TONALITIES: an Online Collaborative Interface for Music Analysis

TONALITIES, *IReMus'* pilot for musical heritage data project *Polifonia*, develops tools for the modal-tonal identification, exploration and classification of monophonic and polyphonic notated music from the Renaissance to the twentieth century. As of today, the tools are available for use within the TONALITIES Interface for music analysis.

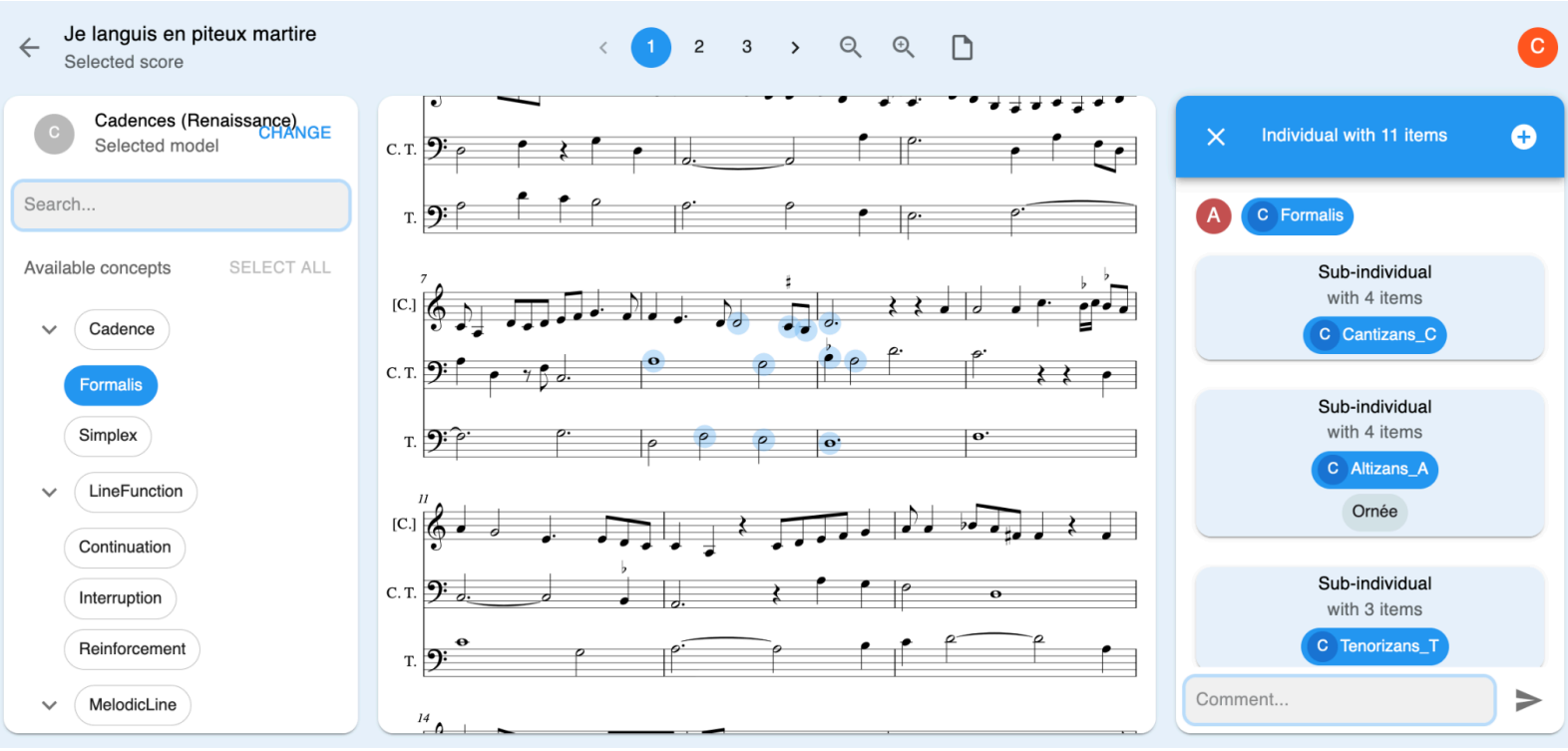
Semantic web technologies and AI to aid in music analysis
The TONALITIES Interface includes interactive music analysis tools to support informed and guided analytical inquiry. It provides an annotation environment that allows the comparison and commentary of different analytical viewpoints when studying musical scores. The software uses semantic web technologies to produce theoretical models whose concepts can be associated manually, and eventually using artificial intelligence, with arbitrary musical selections via a highly ergonomic interface. *"Thanks to an annotation environment that encourages scientific argumentation and collaborative decision-making like this, the TONALITIES User Interface resolves a number of socio-cultural, academic and socio-economic gaps, such as the lack of associative workflows and scientifically informed approaches to musical heritage and the lack of interactions with cultural industry actors,"*says Christophe Guillotel-Nothmann, pilot leader of TONALITIES.

