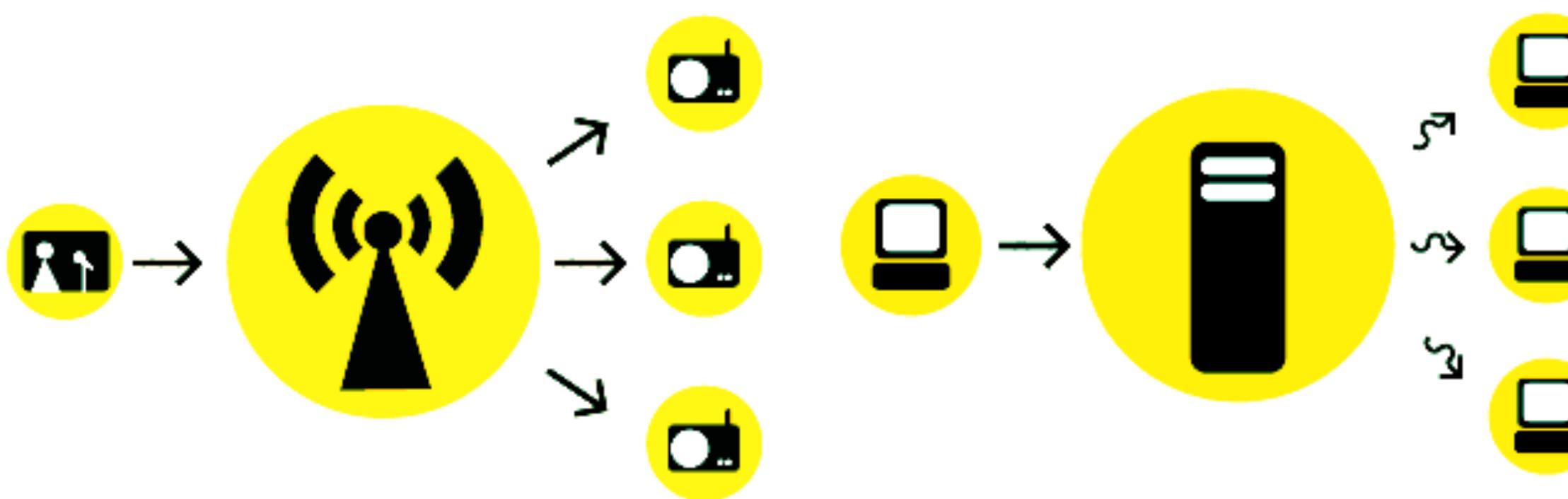
Music recommendation approaches

Incorporating side features into the model

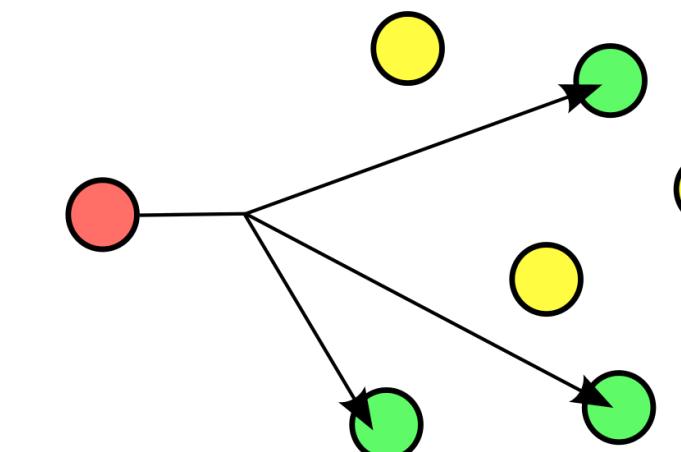
					factor1	-0.1250	-0.0758	0.2597	-0.4078	0.3469	0.4341	0.8519	0.5257	0.7062	-1.6830
					factor2	0.3663	0.2352	-0.1869	-0.3558	0.9251	0.8393	-0.8159	-1.2368	-0.8491	-0.0734
gender	age	factor1	factor2	user/artist	beatles	rolling	bsabbath	metallica	miles	coltrane	autechre	dpunk	reich	bartok	
m	o	-0.7364	-0.5380	a	5	4	3	3	3	2	4	4	4	5	
f	o	0.4071	0.3544	b	5	4	3	2	4	3	3	2	3	4	
m	y	0.6459	-1.1424	c	4	3	3	1	3	2	5	4	5	1	
m	y	0.8063	0.6618	d	5	4	3	1	5	4	4	2	4	1	
f	y	-1.0800	0.7037	e	5	4	2	2	4	3	1	0	1	5	
m	o	-0.0002	0.0000	f	5	4	2	2	4	3	4	3	4	4	

