CompMusic:
Computational models for the discovery of the World's Music

Xavier Serra

Music Technology Group

Universitat Pompeu Fabra, Barcelona

English ⬍ 🇬🇧

HOME

CompMusic is a research project funded by the European Research Council from 2011 to 2017 and coordinated by Xavier Serra from the Music Technology Group of the Universitat Pompeu Fabra in Barcelona (Spain). It aims to advance in the automatic description of music by emphasizing cultural specificity, carrying research within the field of music information processing with a domain knowledge approach. The project focuses on five music traditions of the world: Hindustani (North India), Carnatic (South India), Turkish-makam (Turkey), Arab-Andalusian (Maghreb), and Beijing Opera (China).

dunya.compmusic.upf.edu

dunya   Info   Legal   xserra   Logout

Dunya comprises the music corpora and related software tools that have been developed as part of the CompMusic project. These corpora have been created with the aim of studying particular music traditions and they include audio recordings plus complementary information that describes the recordings. Each corpus has specific characteristics and the developed software tools allow to process the available information in order to study and explore the characteristics of each musical repertoire.

Explore our collections

Carnatic   Hindustani   Makam   Jingju   Andalusian

LATEST NEWS

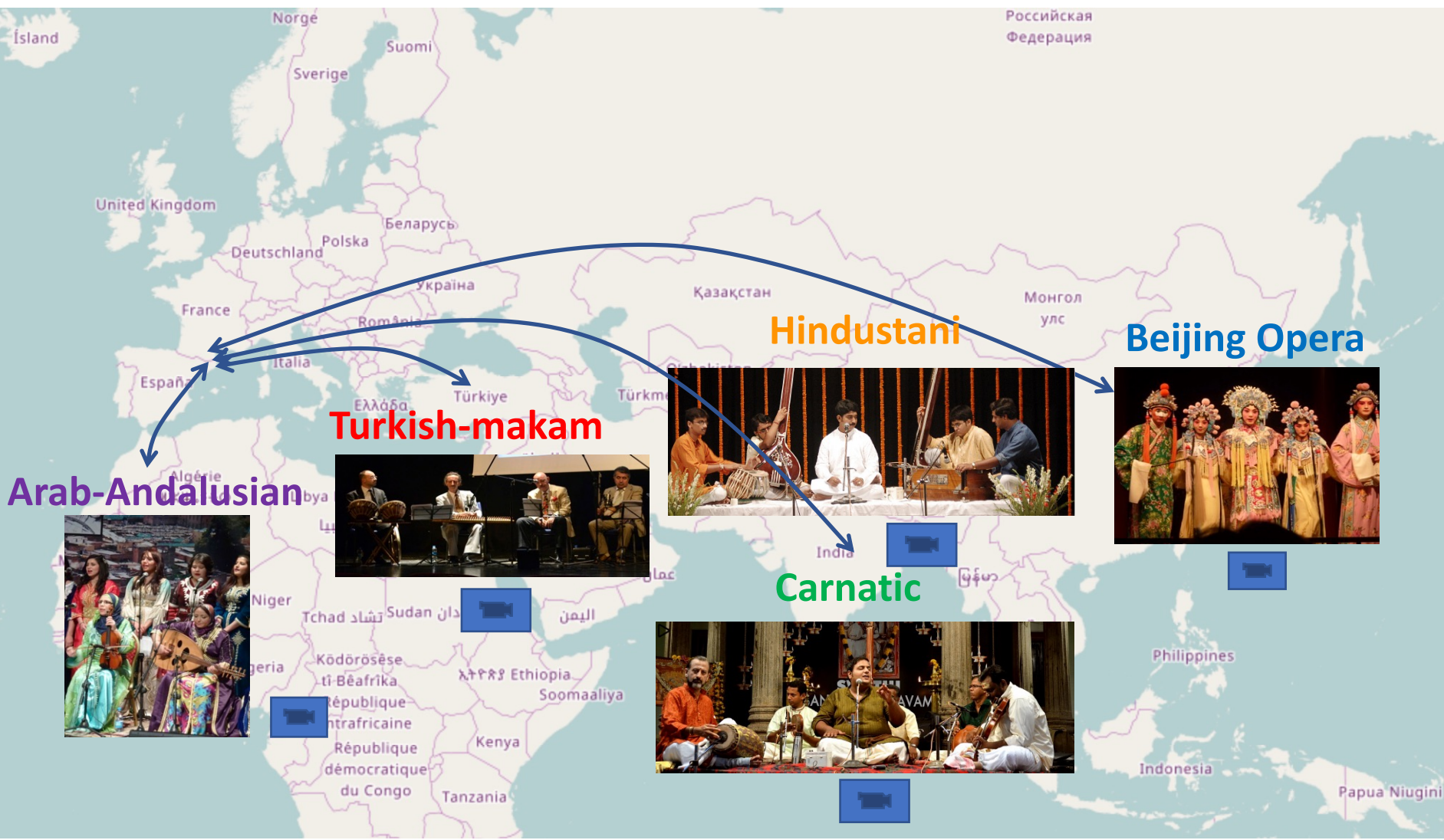**MOOC on North Indian Classical Music by the MTG on the Kadenze platform**
16/03/2018 - 15:36

The MTG, in collaboration with Ragasphere and on the Kadenze on-line...

