Kick-Off & Tool Presentations

Fri, 30 Sep 2016, 18:00 - 20:30

2nd Waves Vienna Music Hackday

Successful start last year

Crossover between music & technology

People with many different backgrounds:

Hobby producer

Digital creatives

Hardware tinkerer

Artists

Coder

Researcher

Musicians

Audio geek

IT specialists

Music Hacking?

music apps

audience interaction

software

platforms

new instruments

sound installations

wearables

hardware

Anything goes, as long as it is related to music!

Tool Presentations

– Ultrasonic Audio Technologies
– MOD Devices: Step onto the future with MOD Duo
– IRCAM: Sound Music Movement Interaction
– Musimap's human and AI based music recommendation API
– Plux: BITalino – A DiY biosignals (r)evolution
– A Tour of Deezer Developer Tools
– Europeana Sounds: Identifying genres in musical heritage
– GiantSteps: Music Analyisis and Composition APIs
– MusicBricks tools
– Announcement of Challenges and Awards

ULTRASONIC

AUDIO TECHNOLOGIES

By:
Miha
Ciglar

Creating directional sound and contact free tactile feedback through airborne ultrasound

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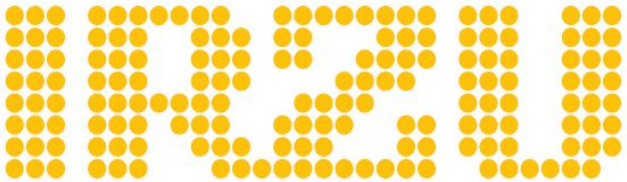
AUDIO TECHNOLOGIES

2008



INŠTITUT ZA RAZISKOVANJE ZVOČNIH UMETNOSTI

INSTITUTE FOR SONIC ARTS RESEARCH

ULTRASONIC
AUDIO TECHNOLOGIES

Syntact - contact-free tactile feedback:

The musician feels the frequencies and the temporal features of music and can change them in real time by virtually moulding the tactile signal

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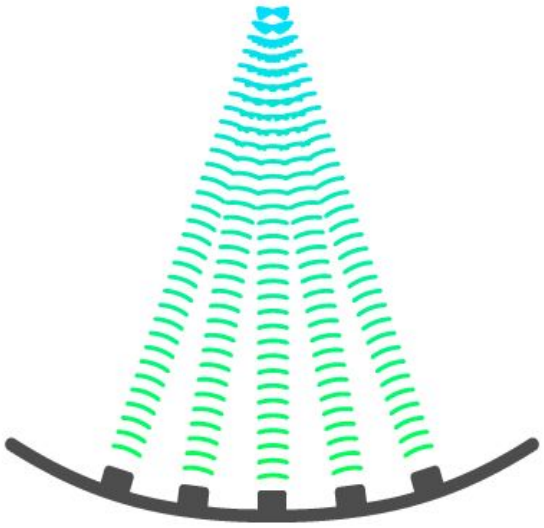
Syntact is a musical interface – It allows direct physical interaction with music



The acoustic energy off all the transducers is accumulated in the focal point where it creates a physical force (a tangible vibration)

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Syntact - contact-free tactile feedback:

Visualization of the ultrasonic waves and the focal point with liquid nitrogen

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Acouspade – speaker with focus (2012)

Hyper-directional sound is created by modulating a high frequency carrier. Due to nonlinear interaction of sound waves in air, the modulated ultrasonic signal gets self demodulated and becomes audible while passing through air.

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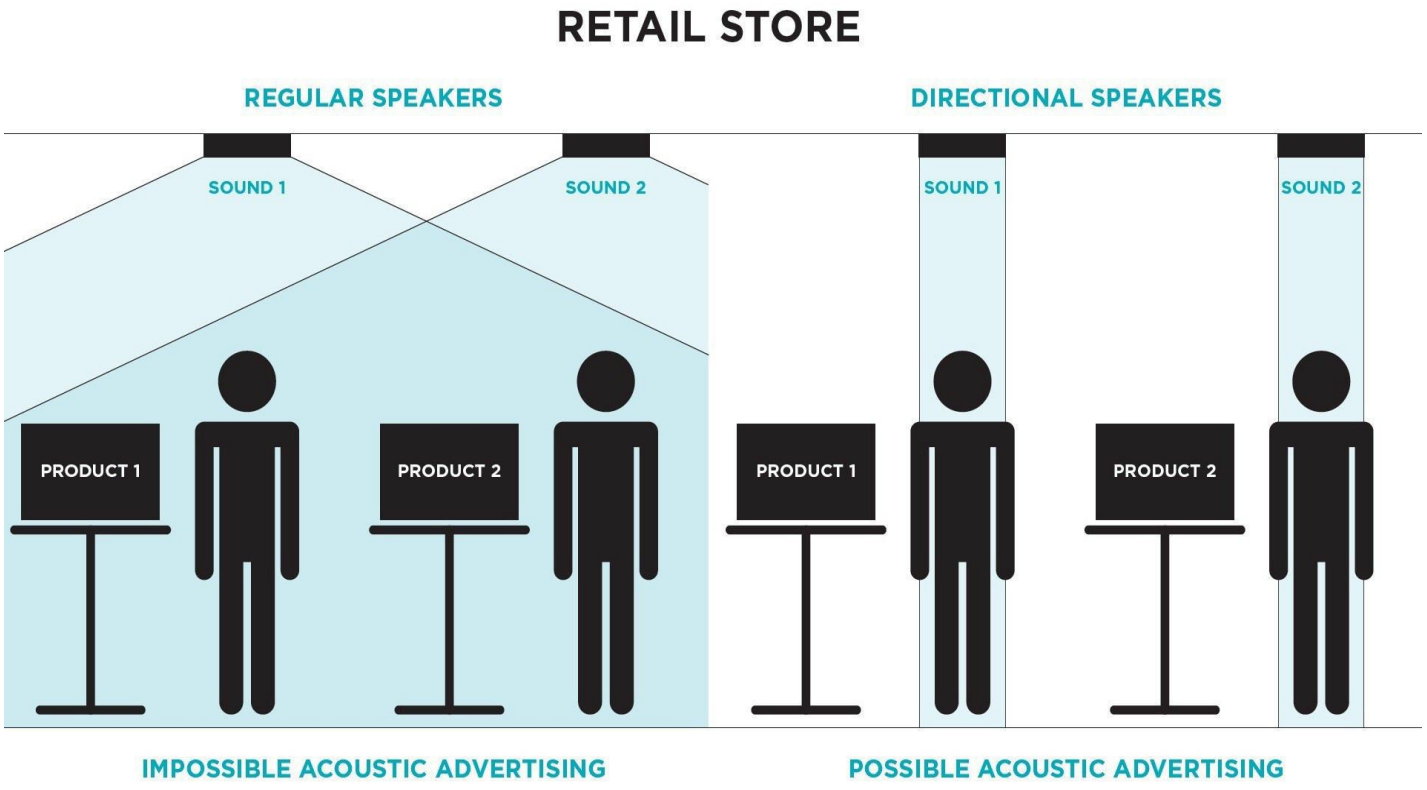
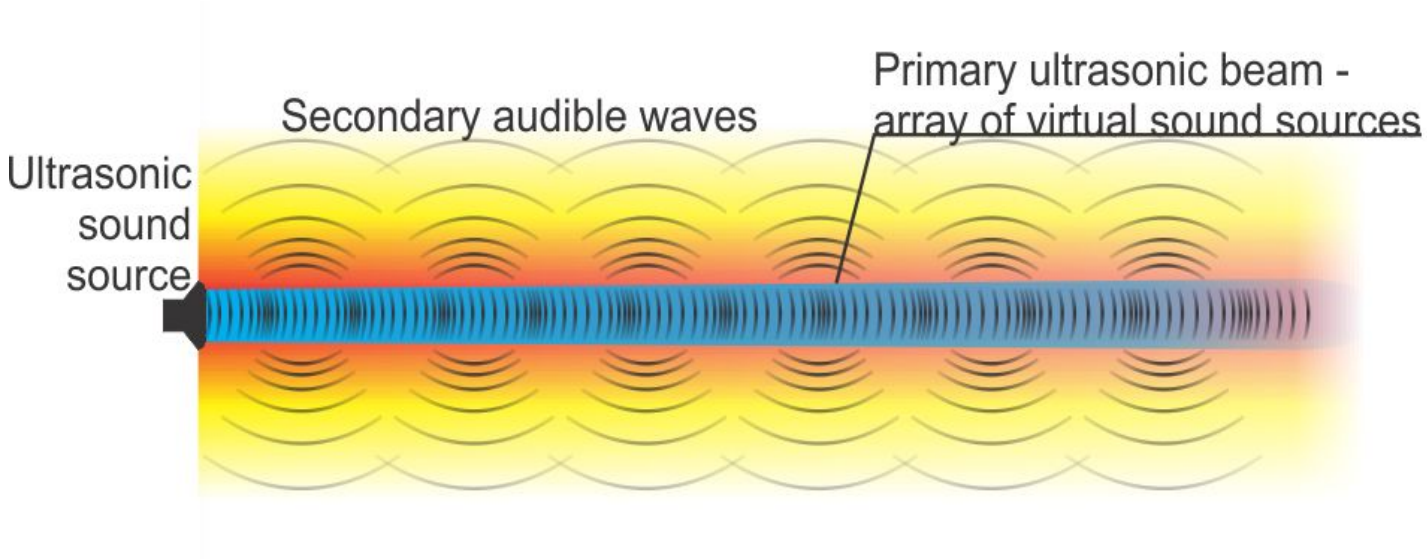
AUDIO TECHNOLOGIES

Applications: in-store advertising, museums, galleries



Operation principle

The term Parametric Acoustic Array (PAA) was introduced by P. J. Westervelt in 1963



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Acouspade 134AB(S)DUMA-M/S

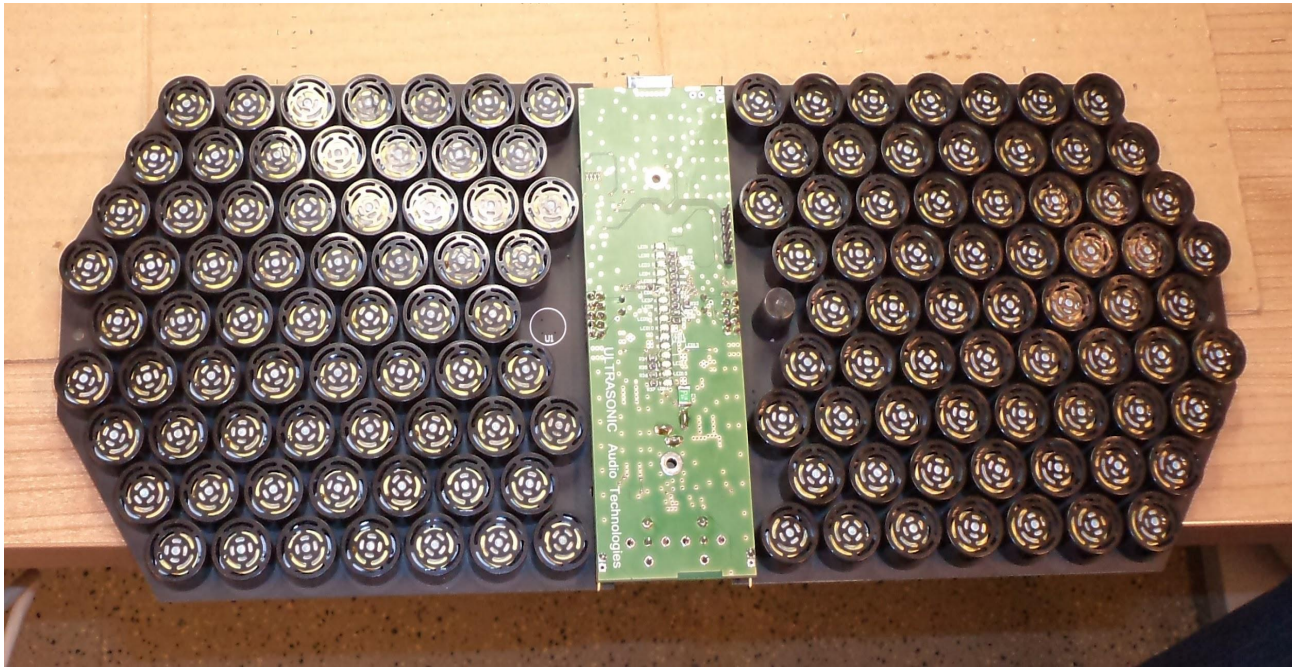
-Miniaturised amplifier integrated within the emitter housing

-Bluetooth connection

-Motion detection

ULTRASONIC
AUDIO TECHNOLOGIES

Acouspade AB(S)-134-DUMA-M/S



guts

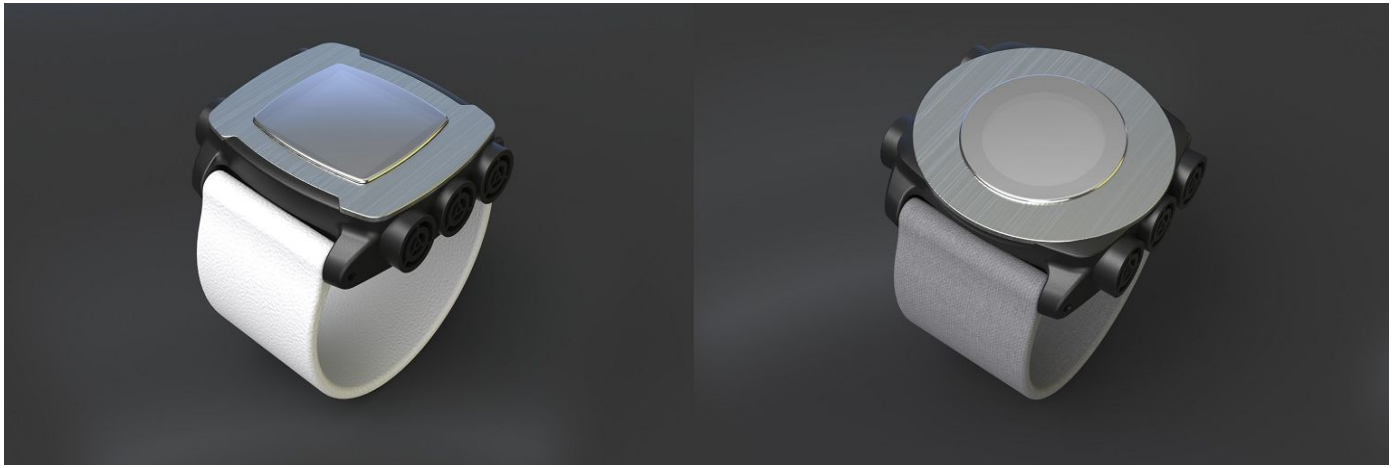
ULTRASONIC
AUDIO TECHNOLOGIES

Acouspade AB(S)-134-DUMA-M/S

-Launch: 1st March 2016

ULTRASONIC
AUDIO TECHNOLOGIES

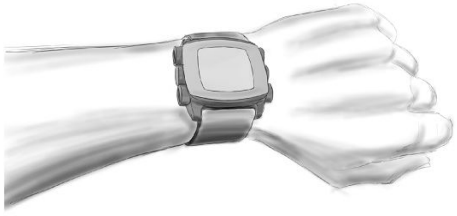
TaPa (Talking Palm)

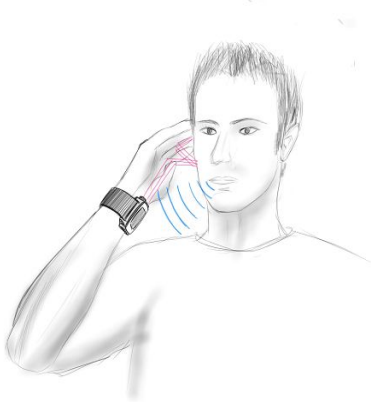


TaPa is - a bracelet containing a directional speaker. The bracelet is a substitute for the mobile phone. A hyper-directional speaker is mounted below the wrist, facing the palm. When you put your hand close to your ear, the sound bounces off the palm and is directed into your ear.