This interface is intended for a variety of audiences - cultural institutions; higher education, secondary education and specialist music training; professional performers; researchers and the music industry - in order to achieve different application objectives: guiding listening, seeing and hearing, understanding musical structures, collaborative analysis of large corpora of digitised scores, using AI in particular. AI is used to create ground truth for deep learning, to visualise machine annotations and to correct them for incremental learning.

The aim is to highlight different musical properties by comparing points of view and keeping track of the reasoning that led to the production of documented and signed musical analyses. Users can do this by first creating an *ORCID ID* and starting an analytical project. Other users can open the same project and work on it, and each contribution is signed, as each user is identified via their *ORCID ID*. A big plus is that any MEI score that is publicly available on the web can be annotated by just providing a link. To learn more about how to get started, watch the tutorial video on YouTube.

Patent for a useful new teaching tool
Stakeholders from the educational sector, who were actively involved in the user experience design, praise the usefulness of the tool and design of the interface: *"I am really impressed by the elegance of the overall interface"*, says professor of music Richard Freedman, key stakeholder from Haverford College (USA) and who will use the tool during his Fall 2024 classes.

The interface proves to be a valuable teaching tool - at both secondary and higher education levels - in that it enables structural elements to be designated and associated with analytical concepts (e.g. cadence, chords, exposition of sonata forms). From a pedagogical point of view, it contributes to a reasoned integration of AI into training and makes it clear that the association



between concepts and musical segments is never neutral but a matter of interpretation. The interface supports amateur and professional artistic training, because it establishes the link between what is seen and heard, and will eventually make it possible to annotate different recorded interpretations of music - for example on the basis of concepts derived from historically informed interpretation.

Recently the *Centre national de la recherche scientifique* acquired a patent on this unique and useful music analysis collaboration tool. The interface was developed as part of the *Horizon 2020* funded project *Polifonia*. Within Polifonia, four years of research development at the intersection of musicology, semantic web technologies and Music Information Retrieval have led to the release of multiple tools, publications and a linked music data portal 'Polifonia Web Portal'. All software within this project is offered as an open access component of a *Polifonia Ecosystem*. As of today, the TONALITIES user interface can also be found here and can be used and implemented freely, as long as the *IReMus* laboratory is credited.

Learn more

TONALITIES interface:
https://data-iremus.huma-num.fr/tonalities/
TONALITIES tutorial video:
https://youtu.be/jySBQWjWZZg?si=wYCB_esClxj2FJ4K

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IReMus
IReMus (Institut de recherche en Musicologie) is a CNRS laboratory that covers most of the sub-disciplines of musicology (historical and systematic musicology, ethnomusicology, the study of contemporary popular culture, musical institutions, the sociology of music, cognitive psychology, musical aesthetics, digital musicology), and is responsible for promoting the musical heritage preserved in France.

Polifonia
Polifonia is a 3M€ project funded by the EU Horizon 2020 Programme that will run from January 2021 until April 2024 to recreate the connections between music, people, places and events from the sixteenth century to the modern day. These findings will be available to everyone as an interconnected global database on the web – a knowledge graph – and will enhance our understanding of European musical heritage.