Xavier Serra invited to talk at the University of Rochester in New York
01/03/2018 - 00:24

Xavier Serra gives two seminars at the University of Rochester (New York)...
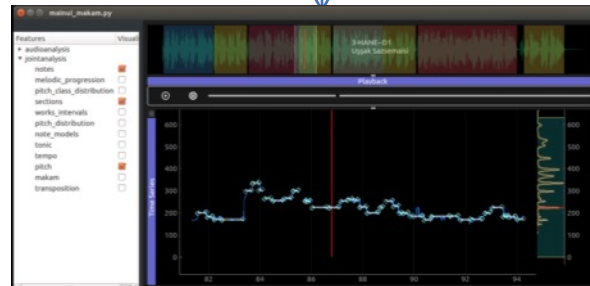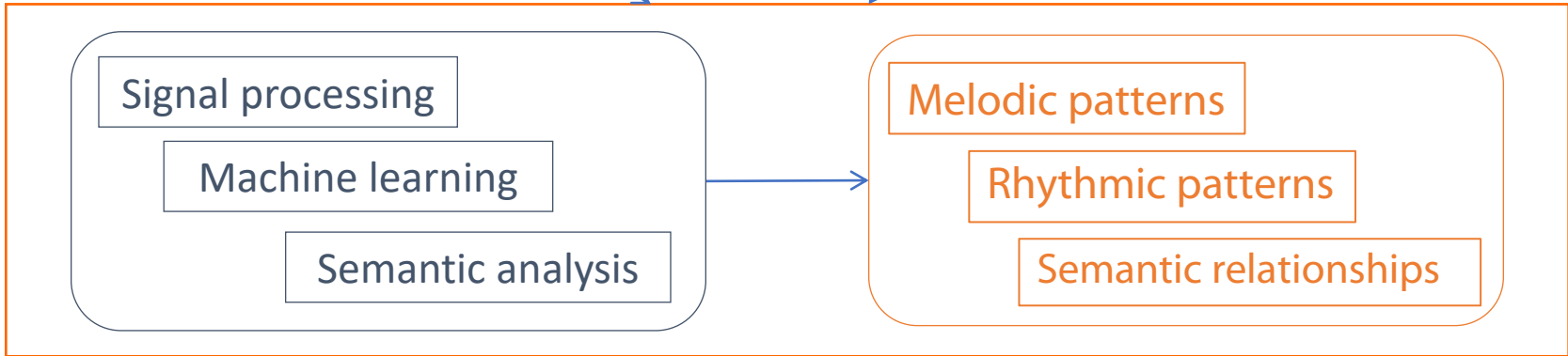
LATEST BLOGS

Interviews published in a Chinese Wechat Official Account 04/09/2017
WeChat Official Accounts can be understood as the WeChat equivalent of a Facebook page. They are drawing a lot of interest these days, as WeChat has risen to dominate the Chinese social media space (Chinese users spend ⅓ of their smartphone time...

Final Report 24/08/2017
CompMusic has finished, and our funding agency, ERC, asked us to write a brief report. Here is it. Achievements along the main objectives/activities The CompMusic project has been a big and long project with many achievements...

Technology and Multiculturality 17/04/2016
[Article published in the daily newspaper La Vanguardia on Sunday 17th 2016. English translation of the original text written in catalan.] The violin, typewriter or mobile are examples of technological devices that were born in certain contexts...

Music traditions studied

Hindustani

Beijing Opera

Turkish-makam

Arab-Andalusian

Carnatic

CompMusic team

Signal processing

Machine learning

Semantic analysis

Melodic patterns

Rhythmic patterns
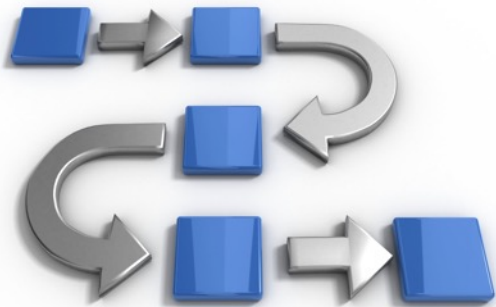
Semantic relationships

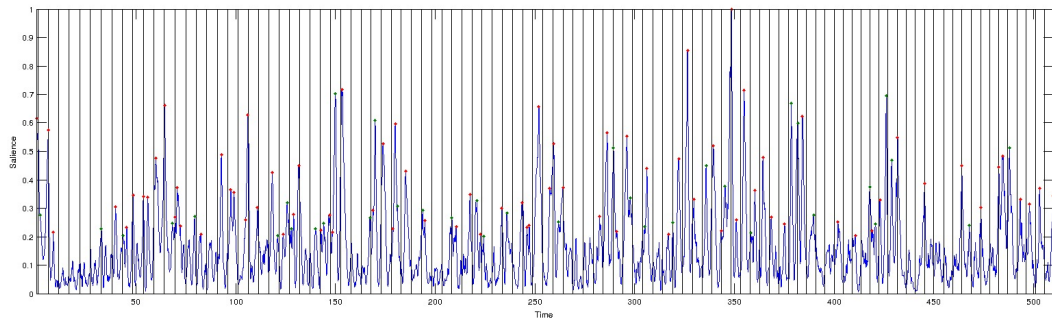*X. Serra,* "A Multicultural Approach in Music Information Research." ISMIR 2011.
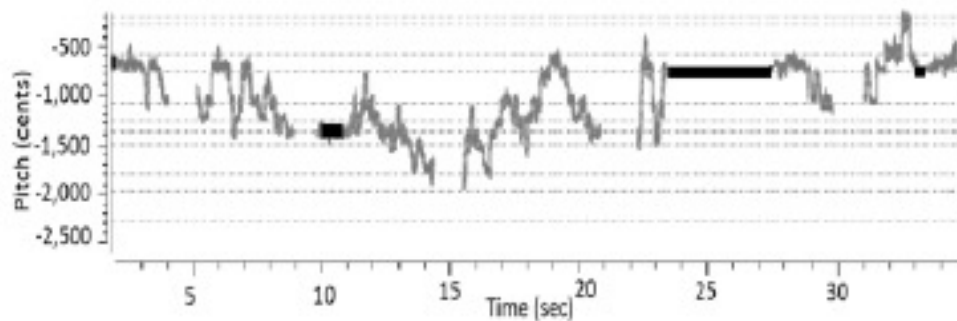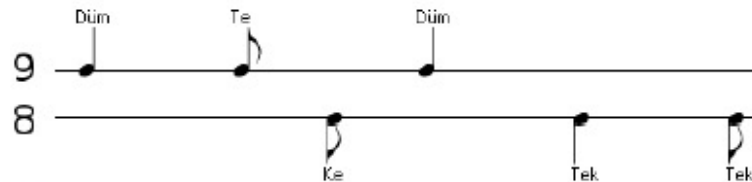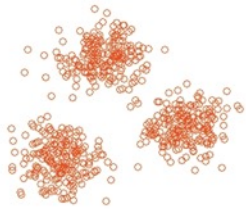
Problem
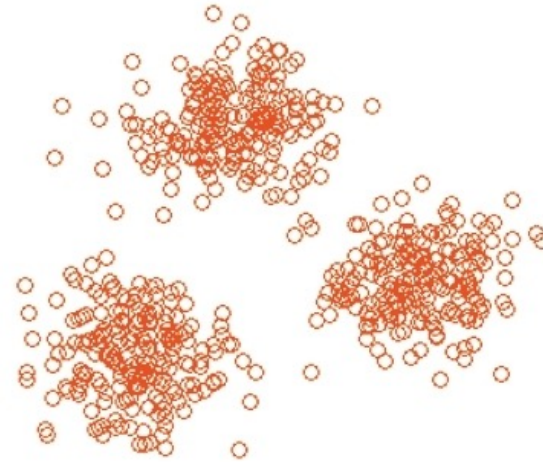
Data
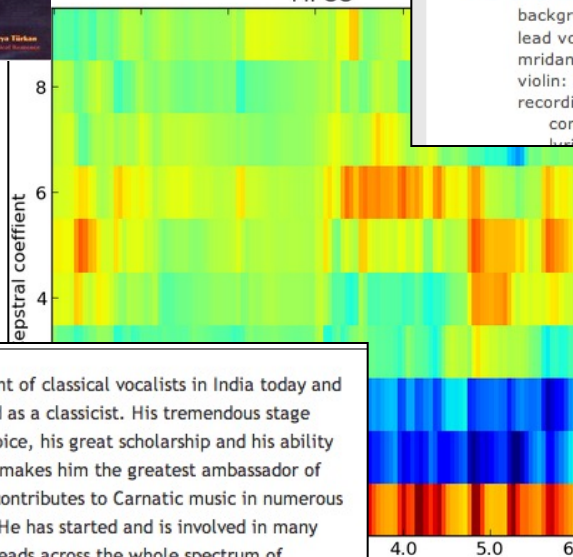
Methodology

