AEC Talk 3

Artificial Intelligence in Higher Music Education

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ARTEMIS Digitisation working group

Association Européenne des Conservatoires, Académies de Musique et Musikhochschulen

AEC Annual Meeting for International Relations Coordinators 2023
Opening Doors: Adopting a More Inclusive Perspective

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13-09-23

Artificial Intelligence in Higher Music Education

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Introduction
Foundations
Technology
Music
Future applications
Threats
Conclusions

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AEC Annual Meeting for International Relations Coordinators; 20-23 September 2023

Introduction

- Disclaimer:
  - We are not experts on AI
  - According to Born (2021)
    - The division of tasks between the composer and scientist may become a "subordination-service" in which science is brought in apparently as subordinate discipline to 'serve' what are assumed to be the pre-existing, autonomous creative 'visions' or 'needs' of composers.

Introduction

- Why now?
  - In 2021, OpenAI introduces Dall-E (Diffusion, Midjourney, etc.)
  - In 2022, OpenAI introduces ChatGPT (Bard, Bing, etc.)
- Context
  - "Similar" applications for expert users existed previously
  - Opening these tools (democratization) allows:
    - Anyone can use it
      - Change on the use of some existing technologies
    - New apps (from different disciplines) can be built over them:
      - Programming, psychology, learning, *creation*, etc.

Introduction

- No Panic! We did it before!
  - Disruptive technologies:
    - Farmers in big lands
    - Picture vs Photography
    - Piano
    - "Video kill the radio star"
    - From Vynil to Spotify (through Cassettes and Napster)
    - Uber food, Cabify…
  - Disruptive technologies in learning/teaching (music):
    - Calculators
    - Internet, Google, Wikipedia
    - Smartphone/iPad
    - MIDI, DAWs, Max, etc.
    - Zoom, Teams, Meet, etc.

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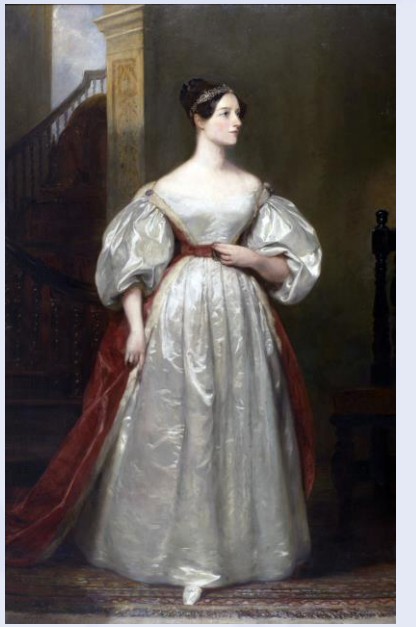
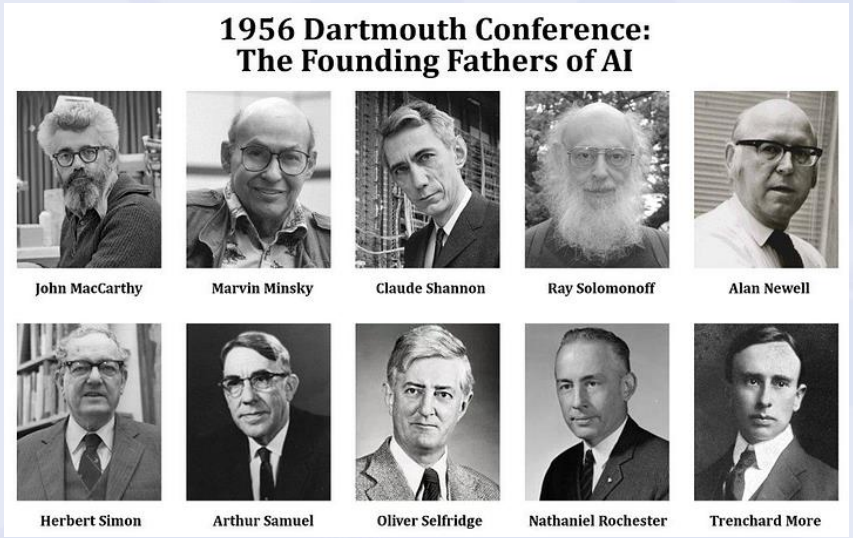
Foundations

