

# Music & the Internet

## MUMT301

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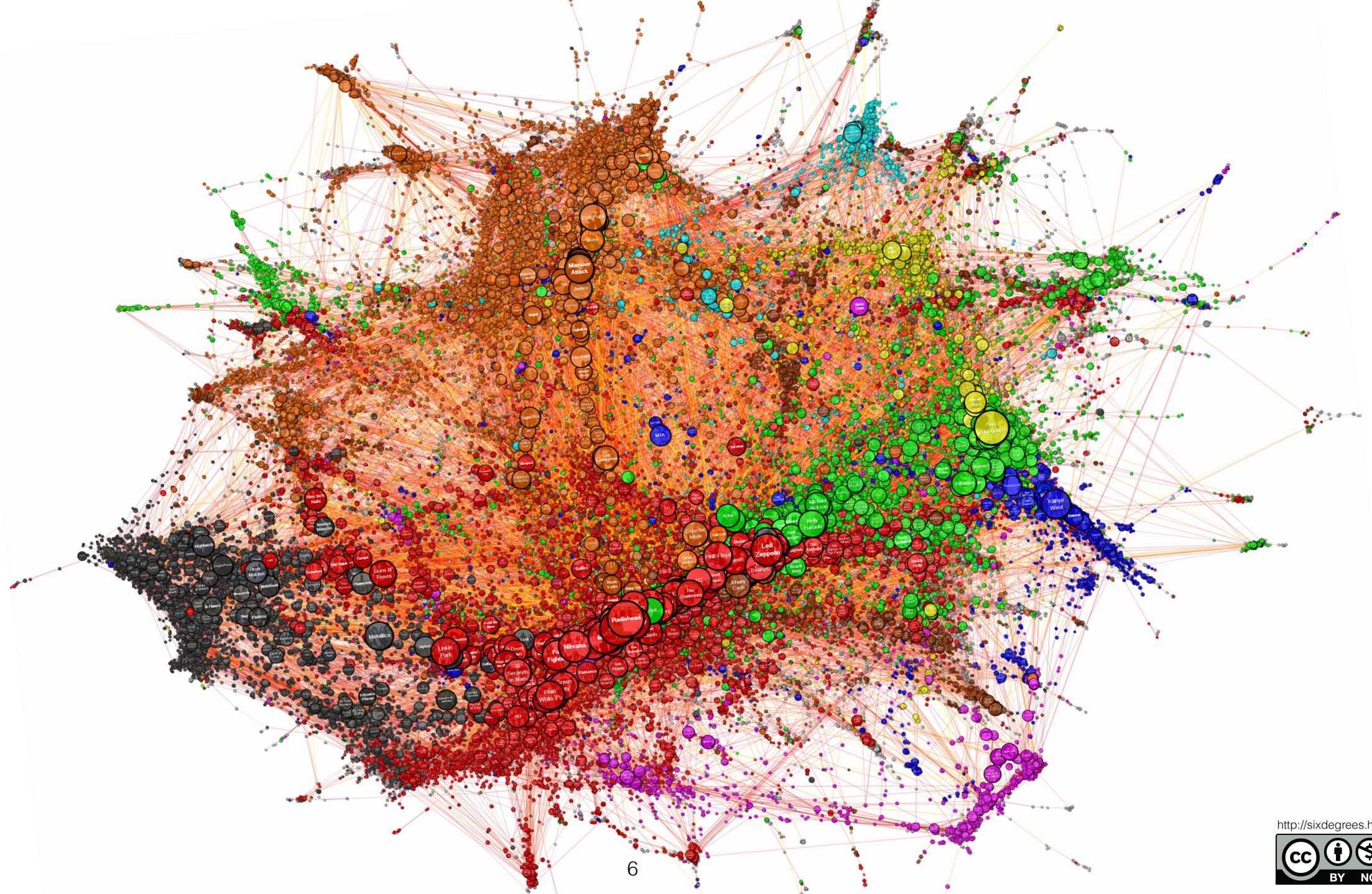
# Plan

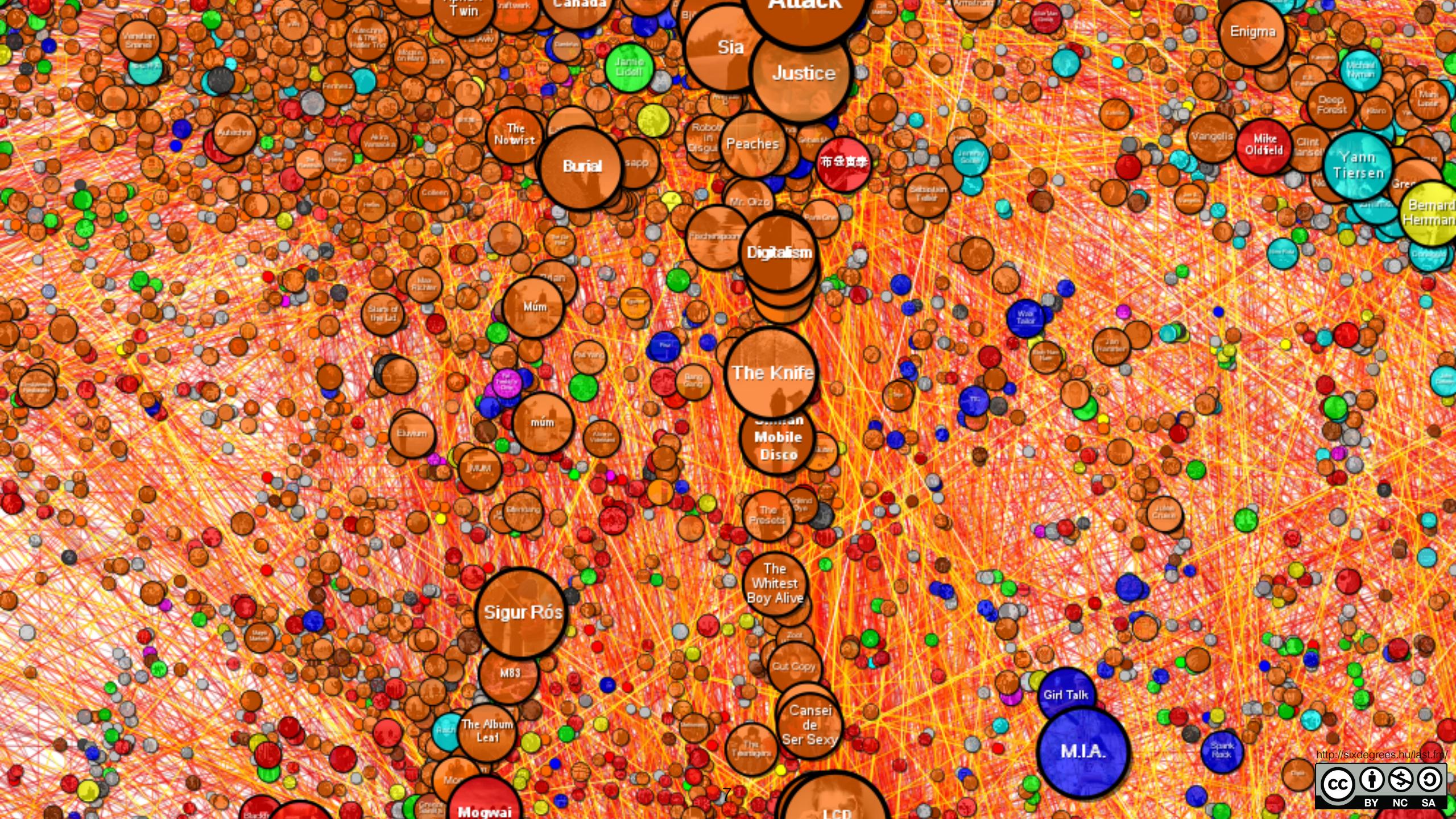
- Assignment 4 review
- Music streaming services presentation
- Automatic music recommendation
- Internet radio broadcasting and streaming media software