Evaluation

Problem

Melody

Rhythm

Data

CD 1

1 Tharunam Eedamma - D.K.Jayaraman
  background vocals: Sukanya Sankararaman, Balaji Shankar
  lead vocals: D. K. Jayaraman
  mridangam: J Vaidyanathan
  violin: R. K. Shriramkumar
  recording of: Tarunam Edamma
    composer: Syama Sastri
    lyricist: Syama Sastri

2 Parvathi Pathim
  background vocals: Sukanya Sankararaman, Balaji Shankar
  lead vocals: D. K. Jayaraman
  mridangam: J Vaidyanathan
  violin: R. K. Shriramkumar
  recording of: Parvathi Pathim
    composer: Muthuswamy Dikshitar
    lyricist: Muthuswamy Dikshitar

3 Chanithodi Theve
  background vocals: Sukanya Sankararaman, Balaji Shankar
  lead vocals: D. K. Jayaraman
  mridangam: J Vaidyanathan
  violin: R. K. Shriramkumar
  recordi
    c
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MFCC

Cepstral coeffient

8

6

4

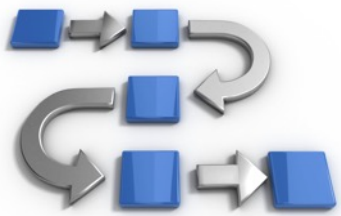4.0   5.0   6.

T.M. Krishna

Vocal

ARTIST'S WEBSITE
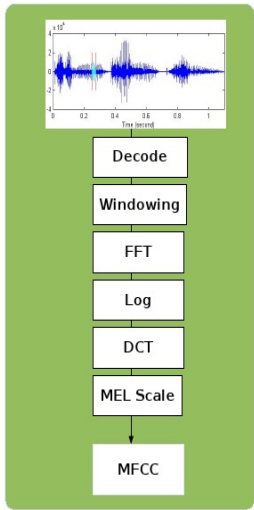
ARTIST'S FACEBOOK

ARTIST'S TWITTER

ARTIST'S YOUTUBE

T.M. Krishna is at the forefront of classical vocalists in India today and is known in the musical world as a classicist. His tremendous stage presence, his awe inspiring voice, his great scholarship and his ability to transcend cultural borders makes him the greatest ambassador of Carnatic classical music. He contributes to Carnatic music in numerous ways other than performing. He has started and is involved in many organisations whose work spreads across the whole spectrum of Carnatic music including research, archival and documentations, taking Carnatic music to various parts of society and to smaller towns and villages, conducting festivals focused at the youth, supporting artists from rural south India who need opportunities to widen their horizons and spotting youth talent and giving them opportunities. He conducts creativity workshops for corporates and has lectured in various organisations like IIM Bangalore, IIT Madras, CII, and Harvard university. He is an author who has co authored 'Voices within' a book dedicated to some of the greats of Carnatic music and contributes regularly to various journals and newspapers. He has also always been in the forefront to raise very many sensitive issues that affects Carnatic music over many years. A multifaceted personality.
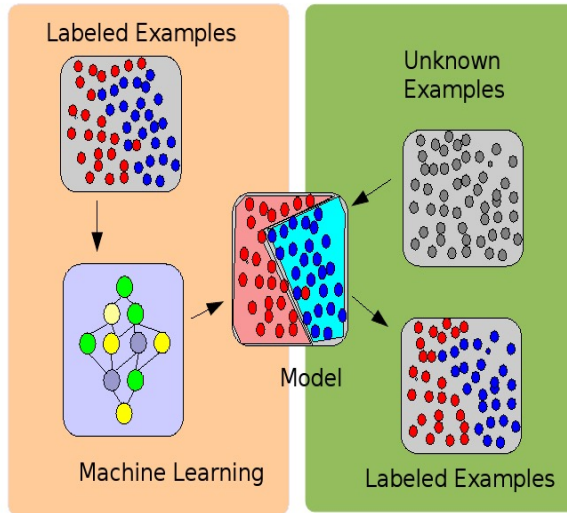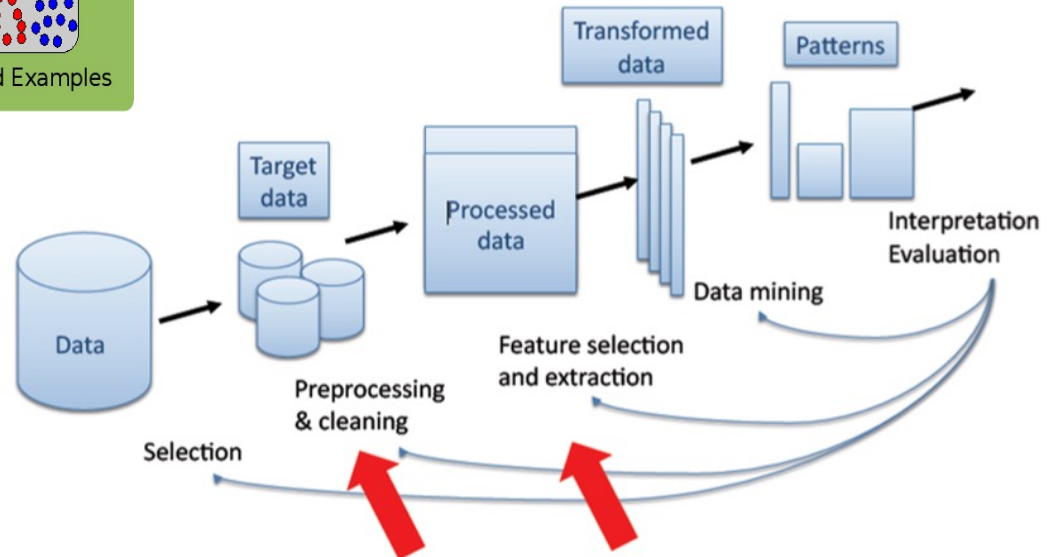
قدام الأصبهان