- Ada Lovelace (1843)
  - "Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent".
- Alan Turing (1936)
  - Introduction of the concept of a machine performing any computation that a human being can.
- John McCarthy, Marvin Minsky, Nathaniel Rochester, Claude Shannon @ Dartmouth Workshop (1956)
  - Proposal of the "Artificial Intelligence" term.

https://ca.wikipedia.org/wiki/Alan_Turing



https://ca.wikipedia.org/wiki/Ada_Lovelace

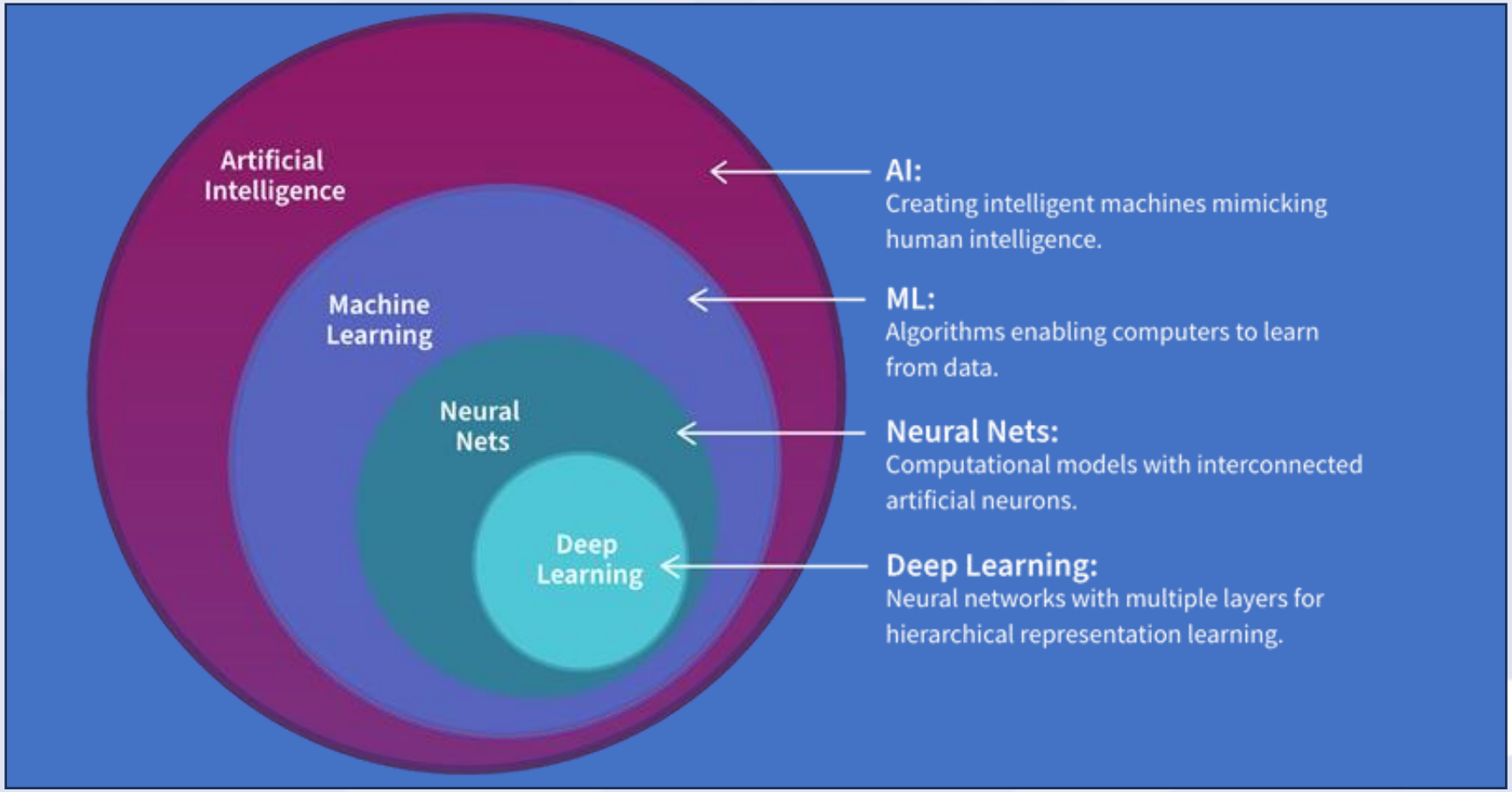


https://miro.medium.com/v2/resize:fit:1400/0*8MW8iP2QC_WNhmiW

Foundations

- Definition:
  - According to Wikipedia:
    - AI is the ability of machines to perform tasks that are typically associated with human intelligence, such as learning and problem-solving.
  - According to Chat GPT-3.5:
    - Merriam-Webster Dictionary Definition:
      - "a branch of computer science dealing with the simulation of intelligent behaviour in computers" or "the capability of a machine to imitate intelligent human behaviour."
    - The Association for the Advancement of Artificial Intelligence (AAAI) Definition:
      - "the scientific understanding of the mechanisms underlying thought and intelligent behaviour and their embodiment in machines."
    - John McCarthy's Definition (Pioneer in AI):
      - "the science and engineering to make intelligent machines, especially intelligent computer programs."
    - Russell and Norvig's Definition (Authors of "Artificial Intelligence: A Modern Approach"):
      - "the study of agents that receive precepts from the environment and perform actions."