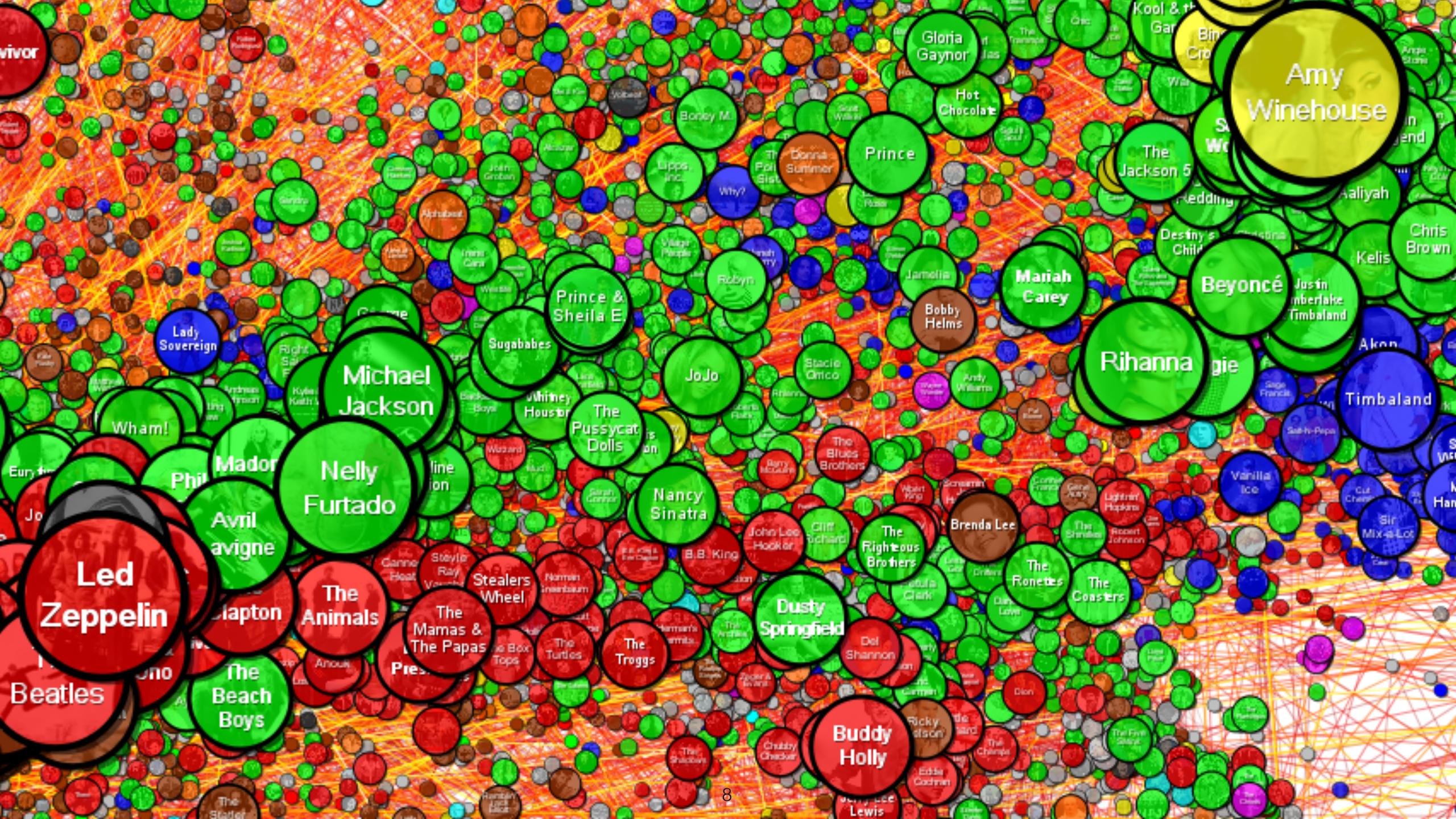
# Assignment 4

- Andrew
- Amelya
- Carlos
- Emmanuel
- Matthew
- Olivier
- Patrick
- Ryan
- Samuel
- Truman
- Willis

# **Automatic music recommendation systems**





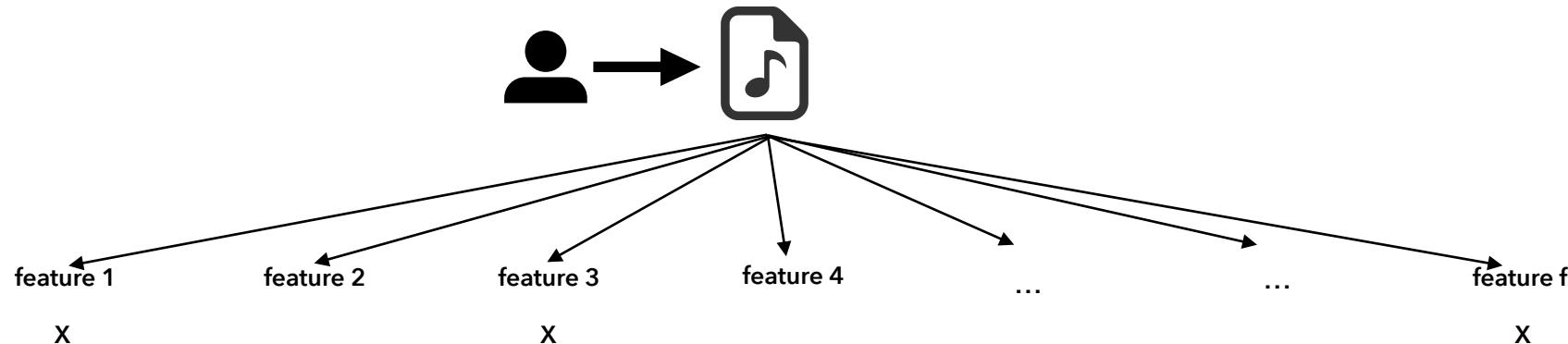


# Music recommendation approaches

- Content-based
- Collaborative filtering

# Music recommendation approaches

## Content-based

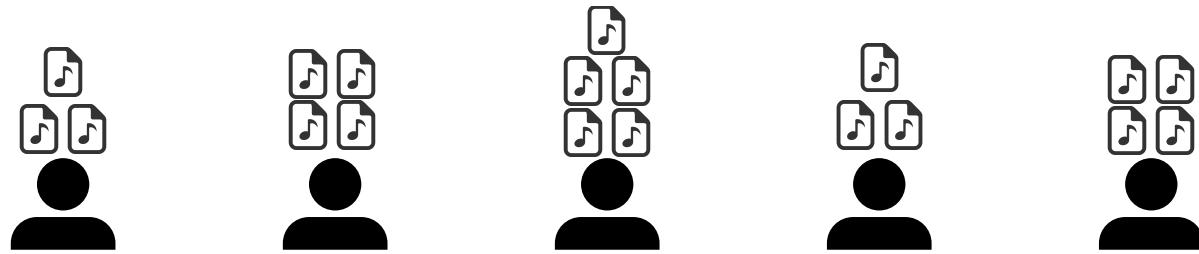


	feature 1	feature 2	feature 3	feature 4	...	...	feature f
music item 1		X					X
music item 2	X	X			X		
music item 3		X			X		X
music item 4			X			X	
...							
...				X			
music item i	X		X		X		X