ULTRASONIC
AUDIO TECHNOLOGIES

TaPa

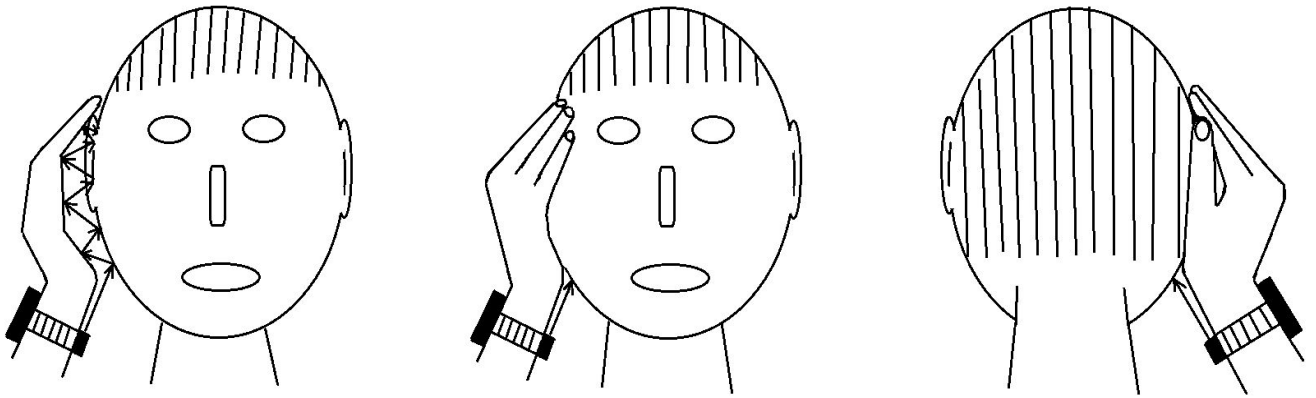




-When you want to make a call, just rotate the bracelet around your wrist and lean you palm next to your ear

ULTRASONIC
AUDIO TECHNOLOGIES

TaPa



-A hyper-directional speaker is mounted bellow the wrist, facing the palm

-The sound enters a cavity formed between the face and the palm, where it is additionally amplifies through acoustic resonances

-The sound does not spread into the environment which preserves silence for others and creates privacy for you

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AUDIO TECHNOLOGIES

Thank you!

ULTRASONIC
AUDIO TECHNOLOGIES

MOD

{SOUND MUSIC MOVEMENT} INTERACTION

Joseph Larralde
Gabriel Meseguer Brocal

http://ismm.ircam.fr/

ircam Centre Pompidou

{SOUND MUSIC MOVEMENT} INTERACTION

RapidMix :

- Rapid Adaptive Prototyping for Industrial Design of Multimodal Interactive eXpressive technology

- wrap together technologies from Europe's research institutions in an API that will ease the use of bio / gesture sensors with machine-learning, MIR and audio synthesis algorithms for multimodal, interactive, expressive applications

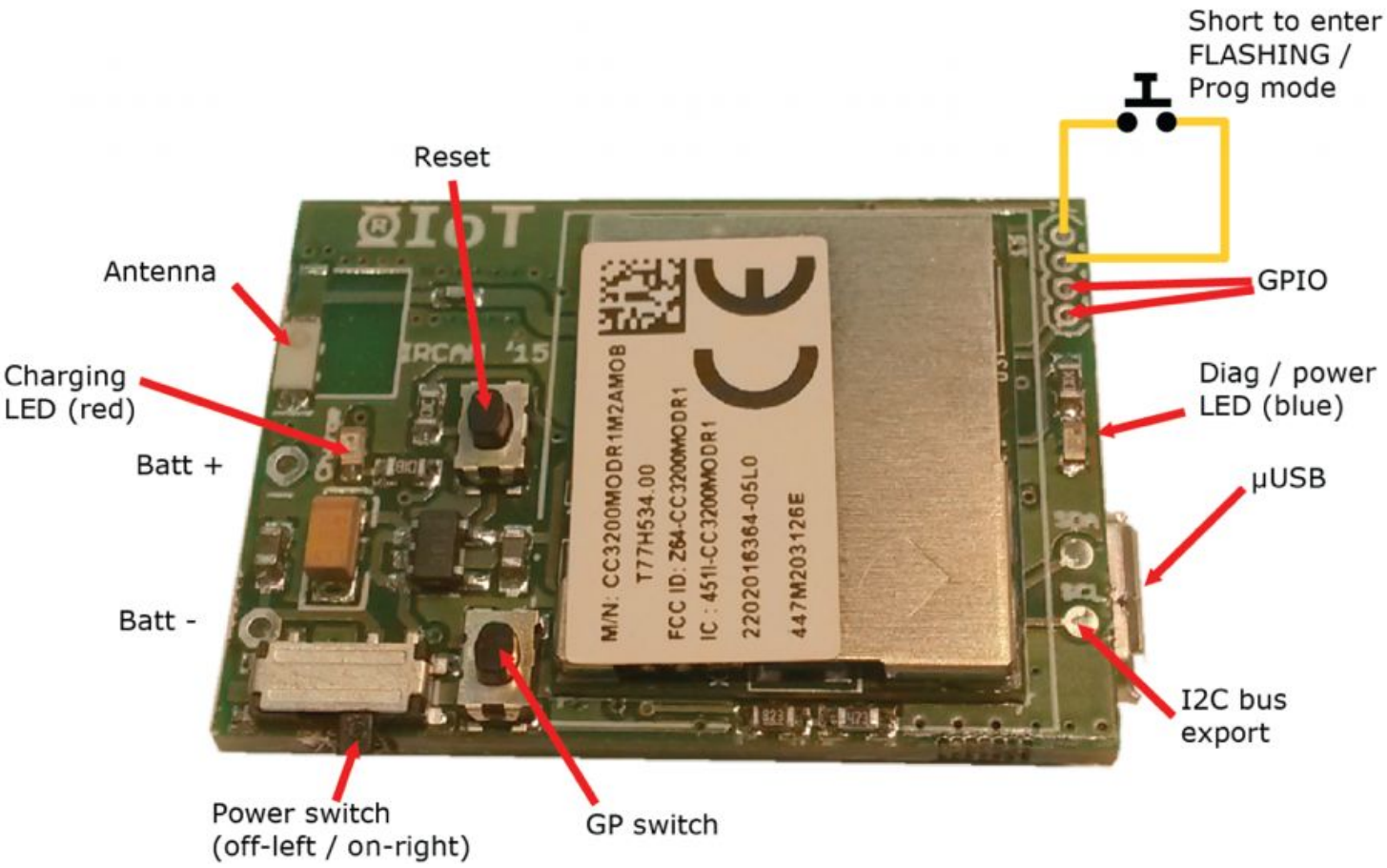
http://rapidmix.goldsmithsdigital.com/

Provided tools :

- R-IoT sensor
  Programmable 9 axis sensor board (IMU) sending OSC data over WiFi
- MuBu (MIR / audio synthesis library for Max)
  multi-buffer container with associated tools for gesture and sound analysis / synthesis
- XMM (machine learning library for gesture recognition)
  C++ library provided as MuBu objects / Python module / Node.js addon

R-IoT WiFi Motion Sensor

9 axis- sensor with 3D accelerometers, gyroscopes and magnetometers



#MusicBricks

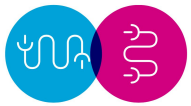
R-IoT WiFi Motion Sensor

OSC Wifi Stream at 200 ms

- 3 accelerometers
- 3 gyroscopes
- 3 magnetometers
- Quaternions and Euler Angles

Based on Texas Instrument WiFi module with a 32 bit Cortex ARM processor

Compatible with TI's Code Composer and with Energia, a port of the Arduino environment



Sensor Analysis

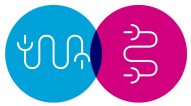
MaxMSP patches to facilitate the R-IoT modules

- Visualization and filtering
- Kick detection
- “Energy” computation

Playing Techniques

- Freefall
- Shaking
- Spinning

Gesture Recognition available in the free MuBu library (Max7)



