



artificial intelligence and music

threats & opportunities

alexander lerch

■ 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)



introduction

artificial intelligence

■ artificial intelligence

- unclear definition: everything that is perceived to act intelligently
- changes over time

■ machine learning

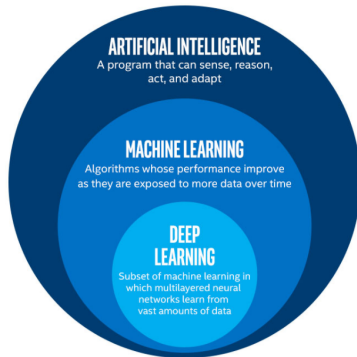
- data-driven: algorithm is more agnostic to task and is parametrized through training with data

■ 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*



Georgia Tech **Center for Music Technology**
College of Design



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

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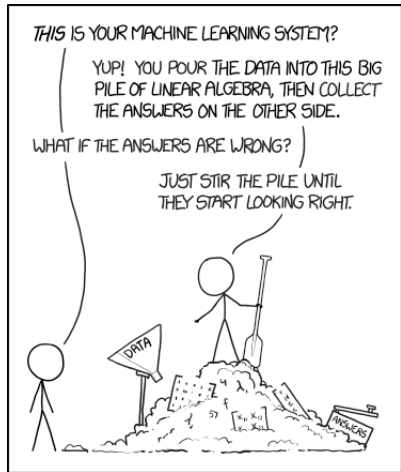
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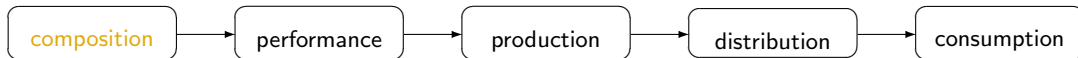
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musical communication

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

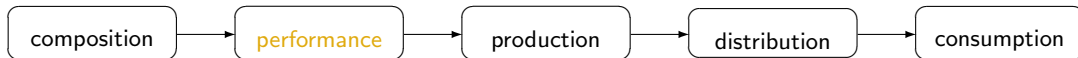
■ distribution & listening

- music recommendation and discovery



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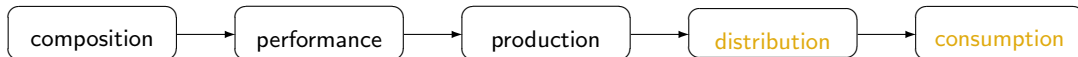
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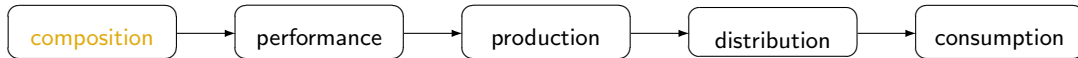


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musical communication and AI



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- intelligent assistance, e.g., ideas, auto-arrangements
- automatic composition

■ performance

- interactive music education systems
- generation of 'human' performance

■ production

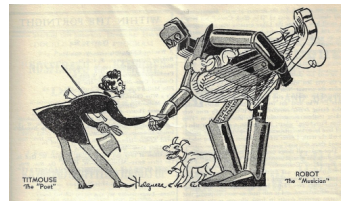
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■ distribution

- match music style and consumer

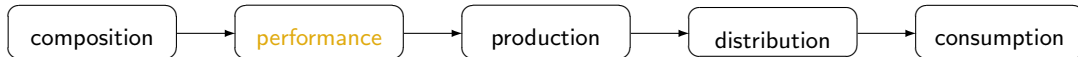
■ consumption

- intelligent music discovery & adaptable music



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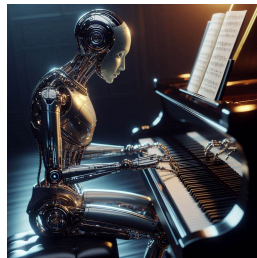
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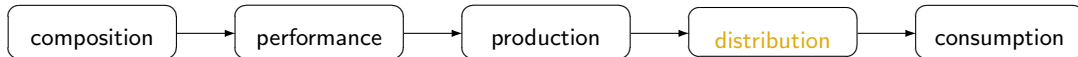
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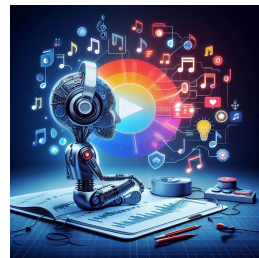
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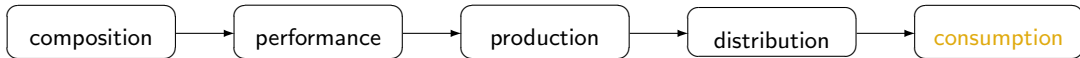
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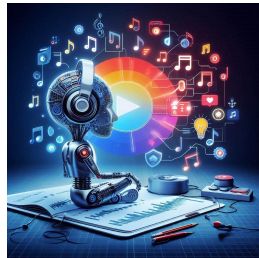
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music ai

opportunities & threats

opportunities

- content creation:
 - speed-up, increased efficiency
 - creative possibilities (morphing, etc.)
 - co-creative idea givers
 - democratization
- consumption:
 - personalization
 - effective discovery and accessibility

threats

- both:
 - 'mainstreamification'
 - bias through for-profit system control
 - sustainability and energy
- content creation:
 - ethical use of data
 - plagiarism growth
 - liability for harmful content
- consumption:
 - user distrust through
 - ▶ inflationary ai-generated content
 - ▶ inexplorable block-box systems

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!

links

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music informatics group: musicinformatics.gatech.edu

