Examples of Digital Musicology

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Outline

- Review a selection of studies
  - Ian Knopke and Frauke Jürgensen (2012)
  - Elena Alessandri (2011)
  - Nicholas Cook (2007)
  - Dmitri Tymoczko (ca. 2008)
  - Reinhard Kopiez (2009)
  - Peter van Kranenberg (2007)
  - Anja Volk (2013)
- Conclusions: affordances of digital musicology

Ian Knopke and Frauke Jürgensen

Evidence for performance practice in sources

- The Buxheim Organ Book, a manuscript source of organ tablatures, compiled in Münich in the 1460s
- Knopke and Jürgensen start with Mark Lindley's theory that this source demonstrates two different tuning systems, Pythagorean and mean-tone
- Lindley categorises triads as Pythagorean or mean-tone
- He gives a few examples, but no statistical evidence
- Knopke and Jürgensen encoded the source and some concordant mensural sources using `**kern`
- They encoded the tablature, the foliation, and a common practice notation transcription orthogonally; a year's work

Ian Knopke and Frauke Jürgensen

Evidence for performance practice in sources

- They were looking for evidence of factors which determine Lindley's triad groupings
- They extracted triads from salient points in the pieces:
  - prolonged sonorities;
  - places where the texture thickens;
  - strong points within mensural units.
- They correlated these with the equivalent triads in the concordant mensural sources
- Many of these triads included sharpened thirds, which the mensural sources did not
- Users of the mensural notation would have applied *ficta* rules
- They argue that the instruments available to these intabulators must have been tuned to favour these triads
- This study employs "chord profiles" to demonstrate trends in Buxheim and related sources

Elena Alessandri

Patterns in music criticism

- Alessandri et al. carried out a statistical analysis of reviews of recordings of the Beethoven piano sonatas published in *Gramophone* between 1923 and 2010.
- They collected their data manually from the Gramophone's online archive
- They constructed a database to record the details of each review:
    - author;
    - date;
    - sonatas reviewed;
    - label;
    - length.
- They also tagged the texts with high-level semantic labels; this was done in triplicate

Elena Alessandri

Patterns in music criticism

- They found that a large proportion of the reviews were written by a small proportion of the critics
- They found that a large proportion of the reviews covered only a small proportion of the labels and of the pianists; a long tail
- From the tagged text, they found that reviews have become more focused on questions of interpretation in recent years
- This study uses extra-musical data to uncover patterns in an extra-musical practice

Nicholas Cook

Objective measures of performance style

- The Centre for the History and Analysis of Recorded Music has produced a collection of the recording history of many of Chopin's Mazurkas (around 1500 recordings)
- Nicholas Cook et al. were interested in empirical studies of musical performance
- They used *Sonic Visualiser* to generate beat data for all the recordings of some of the Mazurkas
- This resulted in very detailed data on expressive timing in performances
- This allowed them to build profiles of phrase arching employed by performers
- These profiles could be compared to find similar performances

Nicholas Cook

Objective measures of performance style

- From this they inferred relationships between performances such as teacher/pupil relations
- This study relies on its objective measures of similarity; a key provision of music information retrieval

Dmitri Tymoczko

Evidence to support traditional music theory

- Dmitri Tymoczko collected a database a Roman Numeral analyses of all the Mozart piano sonatas
- Also included labels for smaller corpora from a number of other composers ranging from Josquin to Beethoven
- Analyses were made and encoded by student and colleague volunteers
- Tymoczko used `music21` to analyse these data
- He addresses some fundamental questions in traditional music theory:
  - How accurate is standard harmonic theory?
  - How did tonal harmony develop?
  - Do non-harmonic tones serve a structural function?
  - Is Roman Numeral Analysis justified?

Dmitri Tymoczko

Evidence to support traditional music theory

- To address accuracy of tonal theories he compares the proportion of progressions in his database that conform to the models in four different theories.
- To address development he compares the proportion of diatonic progressions, and first inversion chords used in works by a span of composers over time.

Reinhard Kopiez

Analysing public and private musical tastes

- Reinhard Kopiez et al. created a database from around 1300 playbills from performances given by Clara Schumann, a collection started by her father and continued by Clara up to her death.
- Spanning over 60 years of performances
- The data were entered by hand by musicologists.
- From these data they were able to conduct historiometric studies of canonisation of repertoire over the course of the C19th.
- Clara Schumann performed 536 distinct works over her career, 70% taken those of R. Schumann, Mendelssohn, Beethoven, and Chopin.

Reinhard Kopiez

Analysing public and private musical tastes

- They found that Clara performed only 2.8% Brahms, debunking the myth that she had an affair with Brahms and so favoured performing his music
- This work borrows from an intellectual movement known as *empirical aesthetics*
- Scholars in this field attempt to find models for understanding aesthetic phenomena such as changing tastes which are sociologically and psychologically informed

Peter van Kranenberg

Machine learning for composer attribution

- Peter van Kranenberg explored author attribution questions of some disputed organ works currently in the J. S. Bach catalogue
- Data comprised 35 works of undisputed authorship (J. S. Bach, Krebs, Kellner, and W. F. Bach)
- He used these as training data for a machine learning algorithm
- The training process results in a model
- The features he worked with included:
  - frequency of different sizes of vertical intervals between parts;
  - frequency of parallel motions of different intervals;
  - methods of treating dissonance;
  - voice density;
  - harmony and pitch entropy measures (i.e. how frequently, therefore predicably, each harmony/pitch occurs);
  - variety of time intervals between note onsets

Peter van Kranenberg

Machine learning for composer attribution

- He extracted features from 30-bar segments of each piece
- For each piece, the model showed the number of sections classified as J. S. Bach as a proportion of the number of sections in the whole piece
- This study demonstrates use of automated techniques to make musical judgements

Anja Volk

Large-scale stylistic analysis

- Anja Volk et al. employ a collection of 11,000 ragtime MIDI files and associated metadata which have been published by enthusiasts online
- Edward Berlin hypothesised that syncopation is a key distinguishing feature of the ragtime style
- Berlin described two different kinds of syncopation (*tied* and *untied*) and describes how the style has adopted them over time
- Volk at al. analysed their database and confirmed Berlin's hypotheses
- They were also able to demonstrate the greater extent of the style beyond Joplin and Scott
- This study demonstrates working with large-scale data
- It demonstrates finding evidence for musical practice beyond the received canon

Affordances of Digital Musicology

- Broad aim amongst (IS)MIR scientists of machine listening
- Objectivity, empiricism, studying trends rather than details
- Studying non-canonical (lost, forgotten, non-'great') repertoire
- Stylistic comparison; objectivity in attribution work
- Patterns in musical content; patterns in extra-musical information
- Musicology of performance