ircam
Centre
Pompidou

{SOUND MUSIC MOVEMENT} INTERACTION

Music & Emotions

Waves Vienna Music HackDay
Vienna, 01/10/2016

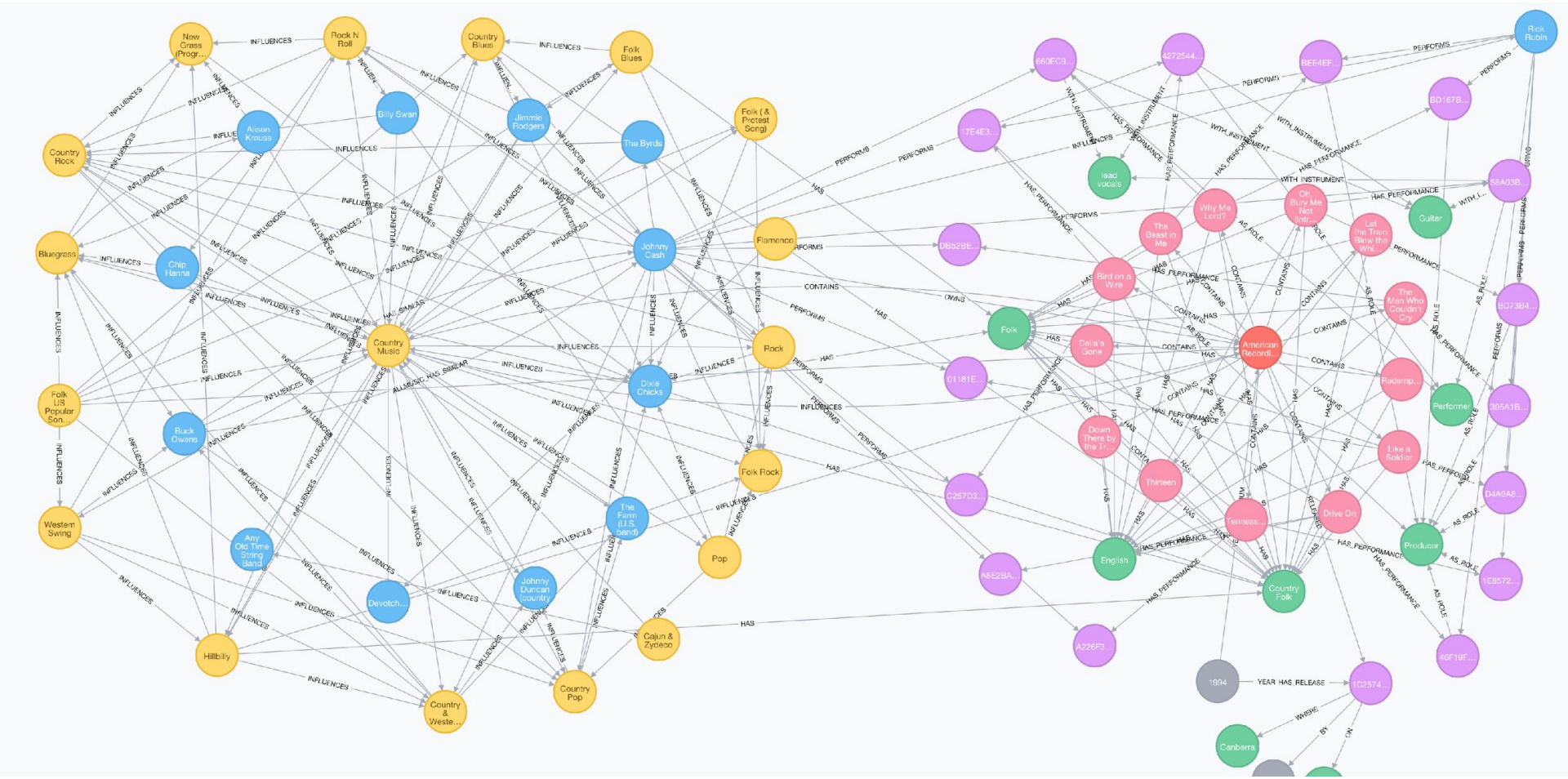
-

Frédéric Notet
CTO

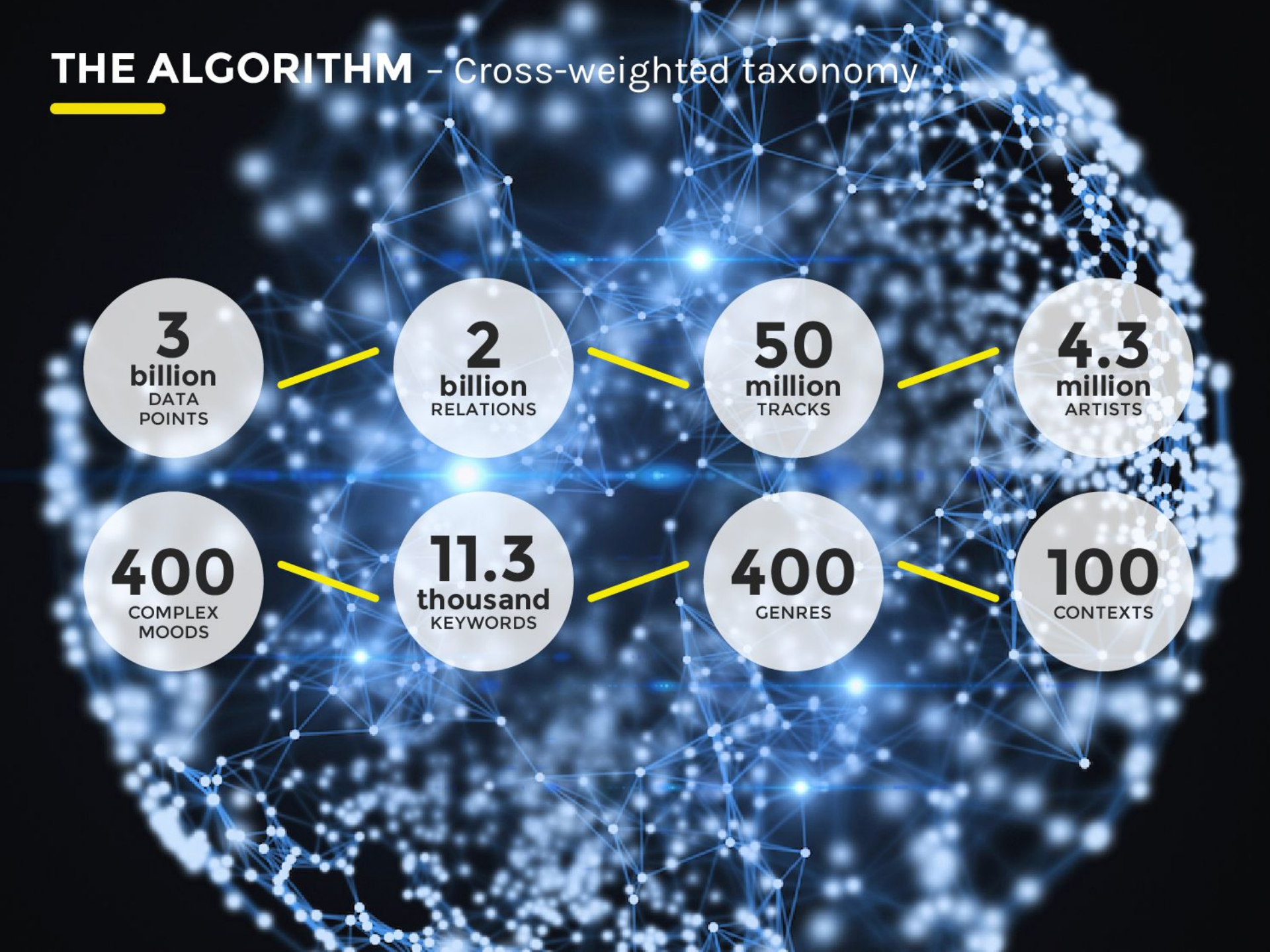
musimap

The Project

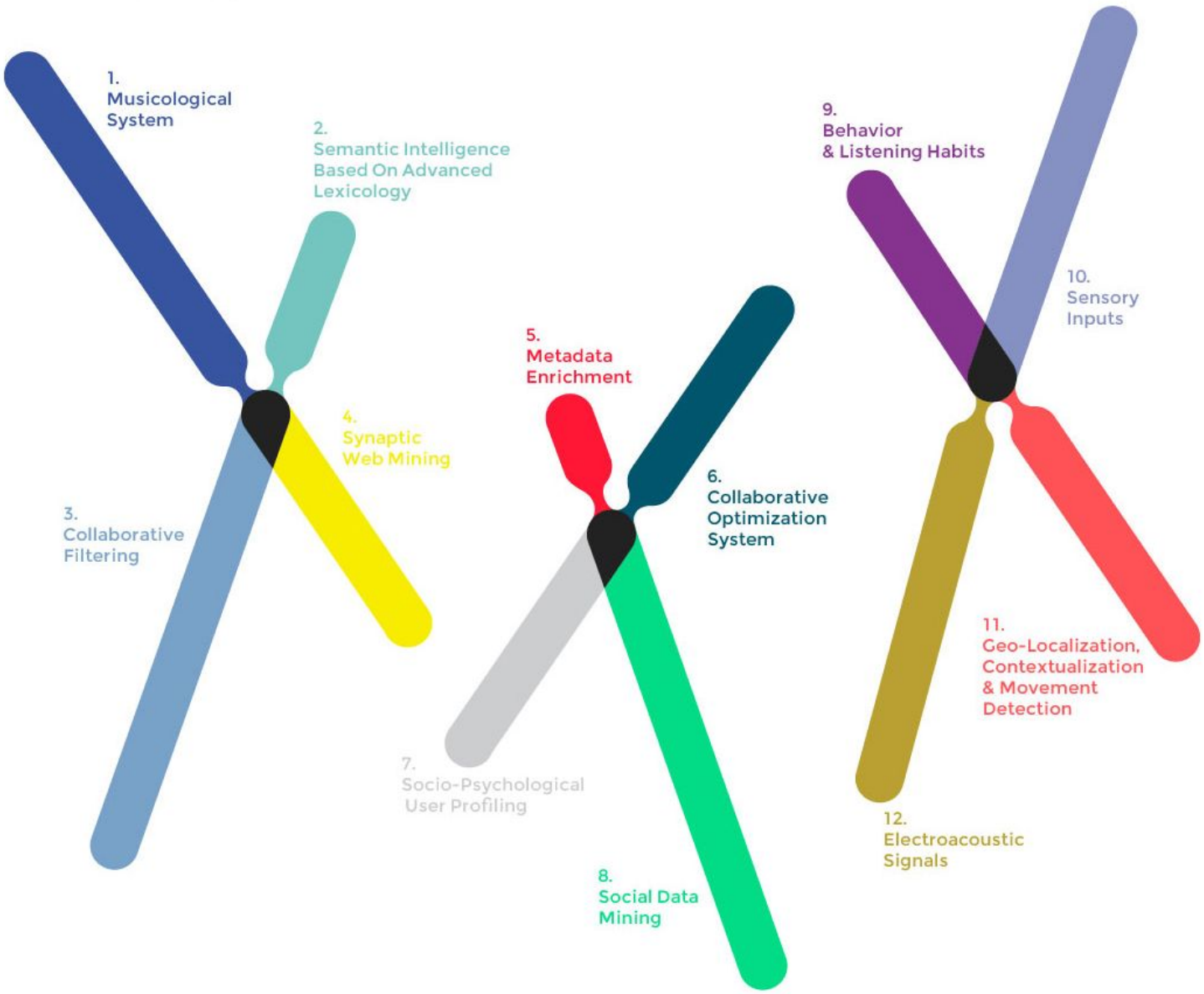
“No musician can compose Music forgetting his influences. All is connected”



THE ALGORITHM – Cross-weighted taxonomy



Music DNA


1.
Musicological
System
2.
Semantic Intelligence
Based On Advanced
Lexicology
3.
Collaborative
Filtering
4.
Synaptic
Web Mining
5.
Metadata
Enrichment
6.
Collaborative
Optimization
System
7.
Socio-Psychological
User Profiling
8.
Social Data
Mining
9.
Behavior
& Listening Habits
10.
Sensory
Inputs
11.
Geo-Localization,
Contextualization
& Movement
Detection
12.
Electroacoustic
Signals

TECHNOLOGY – Rocket science!

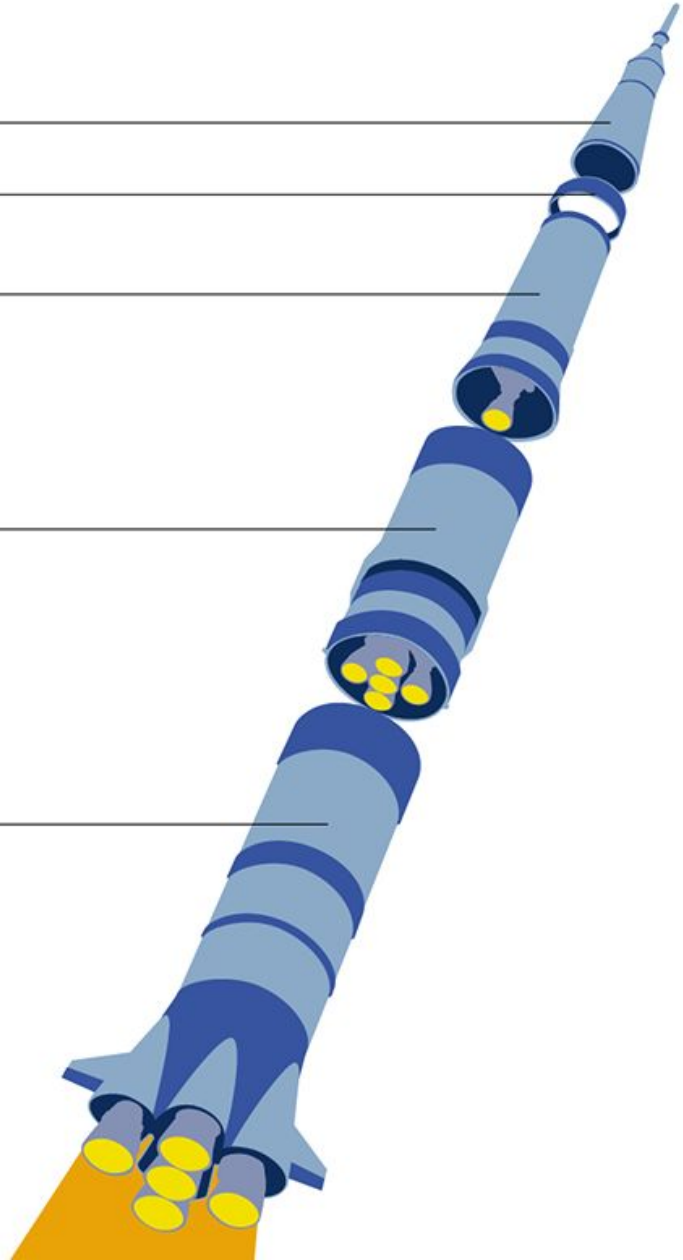
COLLABORATIVE FILTERING

DEEP LEARNING

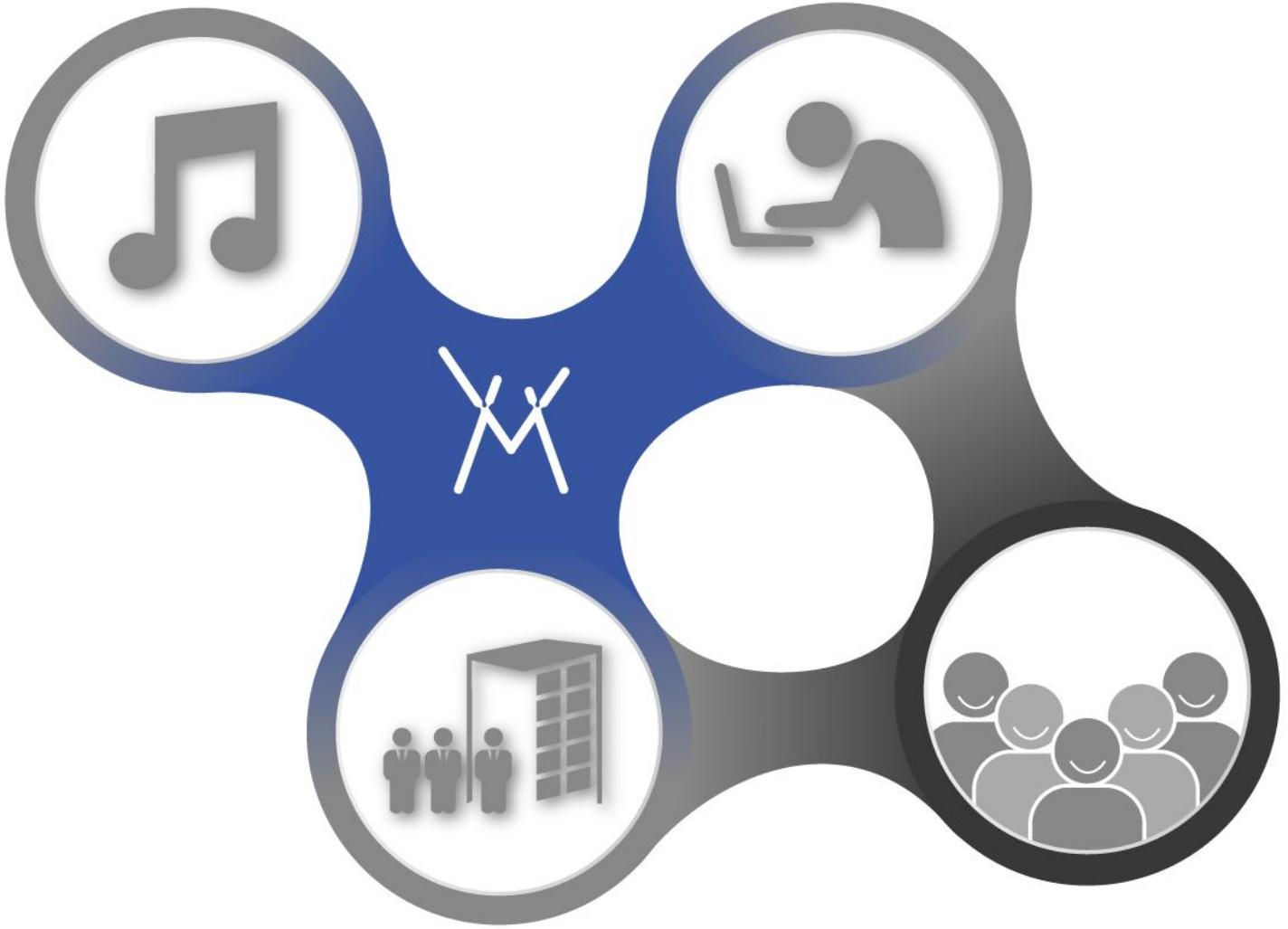
SIGNAL ANALYSIS

SOCIAL AGGREGATION

HUMAN EXPERTISE



ALGORITHM + DATABASE – Matrix for innovative interfaces



Our HTTP based API

Client created !

You have successfully created a new client.

- Name : Waves Vienna Music HackDay - 10/2016
- Client id : jhuom07mp4pr95vf
- Client secret : t09c0gg3906mcfrwxlkkms6bxv361ymu

Please keep those informations. A mail has been sent.

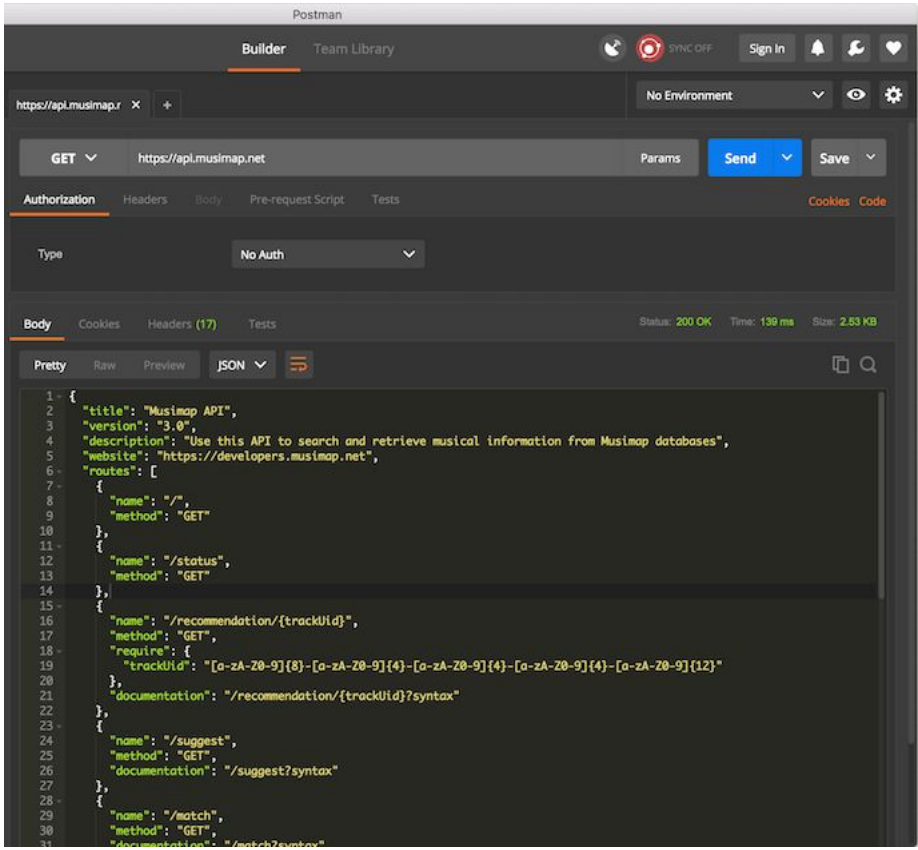
- Access metadata for millions of Artists, Albums or Tracks
- Access recommendation for Tracks
- Access audio analyzer for Audio Files
- Access special catalog of “Waves Vienna Festival” Artists
- Access special catalog of “Barack Obama Profile”

