Machine listening for computer music

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Machine Listening Lab
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In the Machine Listening Lab we develop methods for making sense of natural sounds, everyday sounds, and recorded music. **Machine listening** is the use of signal processing and machine learning to extract useful information from sound.

- Event detection
- Scene classification
- Species identity
- Interactions
- Source separation
- Event onsets
- Rhythms
- Musical score
- ....

**Lead academics:**

Dan Stowell
Emmanouil Benetos
Machine listening: birdsong

- Which species?
- How many birds?
- Singing in response to neighbours?
- Warning about predators?
- Defending a territory, or newly arrived?
Machine listening: Music information retrieval

- Which instruments?
- Which notes? When?
- How performed? e.g. vibrato, legato, soft/hard
- Unexpected sounds? (e.g. artefact removal)
- Song structure, repetition?
Outline

1. Audio feature extraction
2. Onsets and pitches
3. Machine learning (outline only!), classification and clustering
4. Python demo
5. Non-real-time vs. realtime
6. Automatic music transcription
Pipeline

[SV]
Pipeline
Pipeline
Pipeline

[py]
Pipeline (with machine learning)

Data set preparation  Feature processing  Classification

Training data (foreground)

Mel spectrogram  Train classifier

Testing data (foreground)

Mel spectrogram  Apply classifier  Decision
Neural network
Extras
Analysing sound using machine learning

Spectrogram of a dawn chorus

Time

Frequency
Analysing sound using machine learning

Fingerprinting? (‘Shazam’)

Spectrogram of a dawn chorus
Analysing sound using machine learning

Speech recognition methods? Hidden Markov model (HMM)

Spectrogram of a dawn chorus

Frequency

Time
Analysing sound using machine learning

Deep learning?

Spectrogram of a dawn chorus

Time
Frequency