Technology

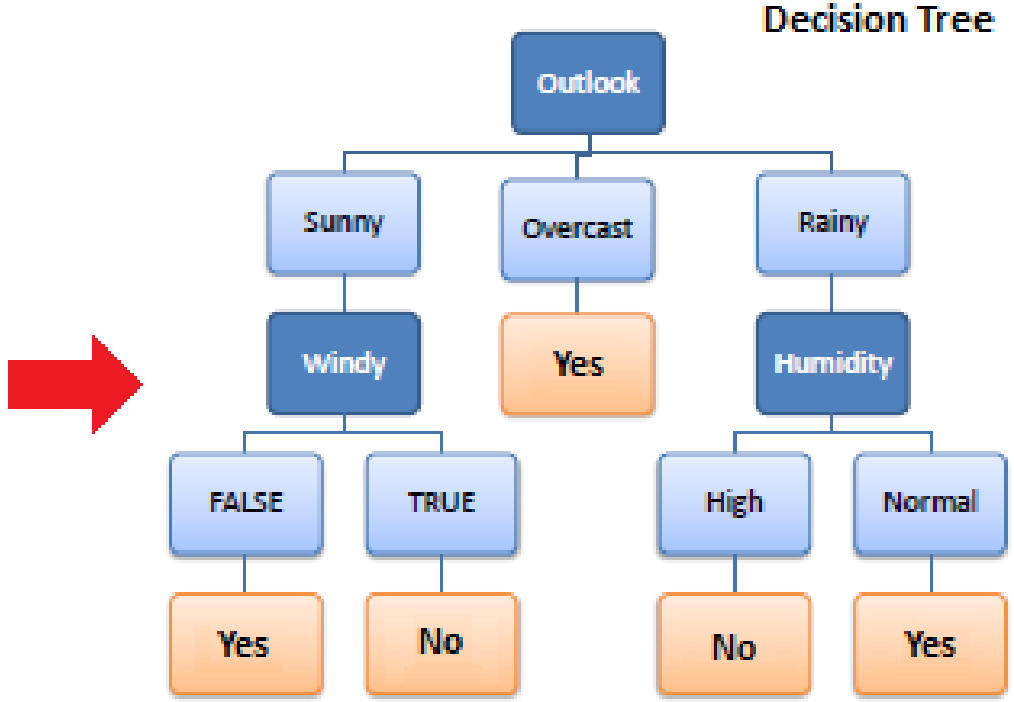


https://www.qlik.com/us/augmented-analytics/machine-learning-vs-ai

Technology

- AI: Creating intelligent machines mimicking human intelligence

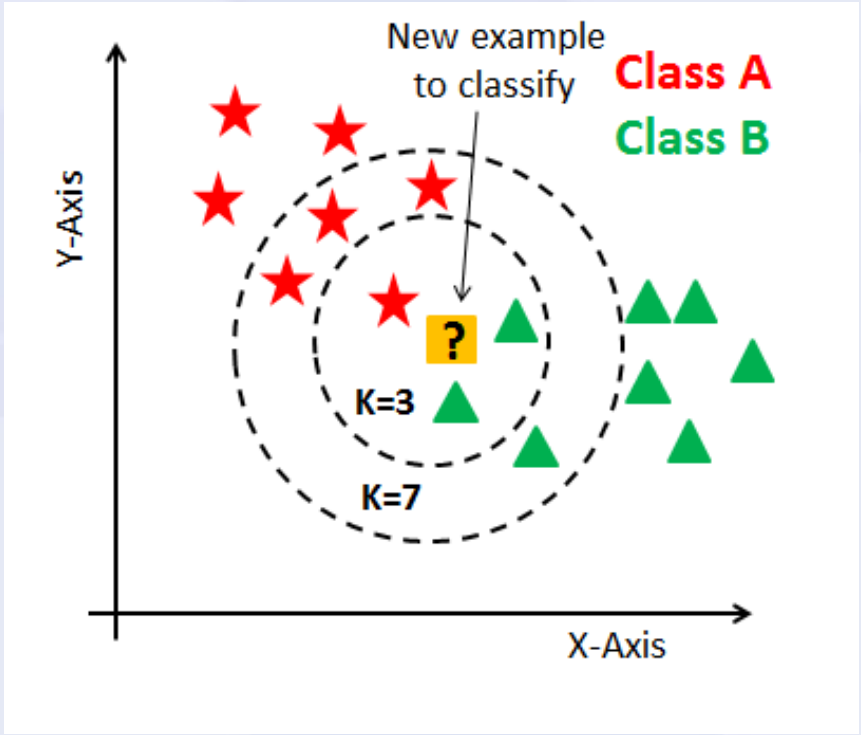
Predictors				Target
Outlook	Temp.	Humidity	Windy	Play Golf
Rainy	Hot	High	False	No
Rainy	Hot	High	True	No
Overcast	Hot	High	False	Yes
Sunny	Mild	High	False	Yes
Sunny	Cool	Normal	False	Yes
Sunny	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Rainy	Mild	High	False	No
Rainy	Cool	Normal	False	Yes
Sunny	Mild	Normal	False	Yes
Rainy	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Sunny	Mild	High	True	No