→ HTTPS://DEVELOPERS.MUSIMAP.NET

A JSON formated API

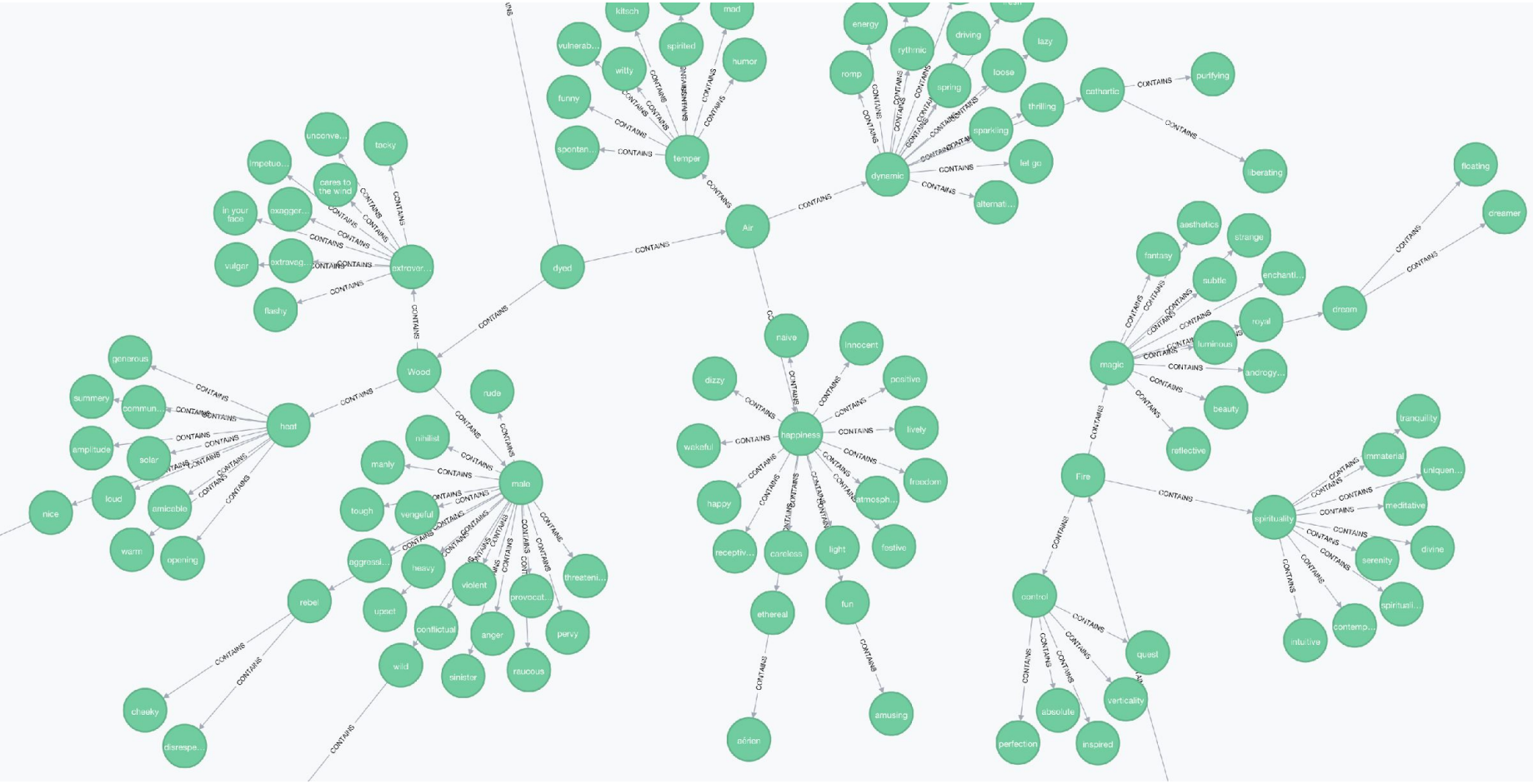
```
curl "https://api.musimap.net/search/v1/tracks?access_token=jgcWP3LzRcGZ7Mn844vz6Kf7mnRc2eHlvUhkX
```


```
{
  "status": "success",
  "code": 200,
  "stats": {
    "total": 11731,
    "offset": 0,
    "limit": 1
  },
  "tracks": [
    {
      "uid": "FB803E56-EC9A-9E21-3AEA-6665A270A904",
      "name": "La Valse d'Amélie",
      "score": 98.19,
      "album": {
        "uid": "74ADAF2F-0CC4-B448-7942-76E190CEFF0F",
        "name": "Le Fabuleux Destin d'Amélie Poulain",
        "year": "200104"
      },
      "genre": {
        "uid": "07C7436A-EF77-6207-0036-A35FEB5D8CB1",
        "name": "Soundtrack And Movie Theme",
        "bgcolor": "bed6dc"
      },
      "owners": [
        {
          "uid": "F8028ECC-4DAE-57F6-B403-E993520BAEE8",
          "nickname": "Yann Tiersen"
        }
      ],
      "references": {
        "deezer": "14406851",
        "spotify": 0,
        "clip": "https://www.youtube.com/watch?v=yYGpQSAf0Ac"
      }
    }
  ]
}
```

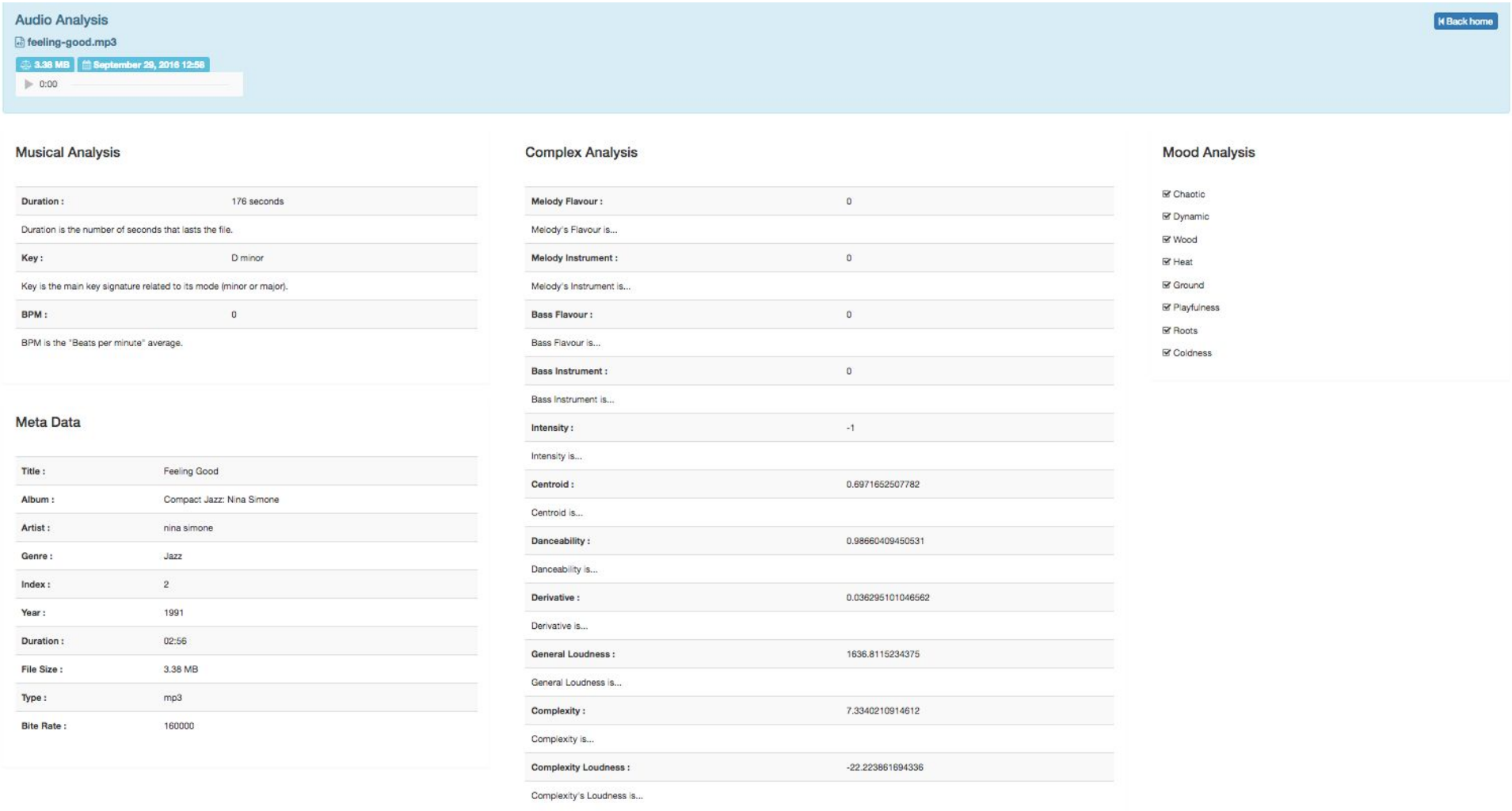



A moods network to humanize results

Moods are in a hierarchy, describing each human feeling



Moods Analyzer – Expertise your audio files



https://www.musimap.com

https://developers.musimap.net

@Musimap / @frednotet

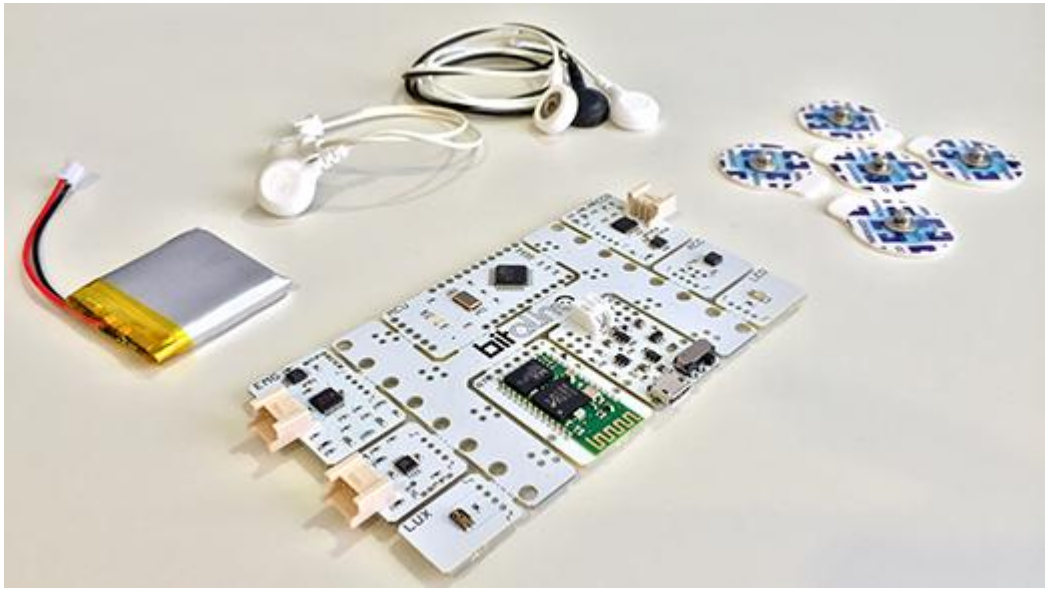
Frédéric Notet

frederic@musimap.com
www.musimap.com

musimap

plux

bitalino



DEEZER

Open Deezer
The gateway to music innovation
DEEZER

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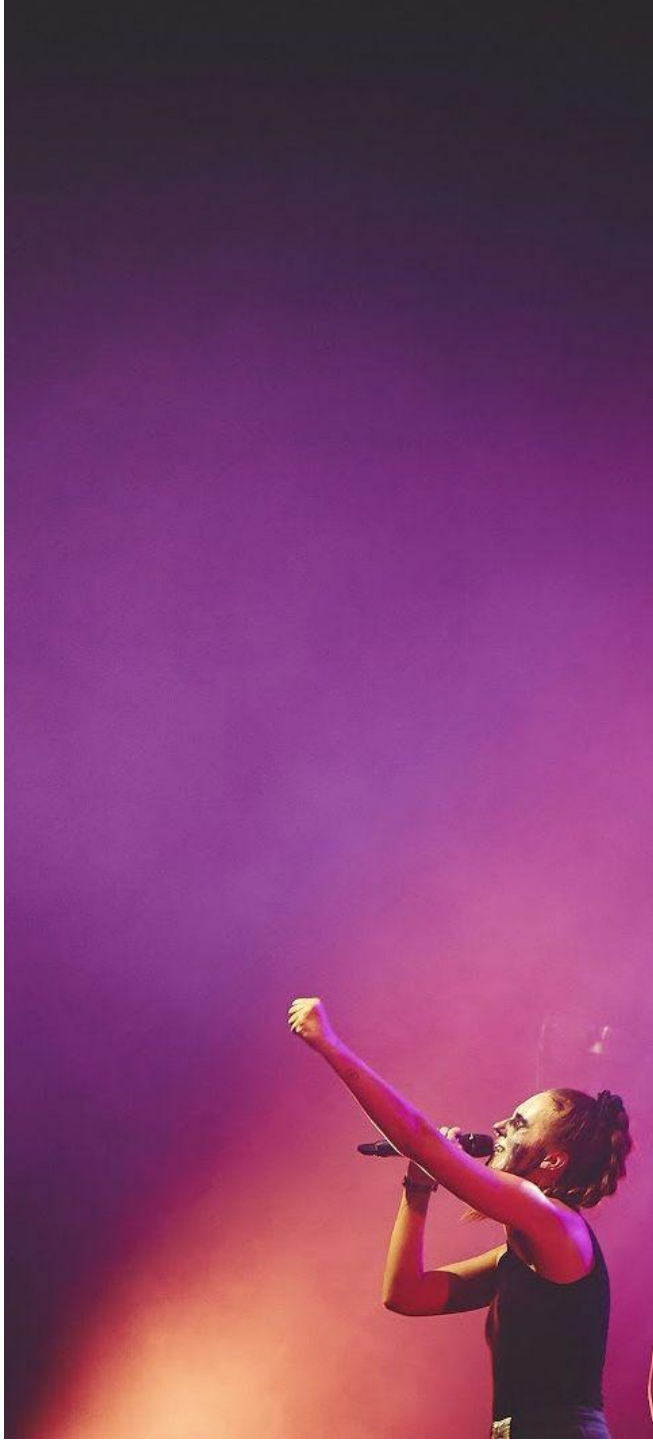
/02 Presentation of the API