# 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

	a	b	c	d
b	0.33			
c	0.33	0.25		
d	0.50	0.25	0.25	
e	0.71	0.25	0.43	0.43

Cosine vector similarity  
Angle of vectors in space

	a	b	c	d
b	0.99			
c	0.98	0.92		
d	0.82	0.98	0.99	
e	0.79	0.98	0.81	0.99

Pearson correlation  
Distance of points in space

	a	b	c	d
b	0.93			
c	0.52	0.20		
d	-0.39	0.96	-0.51	
e	-0.06	1.00	-0.30	0.94

# Music recommendation approaches

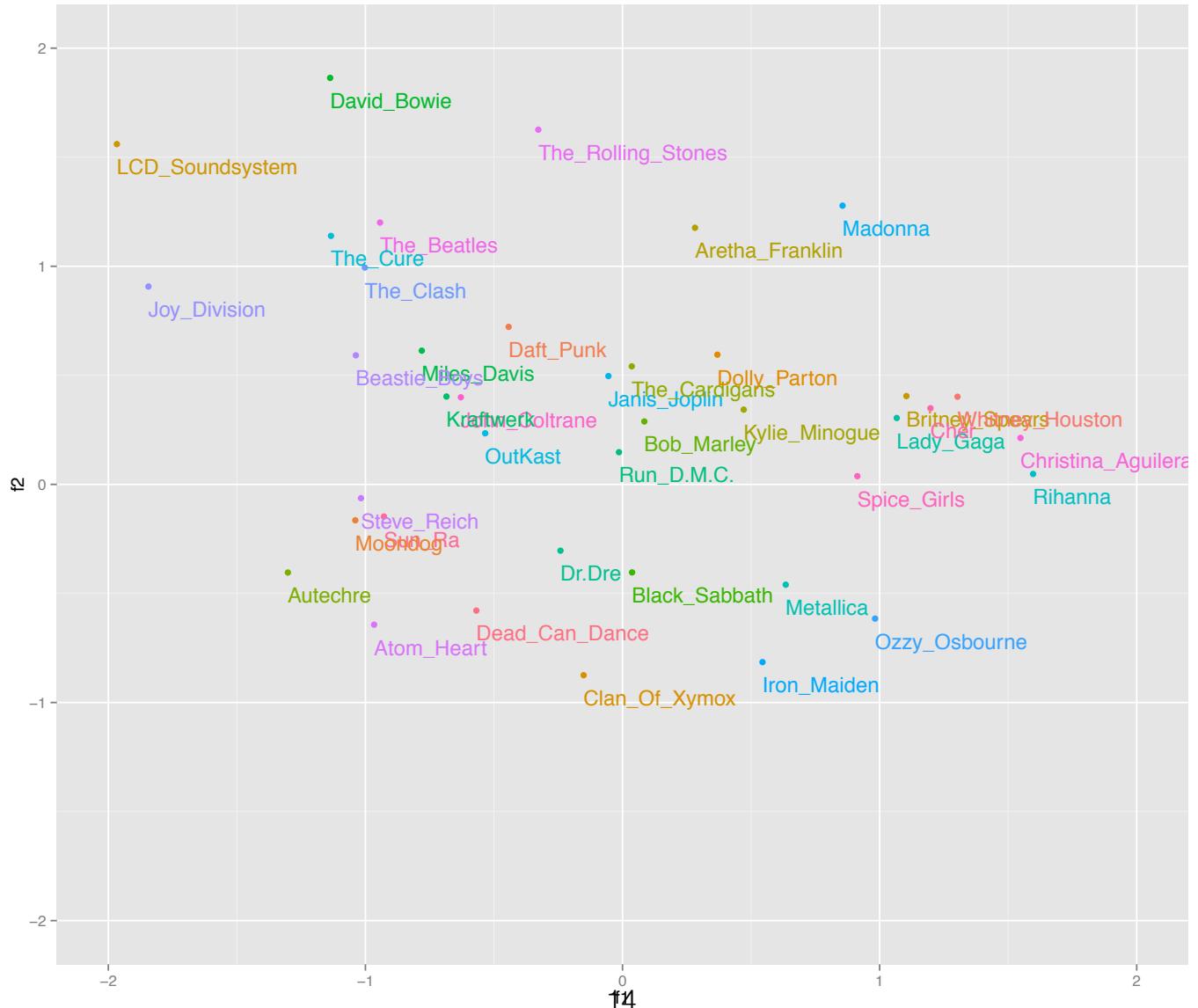
