ISMIR 2017, SUZHOU, CHINA

Tutorial T3
A Basic Introduction to Audio-Related Music Information Retrieval

Music Representations

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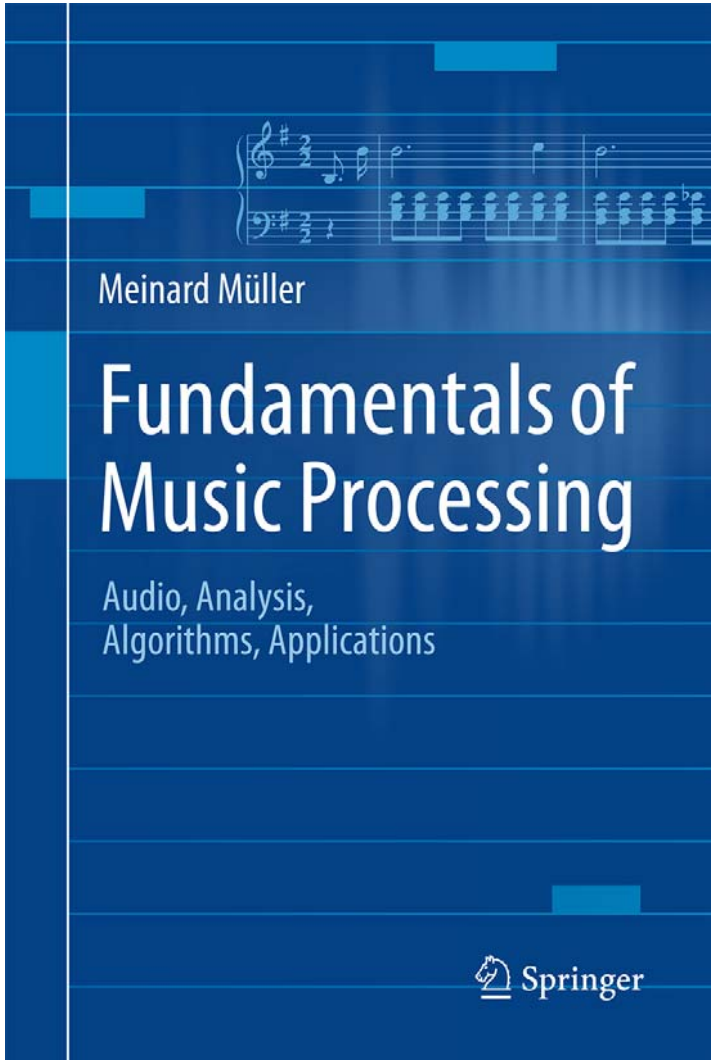
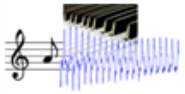
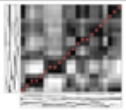
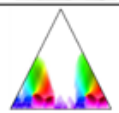
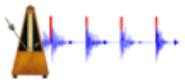
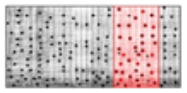
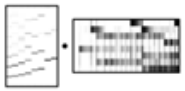
Book: Fundamentals of Music Processing



Meinard Müller
Fundamentals of Music Processing
Audio, Analysis, Algorithms, Applications
483 p., 249 illus., hardcover
ISBN: 978-3-319-21944-8
Springer, 2015

Accompanying website:
www.music-processing.de

Book: Fundamentals of Music Processing

Chapter		Music Processing Scenario
1		Music Represenations
2		Fourier Analysis of Signals
3		Music Synchronization
4		Music Structure Analysis
5		Chord Recognition
6		Tempo and Beat Tracking
7		Content-Based Audio Retrieval
8		Musically Informed Audio Decomposition

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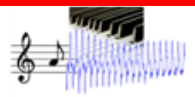
1		Music Represenations
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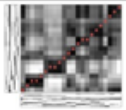
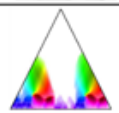
3		Music Synchronization
4		Music Structure Analysis
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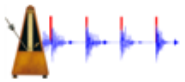
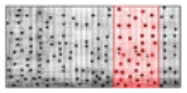
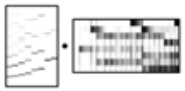
6		Tempo and Beat Tracking
7		Content-Based Audio Retrieval
8		Musically Informed Audio Decomposition

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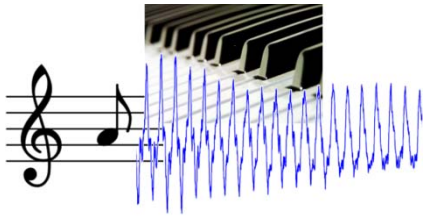
Chapter 1: Music Representations

1.1 Sheet Music Representations
1.2 Symbolic Representations
1.3 Audio Representation
1.4 Further Notes

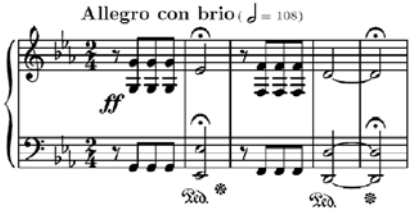


Musical information can be represented in many different ways. In Chapter 1, we consider three widely used music representations: sheet music, symbolic, and audio representations. This first chapter also introduces basic terminology that is used throughout the book. In particular, we discuss musical and acoustic properties of audio signals including aspects such as frequency, pitch, dynamics, and timbre.

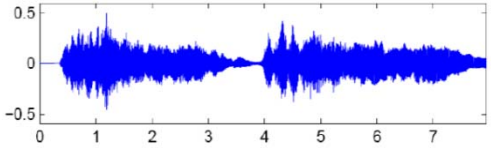
Music

Music Information Retrieval (MIR)

Sheet Music (Image)



CD / MP3 (Audio)



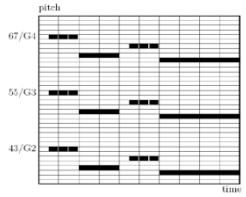
MusicXML (Text)

```
<note>
  <pitch>
    <step>E</step>
    <alter>-1</alter>
    <octave>4</octave>
  </pitch>
  <duration>2</duration>
  <type>half</type>
</note>
```

Dance / Motion (Mocap)

