

Music Information Retrieval

Music Information Retrieval (MIR)

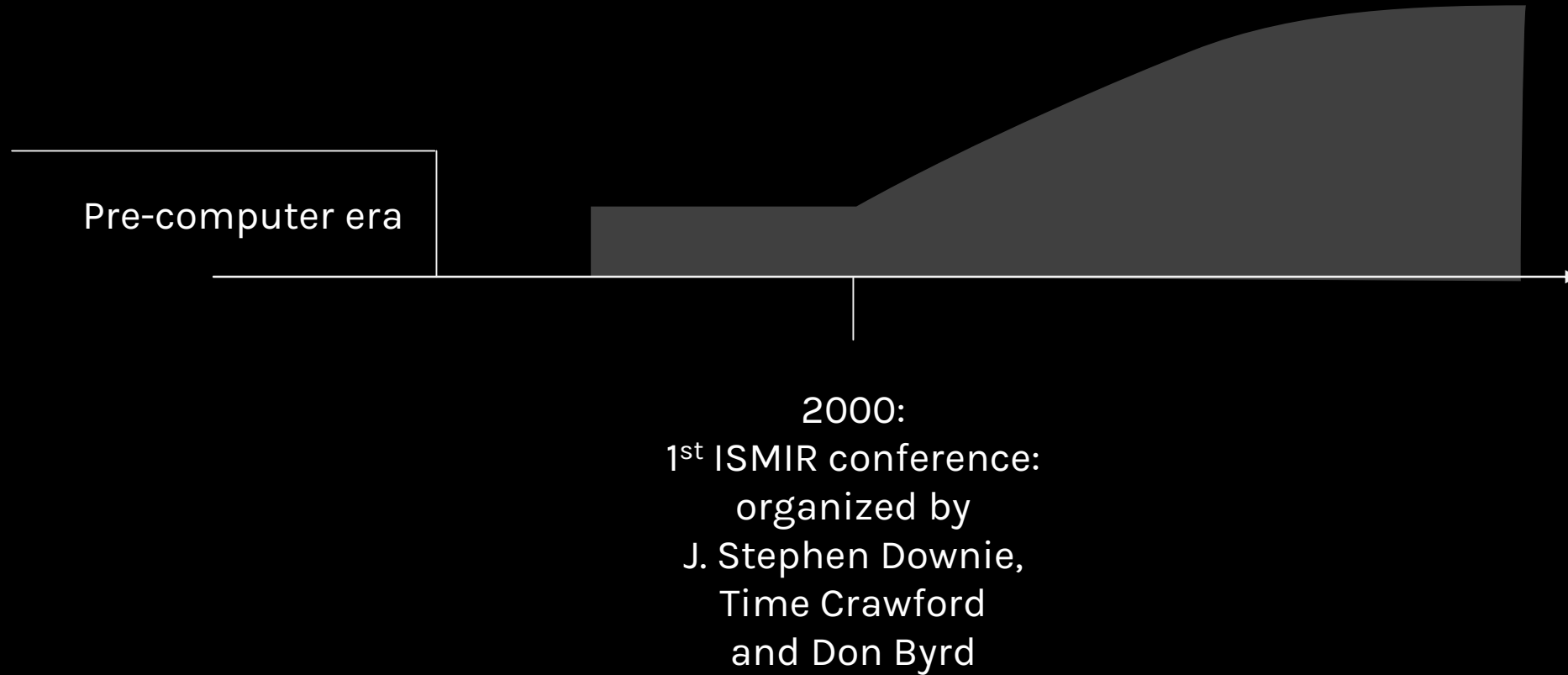
“MIR is concerned with the extraction, analysis, and usage of information about any kind of music entity (for example, a song or a music artist) on any representation level (for example, audio signal, symbolic MIDI representation of a piece of music, or name of a music artist). [Schedl, 2008]

It's mostly about making computers understanding music! However, it is not simply about computer algorithms and code.