## Collaborative filtering

## 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

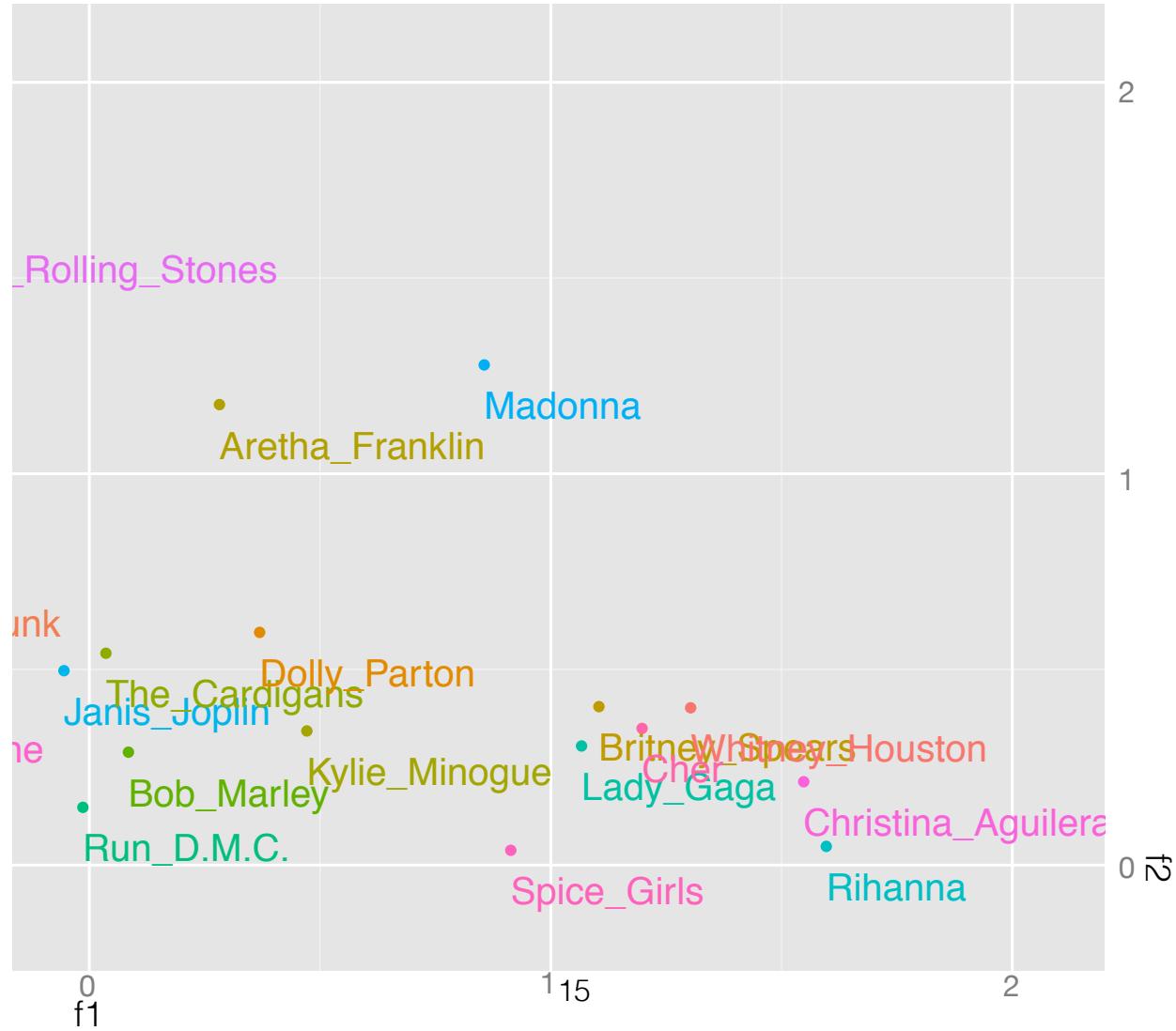
# Music recommendation approaches

## Latent factors models



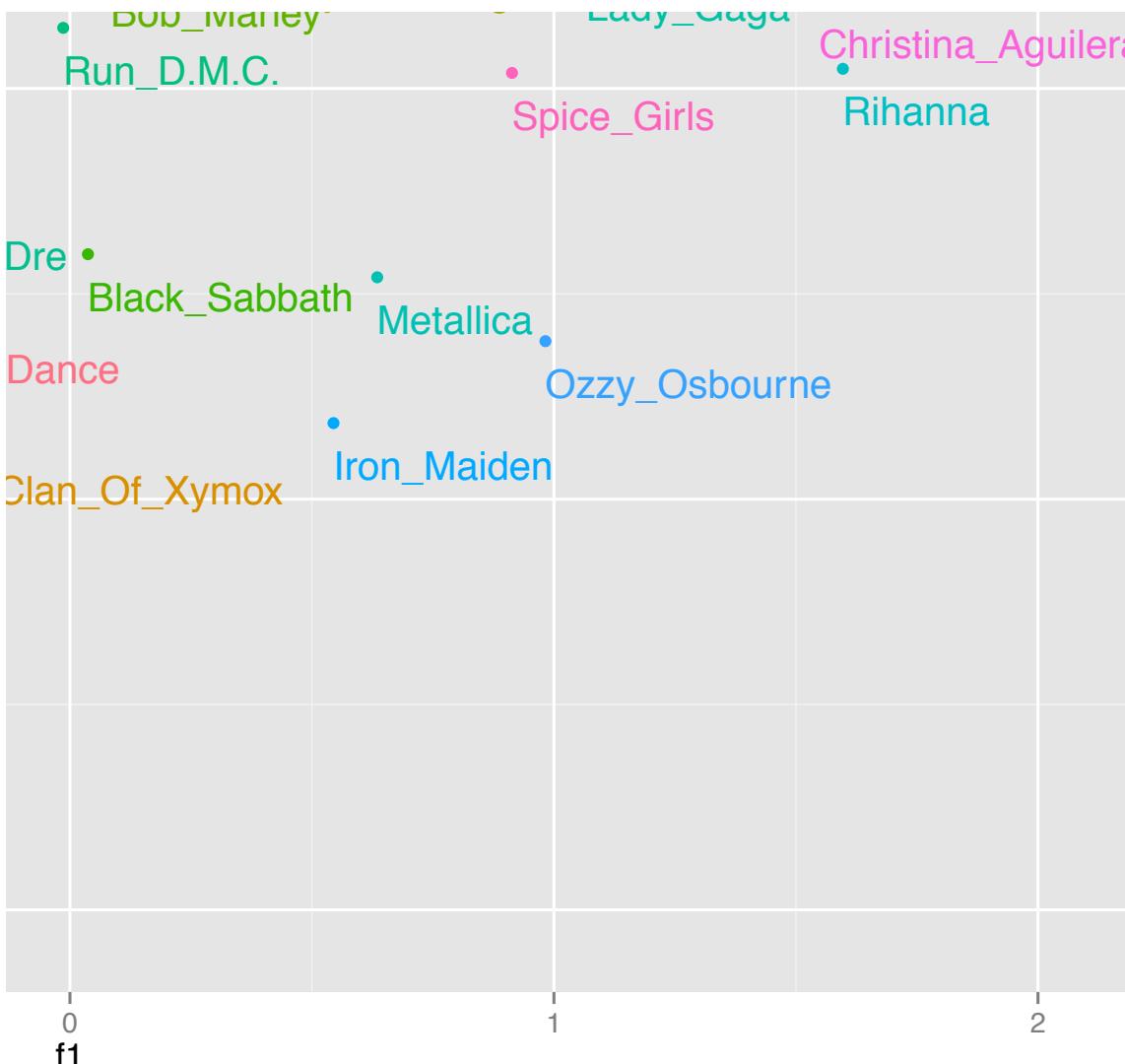
# Music recommendation approaches

## Latent factors models



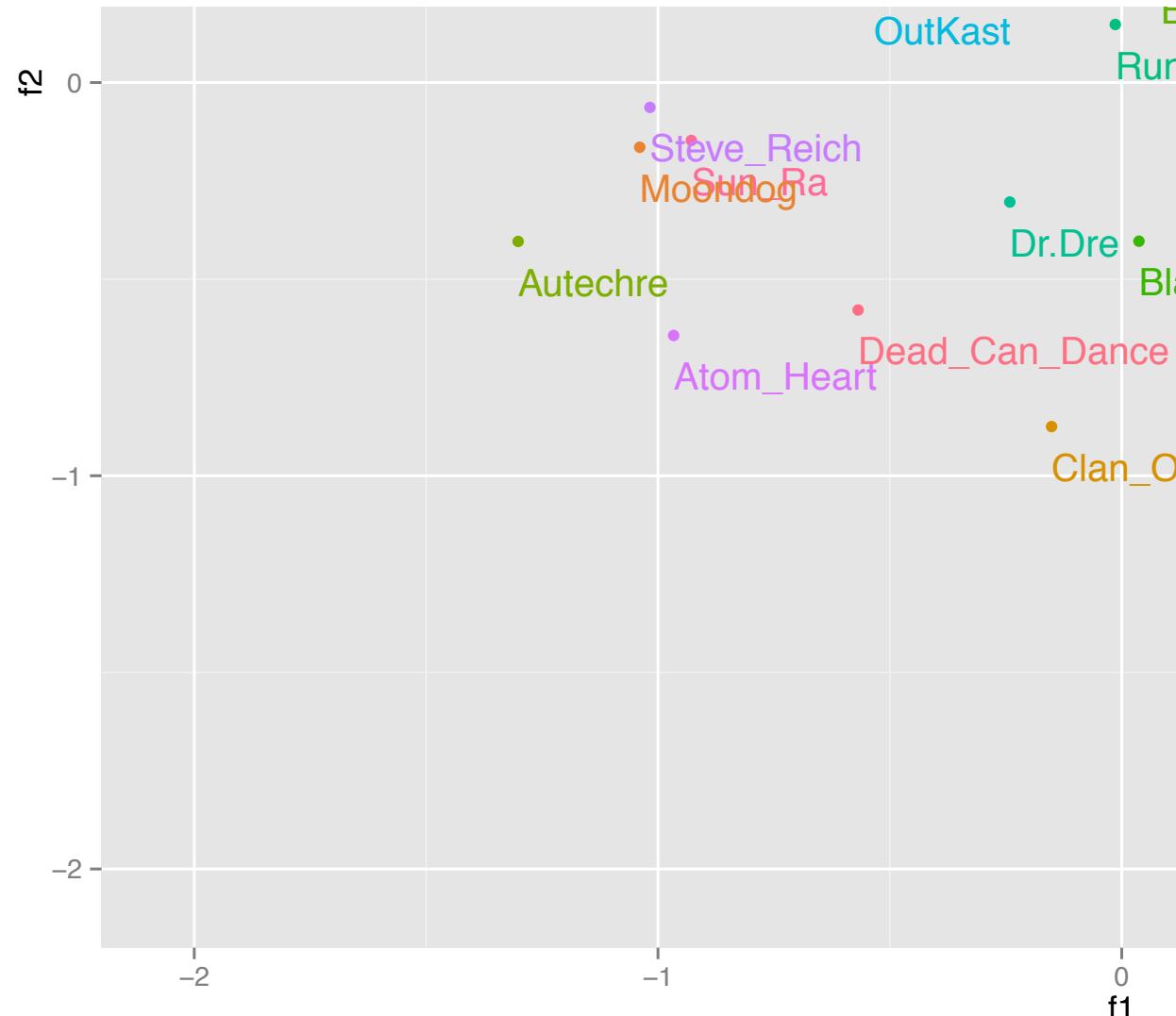
# Music recommendation approaches

## Latent factors models



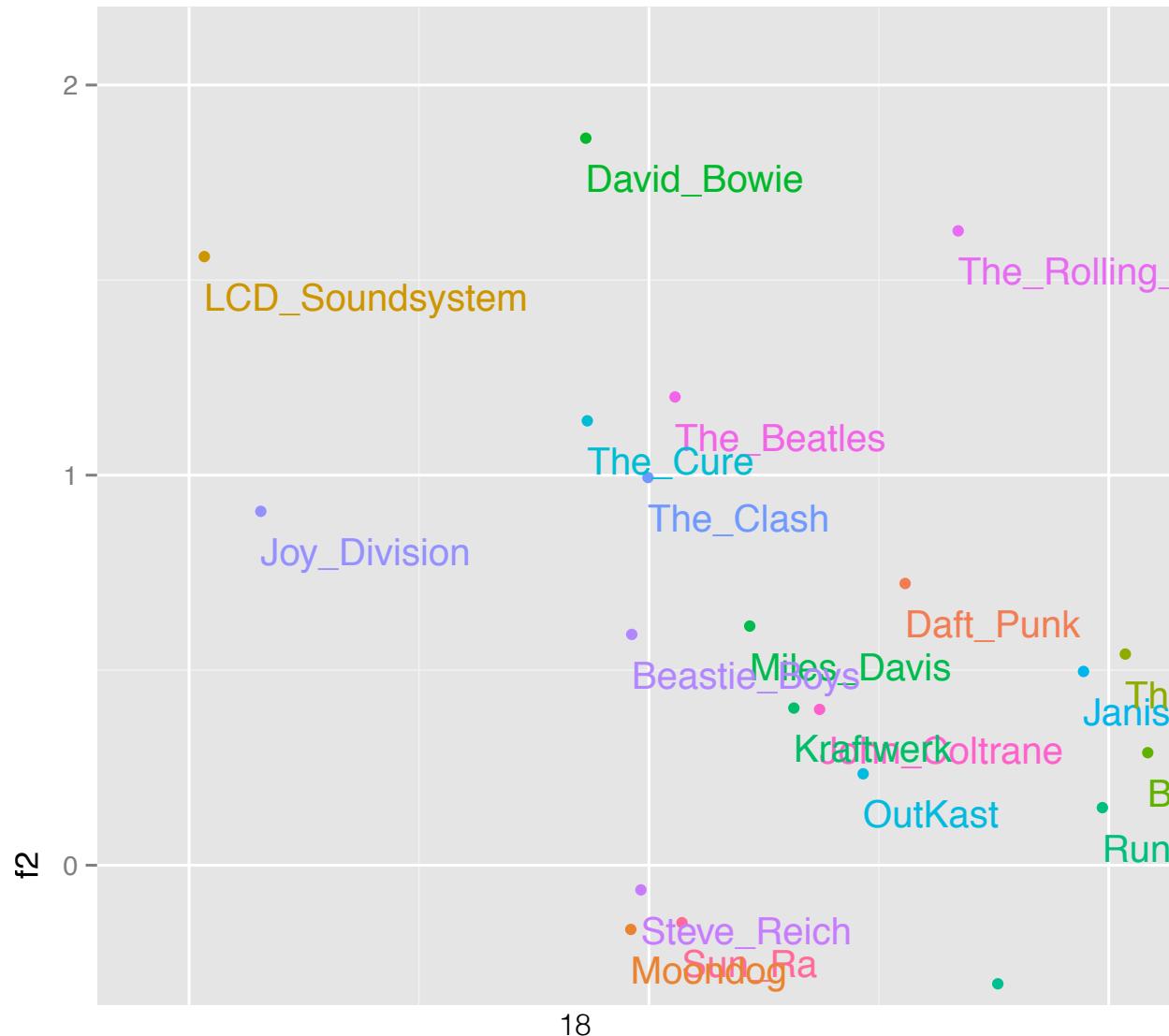