/03 Leverage the API

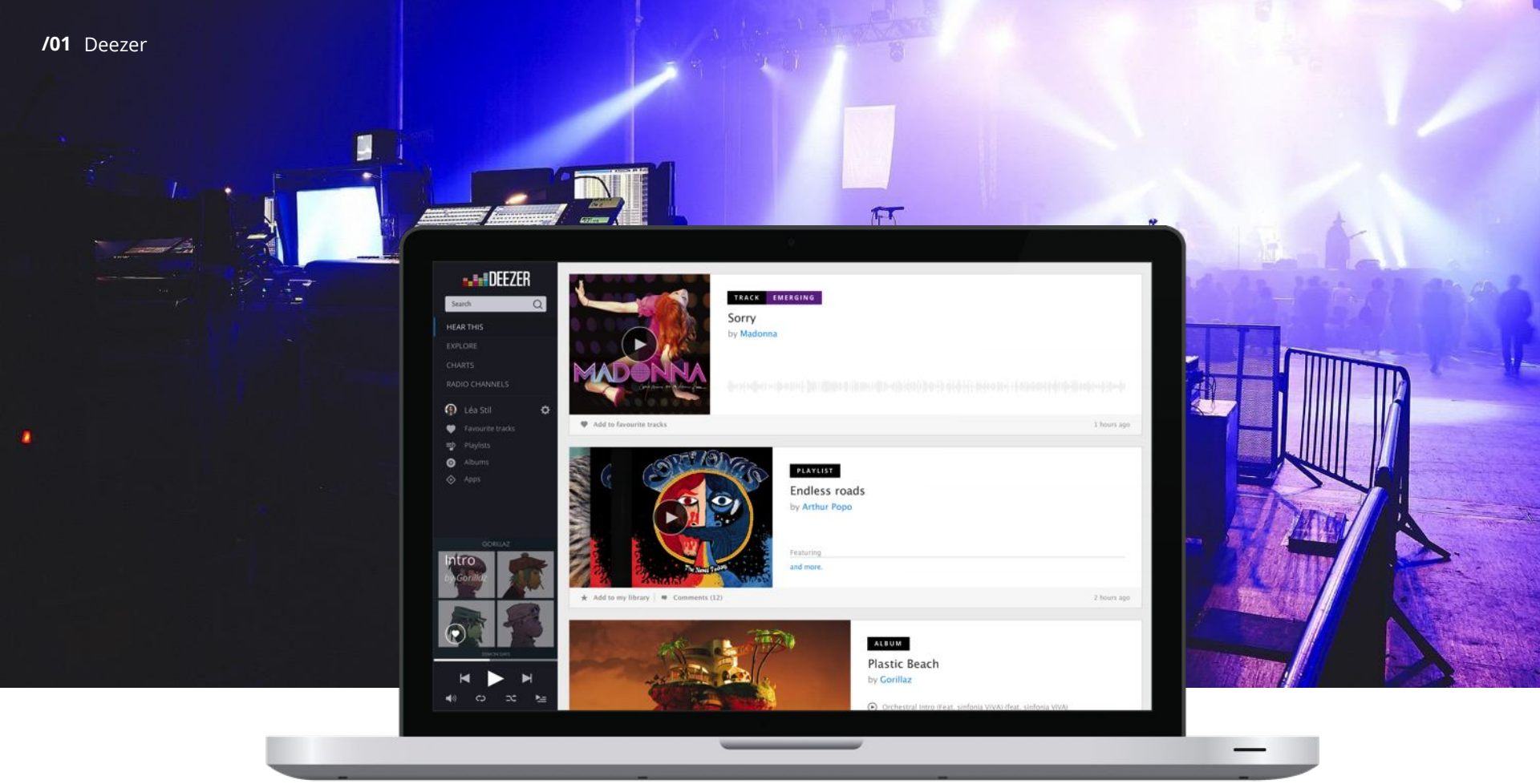
/04 Showcase



/01

Global Presentation

DEEZER



40M Tracks

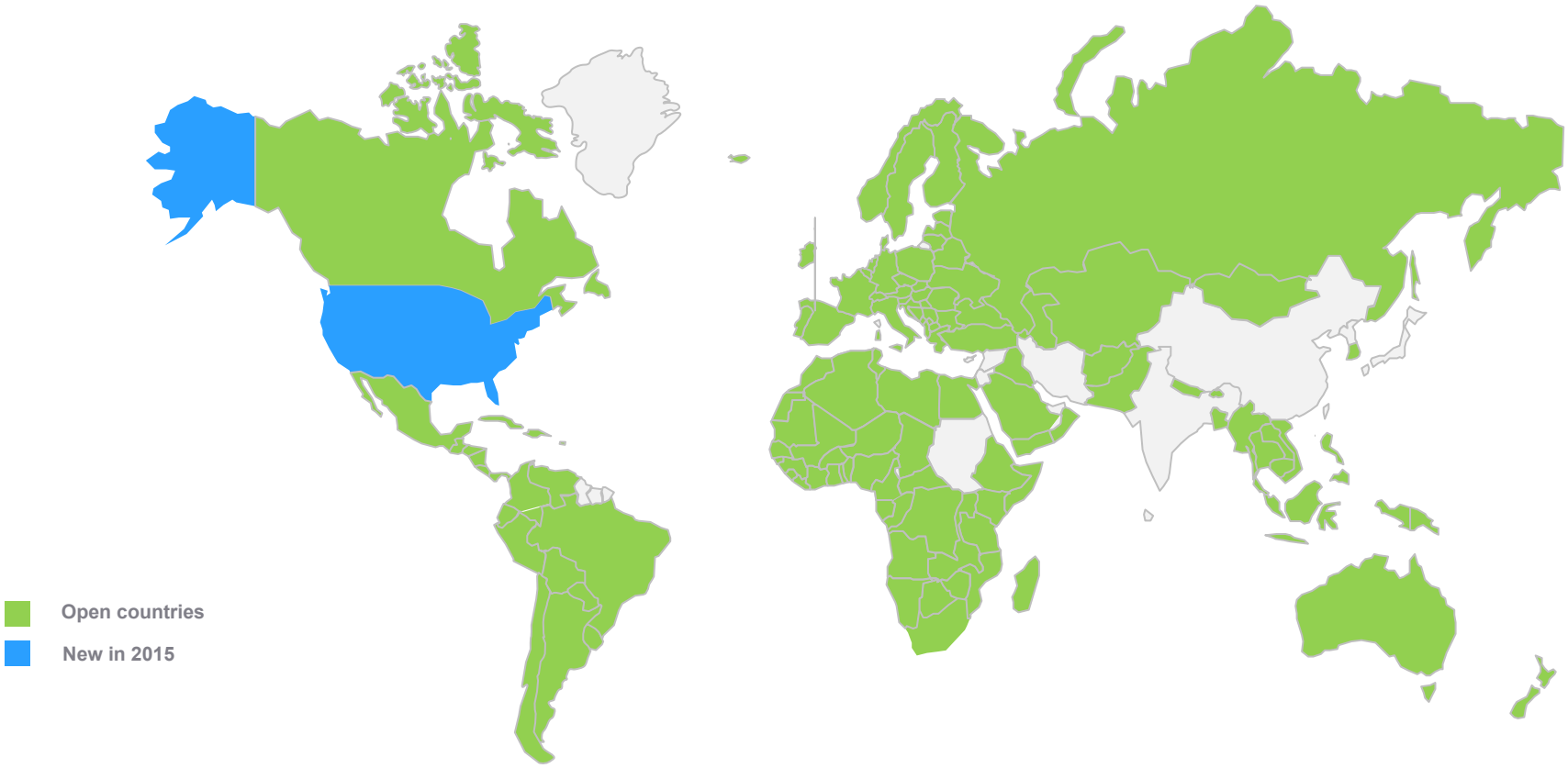
16M MAU

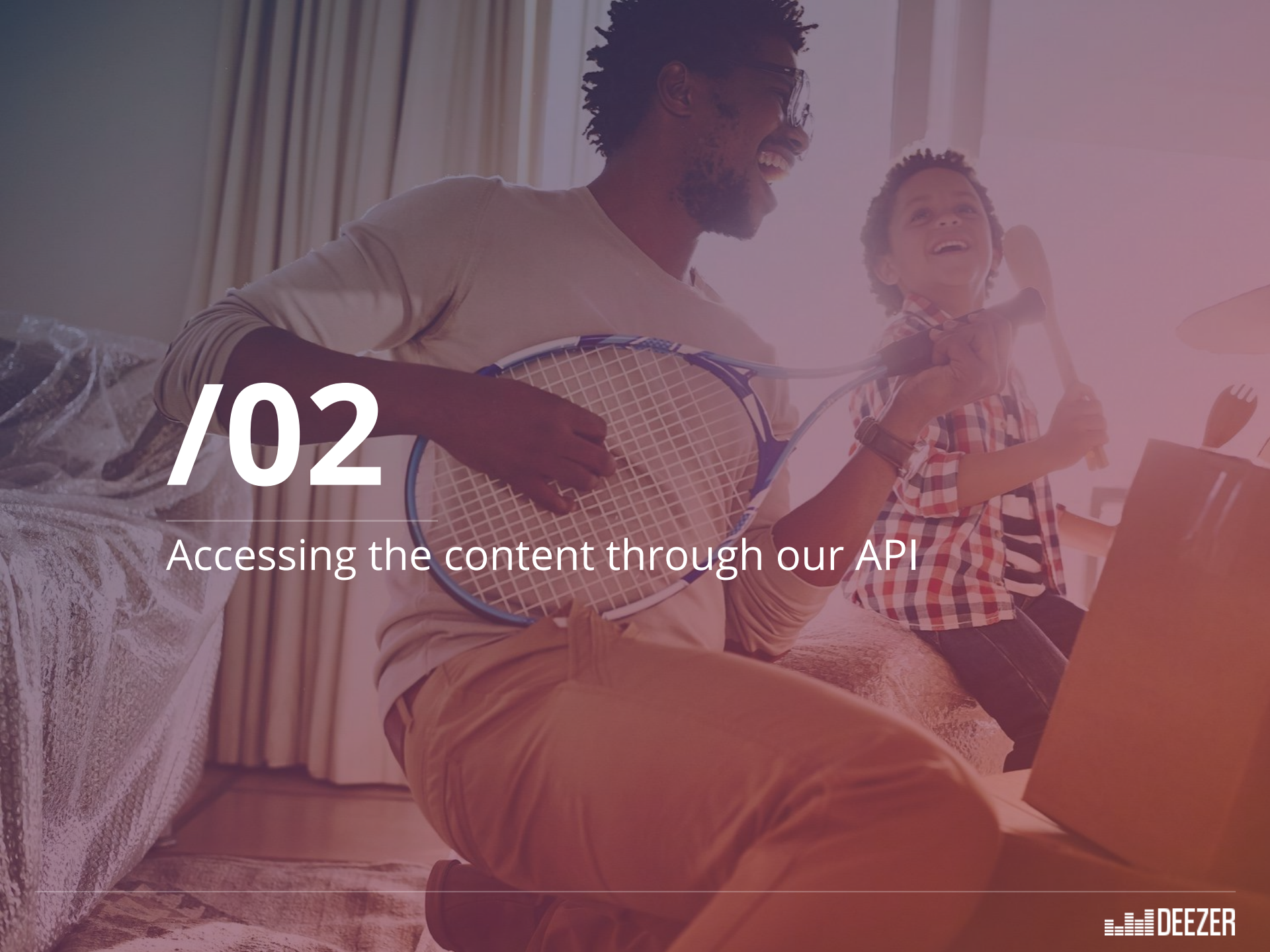
100M Playlists

Editorial

Recommendations

Available in 180+ countries





/02

Accessing the content through our API

DEEZER

Content management

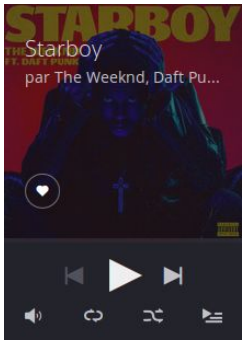
Artists

Albums

Tracks

Playlists

Genres



Charts

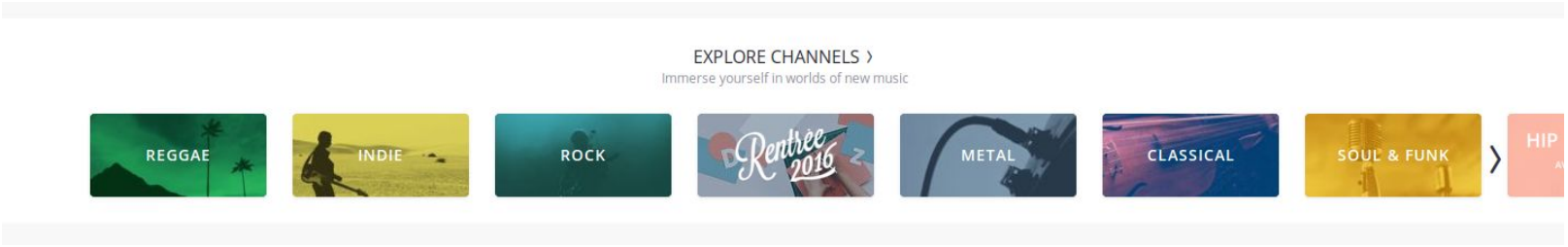
Podcasts

Episodes

Channels

Flow

Editorial



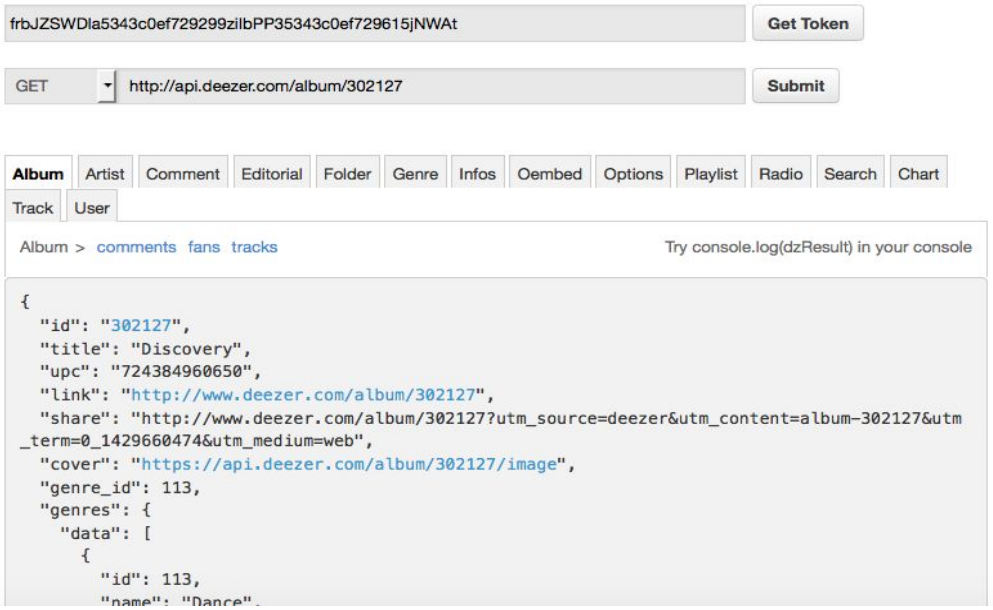
REST API

http://developers.deezer.com

No authentication is required to use the API

Possibility to choose between different return formats

Check out our API discovery developement tool at http://developers.deezer.com !



Fields

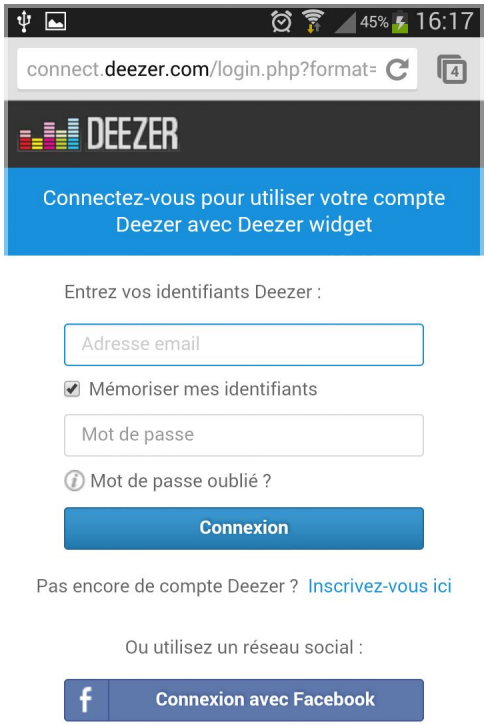
NAME	DESCRIPTION	TYPE
id	The track's Deezer id	int
readable	true if the track is readable in the player for the current user	boolean
title	The track's fulltitle	string
title_short	The track's short title	string
title_version	The track version	string
unseen	The track unseen status	boolean
isrc	The track isrc	string
link	The url of the track on Deezer	url
share	The share link of the track on Deezer	url
duration	The track's duration in seconds	int
track_position	The position of the track in its album	int
disk_number	The track's album's disk number	int
rank	The track's Deezer rank	int
release_date	The track's release date	date
explicit_lyrics	Whether the track contains explicit lyrics	boolean
preview	The url of track's preview file. This file contains the first 30 seconds of the track	url
bpm	Beats per minute	float
gain	Signal strength	float
available_countries	List of countries where the track is available	list
alternative	Return an alternative readable track if the current track is not readable	track
contributors	Return a list of contributors on the track	list
artist	artist object containing : id, name, link, share, picture, picture_small, picture_medium, picture_big, picture_xl, nb_album, nb_fan, radio, tracklist, role	object
album	album object containing : id, title, link, cover, cover_small, cover_medium, cover_big, cover_xl, release_date	object

/03

Leverage the API: SDKs, WebApps, widgets...