https://www.saedsayad.com/decision_tree.htm

Technology

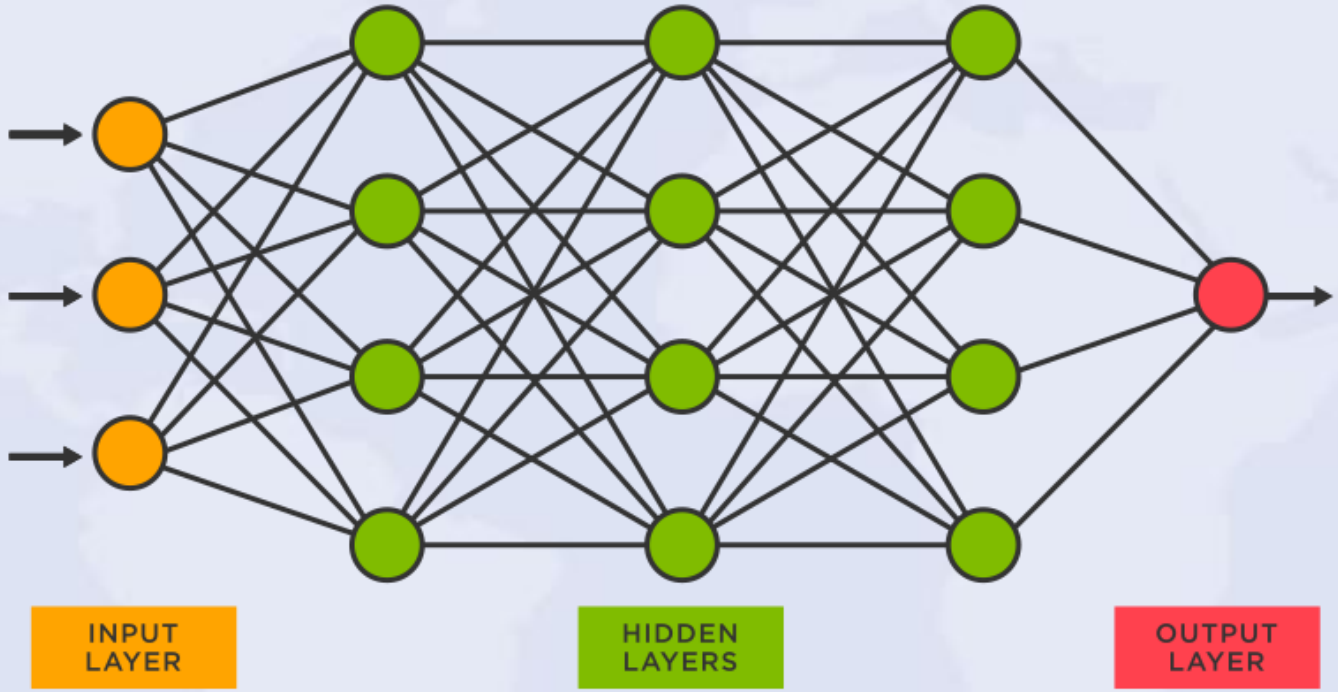
- ML: Algorithms enabling computers to learn from data (audio/MIDI)