Music

MIDI

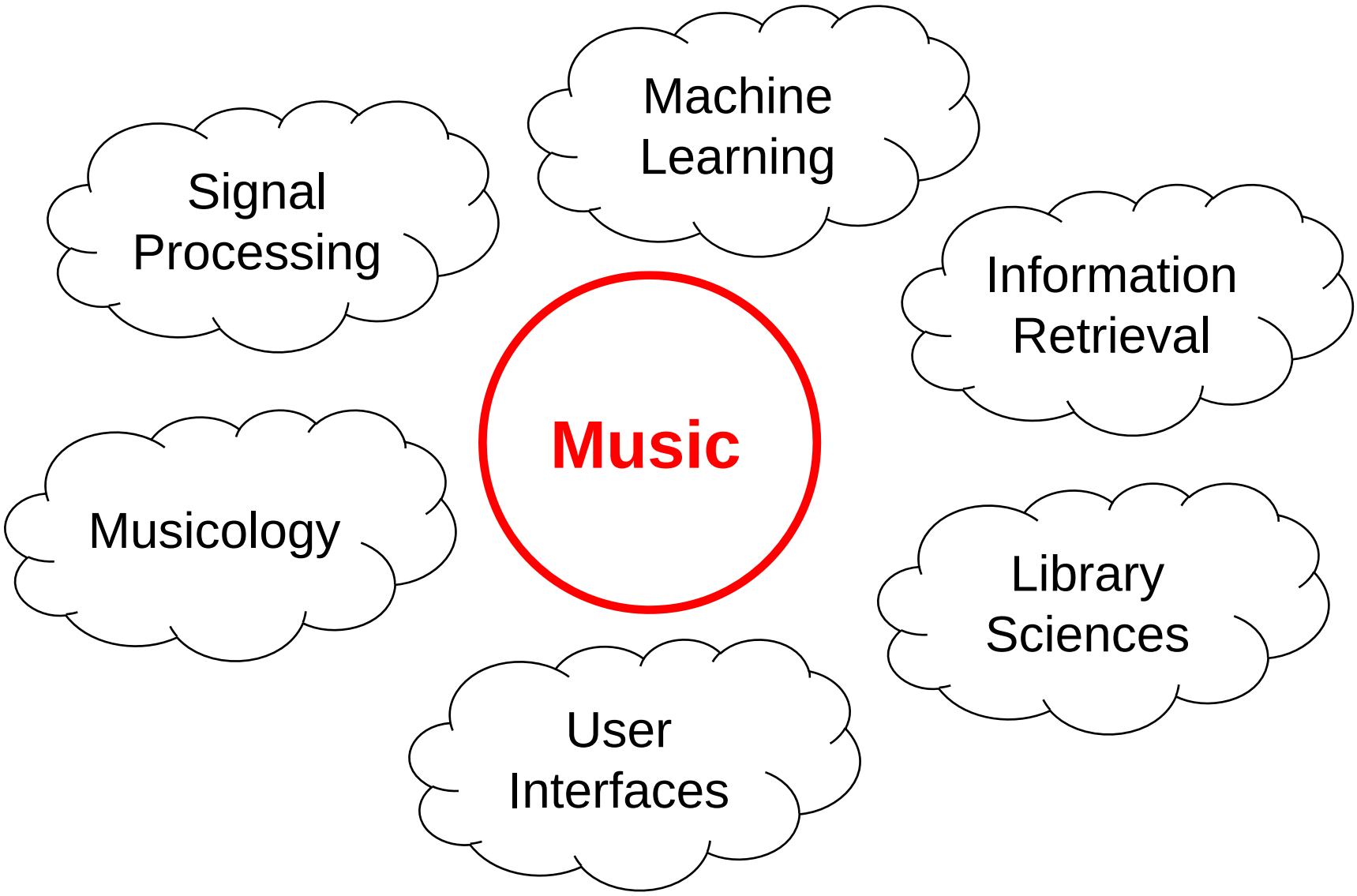


Singing / Voice (Audio)

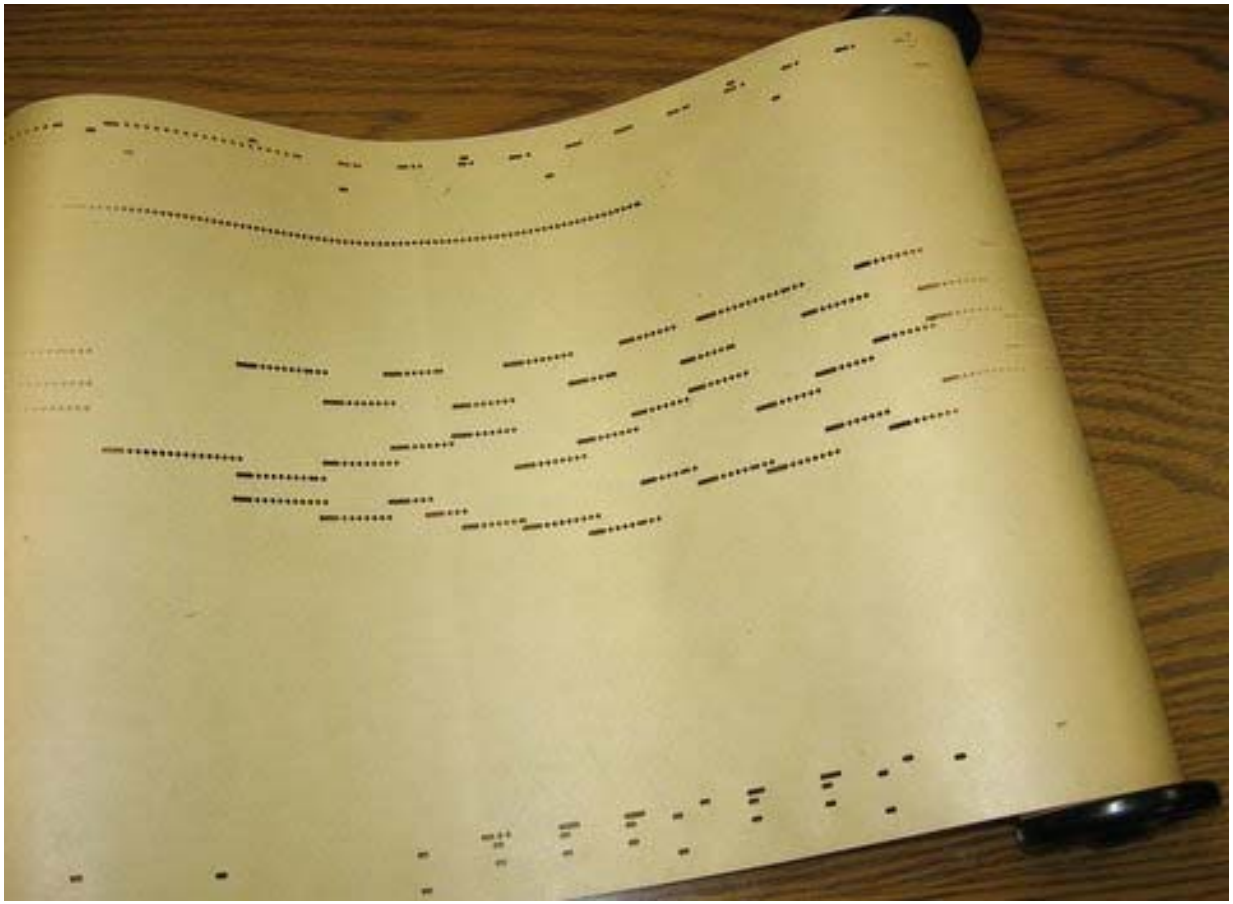
Music Film (Video)

Music Literature (Text)

Music Information Retrieval (MIR)