٣٢   توشية الميزان

الصنعة ١ . شغل - اصبهان . زجل

يَا كَوْكَبَ الأَخْلَاكَ   قَلْبِي هَوَاكَ

"توشية"

هَوَاكَ يَا فَتَّانْ

قَدْ حَيَّرَ الأَذْهَانْ

بِاللهِ يَا سُلْطَانْ

رِفْقًا بِمَنْ هَوَاكَ   وَدَعْ جَفَاكَ

الصنعة ٢ ٢٤٩ . اصبهان . توشيح

سَقَطَ الدُّمُوع جَارِي   مِنْ مُقْلَتِي سَقَطْ

كَالذَّرّ فِي انْحِطَاطِ   لَوْ كَانَ يَلْتَقِطْ

يَا نَاثِرَ اللَّئَالِي   مِنْ دَمْعِيَ

يَا مُشْبِه الغَزَالِ   الفَرِيدِ

يَا كَعْبَةَ الجَمَالِ   بِمُقْلَةٍ وَجِيدْ

يَا غِيدَ كُلَّ غِيدْ

كَلَّفْتِنِي شَطَطْ   يَا جَنَّتِي وَنَارِي

مِنِّي عَلَى شَطَطْ   مُذْ بِتُّ بِالنِّفَارِ

Methodology

Evaluation

	Algo.	$\mathfrak{f}_b$	$AML_{t,b}$	$\mathfrak{I}_b$ Bits	$\mathfrak{f}_s$	Tempo CML	Tempo AML	Tāḷa %
CMR	HMM_0	0.718	0.722	1.44	0.440	0.718	0.938	64
CMR	$AMPF_0$	0.825	0.906	2.17	0.574	0.802	1.000	68
HMR_s	HMM_0	0.759	0.698	1.21	0.551	0.533	0.721	60
HMR_s	$AMPF_0$	0.828	0.834	1.54	0.569	0.714	0.946	63
HMR_l	HMM_0	0.338	0.225	0.77	0.280	0.119	0.350	37
HMR_l	$AMPF_0$	0.390	0.427	1.35	0.268	0.350	0.740	27
Blrm.	HMM_0	0.853	0.910	2.52	0.666	0.755	0.988	91
Blrm.	$AMPF_0$	0.813	0.850	2.15	0.529	0.709	0.957	89

quantitative (algorithms)

qualitative (systems)

Results: data processing methods

- Prominent pitch detection (Atlı et al. 2015)

- Tonic detection and pitch representations (Gulati et al. 2014)

- Structural analysis (Sarala and Murthy 2013)

- Melodic/rhythm pattern detection (Gulati, 2016; Srinivasamurthy 2016)

- Lyrics to audio alignment (Dzhambazov et al. 2016)

- Score to audio alignment (Şentürk 2016)

Results: musicology

- Hindustani and Carnatic
  - Comparison of intonation characteristics (Serrà et al. 2011)
  - Raga grammar in improvisations (Ganguli et al., 2016)
  - Raga identification through the characteristic motives (Gulati et al., 2016)

- Turkish-makam
  - Metrical contradiction in *usuls* (Holzapfel and Bozkurt, 2012)
  - *Makam* characterization through their *seyir* (Bozkurt, 2015)

- Jingju
  - Linguistic tones and pitch contours relationships (Zhang et al., 2015)
  - Characterization of schools of *dan* role-types (Caro Repetto et al., 2015)

Publications

Computational models
for the discovery of the World's Music

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compmusic

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TEAM
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CORPORA
SOFTWARE
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NEWS
RESOURCES
GET INVOLVED