It is an interdisciplinary science:

Musicology, Psychology, Signal Processing, Machine Learning

History of MIR



Music → Information

Representations:

- Audio recording (CDs etc)
- Video
- Motion capture
- **MIDI**
- **Piano Roll**
- **Music XML**
- **Music Scores**
- Lyrics
- Meta data / tags
- reviews

Feature Extraction:

Content vs Context

Similarity

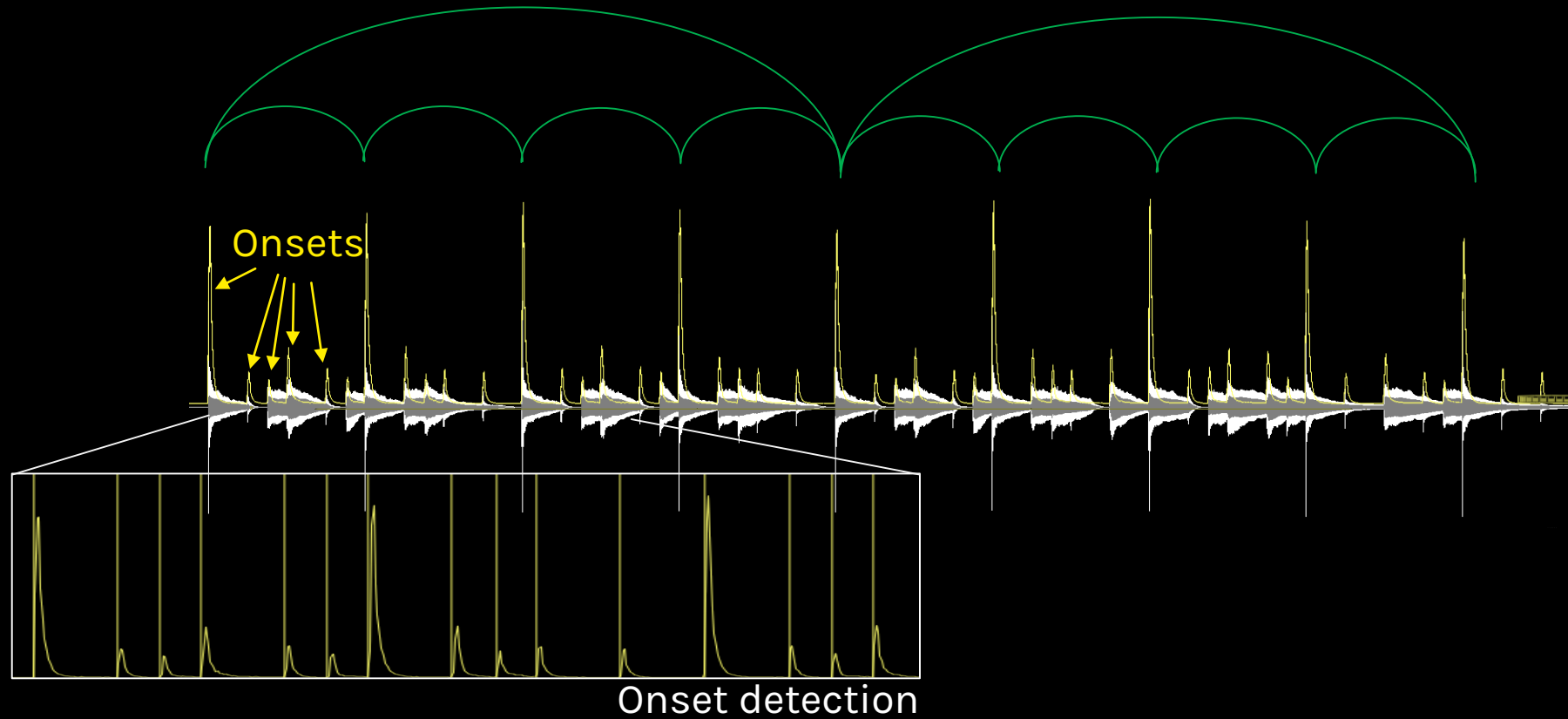
Machine Learning

Tasks:

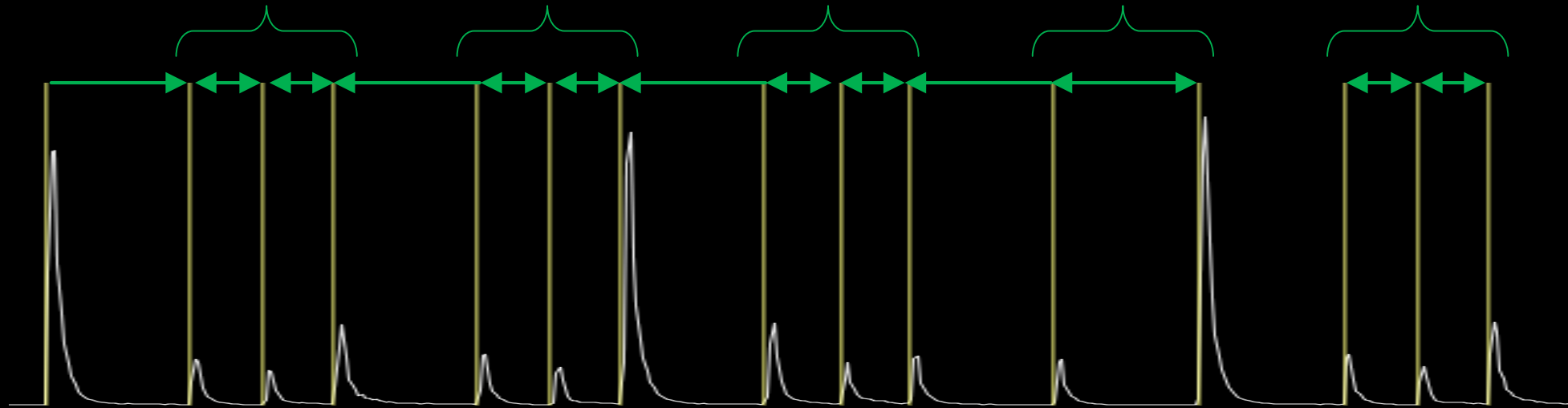
- Recommendation
- Classification (genre)
- Music Transcription
- Pitch, Harmony
- Rhythm, beat and meter, tempo
- Segmentation and Structure
- Fingerprinting
- Query by...some input

Beat and meter

periodic grouping of onsets



Rhythmic figure / Serial grouping of onsets



Example:

Mutual Nearest Neighbor Algorithm (Toussaint, 2017): Events that are mutually nearest neighbors form groups

Challenges in Rhythm

Tempo is defined as the rate of beat, and it is not constant.

But, tempo is not an instantaneous quantity!

How can we define a local tempo?

Not all deviations from a constant beat rate are tempo changes:

On the beat does not mean on the grid! Expressive timing, Swing etc..

How can we evaluate an automatic beat detection?

What is the “ground truth”?

Cultural & Ethical Issues

Different music expressions use different music features in different ways .

Are there universal aspects of Music?

Can we look in music perception and biomusicology for universals?

Or should we develop specific MIR for each style and tradition?

MIR is applied in Music Distribution/Recommendation. What are the consequences for the culturally diverse markets?

Is MIR biased?

Assignment

Download and install Sonic Visualizer: <http://www.sonicvisualiser.org/>

Search, download and install the Queen Mary Vamp plugins for SV.

Download and install Matlab from the program kiosk of UiO: <https://kiosk.uio.no/>

Download and install the MIR toolbox for Matlab: <https://www.jyu.fi/hytk/fi/laitokset/mutku/en/research/materials/mirtoolbox> or search online for “MIR toolbox Matlab”

Load 2 short excerpts (~30sec) of a music file in SV.

Manually annotate the onsets of events and beat positions in two separate layers.

Use the “bar and beat tracker: beat” plugin to track the beat positions.

Export all data as text files and load them in Matlab.

Using `[miraudio (filename)]` load the same audio file in Matlab.

Use the `[mirevents]` and `[mirgetdata]` or `[get]` functions of the toolbox to detect the onsets.

Evaluate the performance of the beat detection plugin and the mirevents function by comparing their output to your own annotations:

- Create a matlab script to automatically compare the arrays OR manually count the false positive and false negative for each case.

- Calculate an evaluation score (suggested F measure)

Write a report on the method and results of the evaluation. Speculate about the weaknesses of the algorithms.