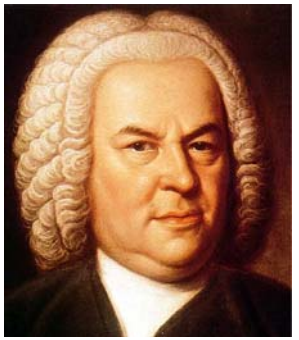


Piano Roll Representation



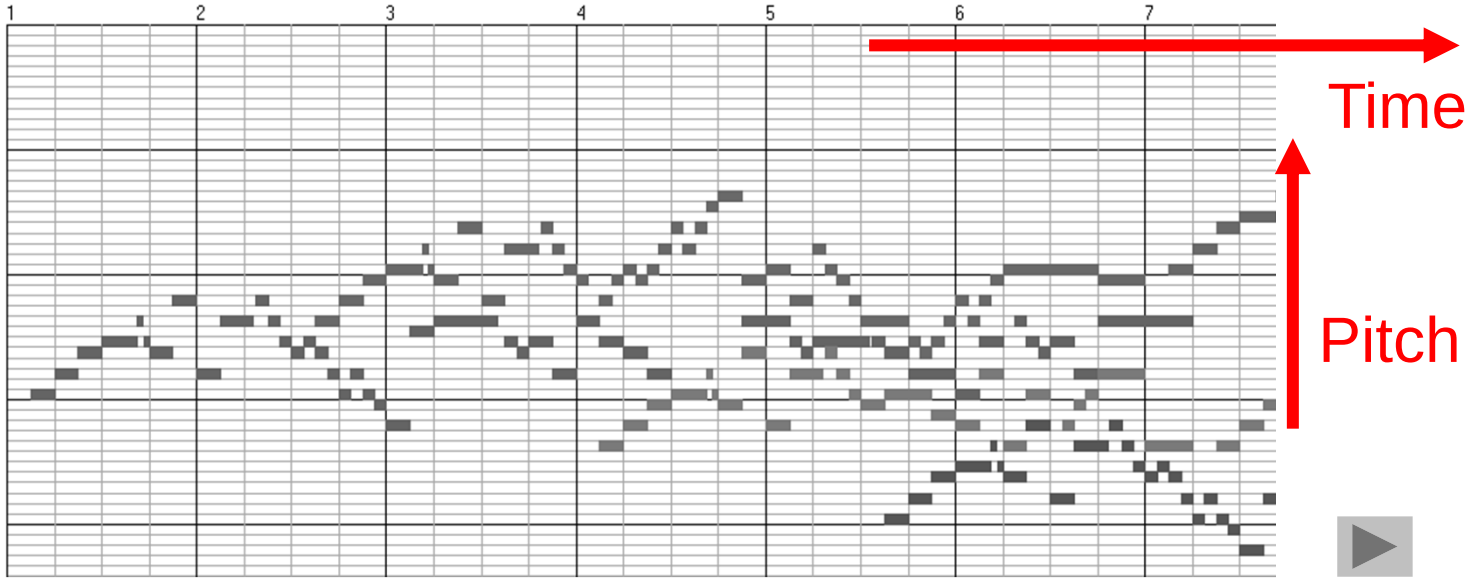
Player Piano (1900)

Piano Roll Representation (MIDI)

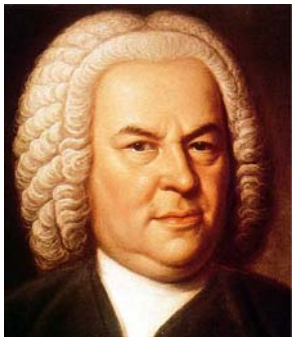


J.S. Bach, C-Major Fuge

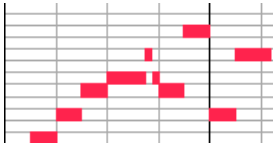
(Well Tempered Piano, BWV 846)



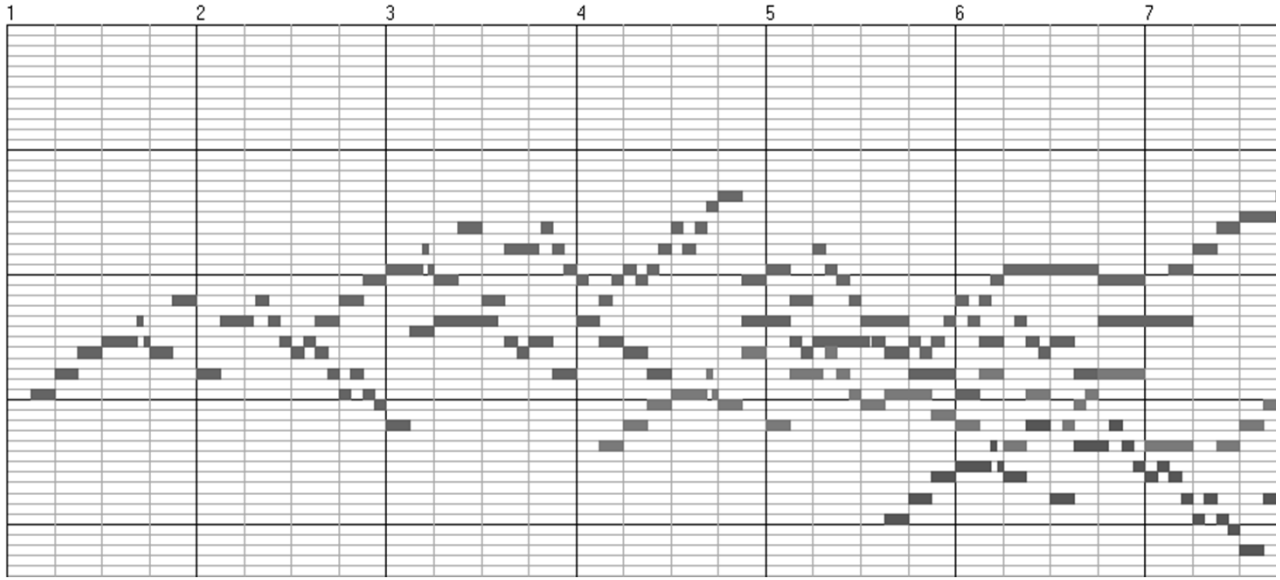
Piano Roll Representation (MIDI)



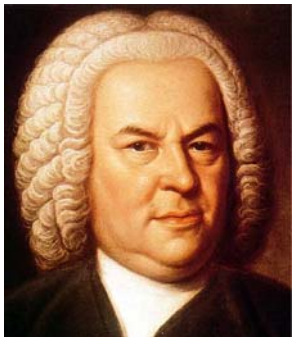
Query:



Goal: Find all occurrences of the query



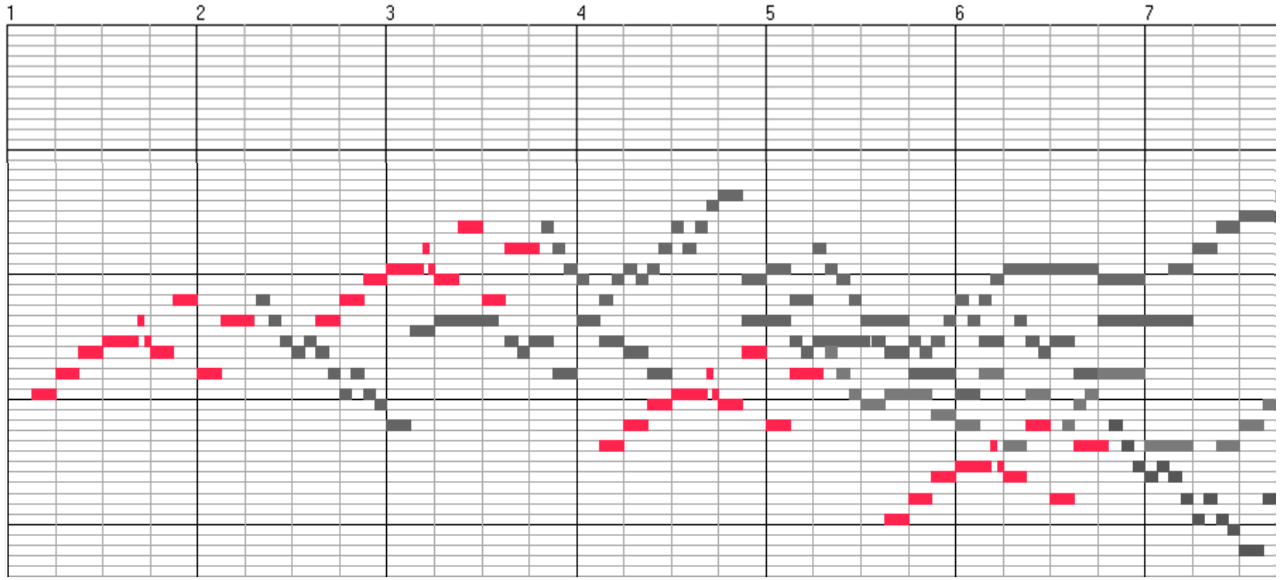
Piano Roll Representation (MIDI)