PUBLICATIONS

English

- S. Şentürk. **Computational Analysis of Audio Recordings and Music Scores for the Description and Discovery of Ottoman-Turkish Makam Music**. PhD Thesis, Universitat Pompeu Fabra, Barcelona (Spain). 2016.
- G. K. Koduri. **Towards a multimodal knowledge base for Indian art music: A case study with melodic intonation**. PhD Thesis, Universitat Pompeu Fabra, Barcelona (Spain). 2016.
- A. Srinivasamurthy. **A Data-driven Bayesian Approach to Automatic Rhythm Analysis of Indian Art Music**. PhD Thesis, Universitat Pompeu Fabra, Barcelona (Spain). 2016.
- S. Gulati. **Computational Approaches for Melodic Description in Indian Art Music Corpora**. PhD Thesis, Universitat Pompeu Fabra, Barcelona (Spain). 2016.
- K. K. Ganguli and P. Rao. "**Perceptual Anchor or attractor: How do Musicians perceive Raga Phrases?**". 22nd Frontiers of Research on Speech and Music (FRSM 2016), November 11-12, 2016, Baripada (India).
- A. Lele, S. Pinjani, K. K. Ganguli, and P. Rao. "**Improved Melodic Sequence Matching for Query Based Searching in Indian Classical Music**". 22nd Frontiers of Research on Speech and Music (FRSM 2016), November 11-12, 2016, Baripada (India).
- Y. Yang. **Structure Analysis of Beijing Opera Arias**. Master Thesis, Universitat Pompeu Fabra, Barcelona (Spain). 2016.
- R. Caro Repetto and X. Serra. "**NACTA: construyendo el futuro de la tradición del jingju**". XIV congreso de la Sociedad de Etnomusicología, IX congreso de IASPM España. October 20th-22nd 2016, Madrid (Spain).
- B. Uyar. **Türk Makam Müziği Usulleri İçin İnteraktif Eğitim Aracı**. Master Thesis, Bahçeşehir University, Istanbul (Turkey). 2016
- B. M. Atıcı. **Makam Müzikleri İçin Etkileşimli Eğitim Sistemi**. Master Thesis, Bahçeşehir University, Istanbul (Turkey). 2016
- H. S. Atlı. **Türk Makam Müziği'nin Ezgisel Boyutuna Yönelik İnteraktif Eğitim Programı**. Master Thesis, Bahçeşehir University, Istanbul (Turkey). 2016
- S. Şentürk and X. Serra. "**Composition Identification in Ottoman-Turkish Makam Music Using Transposition-Invariant Partial Audio-Score Alignment**". 13th

Tools: data + software

Dunya comprises the music corpora and related software tools that have been developed as part of the CompMusic project. These corpora have been created with the aim of studying particular music traditions and they include audio recordings plus complementary information that describes the recordings. Each corpus has specific characteristics and the developed software tools allow to process the available information in order to study and explore the characteristics of each musical repertoire.

Explore our collections

Carnatic | Hindustani | Makam | Jingju | Andalusian

Corpus-based research

WWW & other → Data gathering & preprocessing → data → Corpus creation → corpus → Datasets creation → dataset → Data processing → Models, patterns → Evaluation & interpretation → Knwl
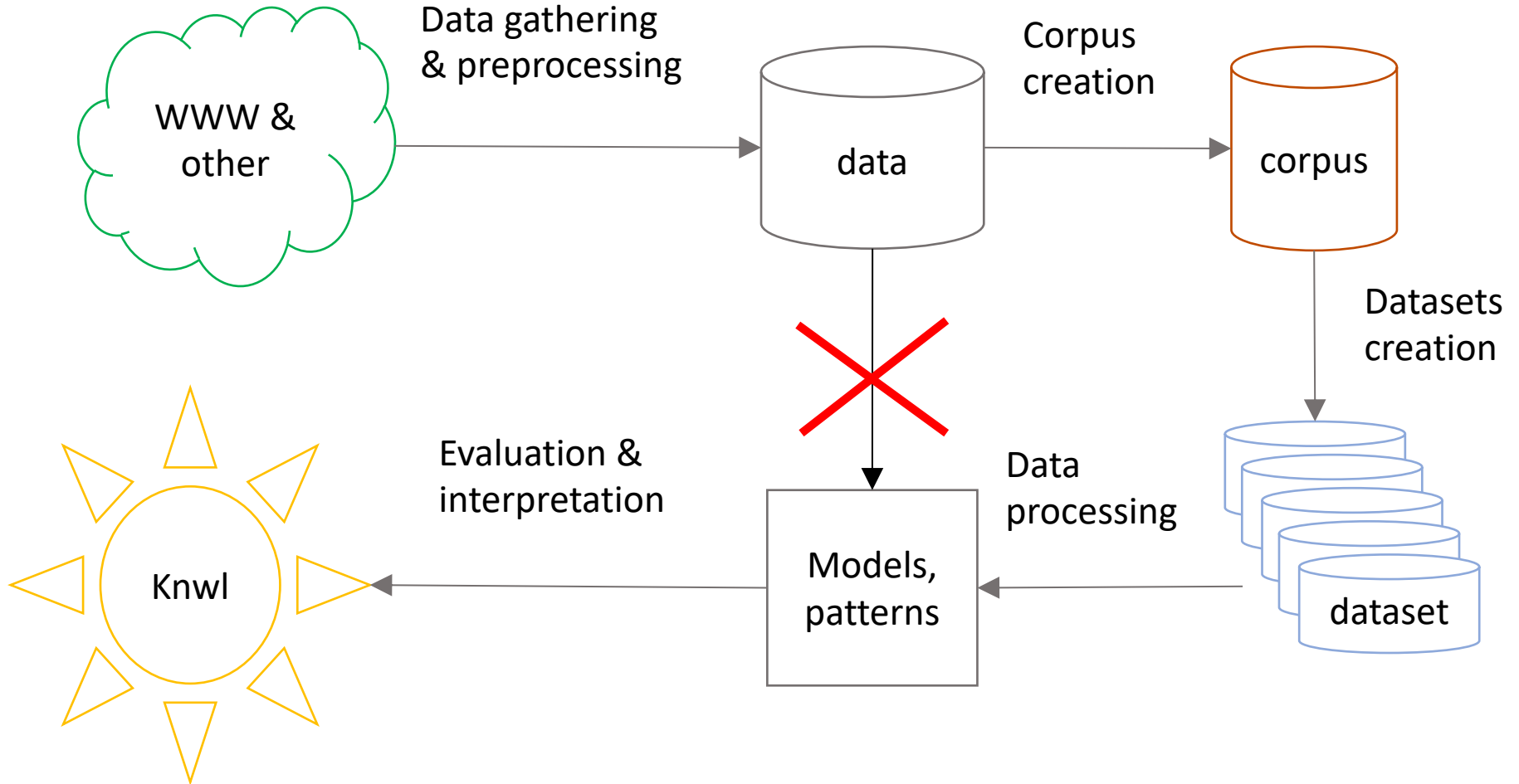
X. Serra. "The computational study of a musical culture through its digital traces." Acta Musicologica 2017.