DEEZER

3 things SDKs are useful for



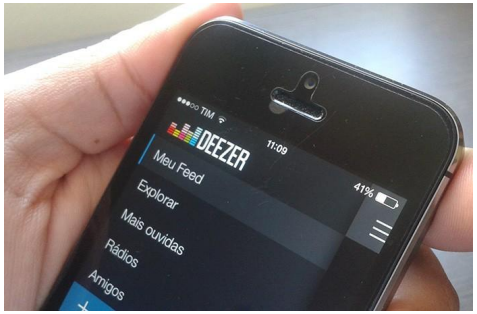
Third party auth via oauth2
Access to account information

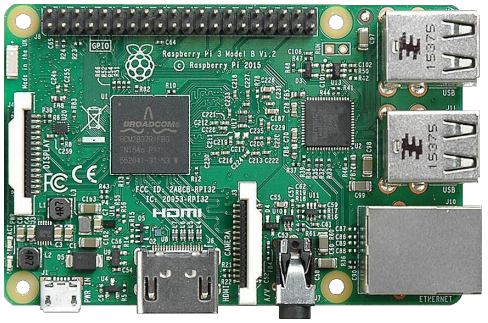
Content streaming (requires an account)

Automated API Calls

Choose the SDK that fits your needs...

...and bring deezer to all of your devices



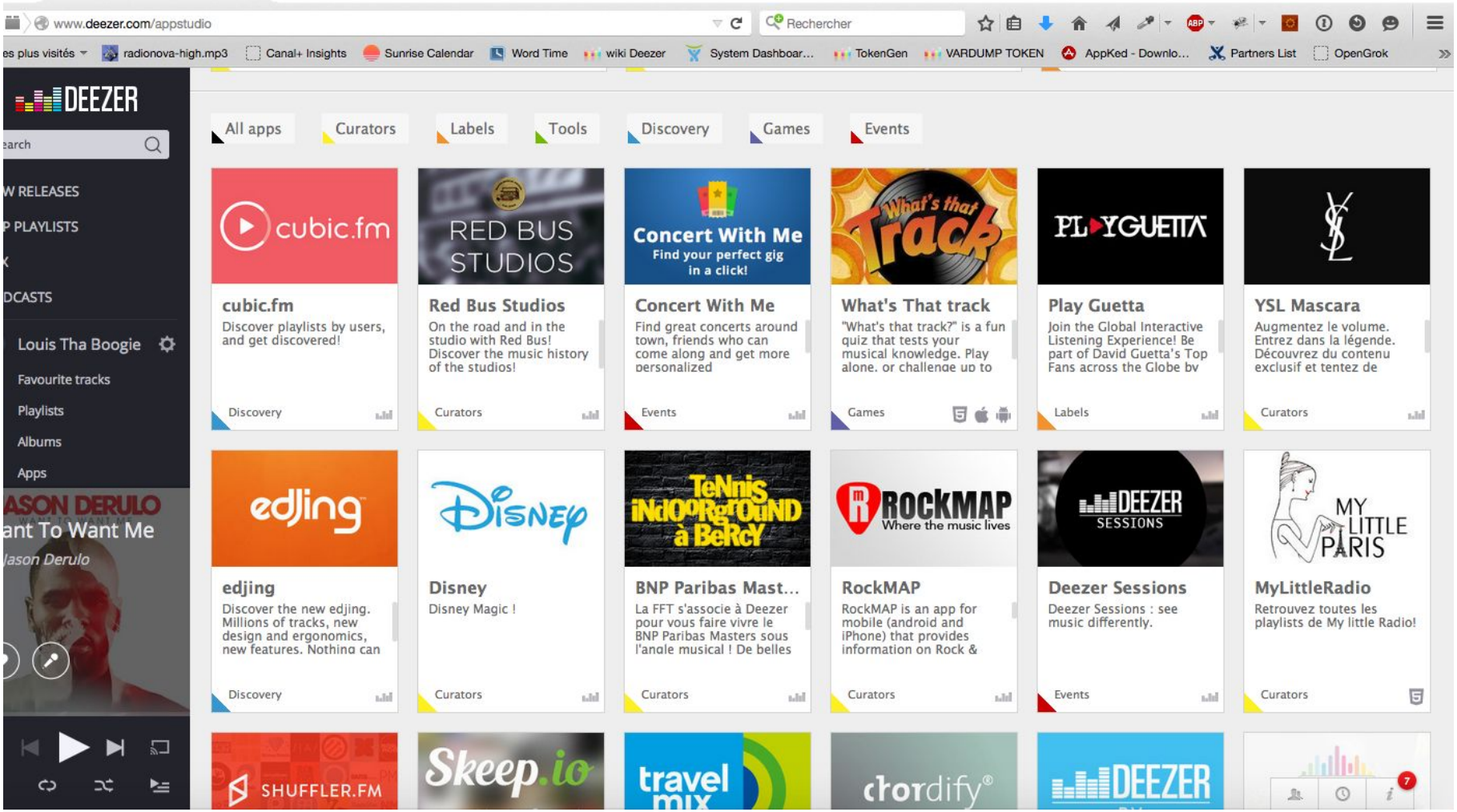


Deezer WebApps API

www.deezer.com/app/demo

- Based on JavaScript SDK
- Support for all major browsers: IE7+, FF, Chrome, Opéra
- Same code for both platforms: inside or outside Deezer
- Interactions with Deezer's player and user's library

Deezer's App Studio



Hacking Fast

- **1. Create your App ID**

  MyApps: http:developers.deezer.com/myapps

- **2. Select your SDK**

  JS SDK: http://developers.deezer.com/sdk/javascript

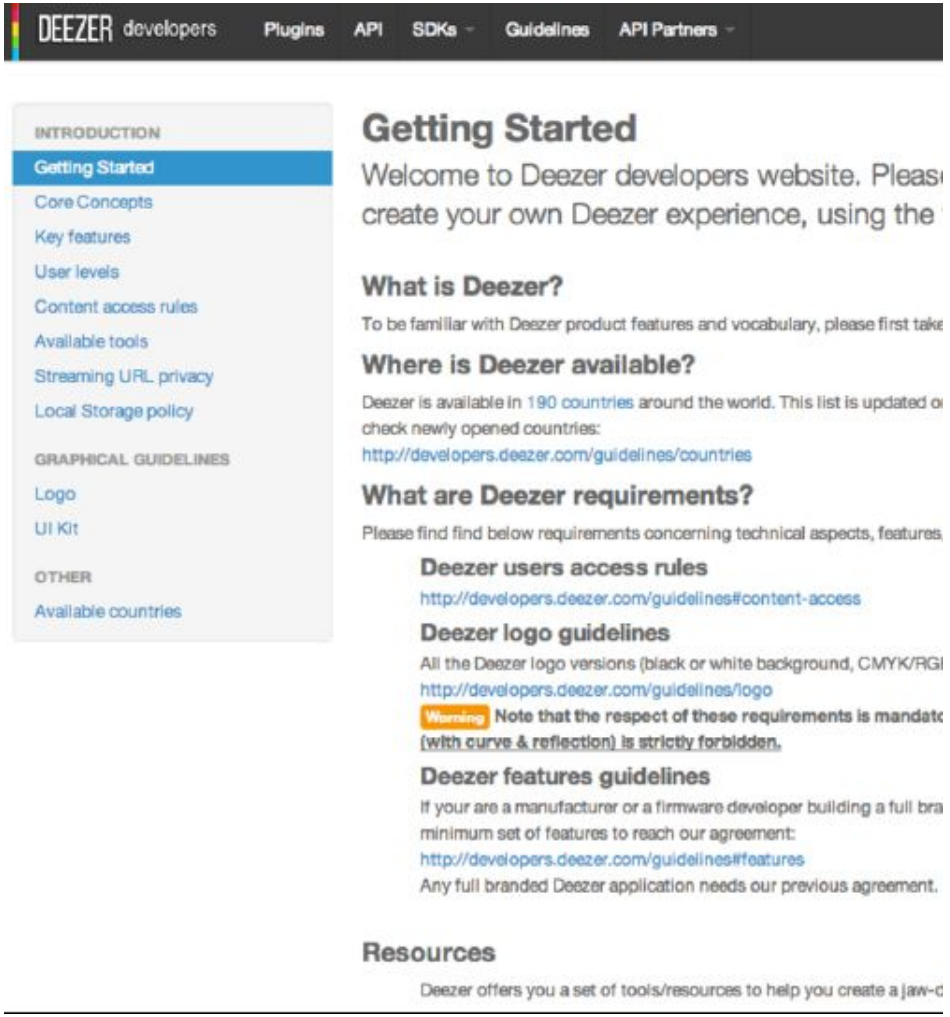
- **3. Learn how to hack fast with our API explorer**

  API explorer:
http://developers.deezer.com/api/explorer

- **4. Guidelines for an immersive experience ;)**

  Guidelines:
  http://developers.deezer.com/guidelines

  UI & logo Guidelines:
  http://developers.deezer.com/guidelines/logo
  http://developers.deezer.com/guidelines/ui-kit