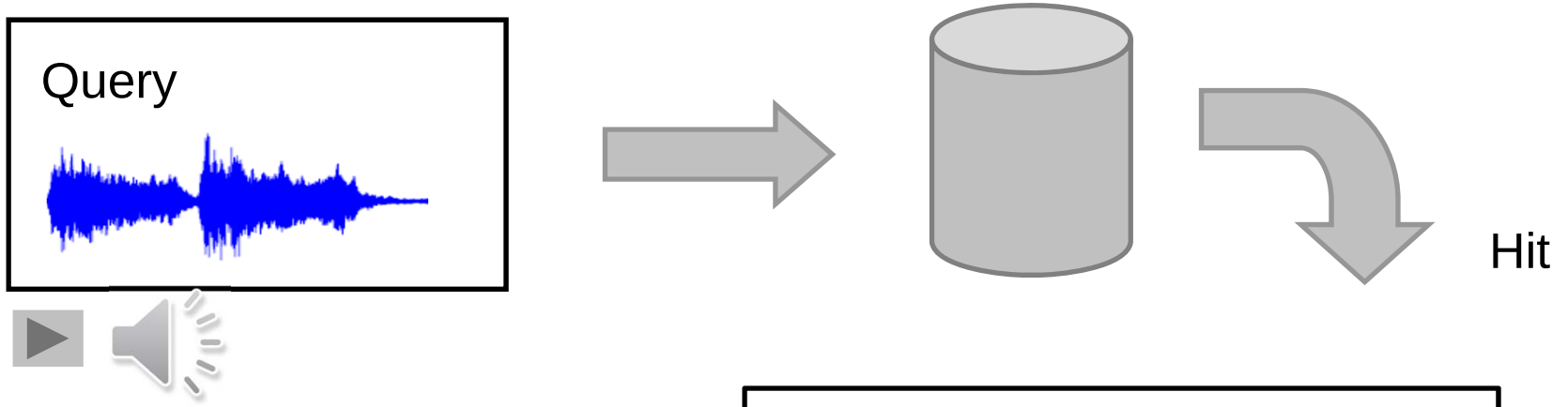
Query:

Goal: Find all occurrences of the query

Matches:



Music Retrieval



Audio-ID

Bernstein (1962)
Beethoven, Symphony No. 5

Version-ID

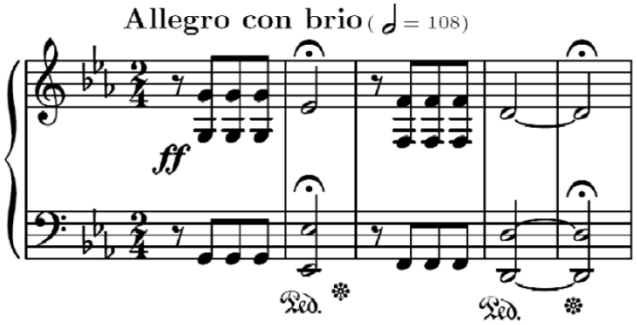
Beethoven, Symphony No. 5:
- Bernstein (1962)
- Karajan (1982)
- Gould (1992)

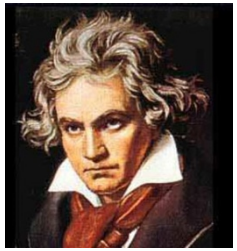
Category-ID

- Beethoven, Symphony No. 9
- Beethoven, Symphony No. 3
- Haydn Symphony No. 94

Music Synchronization: Audio-Audio

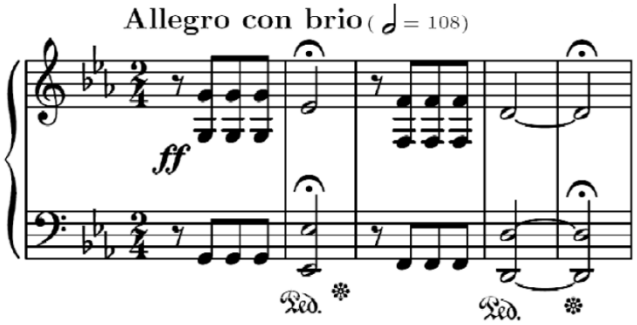
Beethoven’s Fifth

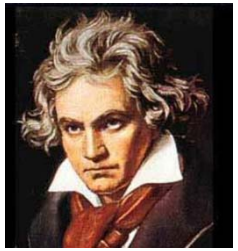




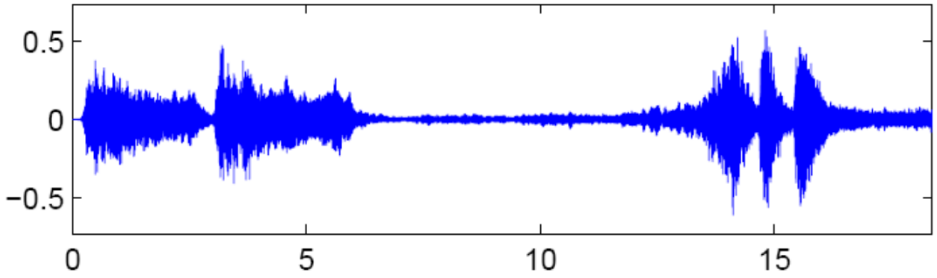
Music Synchronization: Audio-Audio

Beethoven's Fifth

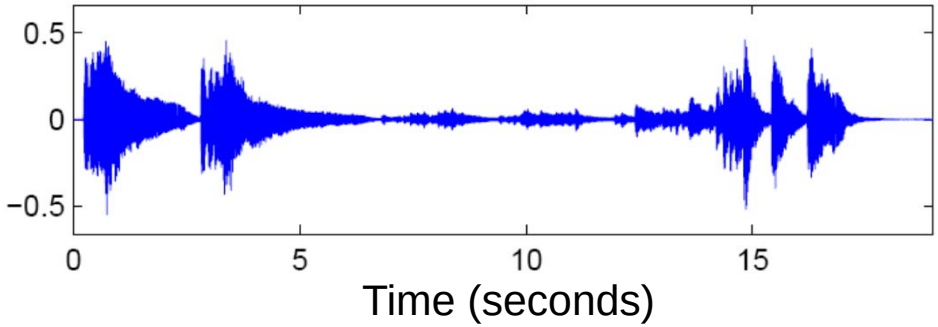




Orchester (Karajan)

