Modeling Repetition and Variation for MIR

WiMIR Workshop, 28 Sept 2018
Paris, France

Who Are We?

- Anja Volk (Utrecht University)
- Hendrik Vincent Koops (Utrecht University)
- Iris Yuping Ren (Utrecht University)
- Juan Pablo Bello (New York University)
- Eric Nichols (Microsoft)
- Jaehun Kim (Delft University)
- Marcelo Rodriguez Lopez (Yousician)
- Changhong Wang (Queen Mary University of London)
- Jing Chen (Nanchang University)
- Tejaswinee Kelkar (University of Oslo)

Why repetition and variation?

Music is the canonical domain of repetition. (Margulis, 2013)

The principle of variation underlies all music (Nelson, 1948).

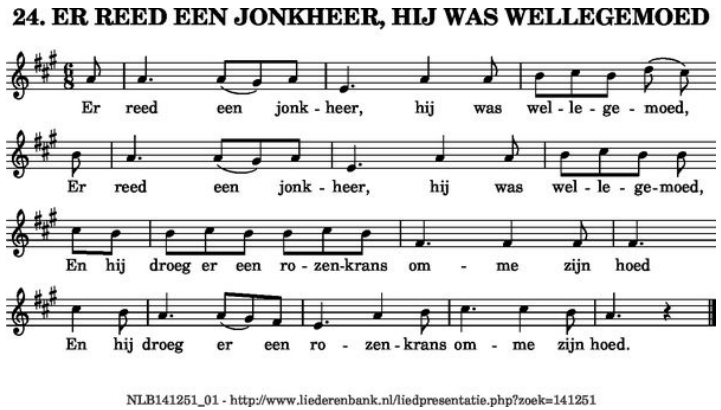
Modeling Repetition and Variation for MIR

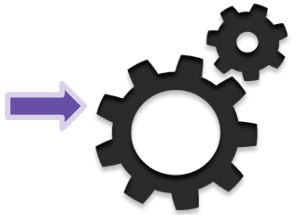
… is important for a lot of contexts, such as segmentation, fingerprinting, automatic music generation ...

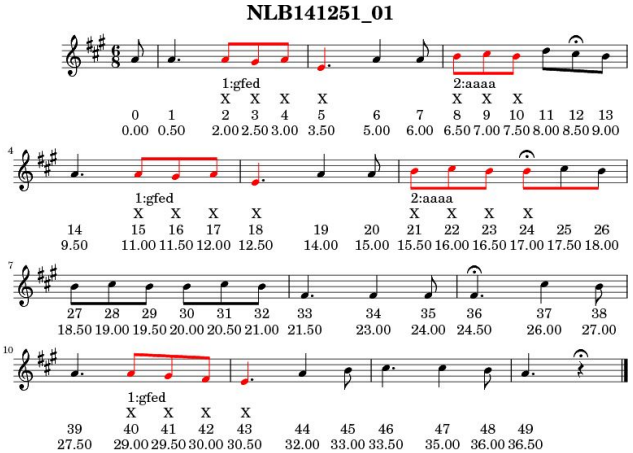
… and opens a lot of questions:

What patterns do we perceive? Which patterns should we expect to automatically find?

Musical Pattern Discovery: The ideal algorithm







Modeling Repetition and Variation for MIR

… is important for a lot of contexts, such as segmentation, fingerprinting, automatic music generation ...

… and opens a lot of questions:

What patterns do we perceive? Which patterns should we expect to automatically find?

How do we evaluate the patterns we have found?

What is the role of human annotation for evaluation?

Let’s all do an annotation on young Beethoven!!!

QUARTETT

für zwei Violinen, Bratsche und Violoncell

von

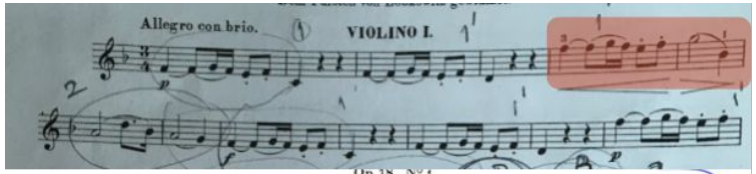
L. van BEETHOVEN.

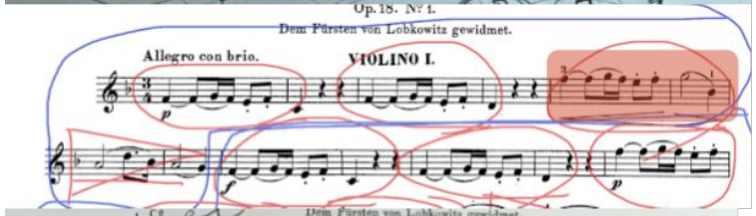
Op. 18. № 1.

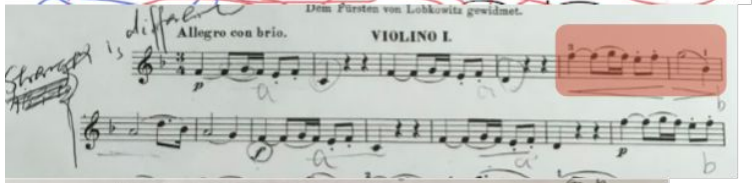
Dem Fürsten von Lobkowitz gewidmet.