side feature	value	factor 1	factor 2
age	o	-0.3872	-0.1737
age	y	0.1648	0.4031
gender	m	0.3986	-0.1552
gender	f	-0.3539	0.1451

Internet radio broadcasting

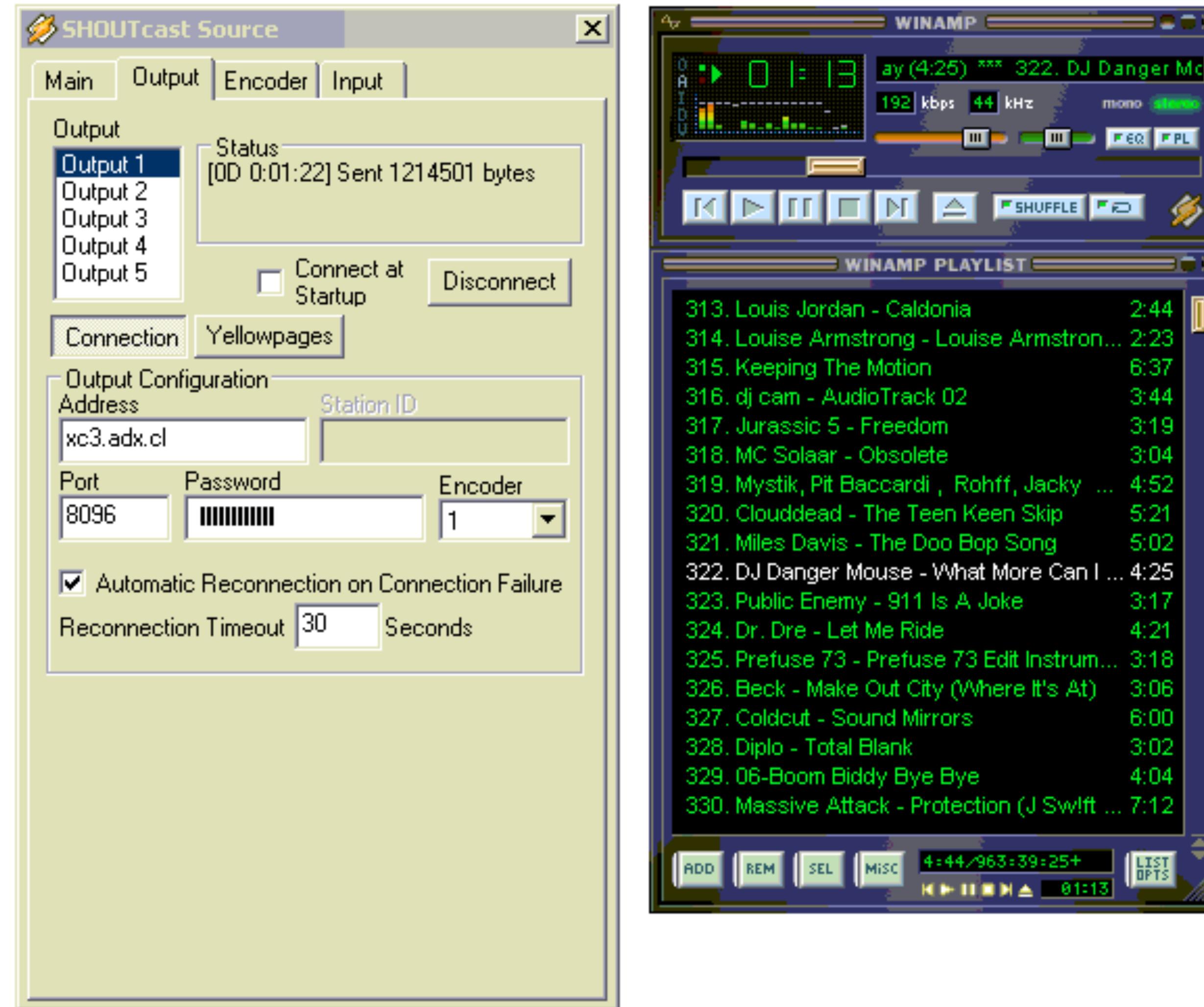


Unicast: Sends IP packets to identified recipients on a network, with added bandwidth



Multicast: sends IP packets to a group of hosts on a network, with no added bandwidth, and not requiring prior knowledge of who or how many receivers there are.