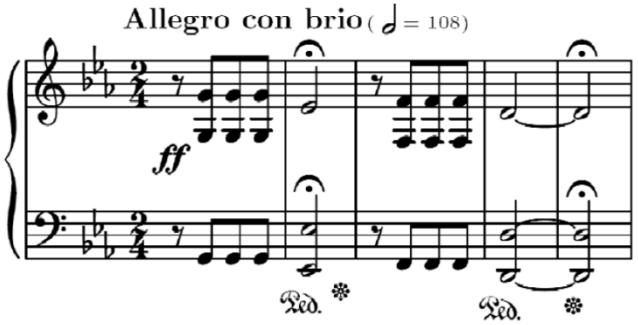


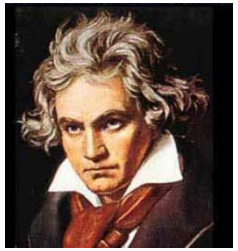
Piano (Scherbakov)



Music Synchronization: Audio-Audio

Beethoven's Fifth





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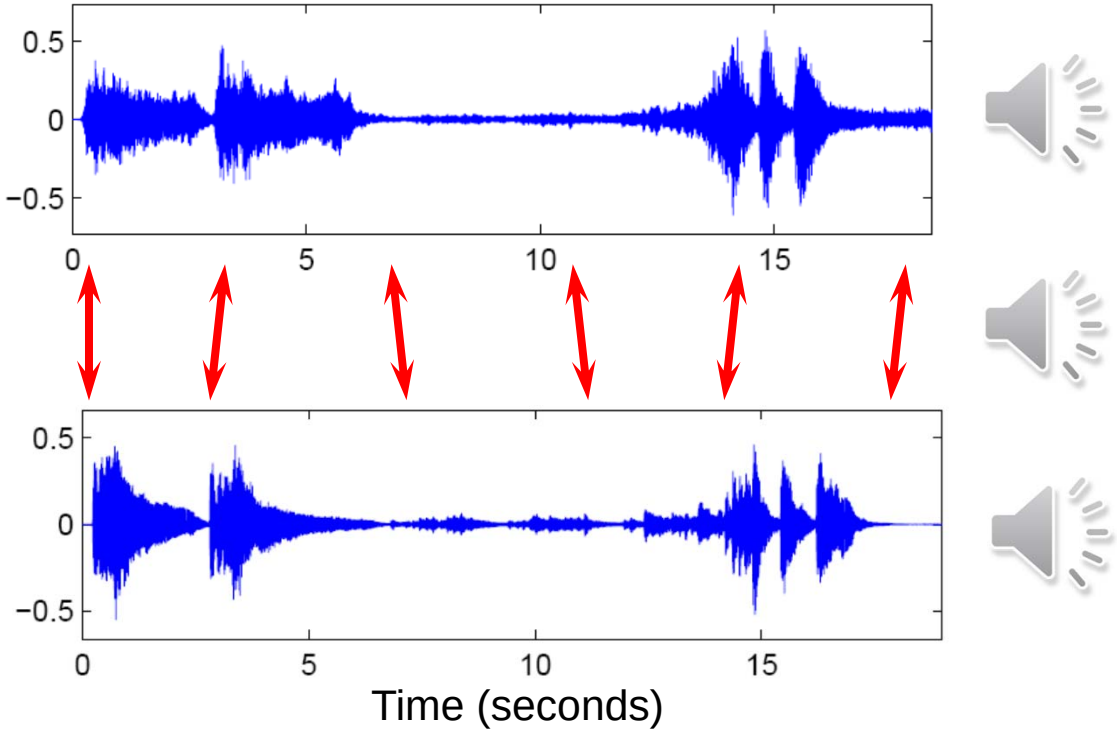
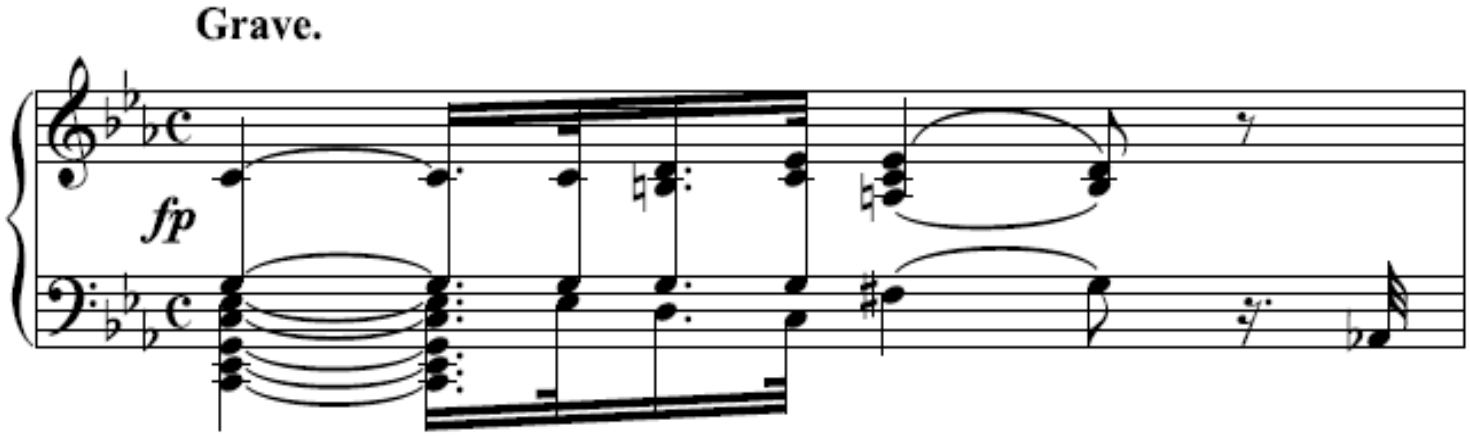