# Music recommendation approaches

## Latent factors models



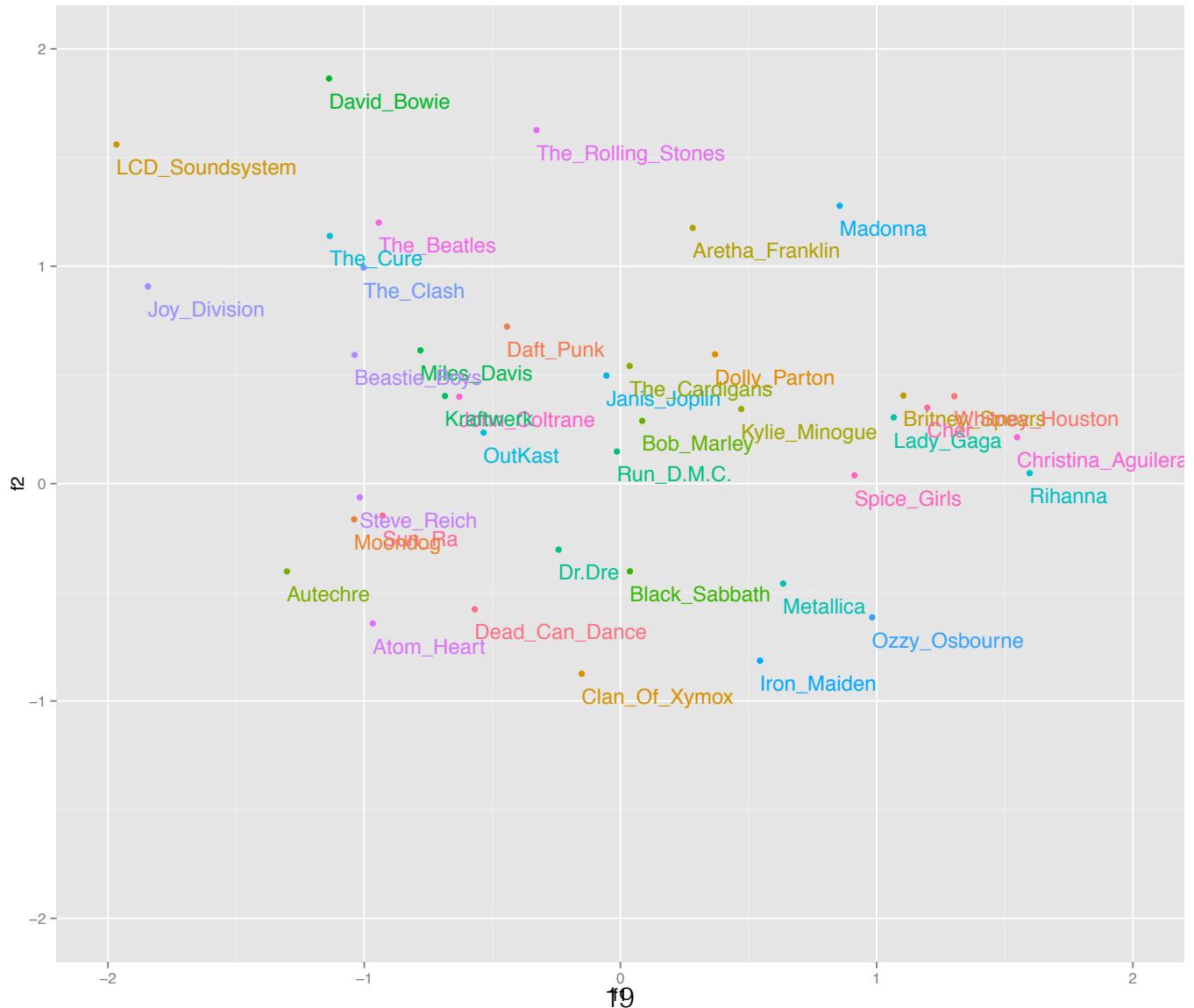
# Music recommendation approaches

## Latent factors models



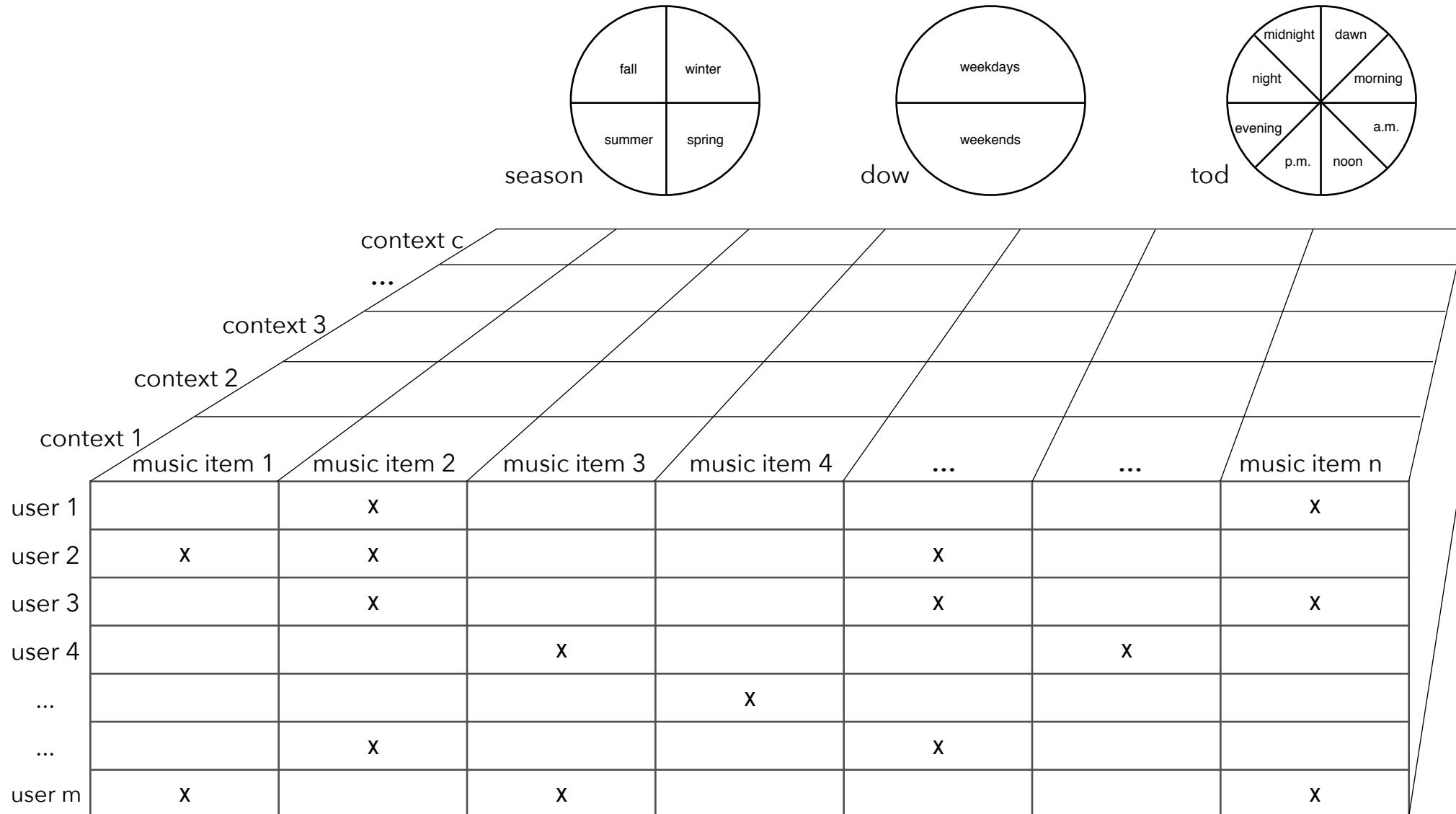
# Music recommendation approaches

## Latent factors models



# Music recommendation approaches

## Incorporating context into the model



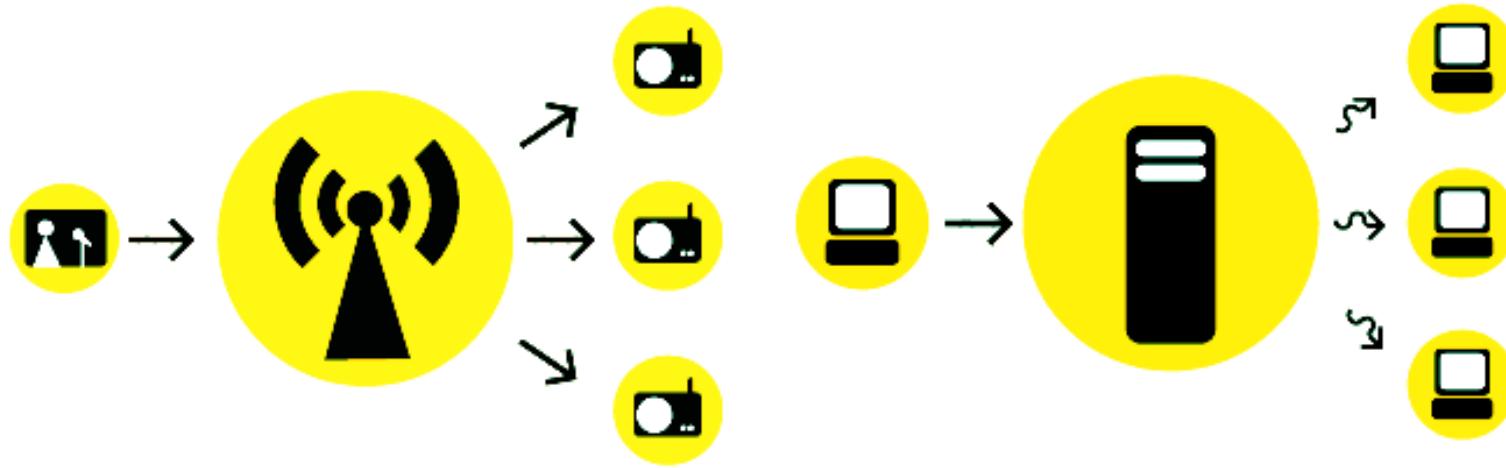
# Music recommendation approaches

## Incorporating side features into the model

				<b>factor1</b>	-0.1250	-0.0758	0.2597	-0.4078	0.3469	0.4341	0.8519	0.5257	0.7062	-1.6830
				<b>factor2</b>	0.3663	0.2352	-0.1869	-0.3558	0.9251	0.8393	-0.8159	-1.2368	-0.8491	-0.0734
<b>gender</b>	<b>age</b>	<b>factor1</b>	<b>factor2</b>	<b>user/artist</b>	<b>beatles</b>	<b>rolling</b>	<b>bsabbath</b>	<b>metallica</b>	<b>miles</b>	<b>coltrane</b>	<b>autechre</b>	<b>dpunk</b>	<b>reich</b>	<b>bartok</b>
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

