Digital musicology: through research and teaching

Tim Crawford
t.crawford@gold.ac.uk
Goldsmiths, University of London, United Kingdom

Kevin Page
kevin.page@oerc.ox.ac.uk
Oxford University, United Kingdom

David Lewis
david.lewis@oerc.ox.ac.uk
Oxford University, United Kingdom

David De Roure
david.deroure@oerc.ox.ac.uk
Oxford University, United Kingdom

Introduction

The Transforming Musicology project began in 2013, with funding from the UK's Arts and Humanities Research Council. It had three primary aims: to explore how technology could enhance, and perhaps 'transform', the practice and dissemination of conventional musicological research; to explore how large, new online sources of information, such as social media, might be exploited by digital musicology; and to look, in a modest way, at how digital approaches might be adopted in a sustainable way by the musicological community and beyond.

In this paper, we give an overview of the project and how it developed, discuss our strategy for approaching these goals, and reflect on how an inclusive strategy for both research and teaching can be effective, despite its organisational and financial costs.

The Transforming Musicology research project

Conventional musicology is represented in the project by two research strands, one drawing on music from the early modern period and with an emphasis on corpus-based research, and the other considering both the psychological perception and the historical reception of Wagner's use of leitmotifs, centred on his Ring cycle. The project also funded four mini-projects, selected from an open call, to extend the range of research that Transforming Musicology could cover. These, like our research on musicology of online communities, could then be treated as case studies for an analysis of technology needs and overlaps, points of connection, workflows and the areas where connective technologies such as Linked Data might be most effective.

The **early modern** strand of our project builds on two corpora: Early Music Online (EMO), scanned images and metadata for 300 sixteenth-century printed music books owned by the British Library; and the Electronic Corpus of Lute Music (ECOLM), a collection of full-text encodings and metadata for lute music. These contain closely interrelated music, and Optical Music Recognition tools were used to support the extraction of musical information from the facsimile images. Additional funding supported the creation of an open Linked Data union catalogue connecting the resources to one another and to relevant external resources, and the creation of a prototype application that supports both the linking process, and the publishing of web pages based on the now-linked resources. In collaboration with the BBC (the UK's national broadcaster) this resulted in demonstration pages for a BBC radio programme, the Early Music Show, allowing navigation of broadcast programme information, enriched with images and information from EMO, ECOLM, DBPedia and other sources of Linked Data (Weigl et al., 2016). Meanwhile, the musical content can be analysed to explore the creative process of arranging the vocal music of EMO for the lute, as seen in ECOLM (Lewis, Crawford & Müllensiefen, 2016)

The **Wagner** research strand has two elements. Firstly, we are exploring the early development of guidebooks and other media aimed at helping listeners recognise and follow the so-called leitmotifs in Wagner's four-opera cycle, Der Ring des Nibelungen. These diverge from the composer's own description of the use of motifs in his works, and tease out different aspects of the musical and dramatic themes of the works. In addition to the musicological question here, we also investigate whether a semantic web ontology can usefully represent the diversity of motifs, their different expressions and their relationships (Rindfleisch, 2016).

The second Wagner element is psychological, with biometric readings taken from audience members during performances of all four operas of the cycle. Along with memory tests, these provide us with a huge amount of data to interpret, and challenges for how to publish that data in ways that are useful to others.

Further to this real-time physiological data, we also have expert annotations of a score, recording performance aspects that might be significant in the subject responses but not recorded in the notation, along with a complex set of information for aligning the time-based responses with each other and with a musical score (Baker & Müllensiefen, 2016).

A vast quantity of music of all kinds has become available on the web during recent decades and has engendered a correspondingly large amount of commentary, whether simply in the form of 'likes', or through intense online discussion on specialist websites to sophisticated scholarly articles. We carried out a pilot investigation of **user communities** on a lyric-annotation website, genius.com, formerly Rap Genius. With over 3,000,000 annotations, this can be regarded as a paradigmatic and valuable musicological resource which needs to be approached with the techniques of Big Data; our work has been centred on the overlaps between the networks of annotators and the songs and artists they annotate (Fields & Rhodes, 2016).

The four **mini-projects** have contributed: audio analysis of historical electronic music; ornamentation style in traditional Irish flute playing (Jančovič, Köküer, and Baptiste, 2015); a big data approach to finding the sources of the poetry used in medieval sacred songs; and an exploration of 18-20th-century London musical life based on digitised concert information from programmes and newspapers (Dix et al., 2014).

For these investigations, we have evaluated how **semantic web technologies** may offer solutions for bridging between disparate data and tool sets, and help document the research and its data, making it more reproducible as a result. (Nurmikko-Fuller and Page, 2016)

The Transforming Musicology website's Publications section offers a more complete list of research outputs than can be covered here.

We have embedded engagement with technology, musicology and other music-related communities in our work in general, but the most significant step for us in ensuring sustainability for digital musicology has been the creation of a week-long digital musicology workshop as part of the Digital Humanities at Oxford Summer School. The summer school is the largest of its kind in Europe, and is made up of a framework programme, consisting of a morning session each day, after which students attend the more specialist workshop they have selected.

By summer 2017, this will have run in three consecutive years and attracted a diverse set of over fifty students.

Teaching Digital Musicology at the Digital Humanities at Oxford Summer School

Although courses do exist on specialist areas within musicology (such as the Music Encoding Initiative summer school in Paderborn) this is the first dedicated to the whole discipline. In designing the curriculum, the Transforming Musicology team have reflected on how we can best make the methods that we have investigated over the course of the project – along with others that we know are used and work well – readily accessible to the wider musicology community.

Just as we have endeavoured to be inclusive in our approach to the musicological research that we have undertaken and supported within the project, we have also sought to create a space in which musicologists can be introduced to, and given the opportunity to experiment with, a wide variety of tools and approaches. It is important to us that the questions that musicologists investigate are not distorted when technology is brought to bear, and our teaching reflects this by balancing sessions about general-purpose tools with domain-specific use-case descriptions.

Students are eased into the week with an introduction giving an overview of the week ahead, but also some personal reflections about moving into a digital musicology approach from a more traditional background, and each day begins with presentations of case studies to motivate the techniques introduced during that day. Each day broadly considers a single topic, covering audio processing on both a small and large scale, music encoding, Optical Music Recognition and music processing. The final day presents more case studies and closes with a round table discussion which is intended to give the students the opportunity to reflect on the week and their own research practice and consider if and how the skills that they have learned can be useful to them.

The workshop is intended to stimulate ideas rather than to make programmers and audio engineers of our students, although we do still expect students to perform simple programming tasks and introduce them to key audio concepts and tools. Such lofty, long-term goals are difficult to evaluate. We take immediate feedback through a form on the last day, although the longer-term effect of attending can only be seen as the students develop their research in the coming years. Shorter-term impacts, including collaborations with

tutors on papers and research proposals, and increasing contributions to conferences and workshops with an explicitly digital aspect can already be seen.

Musicology has always been interdisciplinary in nature, and has been transforming itself based on contributions from computing and web technology for over fifty years. We see our project as contributing to and supporting that transformation, both through our own research and through developing the skills of others.

Acknowledgements

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