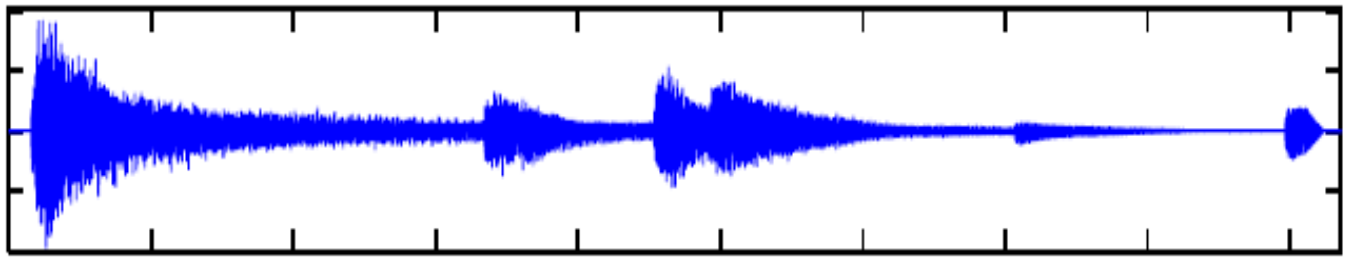
Application: Interpretation Switcher

Music Synchronization: Image-Audio

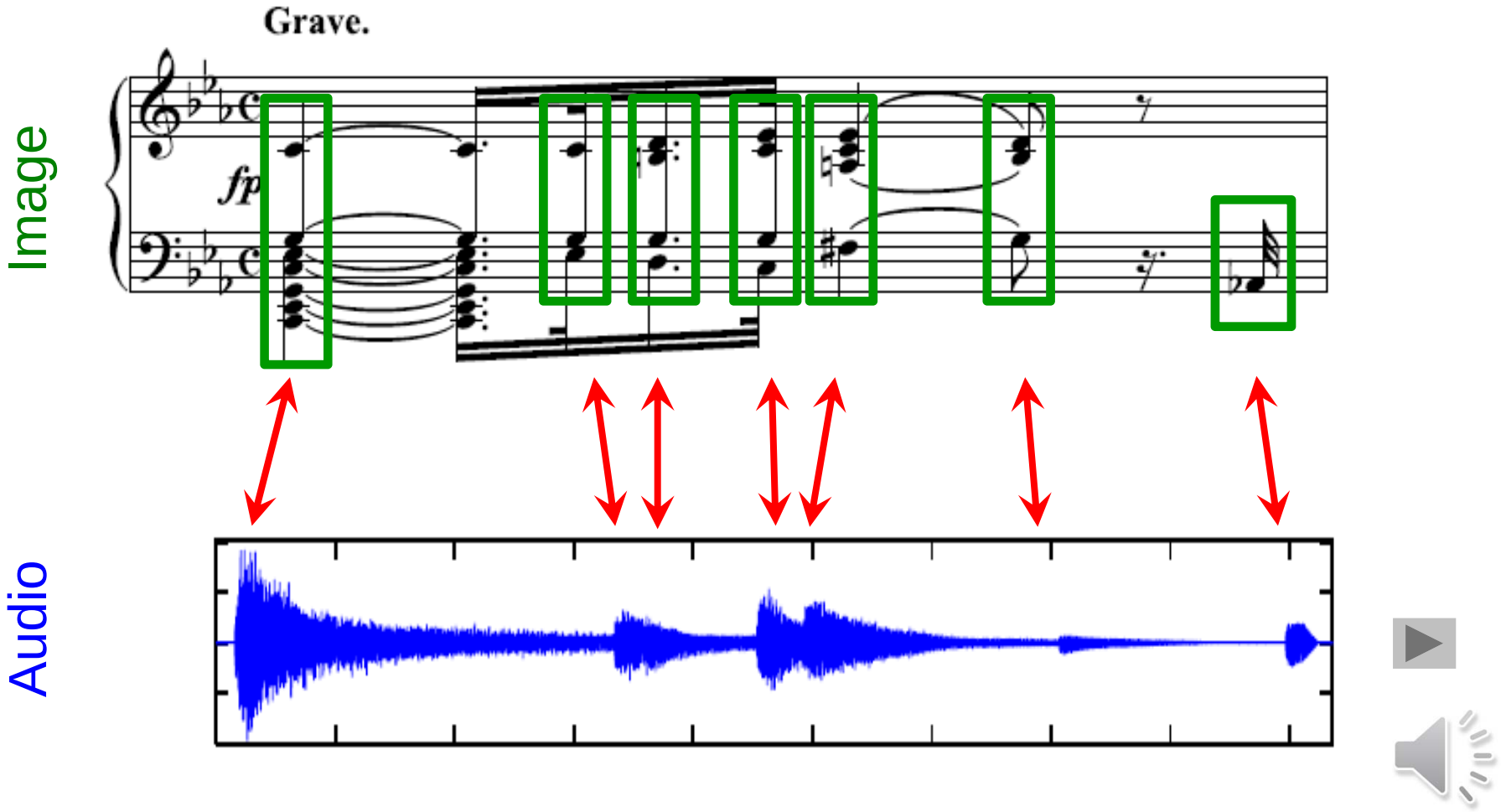
Image



Audio

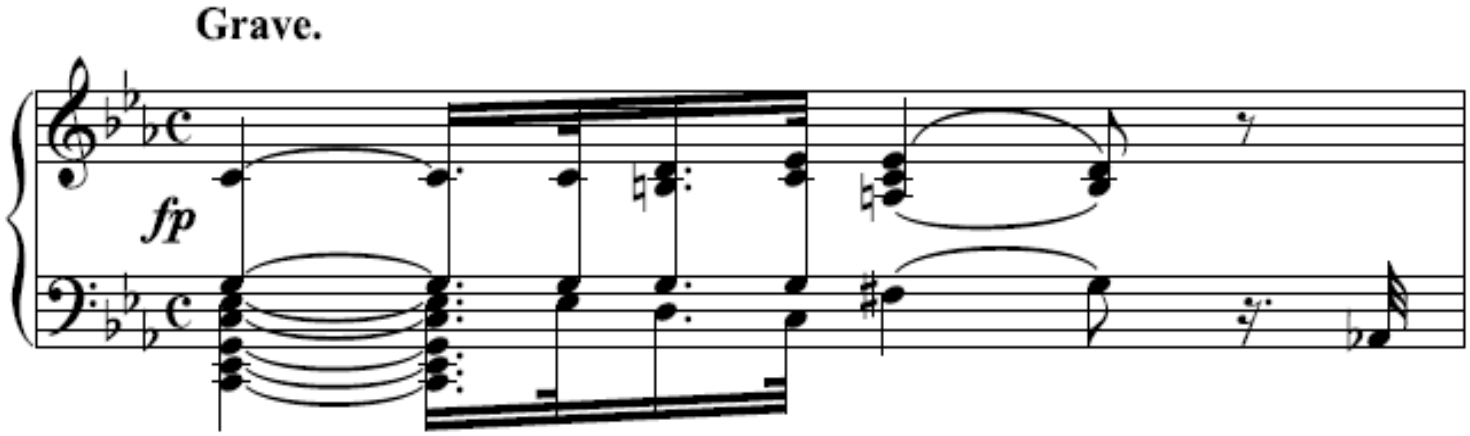


Music Synchronization: Image-Audio

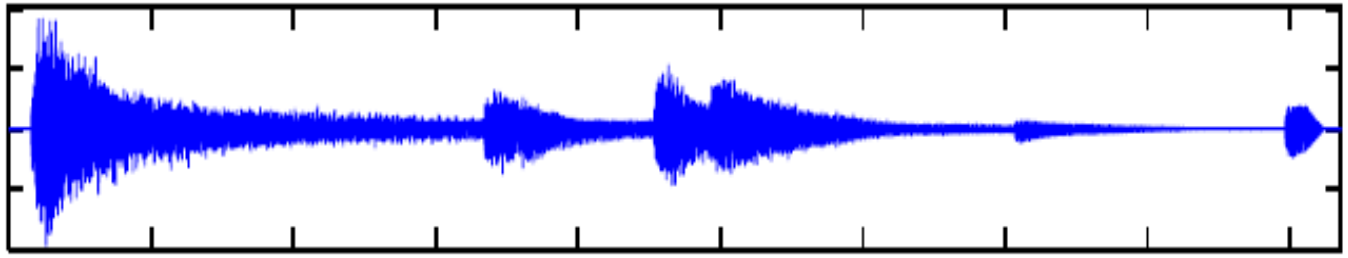


How to make the data comparable?