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

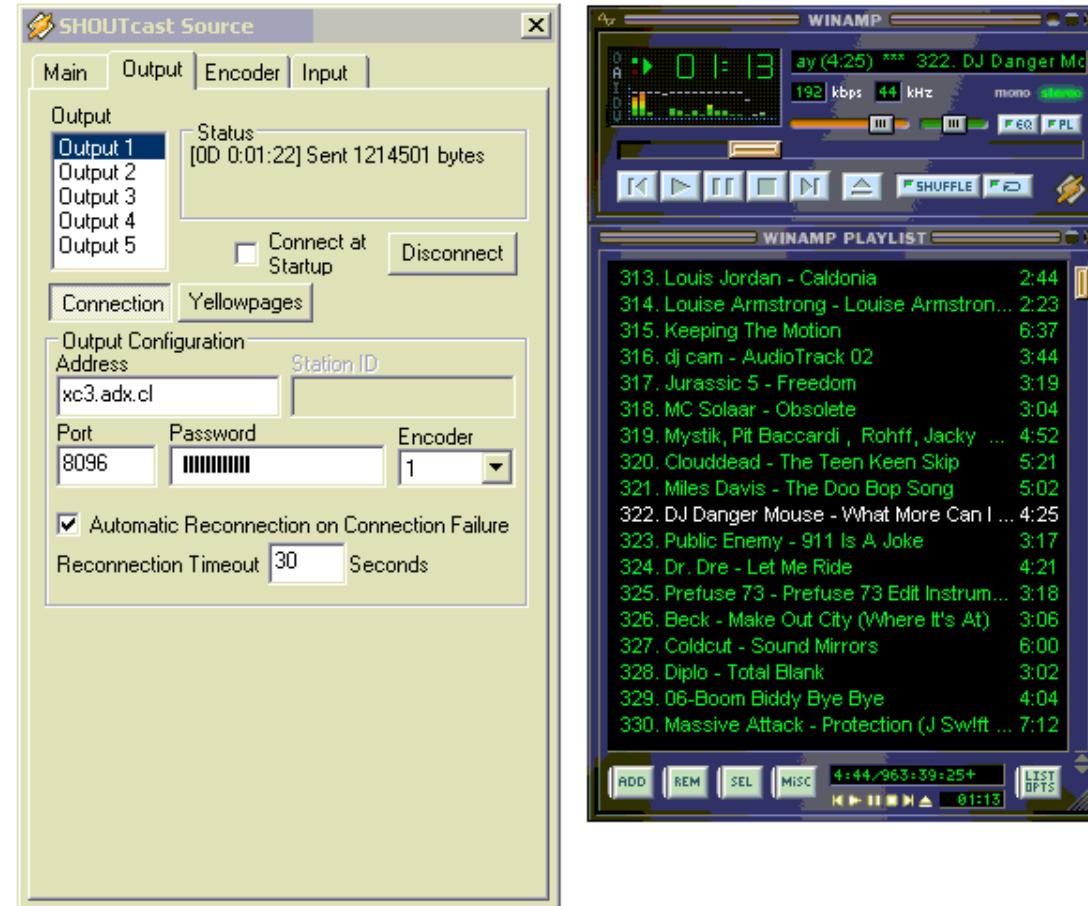
# Internet radio broadcasting



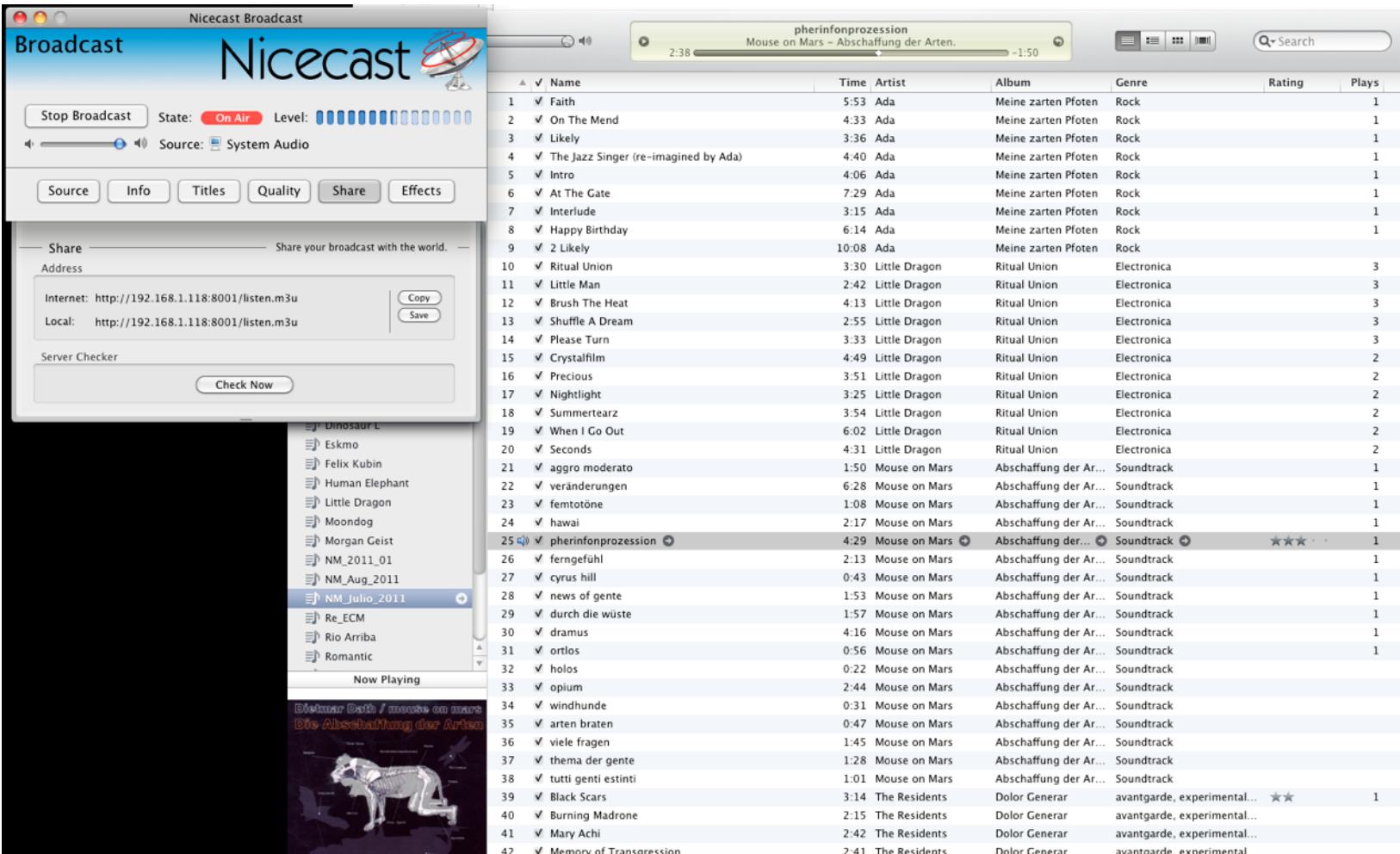
Unicast: Sends IP packets to identified recipients on a network, with added bandwidth

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.