Corpora and datasets

Music repertoire

Research corpus

test datasets
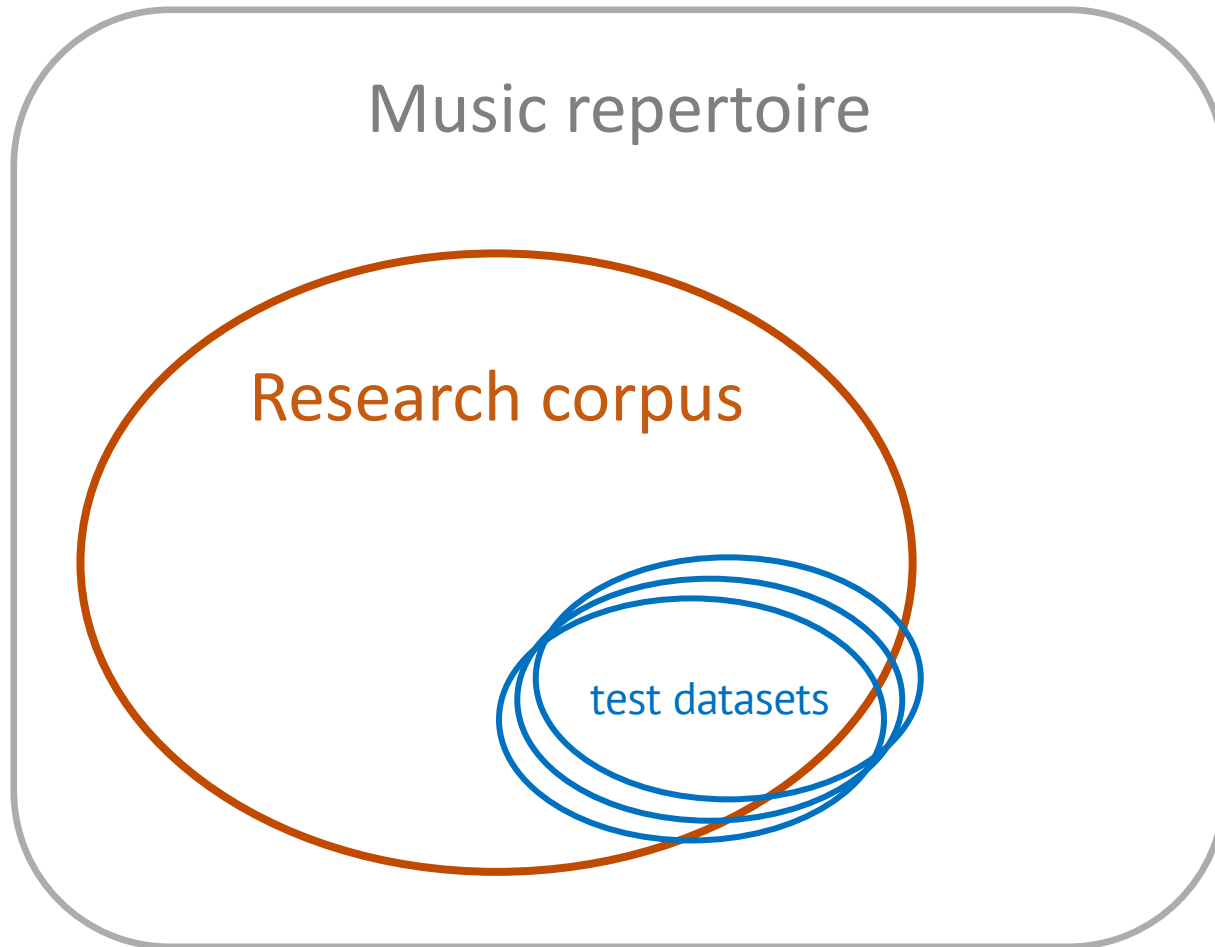
- Purpose
- Coverage
- Completeness
- Quality
- Reusability

X. Serra. 2014. "Creating Research Corpora for the Computational Study of Music: the case of the CompMusic Project." AES.

Release	Artist	Format	Tracks	Country	Date	Label
Carnatic Instrumental - Violin	T.N. Krishnan	CD	7	IN	1987	HMV (record store promos)
Live Concert Of Madras Music Festival	Namagiripettai Krishnan	CD	5	IN	1989	Geethanjali
Pancha Nadai Pallavi	Shankar	CD	2	US	1990	ECM Records (Edition of Contemporary Music)
Carnatic - Vocal (Classical Live Concert)	Madurai Mani Iyer	CD	10	IN	1994	INRECO
Carnatic Vocal	Sudha Ragunathan	CD	8	IN	1994	INRECO
Carnatic Vocal (1910 - 1965)	G. N. Balasubramaniam	CD	4	IN	1994	INRECO
Vocal	Semmangudi Srinivasa Iyer	CD	3	IN	1994	Saregama
Classical Vocal	Bombay Jayashri	CD	9	IN	1997	AVM audio
December Season 1999	T. M. Krishna	CD	9	IN	1999	Charsur Digital Workstation
December Season 1999	S. Sowmya	Digital Media	16	IN	1999	Charsur Digital Workstation
December Season 1999	Sangeetha Swaminathan	Digital Media	7	IN	1999	Charsur Digital Workstation
December Season 2000	T. N. Seshagopalan	Digital Media	15	IN	2000	Charsur Digital Workstation
December Season 2000	Aruna Sairam	Digital Media	12	IN	2000	Charsur Digital Workstation

	Lossy	Lossless	Total
Unique	4,398,025	2,329,610	5,592,168
All	14,585,390	9,060,048	23,645,438