Image



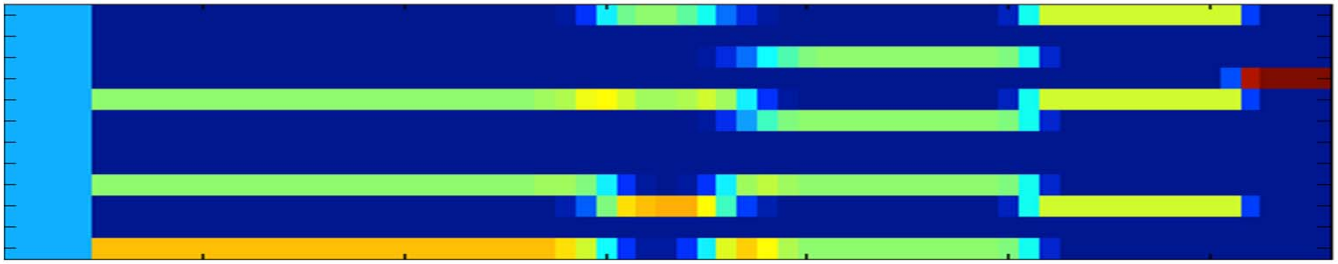
Audio



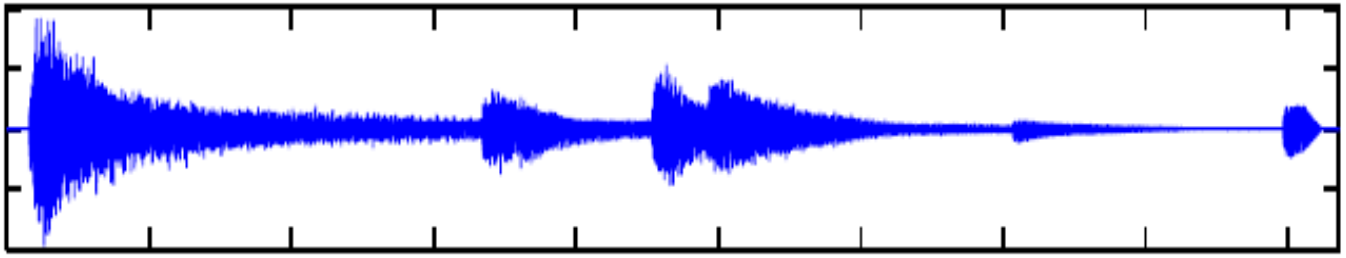
How to make the data comparable?

Image Processing: Optical Music Recognition

Image



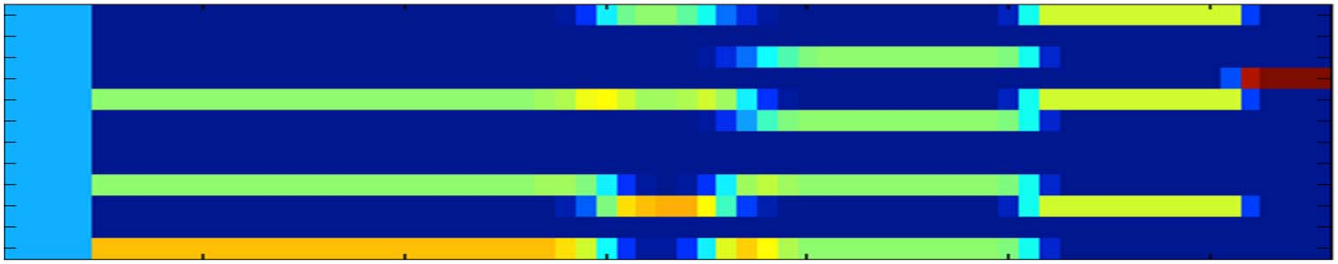
Audio



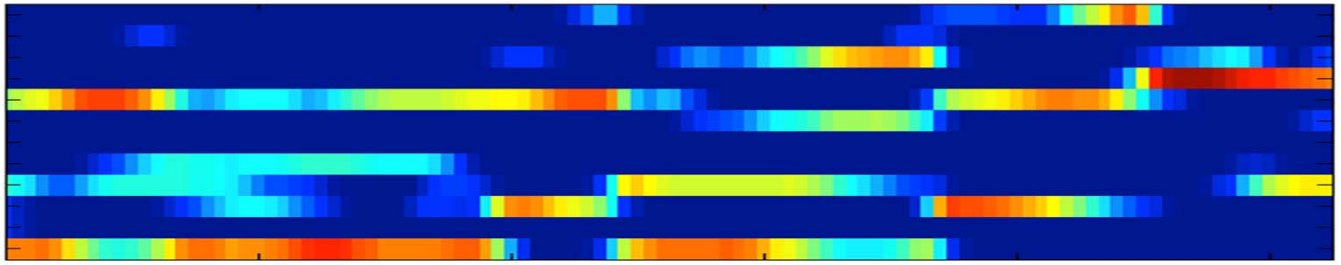
How to make the data comparable?

Image Processing: Optical Music Recognition

Image



Audio

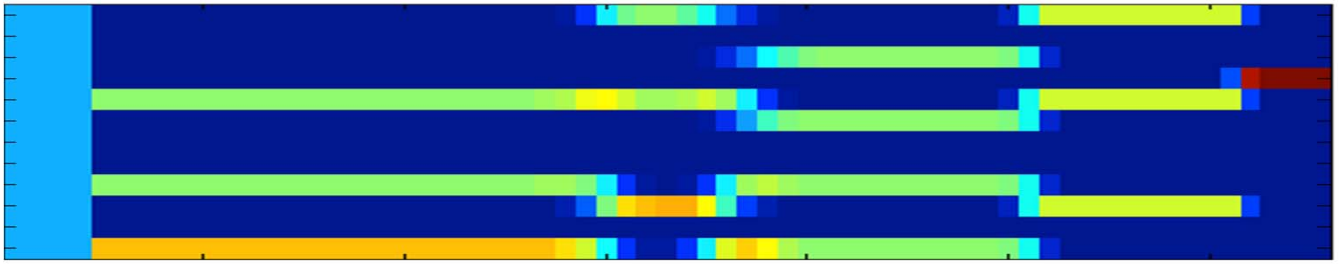


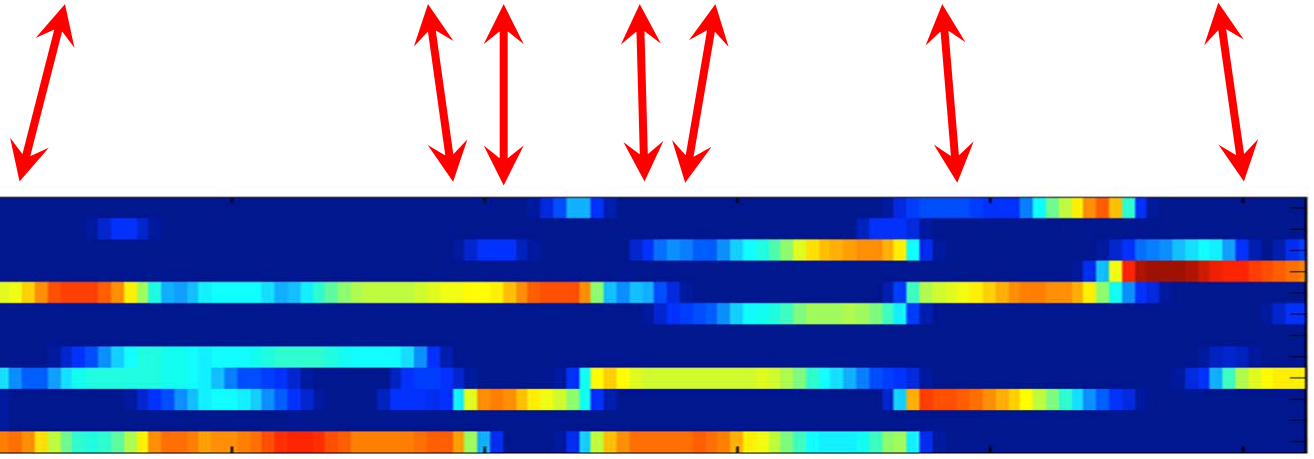
Audio Processing: Fourier Analysis

How to make the data comparable?