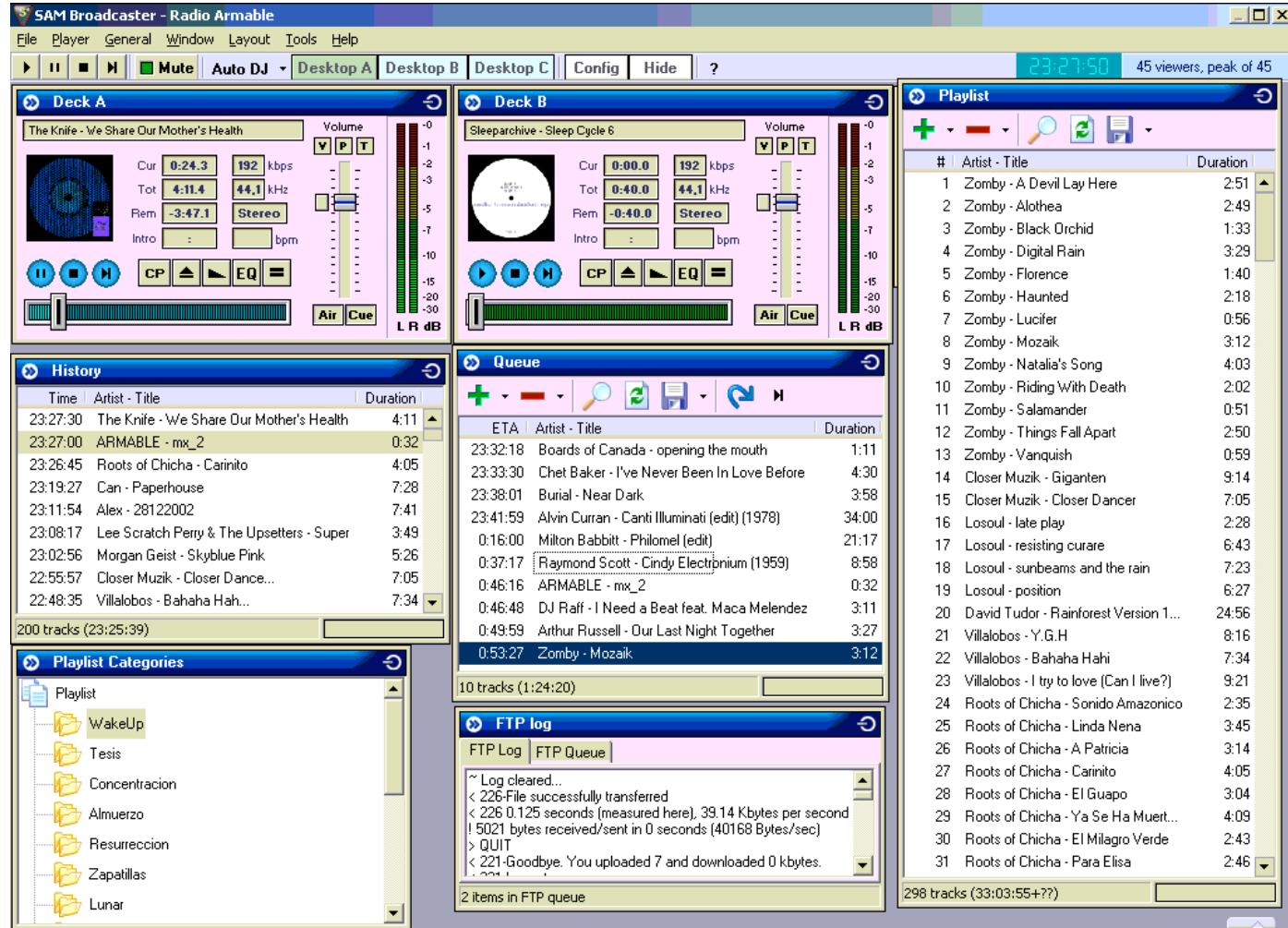
# Playlist creation applications



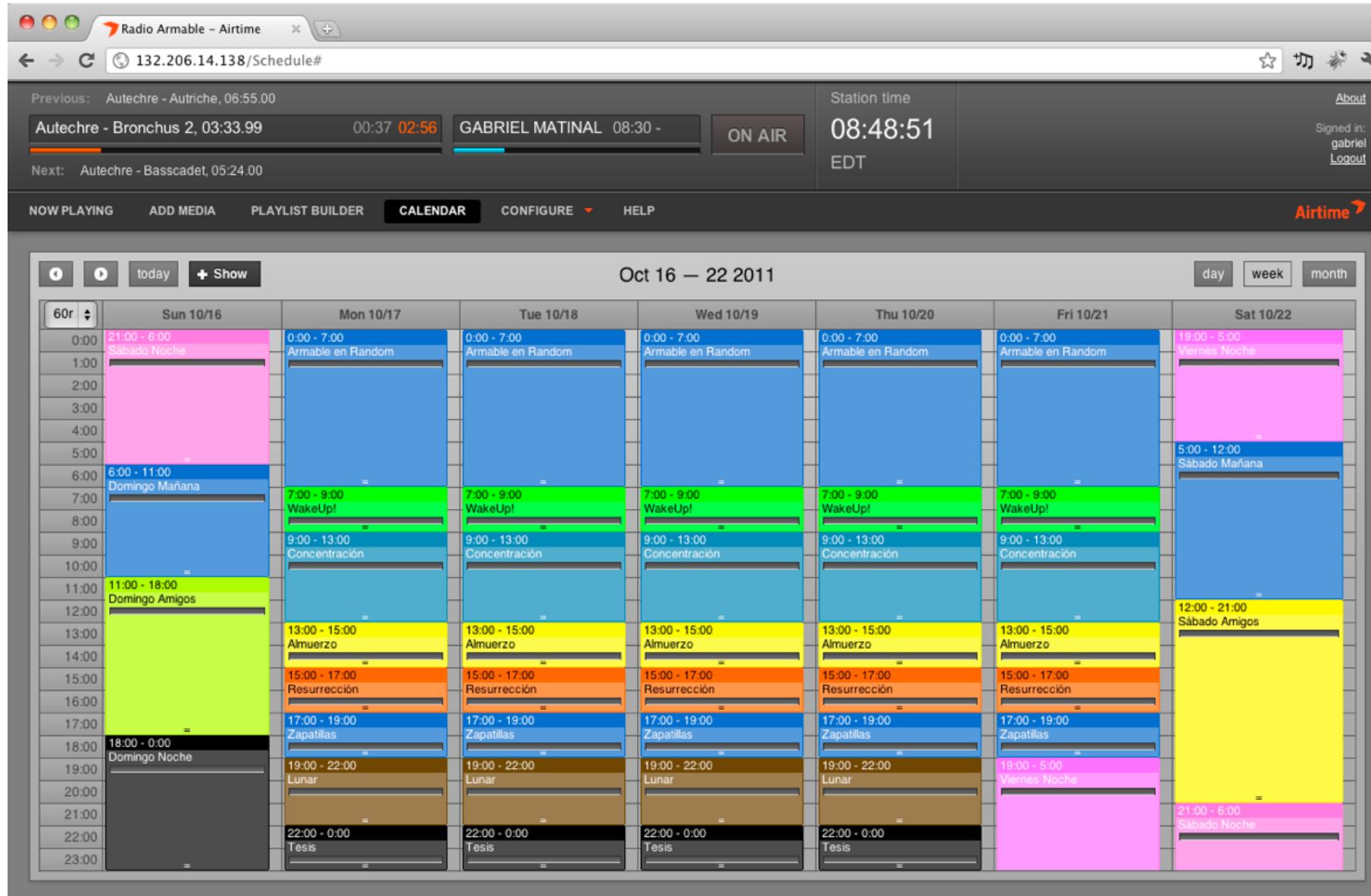
# Playlist creation applications



# Automated radio broadcasting



# Social radio applications



# Streaming Media Servers