https://www.kdnuggets.com/2020/11/most-popular-distance-metrics-knn.html

Technology

- ANN: Computational models with interconnected artificial neurons

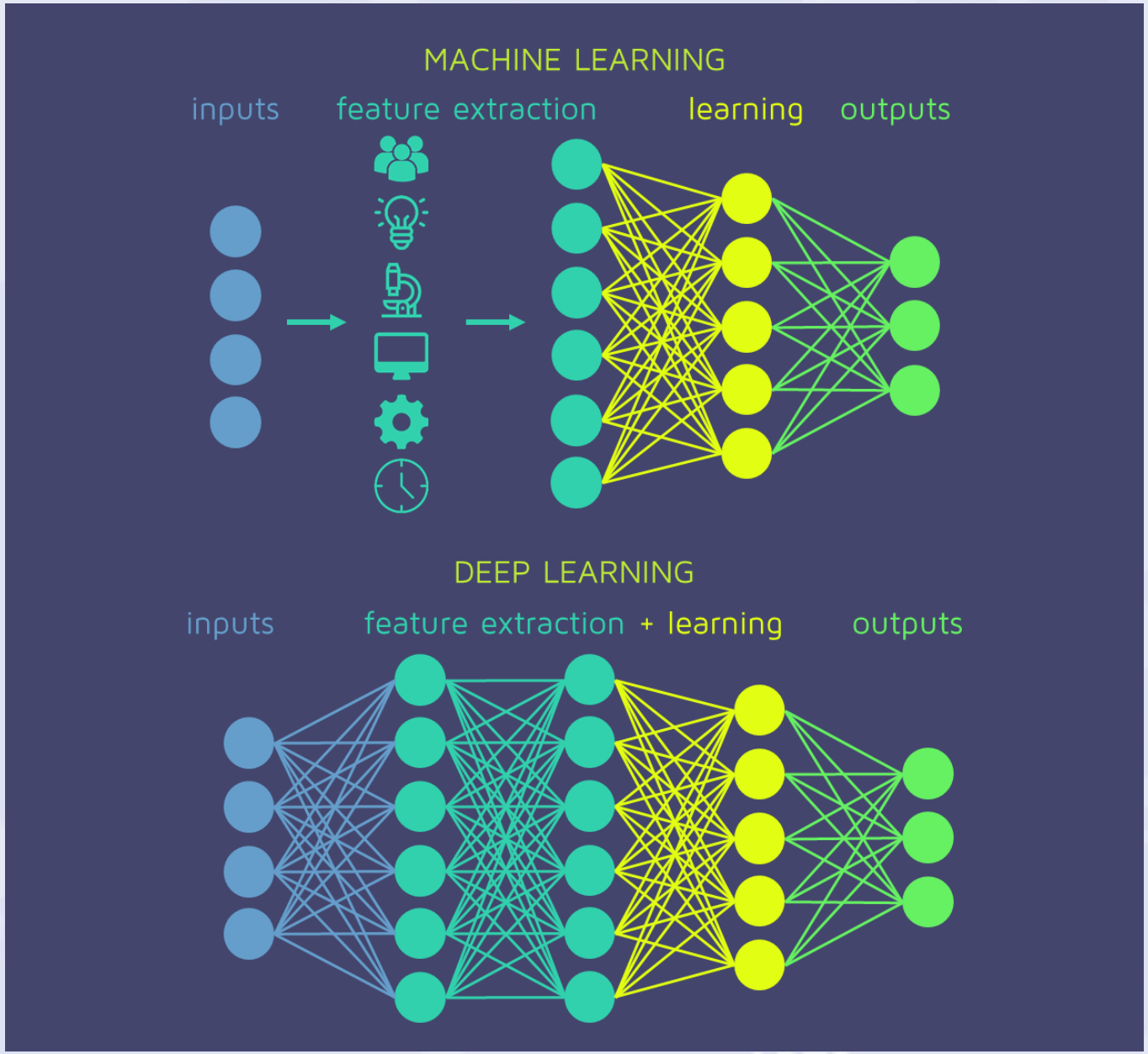