Image Processing: Optical Music Recognition

Image

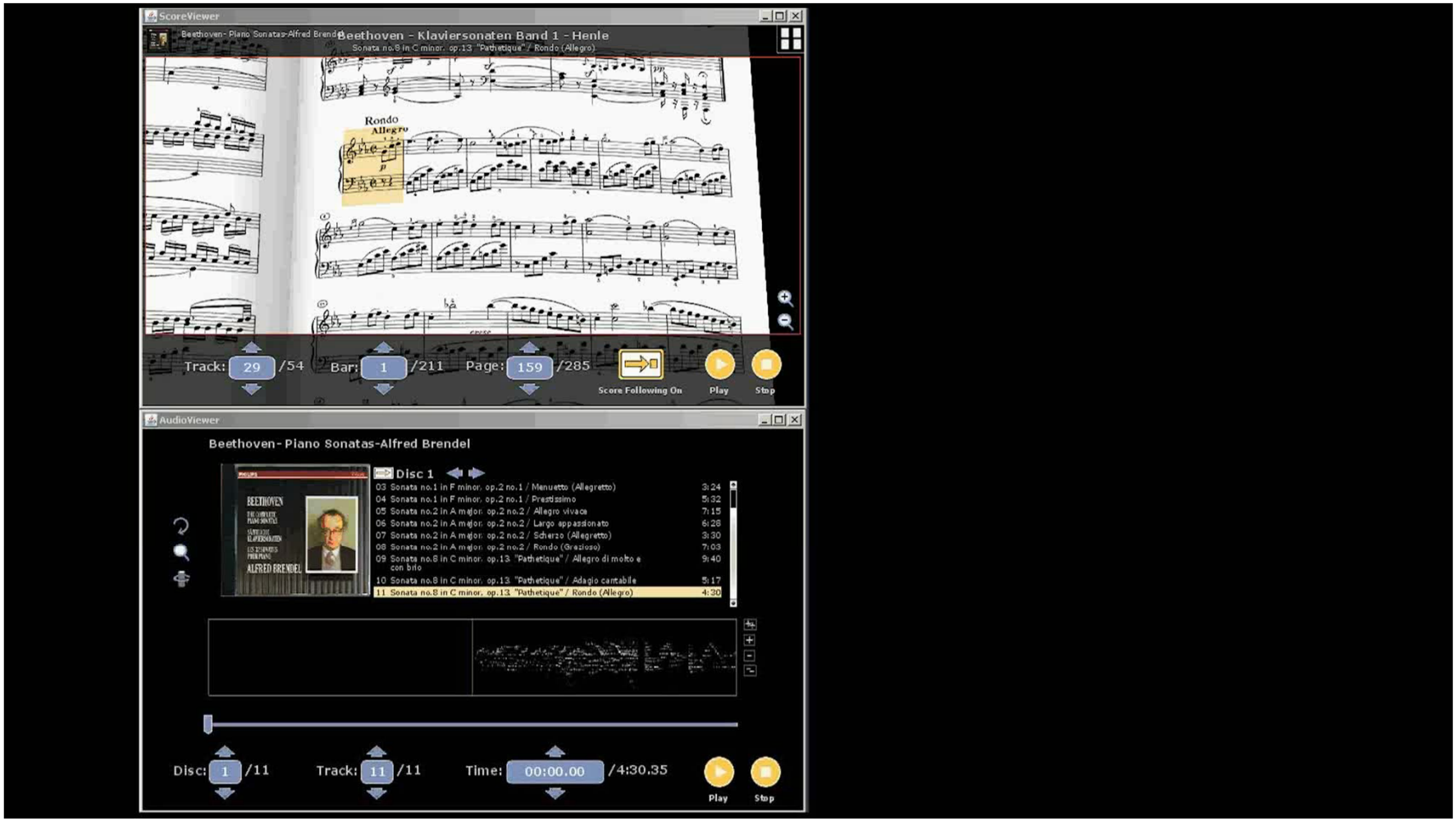
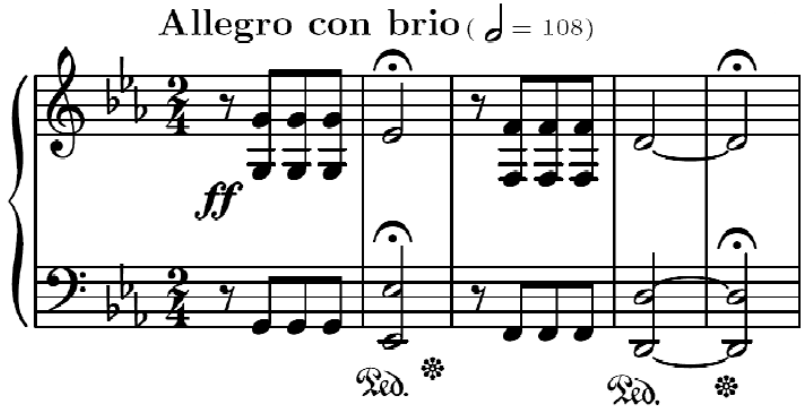
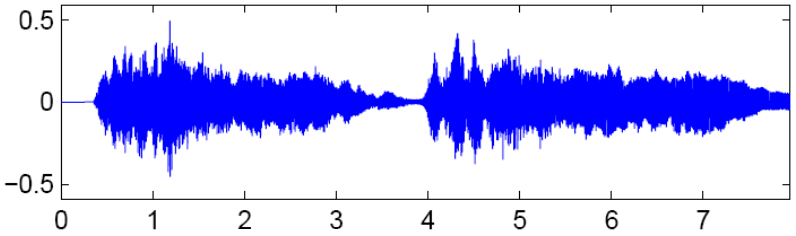
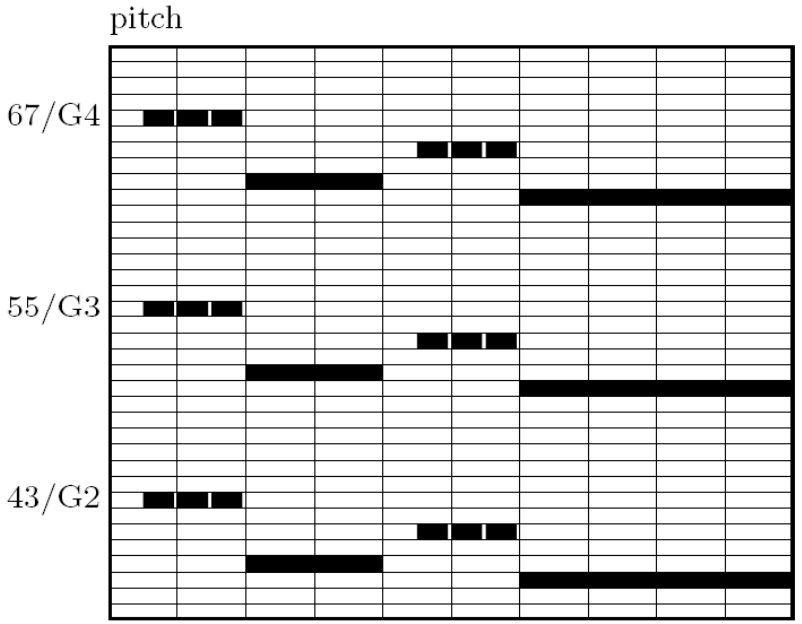




Audio

Audio Processing: Fourier Analysis

Application: Score Viewer



Music Representations