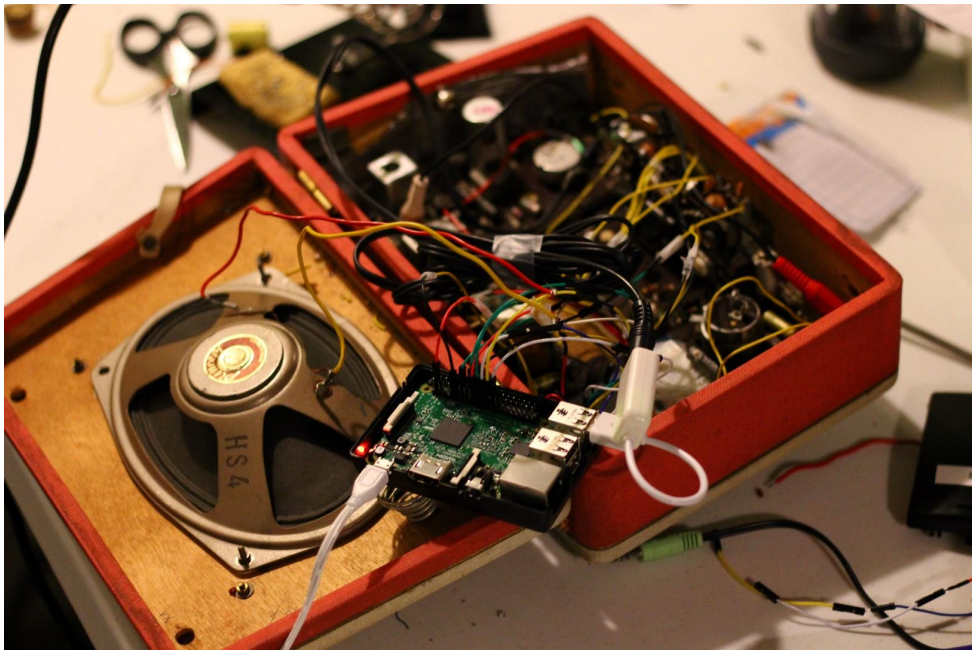


/04

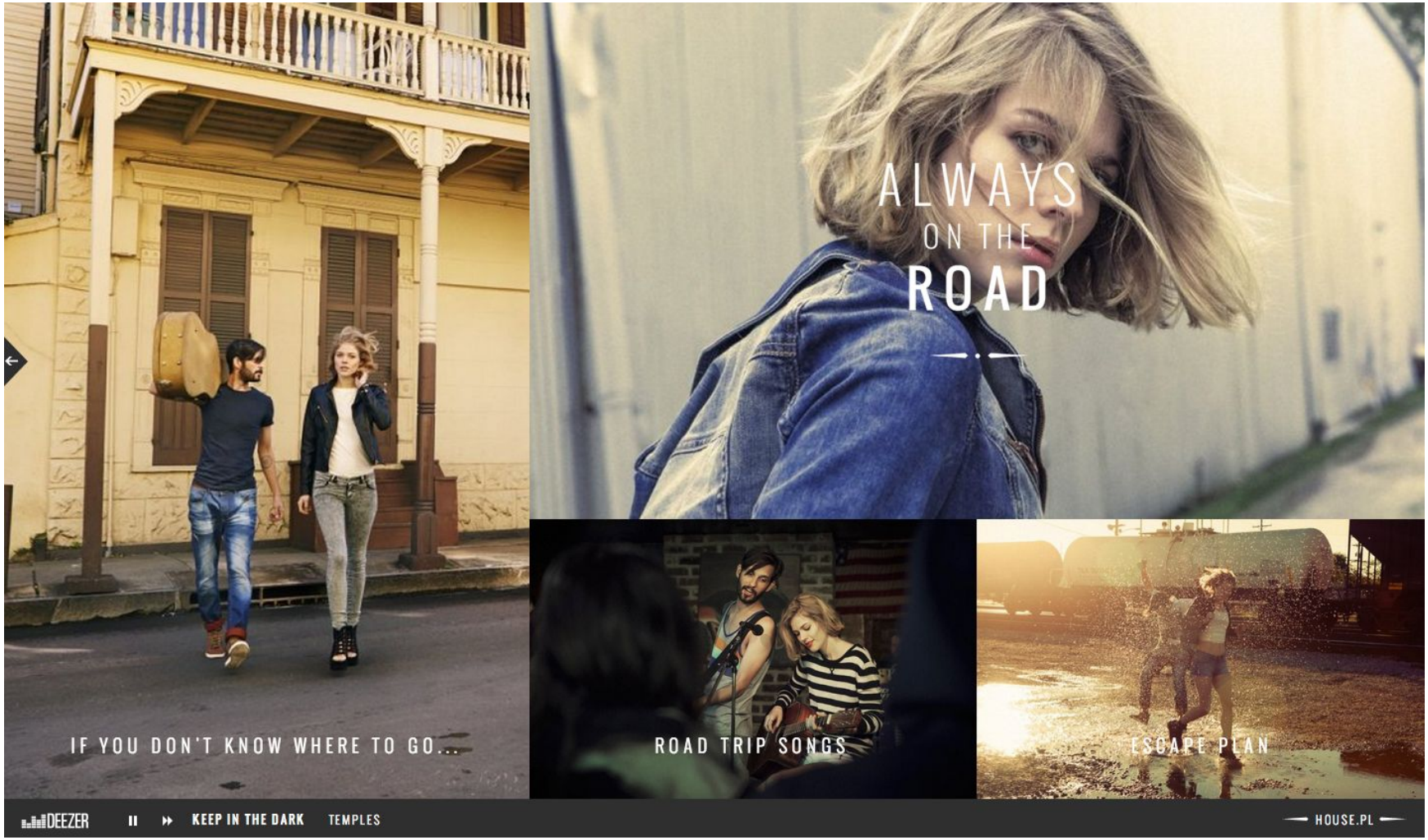
Showcase

DEEZER

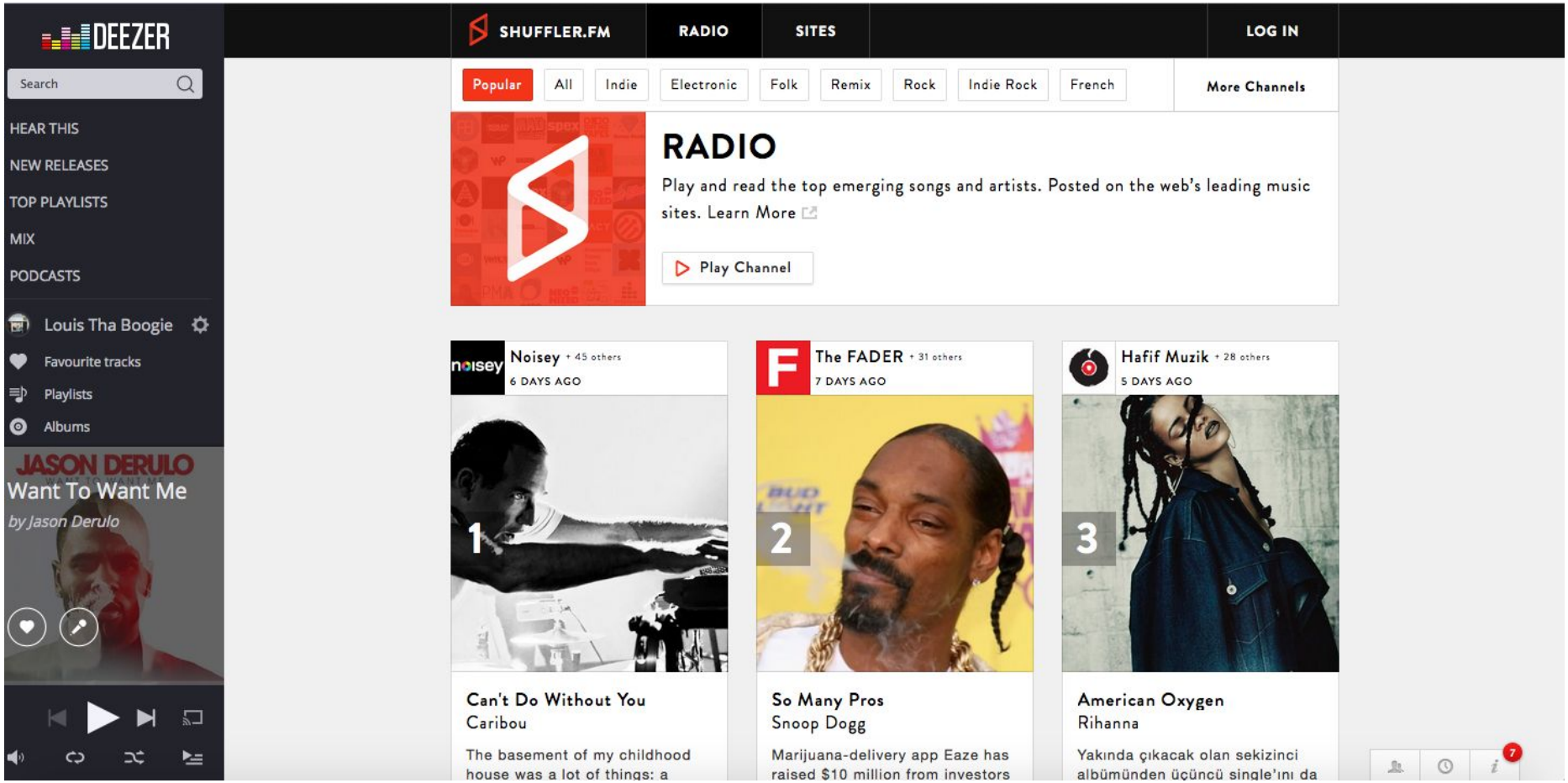
OldRadio - Deezer... in a 1959 radio



House.pl - Custom Players



Shuffler.fm – Audio magazine curated by tastemakers



Identifying genres in musical heritage

- Europeana Project
  - +3500 cultural institutions
  - Over 50 million records
  - Photographs, archival records, art, fashion, tv broadcasts etc.

Identifying genres in musical heritage

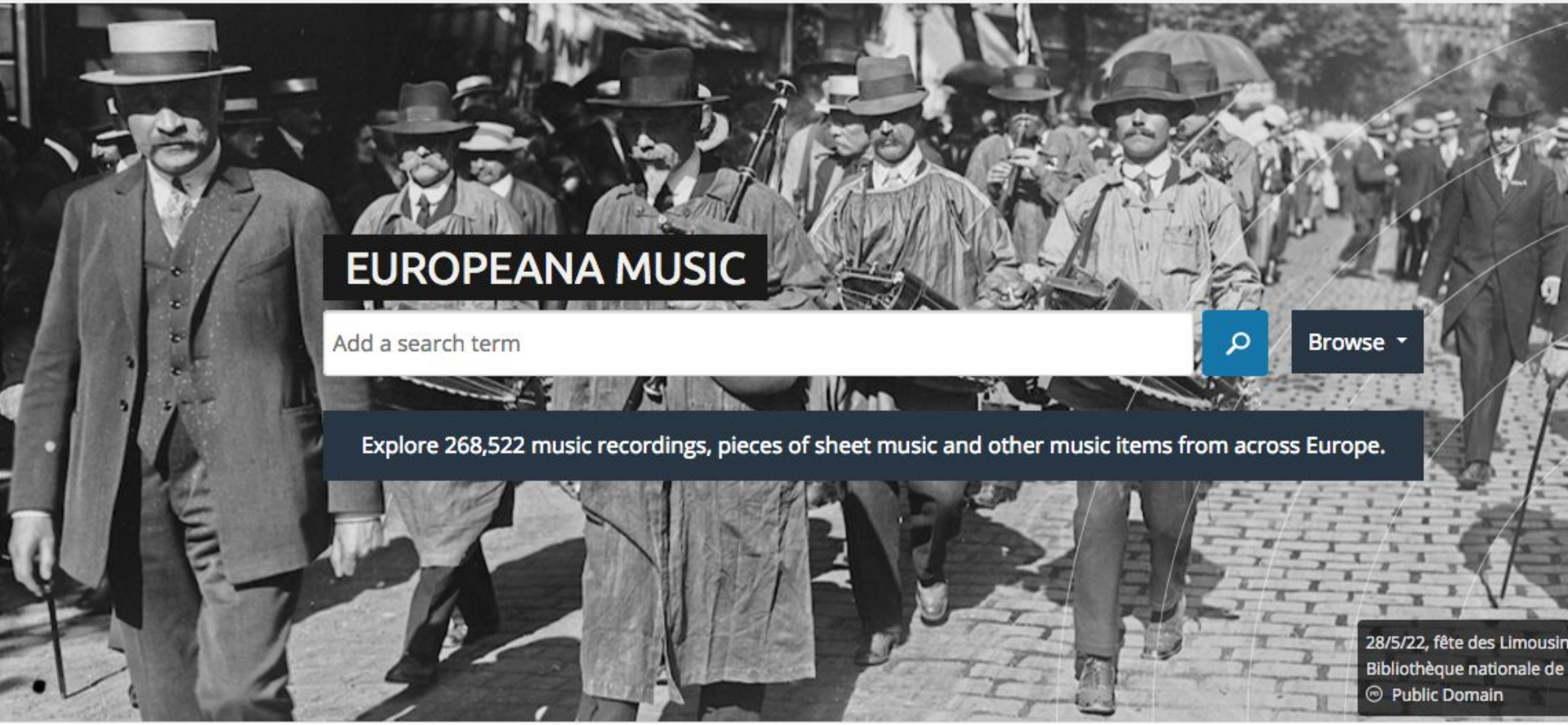
- Europeana Sounds
  - +25 content partners
  - Over 300.000 records
  - Pictures/film/recordings/sheet music

europeana collections

Collections Explore Exhibitions Blog

OUR SITES

Return to Home / Europeana Music



About Europeana Music

- Largely unknown material
- Not to be found anywhere else (Spotify, Deezer etc.)
- But.. often difficult to navigate

METADATA

The challenge

- Work on tools and solutions to detect genres in the sound files.
- Data: http://www.ifs.tuwien.ac.at/~schindler/eusounds_challenge/
- Europeana Sounds Vocabulary: https://github.com/gsergiu/music-genres/tree/master/music-genre/src/main/resources/

The awards

- For the best solution of the day we have 500 euros in vouchers.
- If you are interested, we want to further develop today’s prototype into a working tool for production

giant steps

SEVEN LEAGUE BOOTS
FOR MUSIC CREATION AND PERFORMANCE

STRIDING FOR
IN ELECTRONI
MUSICAL CREA
EXPERIMENTA
& PERFORMAN

GiantSteps Challenge @ Waves Festival

Peter KNEES, Richard VOGL (JKU Linz)

The GiantSteps Project

The seven-league boots for music creation and performance

Goals

- Improve music creation tools to boost inspiration and creative flow
- Break barriers caused by a lack of technical and musical knowledge
- Empower potential music creators

Approach

- Combining **MIR** with **interfaces and interaction** design techniques
- Develop musical expert agents that provide **musical suggestions** when composing
- Align with **user requirements**; test in real-world situations, with practitioners

Partners

Department of Computational Perception

JOHANNES KEPLER UNIVERSITY LINZ

upf. Music Technology Group

NATIVE INSTRUMENTS

reactable

Red Bull Music Academy

STEIM

JCPC

GiantSteps is partly funded by the European Community's Seventh Framework Programme.

giant steps

SEVEN LEAGUE BOOTS
FOR MUSIC CREATION AND PERFORMANCE

GiantSteps Frameworks

- madmom
- Essentia / EssentiaRT~
- Various GiantSteps Assets on GitHub

http://www.giantsteps-project.eu/#/downloads/software

madmom

- Python music processing library
- Signal processing/Music Information Retrieval tools
  - Tempo detection
  - Beat and downbeat tracking
  - Onset detection
  - Chord transcription
  - etc.
- State of the art technology in these areas
- https://github.com/CPJKU/madmom

ESSENTIA

- C++ music processing library, Python bindings
- EssentiaRT~: Pure Data version for real-time processing
- For audio analysis and audio-based MIR
  - Audio I/O, DSP blocks
  - Statistical characterization of data
  - Large set of spectral, temporal, tonal and high-level music descriptors
- http://essentia.upf.edu
- http://mtg.upf.edu/technologies/EssentiaRT~

Various Assets

- Various tools and libraries developed for music making
  - **RhythmCAT**: Real-time concatenative synthesis for rhythms (VST plugin)
  - API for **rhythm pattern variation** (C++)
  - **DrDrum**: Generative drum machine (Pure Data)
  - **House-Harmonic-Filler**: Harmony expert agent (Pure Data)
  - and many more...
- https://github.com/GiantSteps

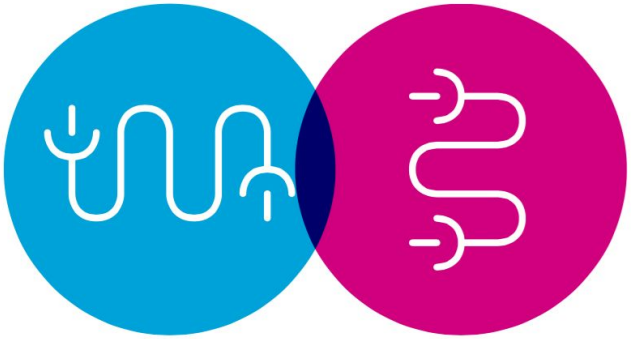
Challenge and Award

Best use of GiantSteps APIs

Use one or more of the GiantSteps APIs for music analysis, recommendation, and semantic sound analysis for

- music making and performance,
- new instruments,
- improvising systems,
- virtual band mates,
- real-time visualizations
- ...

Reward: 250€ music store vouchers



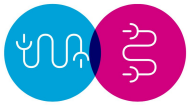
#MusicBricks

is a European initiative

providing innovative Music (Analysis) Software and Hardware tools

as building blocks for hackers

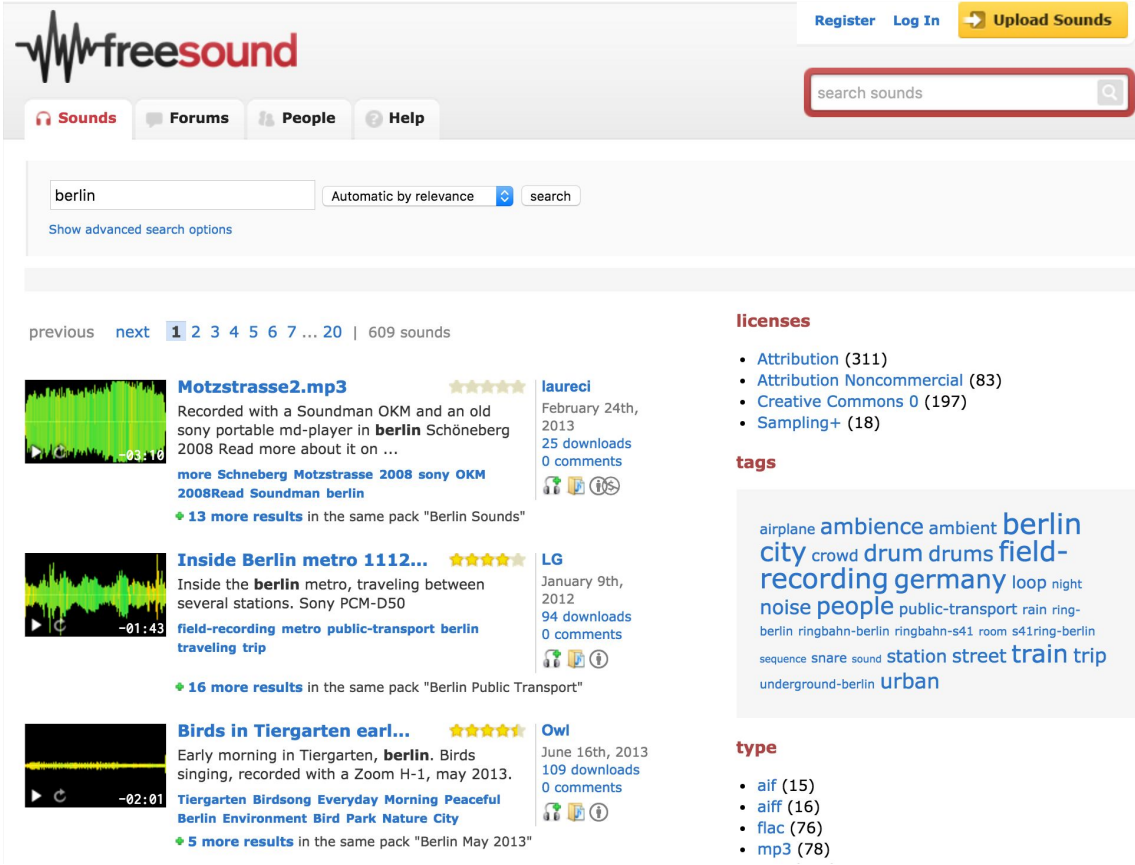
www.musicbricks.net



Freesound API

https://www.freesound.org/docs/api/

- +200k CC licensed sounds
- WebAPI
  - django-rest
- Freesound APIv2 Clients:
  - Python,
    Java,
    ObjectiveC