https://www.tibco.com/reference-center/what-is-a-neural-network

Technology

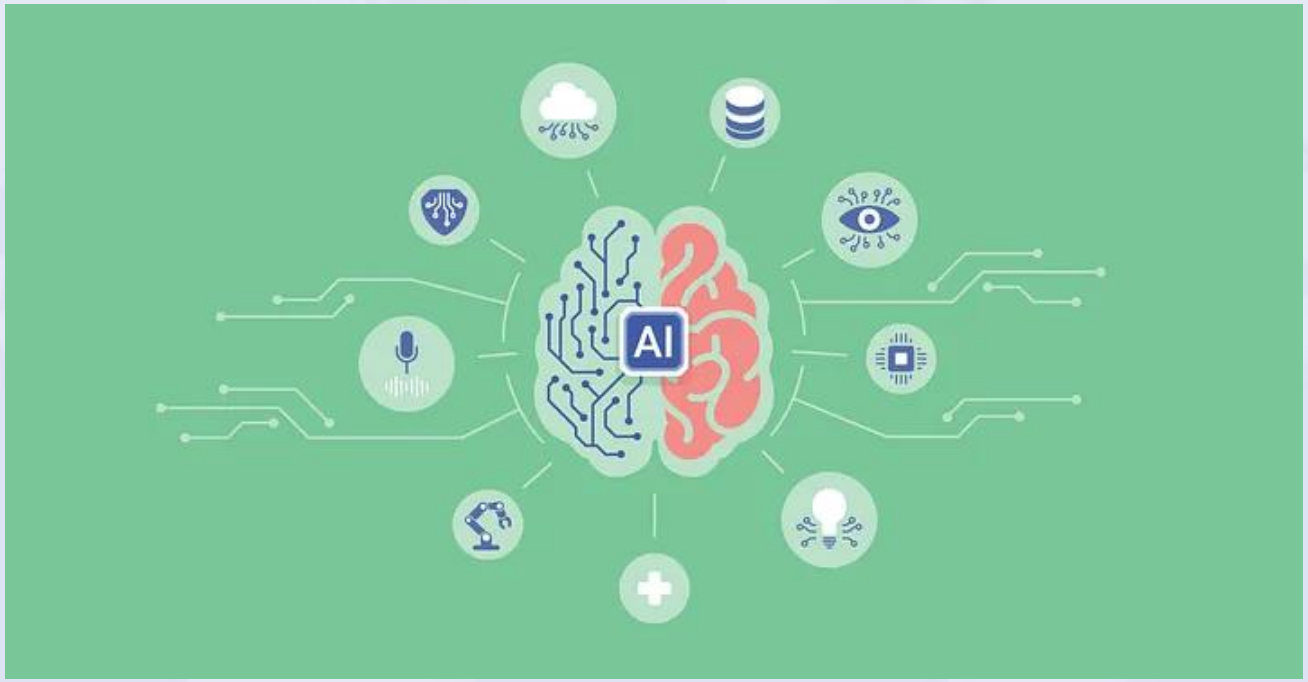
- DL: Neural networks with multiple layers for hierarchical representation learning