Playlist management

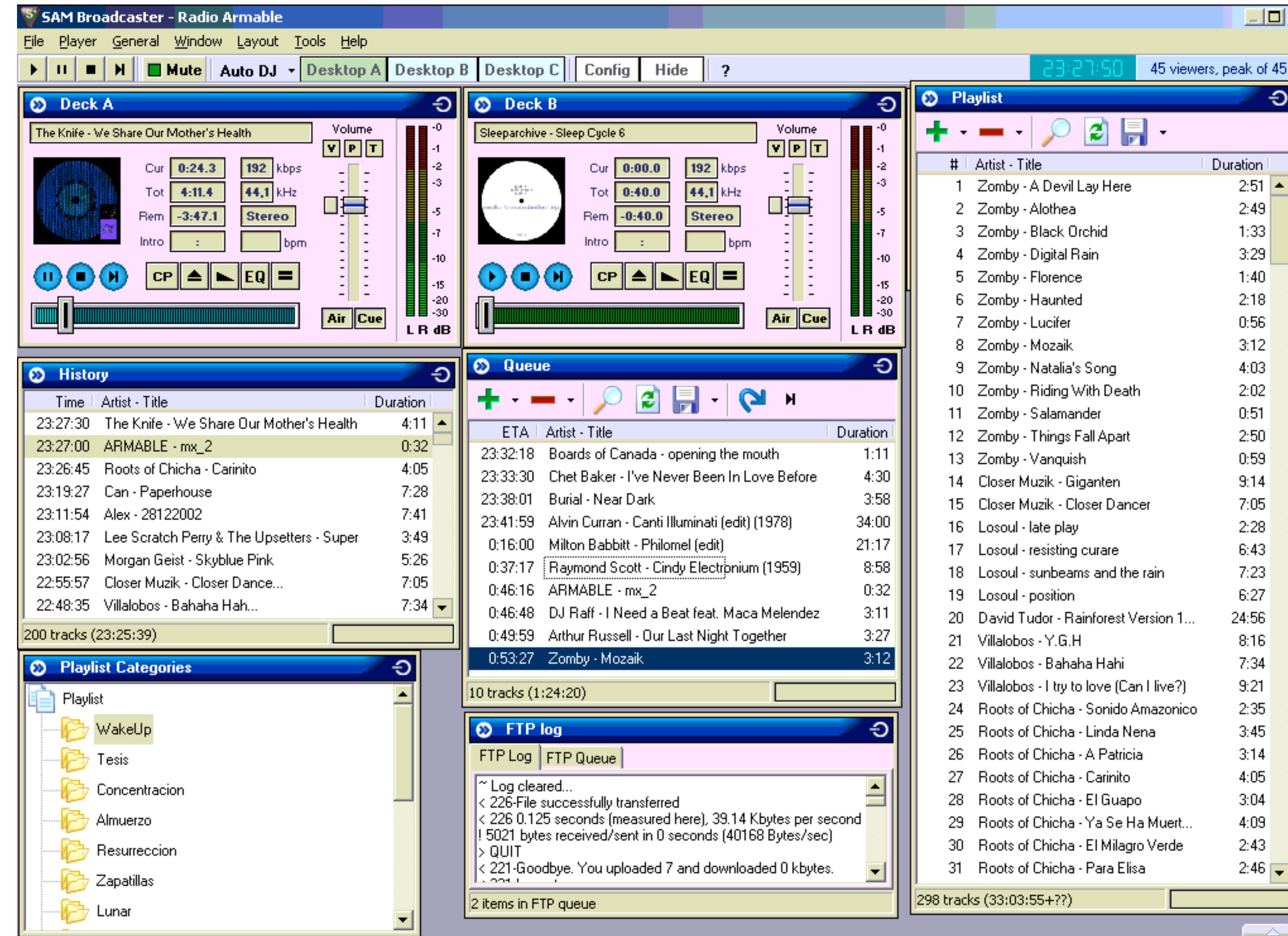


Playlist management

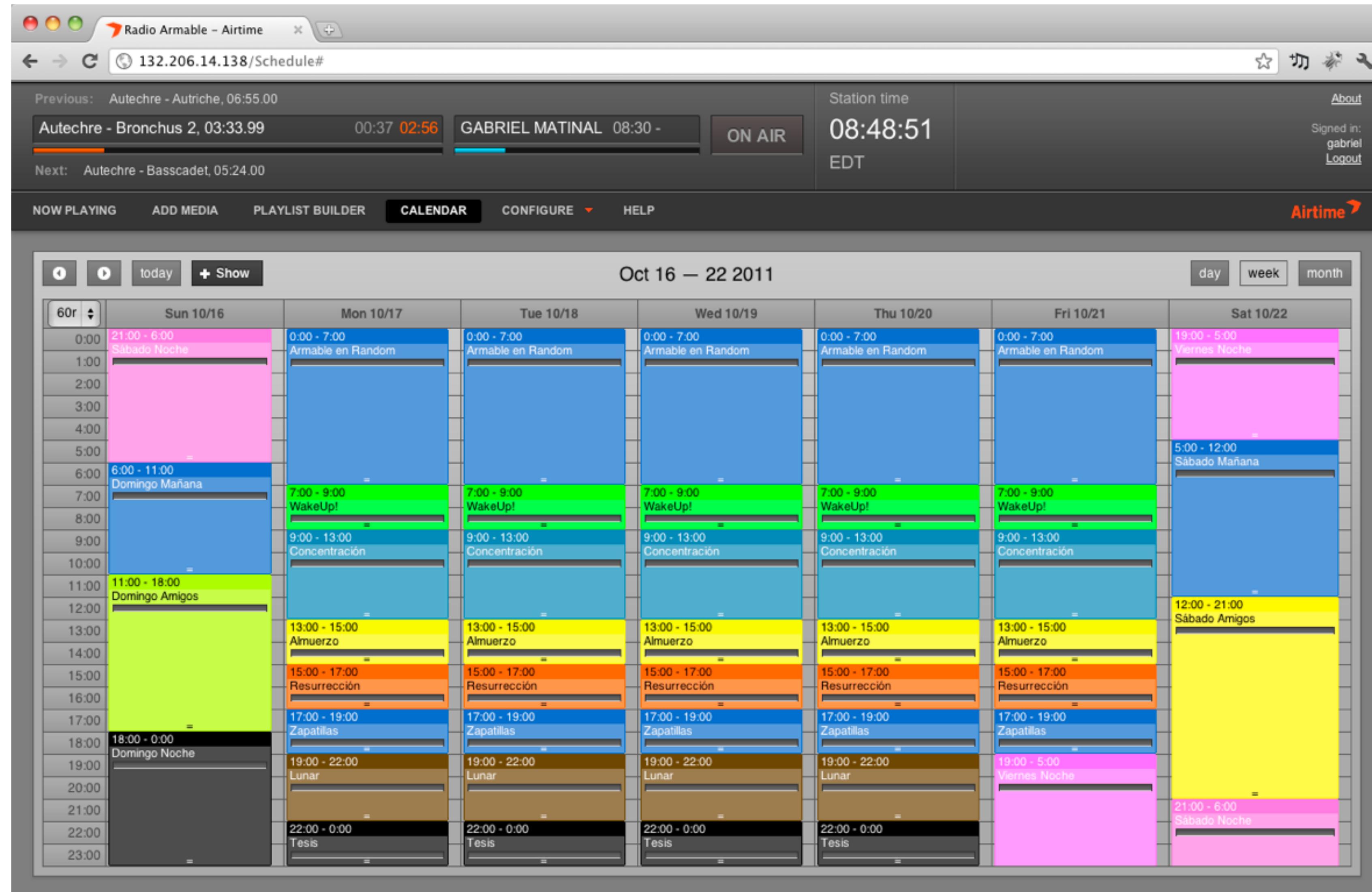
The image shows two windows side-by-side. On the left is the 'Nicecast Broadcast' application. It has a 'Broadcast' tab active, showing a red 'On Air' button, a blue 'Level' slider, and a 'Source: System Audio' dropdown. Below these are tabs for Source, Info, Titles, Quality, Share, and Effects. Under the Share tab, there's an 'Address' section with 'Internet:' and 'Local:' fields containing URLs like 'http://192.168.1.118:8001/listen.m3u'. A 'Server Checker' section with a 'Check Now' button is also present. On the right is a 'iTunes' or similar music player window. The title bar says 'pherinfonprozession Mouse on Mars – Abschaffung der Arten.'. The main area is a table with columns: Name, Time, Artist, Album, Genre, Rating, and Plays. The table lists 42 tracks, starting with 'Faith' by Ada and ending with 'Memory of Transgression' by The Residents. The track 'pherinfonprozession' is currently playing, indicated by a play icon next to its name. The 'Rating' column for this track shows three stars.