Saraga Carnatic dataset

mir-dataset-loaders / mirdata

Unwatch   12   Star   178   Fork   32

<> Code   Issues 42   Pull requests 7   Discussions   Actions   Security   Insights
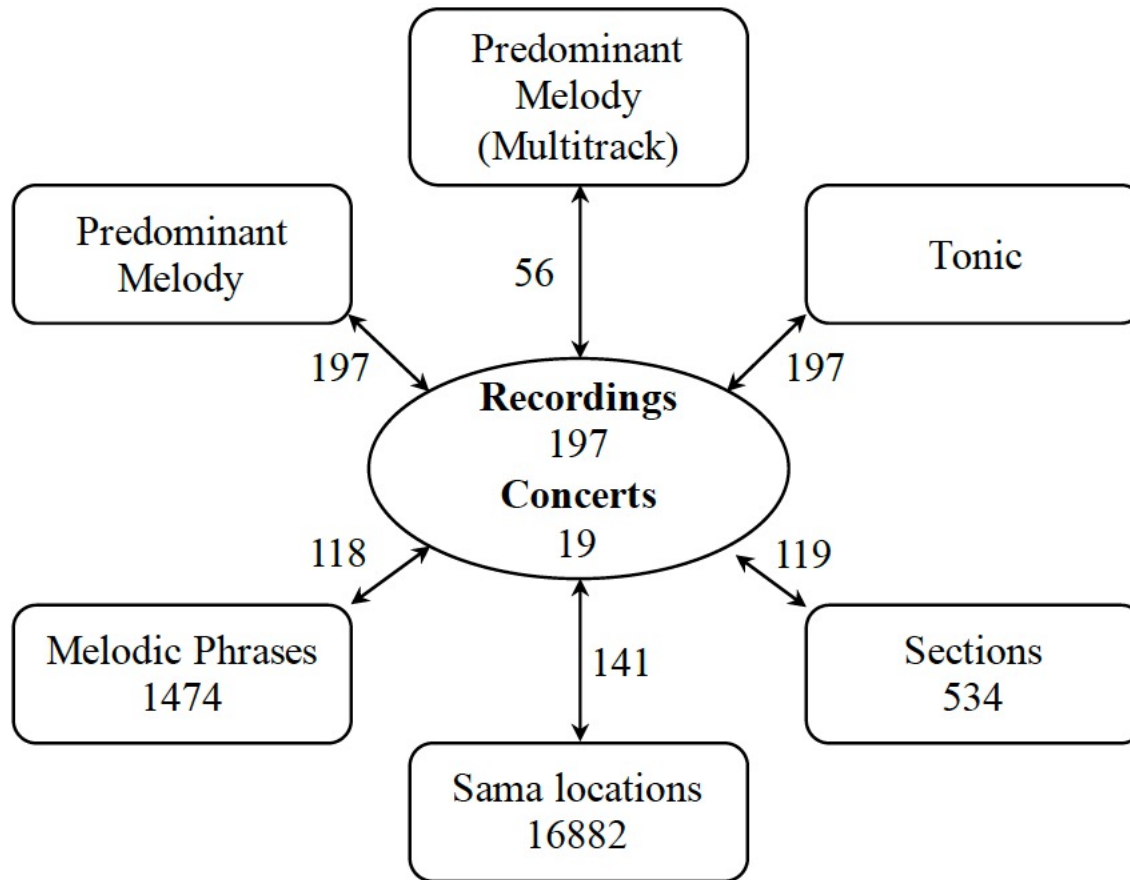
master   24 branches   16 tags   Go to file   Add file ▾   Code ▾

About

Python library for working with Music Information Retrieval datasets

🔗 mirdata.readthedocs.io/en/latest/

rabitt and Rachel Bittner speed up deduplication in NoteData (#513) ...   3fab998 on May 10   277 commits

.circleci	Add mypy (not strict) (#423)	5 months ago	
.github	Move datasets custom tests to subfolder (#475)	3 months ago	
docs	to_matrix converter for NoteData and F0Data (#506)	last month	
mirdata	speed up deduplication in NoteData (#513)	last month	
scripts	Add note annotations for medleydb_pitch and ikala (#507)	last month	
tests	speed up deduplication in NoteData (#513)	last month	
.codecov.yml	fix codecov.yml with 5% threshold (#66)	2 years ago	
.gitignore	Add acoustic_brainz test to gitignore (#386)	6 months ago	
.readthedocs.yaml	add readthedocs config file (#479)	3 months ago	
LICENSE	Update LICENSE	14 months ago	
README.md	Update links to documentation (#422)	5 months ago	
setup.py	to_matrix converter for NoteData and F0Data (#506)	last month	
tox.ini	Add Haydn op20 loader (#447)	2 months ago	

audio   python   music   dataset
mir   mirdata

📖 Readme
⚖ BSD-3-Clause License

Releases 16

🏷 0.3.3 Latest
on Apr 17

+ 15 releases

Packages

No packages published

Contributors 18

▤ README.md

mirdata

mir-dataset-loaders / mirdata-notebooks

<> Code   Issues   Pull requests 2   Actions   Projects
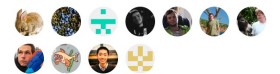
master   mirdata-notebooks / mridangam_stroke / mridanga

👤 genisplaja Update Mridangam notebook   Latest commit cdc443e on Jan 12   History

