github.com/alexanderlerch/2025-Music-AI-T

Music AI: Threats and Opportunities

overview

alexander lerch

Georgia Tech Center for Music Technology
College of Design

about

about me

Georgia Tech Center for Music Technology
College of Design

- **education**
  - Electrical Engineering (Technical University Berlin)
  - Tonmeister (music production, University of Arts Berlin)

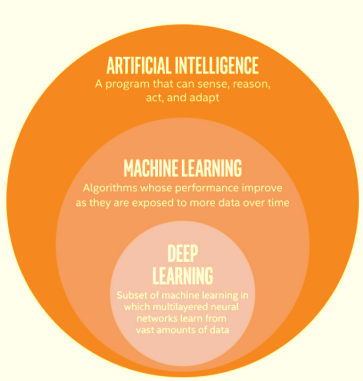
- **professional**
  - Associate Dean for Research & Creative Practice, College of Design, Georgia Tech
  - Associate Professor, School of Music, Georgia Tech
  - prev: 2000-2013: CEO at zplane.development

- **background**
  - machine learning for audio and music (20+ years)
  - audio algorithm design (20+ years)
  - commercial music software development (10+ years)
  - entrepreneurship (10+ years)

www.linkedin.com/in/lerch

introduction
artificial intelligence

- **artificial intelligence**
  - unclear definition: everything that is perceived to act intelligently
  - changes over time
- **machine learning**
  - data-driven: algorithm is more agnostic to task and is parametrized through training with data
- **deep learning**
  - deep neural networks are the ML approach used
- **generative AI**
  - deep neural networks *generating content*



machine learning
importance of data

machine learning: generic algorithm mapping an input to an output

- mapping function is learned from patterns and characteristics **from data**

⇒ model **success largely depends on training data**

- **technical challenges** concerning data
  - *imbalance & bias* (distribution is skewed, biased)
  - *diversity & representativeness*
  - *subjectivity* of annotations
  - *noisiness* (bad quality, bad annotations, . . .)
  - *amount*

https://imgs.xkcd.com/comics/machine_learning.png

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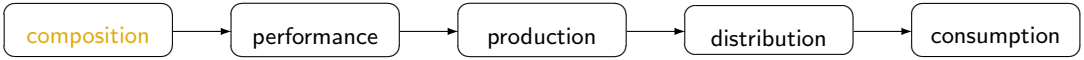
musical communication

chain of musical communication



- **creation of musical ideas** ("score")
  - defines style and idea
- **realization of musical ideas** into acoustical rendition
  - interpretation, modification, addition, and dismissal of score information
  - unique acoustic representation of score
- **recording, mixing, and editing** (in case of record media)
  - editing and splicing of recorded data; timbre, equalization choices
  - not separable from performance in a recording
- **distribution & listening**
  - music recommendation and discovery

musical communication

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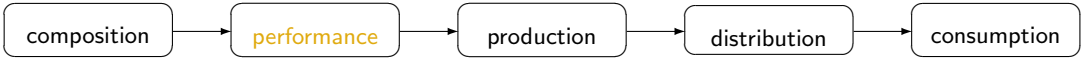

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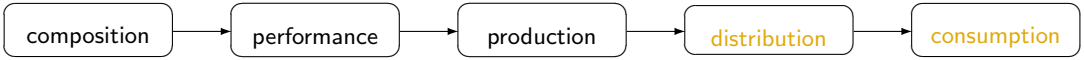

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musical communication
paradigm shift

historical technological disruptions:

- **music**
  - recording devices (tape, grammophone)
  - digitization/softwarization of recording studio
- **general**:
  - internet
  - introduction of photography

systematic evaluation

evaluation targets

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- **system output**
  - originality
    - plagiarism
    - diversity
    - creativity
  - audio quality
  - musical & aesthetic qualities
- **user experience**
- **other criteria**
  - explainability
  - bias
  - ethical use of data & data curation practices
  - resource use & environmental impact

systematic evaluation
methods

- **subjective** testing
  - preference test
  - Turing test
  - rating of properties
- **objective** testing
  - *reference-independent*
  - *comparison of distributions*

