

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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introduction 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



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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



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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



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introduction

course materials & resources

- **text book**: "An Introduction to Audio Content Analysis":
 - published version at IEEE
 - new edition draft available on Canvas (Files \rightarrow manuscript)
- optional reading
 - Mueller, M. "Fundamentals of Music Processing". Springer (2015)
 - Klapuri, A. and Davy, M. (Eds.) "Signal Processing Methods for Music Transcription". Springer (2006)
- online resources @AudioContentAnalysis.org:
 - slides & videos of previous classes
 - datasets
 - code (matlab, python, C++)
- needed software: Python 3, (Matlab)

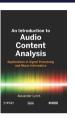


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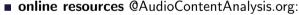
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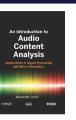
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introduction grading



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 pointslanguage: 1 point
 - misleading or incomplete statements: 2 points
 - wrong statements and errors in equations: 3 points

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