https://www.juambert.top/ProductDetail.aspx?iid=1086471216&pr=39.88



Technology

- Generative AI: Generate new text, image, audio, video, code based on content it has been pre-trained on



https://data360network.medium.com/an-introduction-to-generative-ai-concepts-applications-and-challenges-4389aefbed11

Technology

- ChatGPT definition
  - According to Wikipedia
    - ChatGPT, which stands for Chat Generative Pre-trained Transformer, is a large language model–based chatbot developed by OpenAI and launched on November 30, 2022, which enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language used.
  - According to Chat GPT-3.5
    - ChatGPT is a language model developed by OpenAI, based on the GPT-3.5 architecture. It's designed to understand and generate human-like text based on the input it receives.

Technology

- What ChatGPT can do
  - Write assays
  - Summarize scientific texts
  - Produce lesson, plans
  - Draft academic papers
- What CHATGPT can't do
  - Create
    - Fits on existing data (2 examples with students)
      - Those “modelic” students sometimes are not disruptors in their professional career (exceptions may apply).
      - But you obtain new results! Yes, it’s statistics! The student whose qualification is equals to the mean of qualifications does not exist.
    - Unknown results (but predictive) can be interpreted as creative results
- Behaviour
  - Generative AI hallucinates (using plausible language).
  - It's a language model, not a "world" model.
  - It is amoral.

Music

- News – Mainstream:
  - Iannis Xenakis, Pithoprakta (1955-1956)
    - Estocastic music including mathematical models (youtube).
  - Lejaren Hiller, The Illiac Suite (1957)
    - 1st score generated by AI (youtube).
  - George Lewis, Rainbow Family (1986)
    - Including a Yamaha DX7 synh synchronized with a computer via MIDI (youtube).
  - David Cope, (Emily Howell) From Darkness, Light (2007)
    - Create new compositions in the style of the original input music (youtube).
  - Flow Machines, Daddy's car (2016)
    - A song created in the style of The Beatles (youtube).
  - AIVA, Artificial Intelligence Virtual Artist (2016)
    - An AI composing soundtrack music (youtube).
  - Dirk Kaftan i Walter Werzowa, Beethoven X: The AI Project (2021)
    - An AI completed Beethoven's 10th symphony (youtube).

Music

- Music Industries
  - Automatic music reccommendation (p.ex. Spotify)
  - Copyright management companies using AI (p.ex. BMAT)
  - Free online text to speech applications (p.ex. Murf)
  - Noise removal plugins (p.ex. LALAL.AI)
- Generative Artificial Intelligence
  - Automatic creation of melodies given a list of tags (p.ex. Mubert)
  - MIDI accompaniment Generation (p.ex. popMAG)
  - Short textual description (p.ex. Riffusion)
  - Create full song from text description (p.ex. Jukebox)
  - Detailed textual description (p.ex. MusicML).

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Music

- Research
  - Research papers in journals and conferences (p.ex. ISMIR, AIMG2023)
  - Code & Libraries (p.ex. Tensorflow)
  - Datasets (p.ex. MusicBrainz)
  - Contests (p.ex. AI Song Contest)
- Composers
  - contemporary music (p.ex. Quayola & Seta)
  - jazz (p.ex. Marco Mezquida)
  - electronic music (p.ex. Mouse on Mars).