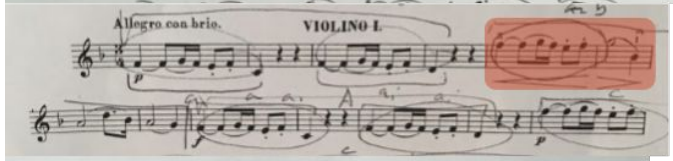
L. v. Beethoven. Band 14. № 1.

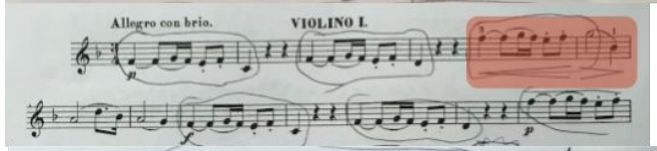
Allegro con brio. VIOLINO I.

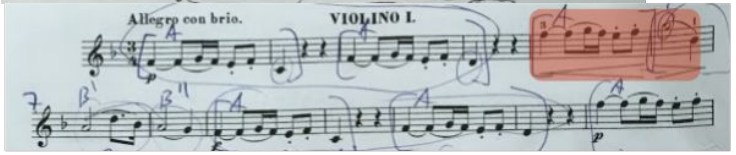

Allegro con brio.
VIOLINO I.

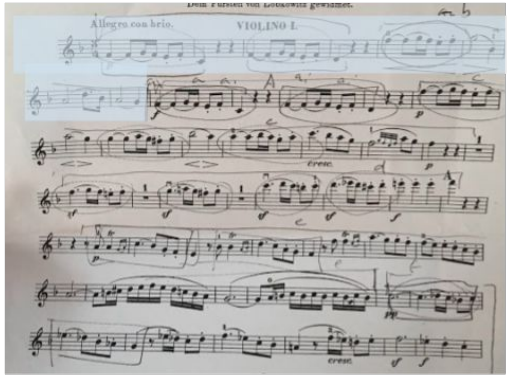

Op. 18. N: 1.
Dem Fürsten von Lobkowitz gewidmet.
Allegro con brio.
VIOLINO I.

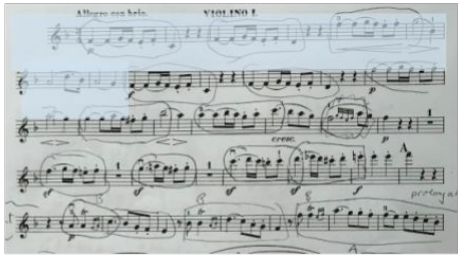

Dem Fürsten von Lobkowitz gewidmet.
Allegro con brio.
VIOLINO I.

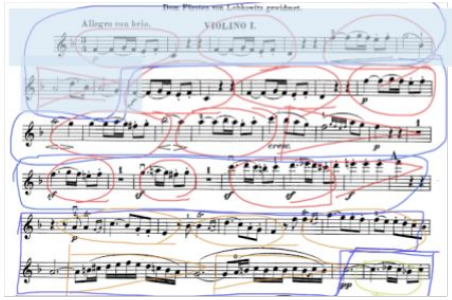

Allegro con brio.
VIOLINO I.

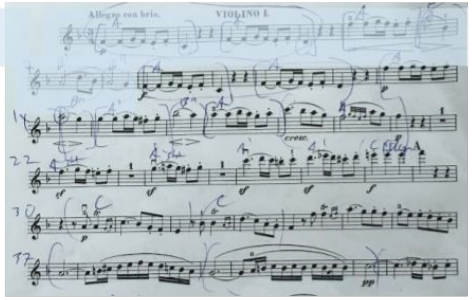

Allegro con brio.
VIOLINO I.


Allegro con brio.
VIOLINO I.


Allegro con brio.
VIOLINO I.


Allegro con brio.
VIOLINO I.


Allegro con brio.
VIOLINO I.


Allegro con brio.
VIOLINO I.

Annotation Tasks: An idea

Listen to the following pieces and annotate the salient melodic patterns with

1) Relevance: Importance

2) Viewpoint: Rhythmic, intervallic, different feature dimensions in music

3) Reason: A short description on why you annotated it this way

4) Reflection: How did items 1) to 3) go for you?

+ Contour, other ways without looking at the sheet music?

Conclusions I

- Define the annotation task (and goal) in detail
- Possible annotation types include:
  - Motif labels (A, B, etc.)
  - Variations on motifs
  - Degree and type of variations
  - Labels on multiple levels of hierarchy
  - “Filler” label for non-core musical material
- Handle disagreement between annotators
- Consider ecologically-valid approach (e.g., collect annotations from music theory students, or other contexts such as musicians learning a new musical piece)
- Create software to facilitate annotations

Conclusions II

- For pattern discovery, a “ground truth” from only one person is pretty meaningless, though this is what we usually do in MIR. How do we deal with multiple interpretations?
- Yes-No-output from algorithms on whether something is a pattern (or not) might also be pretty meaningless for humans, often it is debatable.
- Conversation creates understanding in case of disagreement:
  - Include the motivation of patterns and variation in creating annotations and evaluating systems
- How about algorithms provide “pattern candidates” and let humans decide which ones are useful in which context (bring the human in the loop).