	Name	Time	Artist	Album	Genre	Rating	Plays
1	✓ Faith	5:53	Ada	Meine zarten Pfoten	Rock	1	
2	✓ On The Mend	4:33	Ada	Meine zarten Pfoten	Rock	1	
3	✓ Likely	3:36	Ada	Meine zarten Pfoten	Rock	1	
4	✓ The Jazz Singer (re-imagined by Ada)	4:40	Ada	Meine zarten Pfoten	Rock	1	
5	✓ Intro	4:06	Ada	Meine zarten Pfoten	Rock	1	
6	✓ At The Gate	7:29	Ada	Meine zarten Pfoten	Rock	1	
7	✓ Interlude	3:15	Ada	Meine zarten Pfoten	Rock	1	
8	✓ Happy Birthday	6:14	Ada	Meine zarten Pfoten	Rock	1	
9	✓ 2 Likely	10:08	Ada	Meine zarten Pfoten	Rock	1	
10	✓ Ritual Union	3:30	Little Dragon	Ritual Union	Electronica	3	
11	✓ Little Man	2:42	Little Dragon	Ritual Union	Electronica	3	
12	✓ Brush The Heat	4:13	Little Dragon	Ritual Union	Electronica	3	
13	✓ Shuffle A Dream	2:55	Little Dragon	Ritual Union	Electronica	3	
14	✓ Please Turn	3:33	Little Dragon	Ritual Union	Electronica	3	
15	✓ Crystalfilm	4:49	Little Dragon	Ritual Union	Electronica	2	
16	✓ Precious	3:51	Little Dragon	Ritual Union	Electronica	2	
17	✓ Nightlight	3:25	Little Dragon	Ritual Union	Electronica	2	
18	✓ Summertearz	3:54	Little Dragon	Ritual Union	Electronica	2	
19	✓ When I Go Out	6:02	Little Dragon	Ritual Union	Electronica	2	
20	✓ Seconds	4:31	Little Dragon	Ritual Union	Electronica	2	
21	✓ aggro moderato	1:50	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
22	✓ veränderungen	6:28	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
23	✓ femtotöne	1:08	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
24	✓ hawai	2:17	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
25	✓ pherinfonprozession	4:29	Mouse on Mars	Abschaffung der Ar...	Soundtrack	★★★ · ·	1
26	✓ ferngefühl	2:13	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
27	✓ cyrus hill	0:43	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
28	✓ news of gente	1:53	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
29	✓ durch die wüste	1:57	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
30	✓ dramus	4:16	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
31	✓ ortlos	0:56	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
32	✓ holos	0:22	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
33	✓ opium	2:44	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
34	✓ windhunde	0:31	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
35	✓ arten braten	0:47	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
36	✓ viele fragen	1:45	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
37	✓ thema der gente	1:28	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
38	✓ tutti genti estinti	1:01	Mouse on Mars	Abschaffung der Ar...	Soundtrack	1	
39	✓ Black Scars	3:14	The Residents	Dolor Generar	avantgarde, experimental...	★★	1
40	✓ Burning Madrone	2:15	The Residents	Dolor Generar	avantgarde, experimental...	1	
41	✓ Mary Achi	2:42	The Residents	Dolor Generar	avantgarde, experimental...	1	
42	✓ Memory of Transgression	2:41	The Residents	Dolor Generar	avantgarde, experimental...	1	