Future applications

- Assisted production
  - Automatic accompaniment
  - Counterpoint, bassline, voicings... proposals for a given melody
  - Automatic creative effects
  - Automatic mixing and mastering
- Music for Industries
  - Corporate music
  - Sound branding
  - Retail store music
  - Alarms, electric cars.
- Functional music
  - Background music (elevators, restaurants, hospitals, etc.)
  - Music for Yoga, Meditation, Relaxing, etc.
  - Music for Cleaning, Driving, etc.
  - Music for Sport activities
- Interactive music
  - Sports
  - Musicotherapy
  - Videogames

Threats

- Massive generation of music
  - Streaming platforms flooded with automatically generated music
  - Right balance between manual and automatic generated music?
- Copyright policy and rights administration
  - Who is the owner of the composition?
    - "Generation is not creation" (Víctor Portugal, Music Lawyer, 2023)
  - Music created by streaming platforms
- Loss of diversity
  - Devaluation of music as a cultural asset
- Deterioration of opportunities and working conditions for musicians
  - Performers and composers are being replaced by computers
- Audience interests towards these "new" types of music

Conclusions

- No panic!
  - Music industry -> 100 years (popularization of disk recording).
  - Music > 40.000 years evolving with technologies .
  - Musicians are more necessary than ever!
- The context of Conservatoires
  - Research
  - Spaces for experimentation
  - Curricula
  - Mobility

Artificial Intelligence

Immediate Challenges (and Opportunities) in HME

Thom Gilbert - Sept 2023

Large Language Models

Chat GPT etc - trained to “understand” human language and provide responses to prompts by interrogating data and predicting words

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Large Language Models

Uses

- Answering questions, like a more powerful Google Search
- Planning - from essays to much bigger projects
- Writing content - reports, emails, poems
- Generating computer code
- Suggesting improvements, modifying text
- Creating Presentations

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Artificial Intelligence

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Academic Integrity

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How do we respond?

Detect, embrace, dilute, avoid?

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Detect? – Turnitin's AI Detection

Unreliable, biased, can't keep up

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I'm a Student. You Have No Idea How Much We're Using ChatGPT.

No professor or software could ever pick up on it.

The vital takeaway here is that it's simply impossible to catch students using this process, and that for them, writing is no longer much of an exercise in thinking. The problem isn't with a lack of AI-catching technology — even if we could definitively tell whether any given word was produced by ChatGPT, we still couldn't prevent cheating. The ideas on the paper can be computer-generated while the prose can be the student's own. No human or machine can read a paper like this and find the mark of artificial intelligence.

Does this challenge require a new definition of plagiarism?

Is it the theft of another's work or the lack of original thought that matters most?

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Spotting AI in your student's work

- Very difficult and easy to get around when used well.
- AI text may come across as competent and fluent but lacking in character, colour or opinion - think inflight magazine copy
- AI could have been used in generating the ideas, but not the finished text
- Likely to be light on specific detail or examples (especially if the student is not very good at using it)
- It can't really do musical examples (bar numbers etc)
- Can be prone to factual errors (although this is improving)
- If in doubt, try it out
- Danger that less able students will be disproportionally caught and penalised (through poor use of the tools)

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Embrace?
How does this work in practice?

- Allow students to use AI tools and treat it like spellcheck?
- Design assignments that use AI content as a starting point for further analysis - but can AI do the further analysis too?
- Policy to insist on the referencing of AI generated content (how can this be enforced?)
- Collaborate with students to define rules around its use - ownership and sense of collective responsibility
- More collaborative/group work may help too
- Incorporate other elements to the assignment - eg viva

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Dilute and Avoid? - make AI less relevant/useful

- Fixed assessment criteria, open approach
- High stakes/high freedom
- Project based work - a documentation of process > end result
- Incorporate more mixed media
- More authentic assessment - student experience, views and interests
- Up the abstraction
- Focus on application of knowledge not the demonstration of it.
- Holistic/continuous assessment of progress/commitment over time
- What do you want to see from a student's response to an assignment? What is its purpose?

This might be a good opportunity to address **issues with curriculum and assessment** that have existed for years regardless.

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