Computational Research in Music

Modelling and Transparency

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3 Topics

- Modelling and analysis
- Requirements
- Transparency

Modelling – Account for a Musical Phenomenon

- Ex. 1: How timbres convey specific emotions? (Eerola, 2012)

$$Tense = \beta_0 + \beta_{SpecCentr}5.2 + \beta_{Diss}3.4 + \beta_{SpecEntr}8.1$$

- Ex. 2: What is the complexity of a piece of music? (Eerola, 2016)

$$Complexity = \beta_0 + \beta_{Prox}0.01 + \beta_{Tonal}0.12 + \beta_{PCEntr}0.05$$

- Ex. 3: How can you tell from movements if musicians interact? (Eerola, Jakubowski, Moran, Keller & Clayton, 2018)

Analysis of Empirical Data

- Obtained from experiments (sometimes require computation)
- Obtained from archival materials (always require computation)
  - Musical features from corpus, wonderful tools available:
    - *symbolic* music: `music21` (python), `miditoolbox`
    - *audio*: `librosa`, `essentia` (python)
  - Also tons of metadata available (streaming services, social media)

Computational Research in Music – Requirements?

- Programming skills
- Interdisciplinary mindset and collaborative agenda
- In advanced tasks, help from computer scientists/ARC staff
  - e.g., CPU intensive tasks, complex architectures/workflows
- Open Source solutions (Python & R rather than Matlab & SPSS)
- Training (PhD, PG, UG), support and promotion

Transparency – Sharing Tools/Data/Analyses

- Models are shared transparently (e.g., https://github.com)
- Commitment to *Reproducible Research*: https://github.com/tuomaseerola/ReproR
  - Since 2003 with toolboxes (MIDI toolbox, MIR toolbox)
  - Since 2013 with data in Harvard Dataverse
  - Since 2016 with Open Science Framework
  - Durham Music and Science Lab commitment: https://musicscience.net/resources/collections/