

Introduction to Audio Content Analysis

Module 0.0: Course Introduction

alexander lerch

introduction

about alexander lerch

■ education

- Electrical Engineering (Technical University Berlin)
- Tonmeister (University of Arts Berlin)

■ professional

- Associate Professor at the Georgia Tech Center for Music Technology
- previous: CEO at [zplane.development](#)

■ research focus

- Music Information Retrieval (MIR)
- Audio Content Analysis
- Audio Signal Processing
- Music Performance Analysis
- Music Generation



introduction

course introduction

Audio Content Analysis and Music Information Retrieval (MIR):

- extract and infer descriptors from music signals
- answers questions and tasks such as
 - “What is the tempo/key/mood of this song?”
 - “Transcribe this signal into a musical score.”
 - ...
- MIR is commercially interesting for, e.g.,
 - music recommendation
 - music identification
 - intelligent music production
 - automatic music generation

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course goals

after successful completion of this course, you will

- 1 have a good **overview of typical tasks** in MIR
- 2 **understand algorithmic approaches** in a large variety of basic MIR systems
- 3 be able to **implement MIR systems** in Matlab/Python
- 4 be able to **formally evaluate** systems with common datasets and metrics



introduction

course overview

1 Introduction to ACA and MIR

2 Fundamentals

- Signals & Pre-Processing
- Input Representations
- Inference
- Data & Evaluation

3 Music Transcription

- Tonal Analysis (Pitch, Key, ...)
- Analysis of Intensity
- Temporal Analysis (Onset, Beats, Structure, ...)
- Alignment

4 Music Identification & Classification

- Audio Fingerprinting
- Classification: Genre, Similarity, Mood, Instrument
- Music Performance Assessment



introduction

prerequisites

- basic knowledge in **DSP**
 - signals & systems, block diagrams, linear algebra, ...
- familiarity with **Matlab and Python**
 - scripting and functions, file I/O, ...
- helpful: knowledge of **machine learning** concepts
 - classification & regression, training and testing, evaluation metrics



introduction

course materials & resources

■ **text book:** “An Introduction to Audio Content Analysis”:

- published version at IEEE
- new edition draft available on Canvas (Files → manuscript)

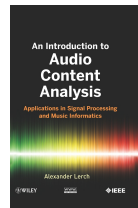
■ optional reading

- Mueller, M. “Fundamentals of Music Processing”. Springer (2015)
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■ online resources @AudioContentAnalysis.org:

- slides & videos of previous classes
- datasets
- code (matlab, python)

■ software: Python 3, (Matlab)



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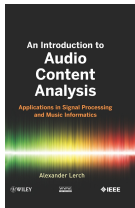
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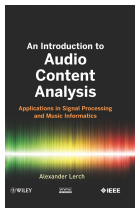
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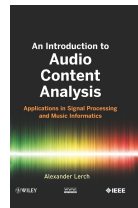
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grading

■ grades

exercises & assignments	45%
exercises & participation	10%
project	45%
presentation (proposal)	5%
presentation (midterm)	5%
presentation (final)	5%
paper	10%
algorithmic design and implementation	20%

- **bonus points** for finding errors in the manuscript or in the slides added to the assignment grade of your choice
 - typos: 0.5 points
 - language: 1 point
 - misleading or incomplete statements: 2 points
 - wrong statements and errors in equations: 3 points

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