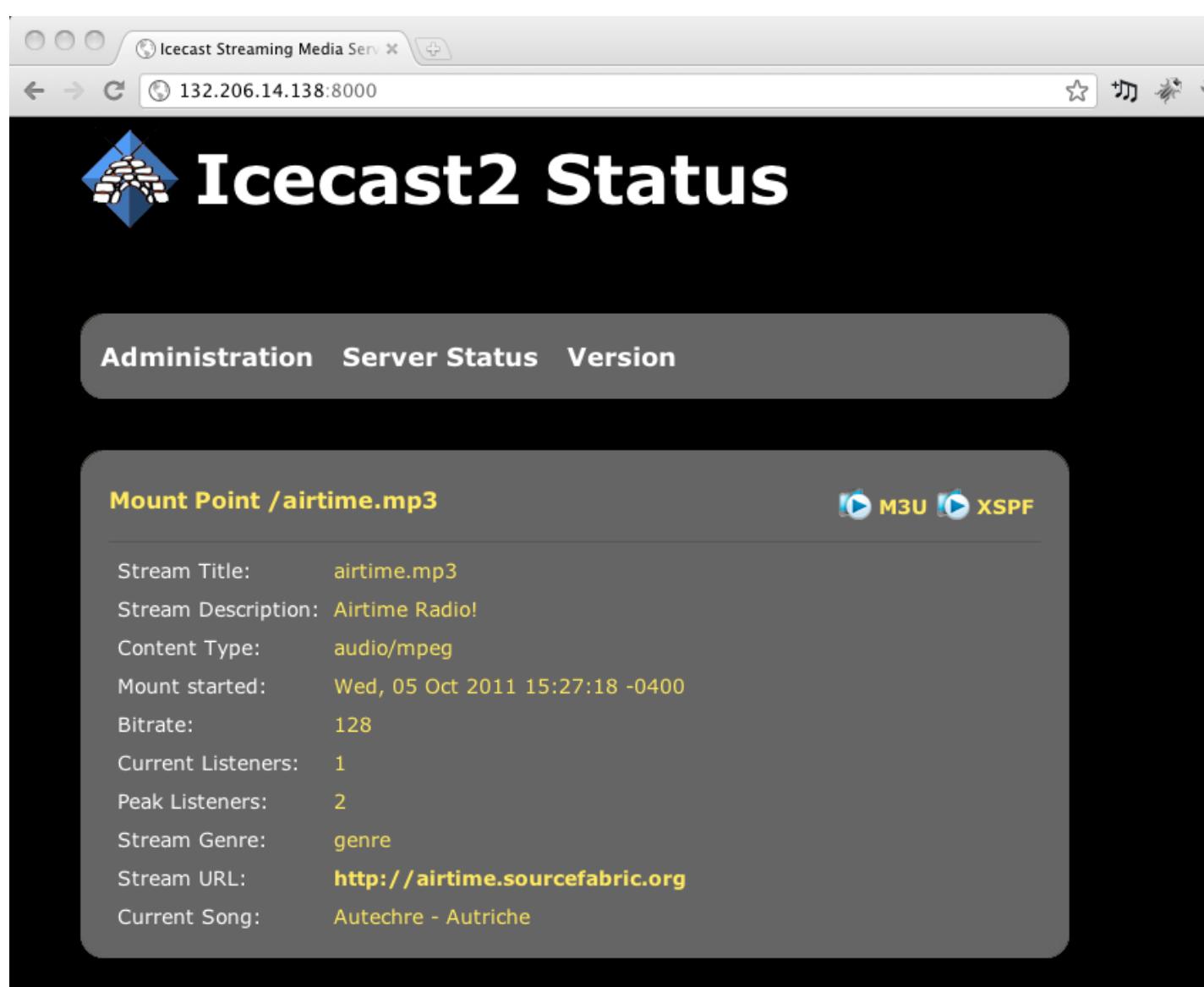