👥 1 contributor

2353 lines (2353 sloc)   455 KB   Raw   Blame

Mridangam stroke type classification task using Essentia Music Extractor.

```
In [2]:    #If not installed, install Essentia.
           # This cell is for running the notebook in Colab
           import importlib.util
           if importlib.util.find_spec('essentia') is None:
               !pip install essentia

           !pip install git+https://github.com/mir-dataset-loaders/mirdata.git
```

```
Collecting essentia
  Downloading https://files.pythonhosted.org/packages/d6/cf/3c776d02b63fed7b0958bef2ce57b900870e2ac3f1fd8ffbb63f22d0e69e/essentia-2.1b6.dev234-cp36-cp36m-manylinux1_x86_64.whl (11.7MB)
    ████████████████████████| 11.7MB 3.7MB/s
Requirement already satisfied: pyyaml in /usr/local/lib/python3.6/dist-packages (from essentia) (3.13)
Requirement already satisfied: numpy>=1.8.2 in /usr/local/lib/python3.6/dist-packages (from essentia) (1.19.5)
Requirement already satisfied: six in /usr/local/lib/python3.6/dist-packages (from essentia) (1.15.0)
Installing collected packages: essentia
Successfully installed essentia-2.1b6.dev234
```
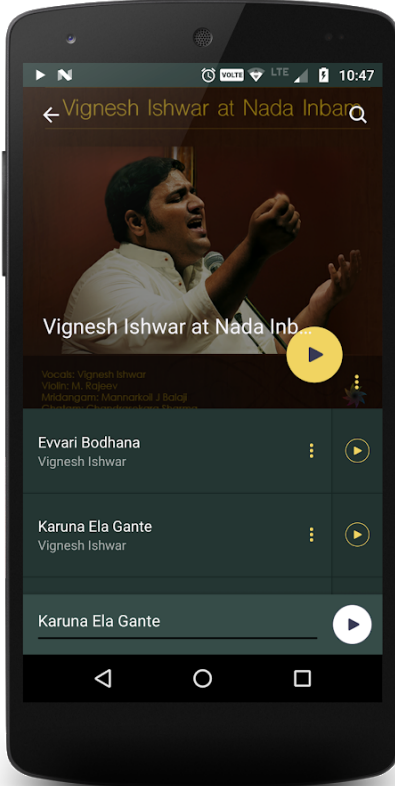
Applications: Dunya Desktop

Applications: Saraga

Applications: Riyaz
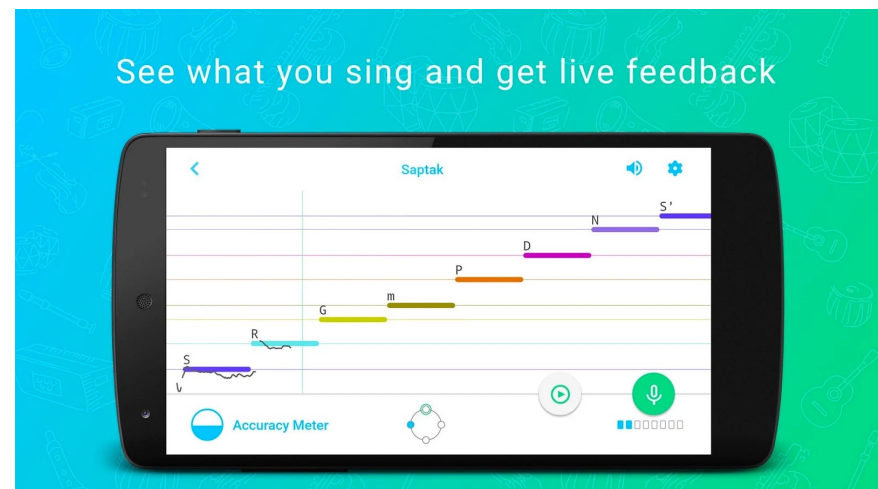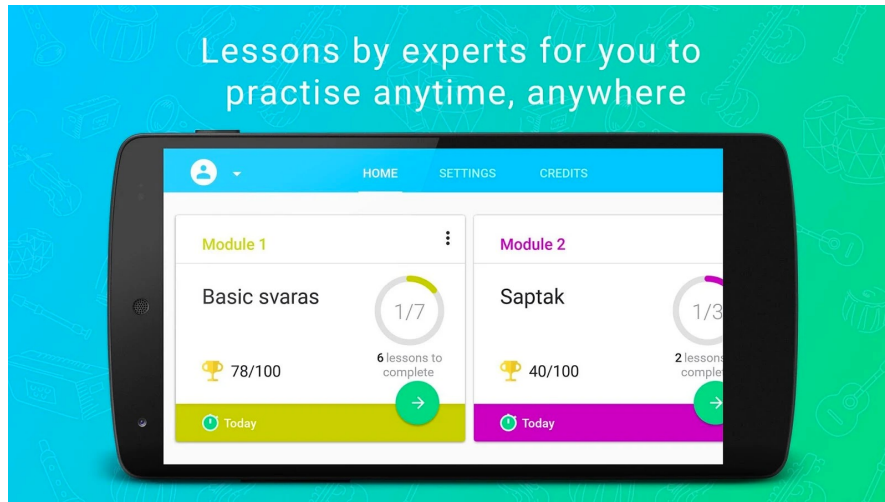
Applications: Music Critic

Related current work

- Improving Corpora/datasets (MIR-data)

- Music appreciation tools (MusicalBridges)

- Assessment of musical performances (MusicCritic)

- F0-detection for solo voice in Indian music

- Melodic pattern analysis in Arab-Andalusian scores

- Pattern analysis on Indian music pitch tracks

References

- MTG: https://www.upf.edu/web/mtg/
- CompMusic: http://compmusic.upf.edu

India and China through their music

An approach to the culture and society of India and China through the understanding and appreciation of khayāl and jingju

To the course page ›

News

02.05.2019

12.02.2019

Cat**M**úsica

05.12.2018

NITIN AMIN

AMB EL BANSURI A L'ÀNIMA

Talk and Concert of Hindustani Classical Bansurī

Interview with Musical Bridges researcher Rafael Caro in Catalunya Música

Nitin Amin featured by Revista Musical Catalana

Tāl laboratory

This "laboratory" allows to dissect, explore and interact with some of the most representative tāls used in Hindustani classical music. Read the instructions below.

Tāl visualizer

This visualizer allows to observe how the tāls studied in the laboratory are used in the real performance of a *khayāl*. Read the instructions below.

Raag Bhairav -

Raag Bhairav
Kumar Gandharva

+info

☑ ṭhekā
☑ cursor
☑ tāl

DHIN

na   na

dhin   dhin

झपताल
jhaptal

dhin   dhin

dhin

na   na

tin

55.9 mpm   02:46 / 24:17   Play

jhaptāl   ektāl

Rāg and tāl visualizer

The melody in any *khayāl* performance is determined by the rāg, whose correct and moving expression is the main goal of the singer in this genre. This visualizer allows to follow the melodic progression through a rāg in real performances of *khayāl*, as well as the progression of the tāl cycles. Read the instructions below.