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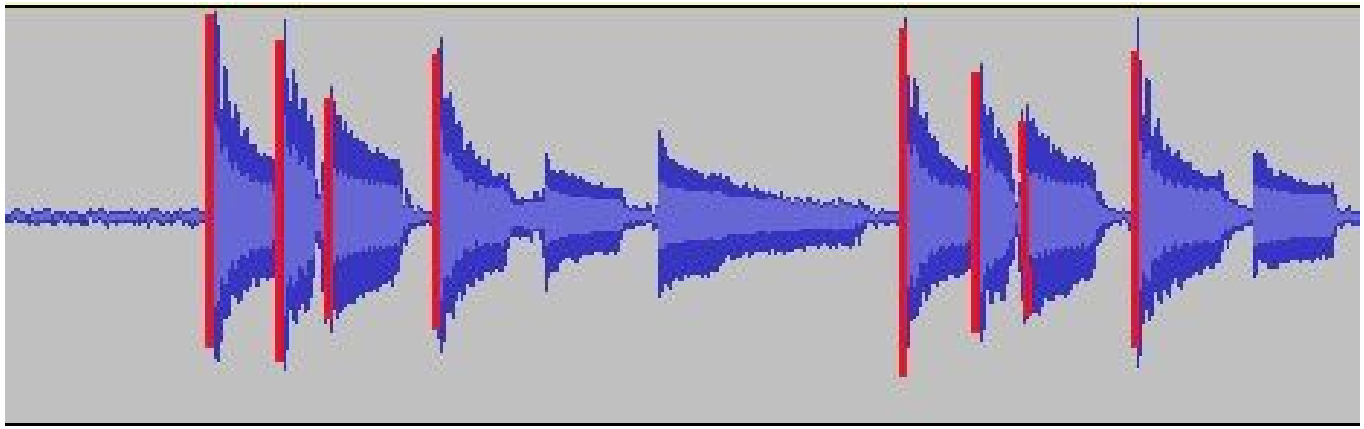
Onset detection

Real-time onset detection/description

Provides onset information:

loudness, timbre, pitch, spectral features



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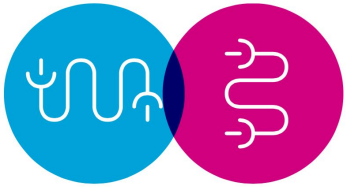
#MusicBricks



Tools by UPF Bcn

- Onset Detection
- Melody Extraction
  http://essentia.upf.edu
- PureData and MaxMSP objects
  http://mtg.upf.edu/technologies/EssentiaRT~

ESSENTIA

- Freesound API
  http://freesound.org/docs/api

freesound

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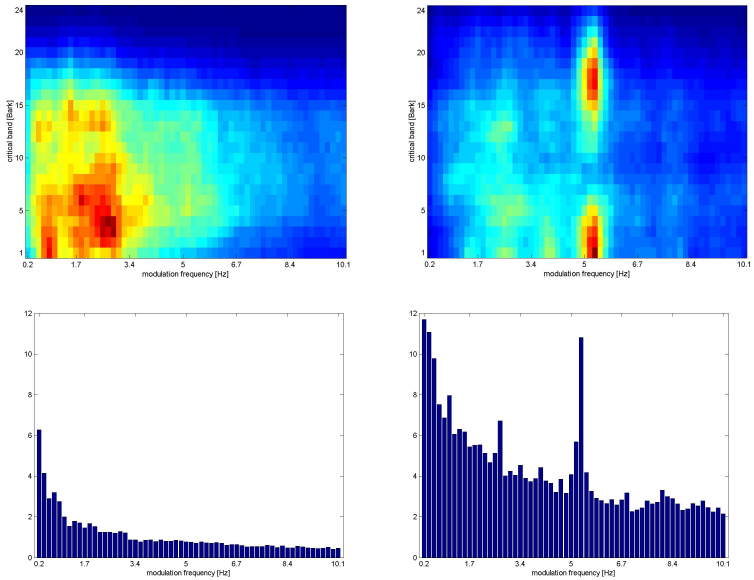
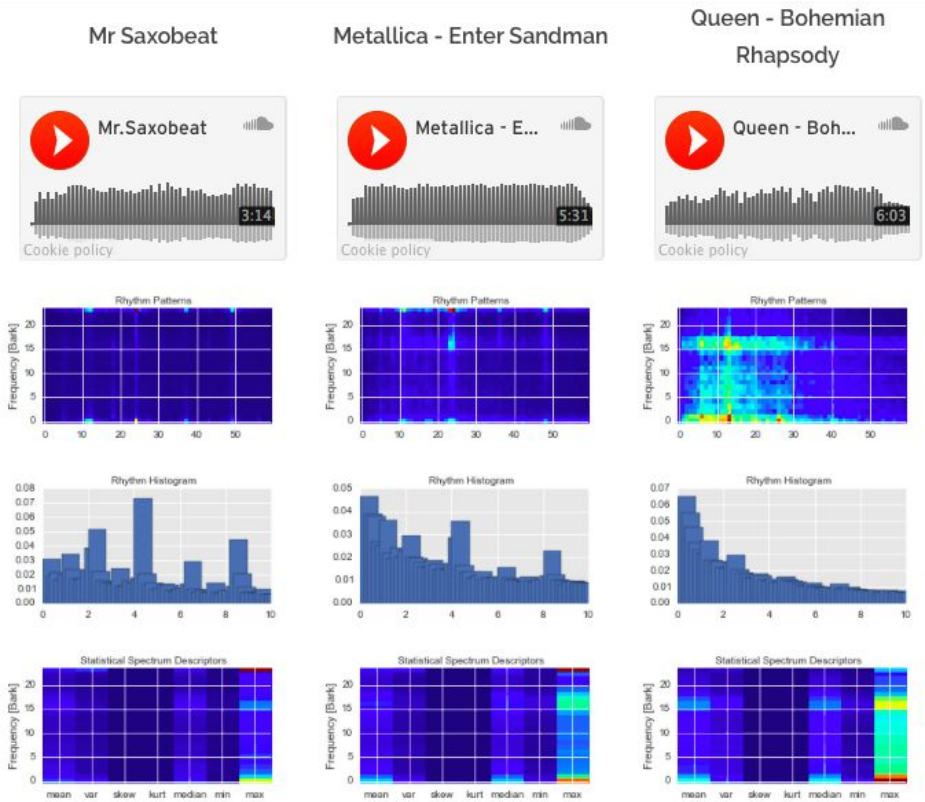
Rhythm & Timbre
Analysis from Music

- analyzes audio (segments or songs)
- get analyzed features:
  - Rhythm Pattern
  - Rhythm Histogram
  - Spectral Descriptor (capturing timbre)



Classical Rock

Rhythm & Timbre
Analysis from Music

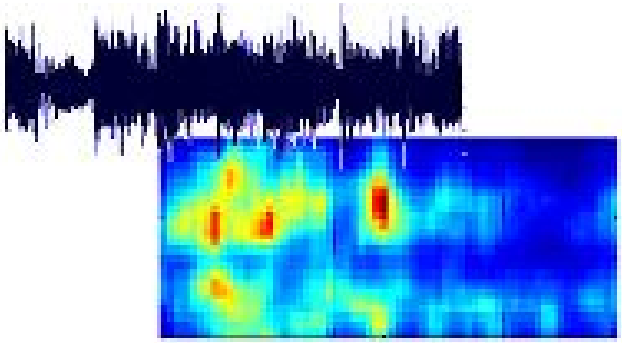


- compute acoustic similarity
- get similar sounding songs by rhythm and/or timbre
- create playlists of a certain style
- detect the genre of a song
- make music recommendations
- etc. etc.

'More like this' - Finding Similar Songs

Rhythm & Timbre

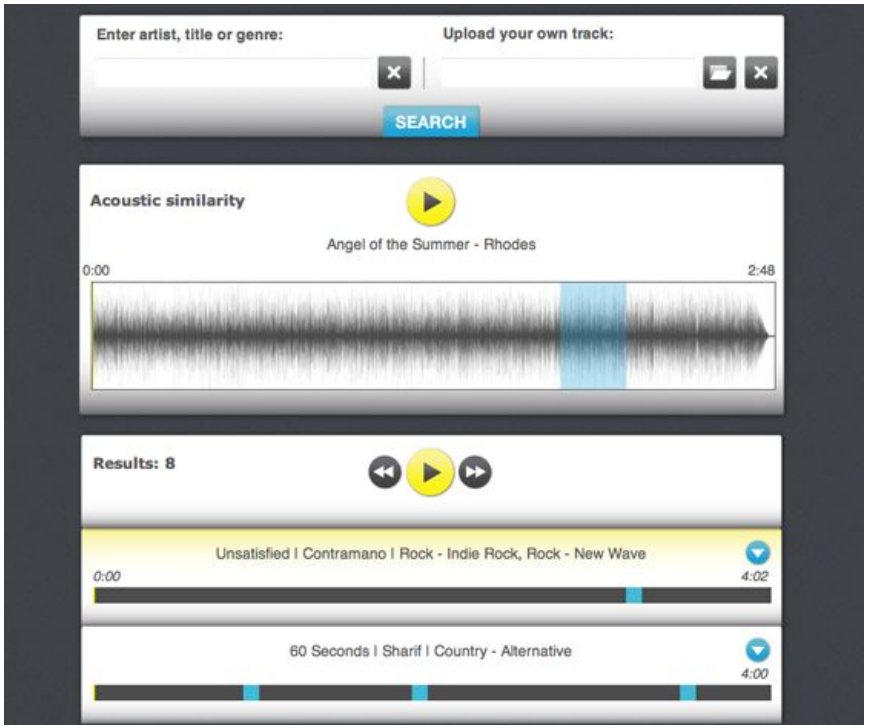
- open source
  - Python
  - Java
  - Matlab



- Download and Tutorials:
  http://ifs.tuwien.ac.at/mir/musicbricks

Music Similarity

Search by Sound: get similar music Web API



http://ifs.tuwien.ac.at/mir/musicbricks

#MusicBricks

Music Similarity

Search by Sound: Web API

- REST API (no installation needed!)
- 50,000 songs from freemusicarchive.org pre-analyzed
- add own songs
- get similar songs (by timbre or rhythm)
- super-fast analysis (~ 1-2 sec/full song)

http://ifs.tuwien.ac.at/mir/musicbricks

Sonarflow

Visual Music Discovery Apps (iOS + Android)

Discovery from online sources

- Youtube
- last.fm
- iTunes
- Spotify
- 7digital

SPECTRAL MIND

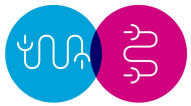
www.sonarflow.com - https://github.com/spectralmind

#MusicBricks

MusicBricks Transcriber (by Fraunhofer IDMT)

Extract Melody + Bass line from audio

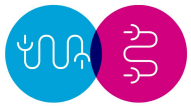
- Predominant melody / bass line (note onset, duration, pitch)
- Key & Chords (e.g., Cm / E / Fm)
- Time signature & beat-grid
- Average tempo (bpm)
- Output formats (MIDI, MusicXML, etc.)
- Executable for Win, Mac & Linux



Real-Time Pitch Detection (by Fraunhofer IDMT)

Realtime analysis of audio samples

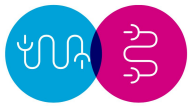
- Detect currently sung or played pitches
- Monophonic mode (f0 + pitch)
- Polyphonic mode (pitches)
  - Informed algorithm (provide most likely pitches -> define search range)
- Library incl. sample projects for all platforms (Win, Mac, Lnx, Android, iOS)



Time Stretch & Pitch Shift (by Fraunhofer IDMT)

Stretch or pitch audio samples

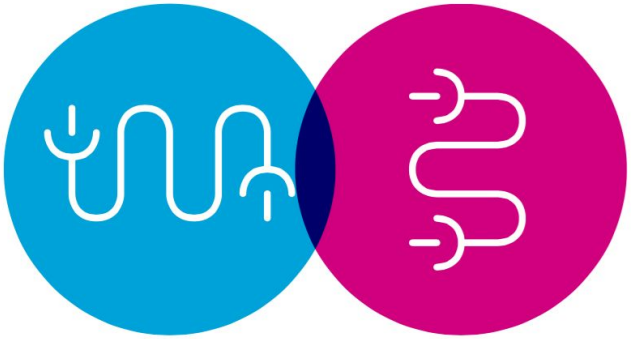
- Realtime
- 50% to 200% of tempo
- -/+ half Octave
- Library incl. sample projects (Win, Mac, Lnx, Android, iOS)
- **Application Example: Songs2See**



Goatify

Replace melody with sample

- Predominant melody extraction
- Input sample pitched according to melody
- Original melody muted



#MusicBricks

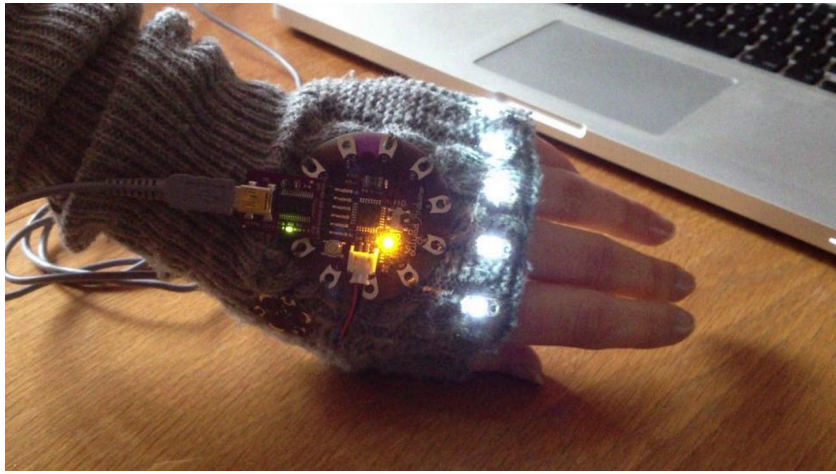
Music Analysis Tools

available from

www.musicbricks.net

Other Tools

- Arduinos + SunFounder Starter Kit
- Raspberry Pi's
- Lilipad Sewing Kit + Textile Fabrics
- FLORA - Wearable electronic platform
- Bitalino body signal kits
- Neurosky Brainwave Kits
- Pico Boards
- Adafruit 12-Key Capacitive Touch Sensor
- KaossPad
- Novation Launchkey MIDI keyboard
- x-OSC Microcontroller
- Bare Conductive Electric Paint
- Flora RGB Smart Neo Pixel
- RFID Wristbands
- PlayStation Portable for Rhythm Hack



- Voice-Changer Boards
- Necomimi Brainwave Cat Ears
- Adafruit NeoPixel RGB
- 3D Printer (MakerBot 2)
- Soldering Station

Challenges

- Best gesture and sound combination (proposed by MOD)
- Best hack on music & emotions (using Musimap API)
- Best hack using body signals
- Best use of GiantSteps APIs for
  music & sound analysis and recommendation
- Europeana Sounds Music Collection
  Genre Detection Challenge

Details: http://bit.ly/waveshack

Challenges	Awards
• Best gesture and sound combination	1 MOD Duo
• Best hack on music & emotions	500 € by Musimap
• Best hack using body signals	Hardware*
• Best use of GiantSteps APIs for music & sound analysis and recommendation	250 € vouchers
• Europeana Sounds Music Collection Genre Detection Challenge	500 € by Europeana

* from MindTecStore and Bitalino

Details: http://bit.ly/waveshack

Thanks to our Sponsors and Partners

Organized by

Thomas Lidy
Alexander Schindler
Oliver Hödl
Peter Knees
Richard Vogl
Joris Pekel
Wulf Gaebele
Christian Löw
Andreas Rauber

JOHANNES KEPLER
UNIVERSITÄT LINZ

Red Bull Music Academy

giant steps

Announcements

- Austrian Heartbeats
  Music Label &
  Music Technology (Startup) Event
  15-17 November 2016 in Tel Aviv

HACKING!

Saturday 9:45 a.m.
Be here in time!

Programme:

– 9:45 - 10:00 Welcome & Ideas Presentation

– 10:00 - 18:00 Hacking

– 18:00 - 18:30 Jury Session

– 18:30 - 20:00 Final Presentations & Awards

Food & Drinks provided!

All Details: http://bit.ly/waveshack

FESTIVAL!

Enjoy the concerts...

... but don’t be late! Saturday **9:45 a.m.**