  $\Rightarrow$ even fundamental, trivial properties are often not matched between training and generated data

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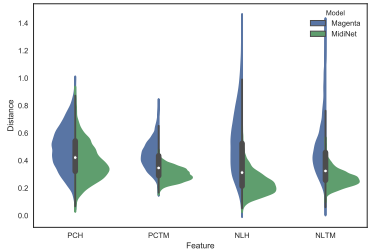

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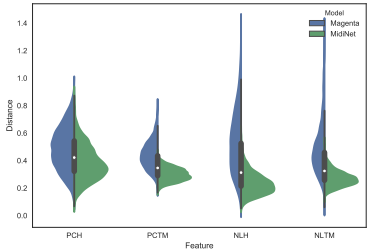


music ai

where we are now

blues funk metal chanson[1]

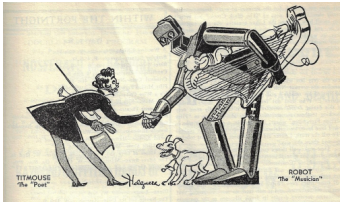
- ML/AI used by and **impacting all stakeholders** in chain of music communication
  - content creators
  - performers
  - producers
  - labels/music industry
  - distributors
  - consumers
- technologies are **here to stay**
- technologies **will improve** in usability, reliability, and accuracy

[1] generated on suno.com with the same prompt for different genres

music ai
opportunities

- **content creation, production**:
  - increased efficiency
  - expanded creative options (separation, morphing, etc.)
  - co-creative idea generation
  - democratization of music making

- **consumption**:
  - personalization
  - effective discovery and accessibility
  - (inter)active listening experiences



longstreet.typepad.com/thesciencebookstore/2017/06/the-invasion-of-musical-robots-1929

music ai
risks & threats

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- **content creation, production**:
  - ethical use of data
  - growth in plagiarism, impersonation
  - liability for harmful content
  - livelihood of creators
  - value perception of artistic content
- **consumption**:
  - consumer distrust through
    - inflationary ai-generated content
    - inexplainable black-box systems
- **general**:
  - 'mainstreamification' (novelty vs. homogeneity)
  - bias (data curation)
  - monopolization (for-profit system control)
  - sustainability and energy

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conclusion
impact

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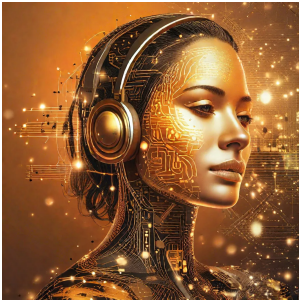
- **society & culture**
  - value of music/art, value of human origin
  - musical bias, increasing homogeneity
- **science**
  - measuring progress
- **economy**
  - livelihoods/workforce
  - new business models
- **environment**
  - energy, local impact
- **regulatory & legal**
  - fair use terms
  - monopolies
  - labeling of ai-created content
  - accountability and liability

conclusion

conclusion

- **many opportunities**
  - increased efficiency in content production
  - new tech will always be used in unforeseen creative ways
  - accessibility increases dramatically
- **paradigm shift has to be actively managed**
  - management and mitigation of impact on workforce/livelihood
  - transparency and informed consumers
  - models for fair compensation
- **old questions worth asking anew**
  - when is a musical piece considered creative
  - what makes a human performance unique
  - can generated content be art



thank you!

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links

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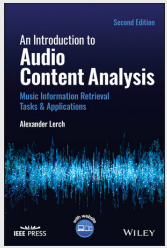
mail: alexander.lerch@gatech.edu

book: www.AudioContentAnalysis.org

music informatics group: musicinformatics.gatech.edu



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