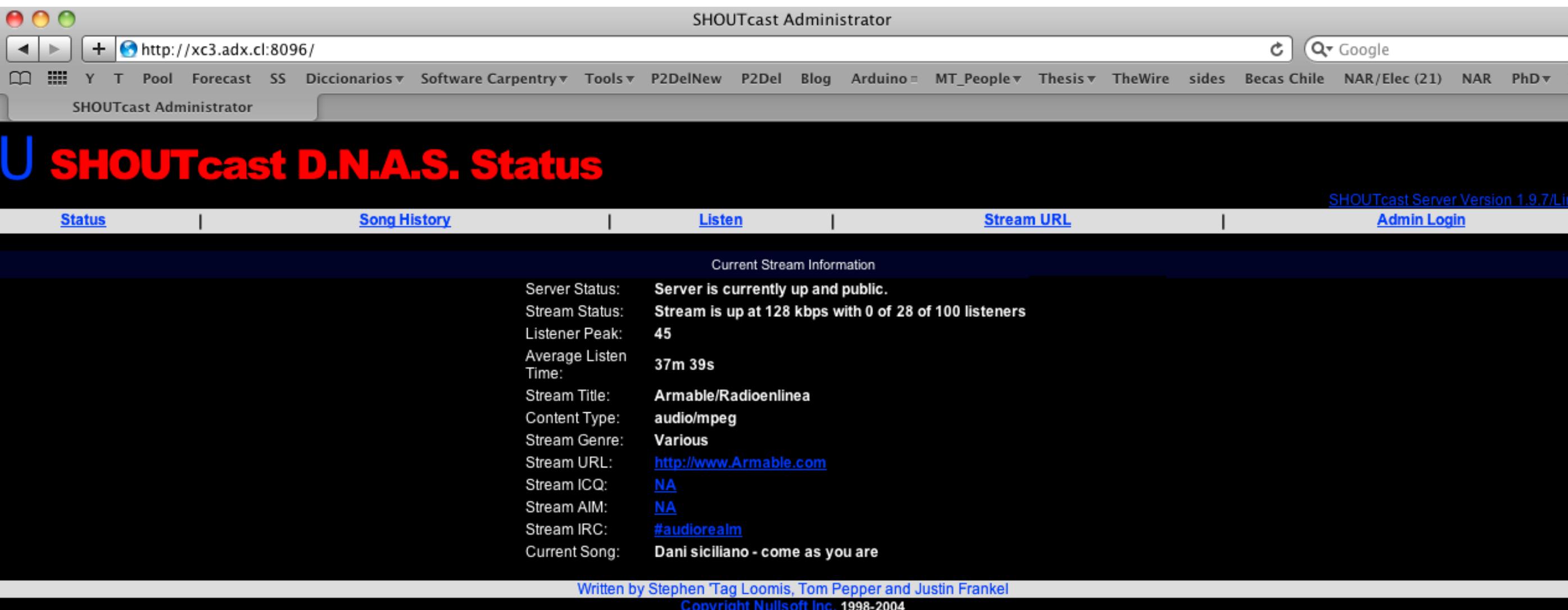
Automated radio broadcasting



Social radio applications



Streaming media servers



<http://icecast.org/faq/>

Streaming media servers

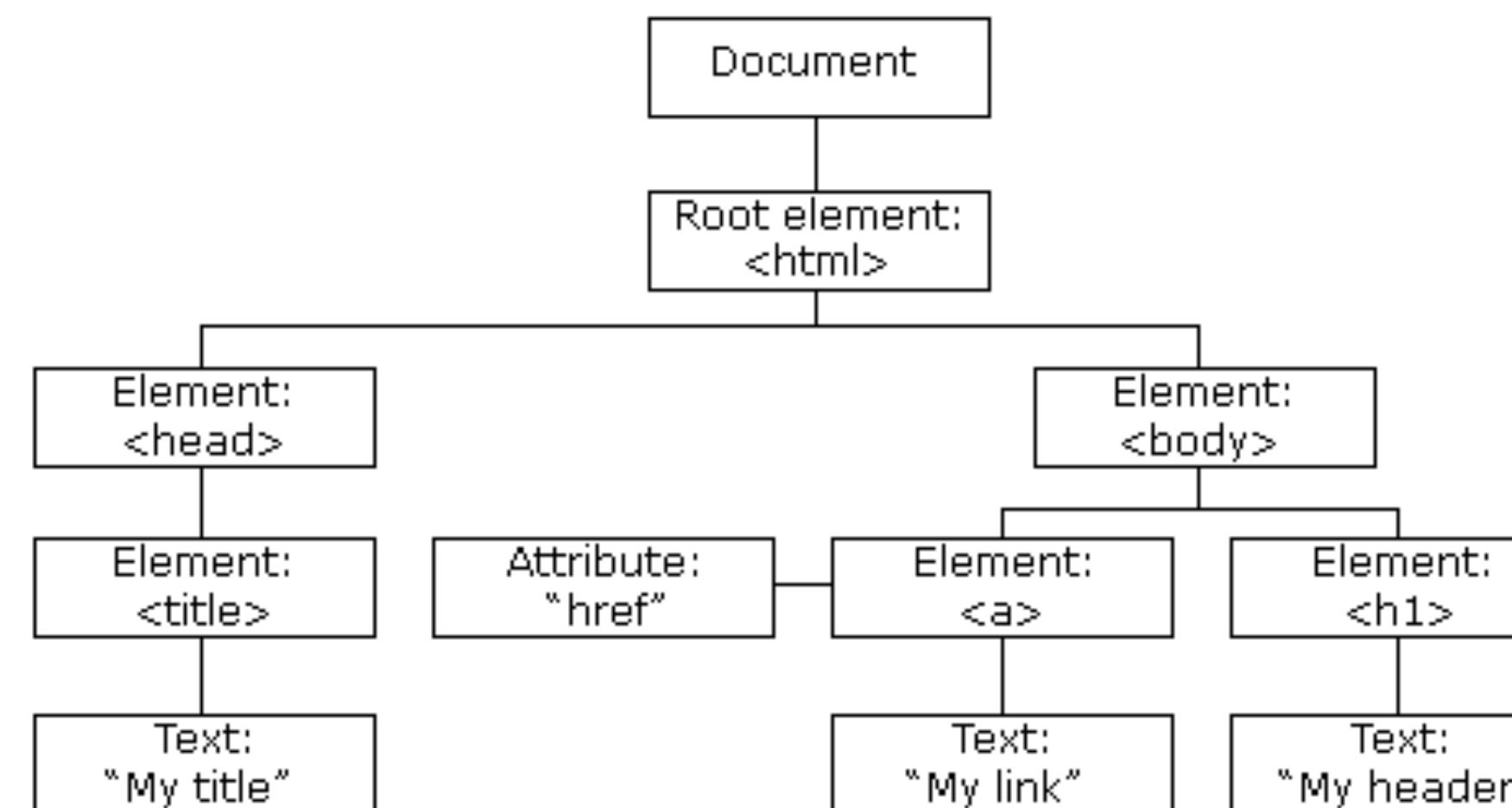
Demo!

- Playlisting app: Spotify
- Audio routing app:
 - Free and open source: Butt + Soundflower
 - Paid and proprietary: Audio Hijack + Loopback
- Streaming media server: Icecast

BREAK

HTML DOM

- "The W3C Document Object Model (DOM) is a platform and language-neutral interface that allows programs and scripts to dynamically access and update the content, structure, and style of a document."
- When a web page is loaded, the browser creates a Document Object Model of the page
- The DOM is constructed as a tree of objects



- With the object model, JavaScript gets all the power it needs to create dynamic HTML