On Computational Musical Creativity

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image (c) Mario Klingemann

Mario Klingemann - *The Butcher's son*

LUMEN GOLD AWARD 2018

Francis Bacon - *Self-portrait* (1950's)

Computational Creativity (CC)

According to the Association for Computational Creativity,

Computational creativity is the art, science, philosophy and engineering of computational systems which, by taking on **particular responsibilities**, exhibit behaviours that unbiased observers would deem to be creative.

Computational Creativity (CC)

The ACC states that the goal of computational creativity is to **model, simulate or replicate creativity** using a computer, to achieve one of several ends:

- to construct a program or computer capable of [**simulating?, modeling?**] human-level creativity
- to better **understand** human creativity and to formulate an algorithmic perspective on creative behavior in humans
- to design programs that can **enhance** human creativity without necessarily being creative themselves

What is Creativity?

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"Creativity is a phenomenon whereby something [material or inmaterial] somehow ***new*** *and somehow* ***valuable*** *is formed."* (Boden)

What is Creativity?

- **Valuable** == useful, interesting, insightful, beautiful, simple…
- **Novel**
  - **P-creative** is new to the person/milieu who created it
  - **H-creative** has never ocurred in history before

Types of Creativity

- **Combinatorial**
  - Produce unfamiliar combinations of known ideas
- **Exploratory**
  - Stretch boundaries of an established domain
  - *“Standing on the shoulders of giants”*
- **Transformational**
  - Radical transformation of a space or a field
  - Fundamentally new ideas, at first counterintuitive

Computational Creativity Research

Computational Creativity Research

CC

2010’s...

DSP

1950’s...

NIME

1990’s...

MIR

2000’s...

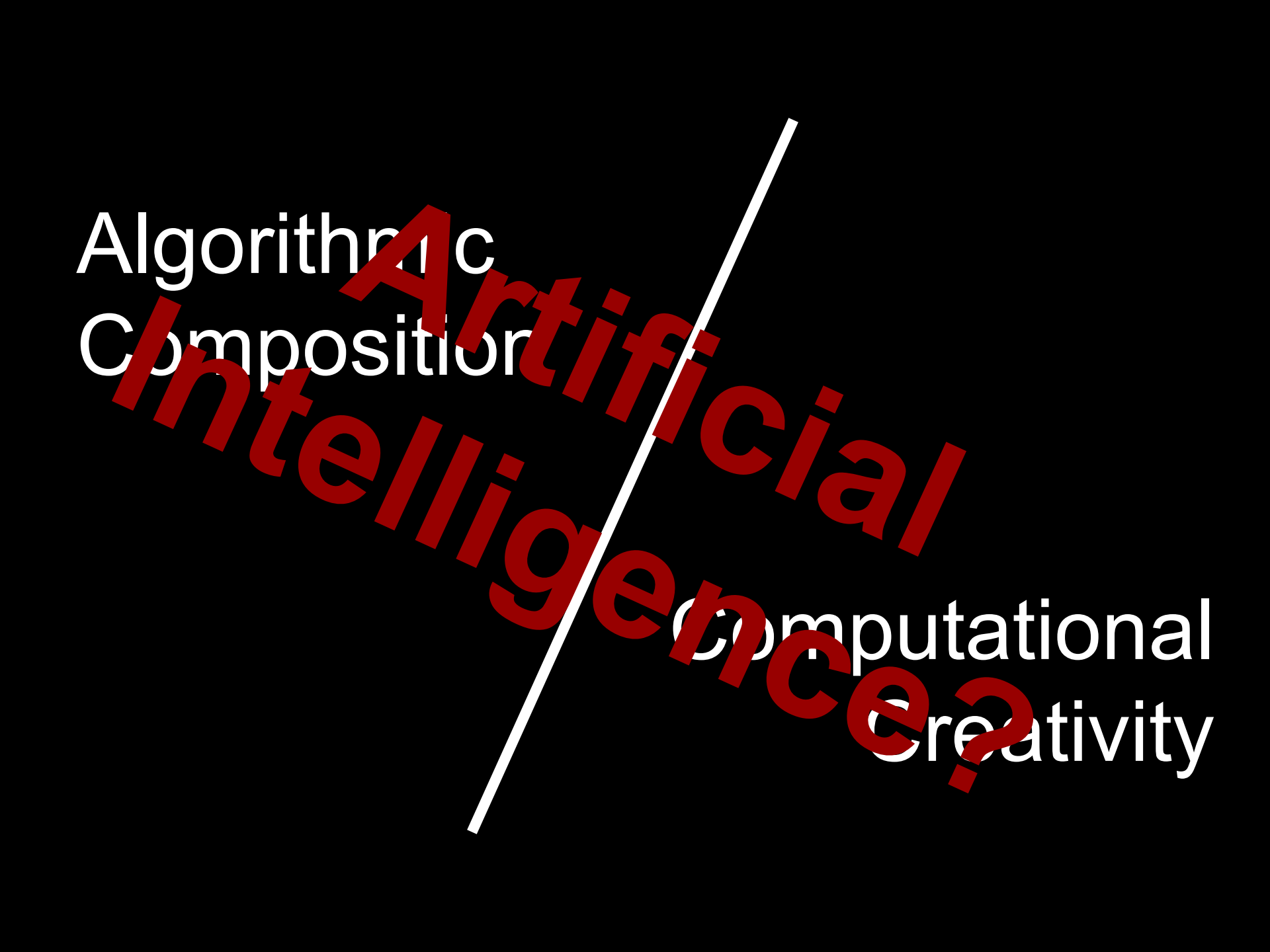
Computational Creativity Research

Conferences

- **ICCC** (2010-)
- **MUME** [Musical Metacreation] (2012-2019)
- **CSMC** [Computer Simulation of Musical Creativity] (2016-2018)
- **AIMC** (= MUME + CSMC) (2020-)

Journals

- **JCMS** [Journal of Creative Music Systems] (2016)
- **JCC** [Journal of Computational Creativity] (2019)


Algorithmic
Composition
Artificial
Intelligence?
Computational
Creativity

Algorithmic Music

Process Driven

Randomness, Rules

Exploring, mapping

Realtime!

Computational Creativity

Data Driven

Model, Style

Learning

Realtime?

Computational Composition Techniques

...conversion rules, markov models, generative grammars, self-similarity, genetic and evolutionary algorithms, cellular automata, neural networks, machine and deep learning...

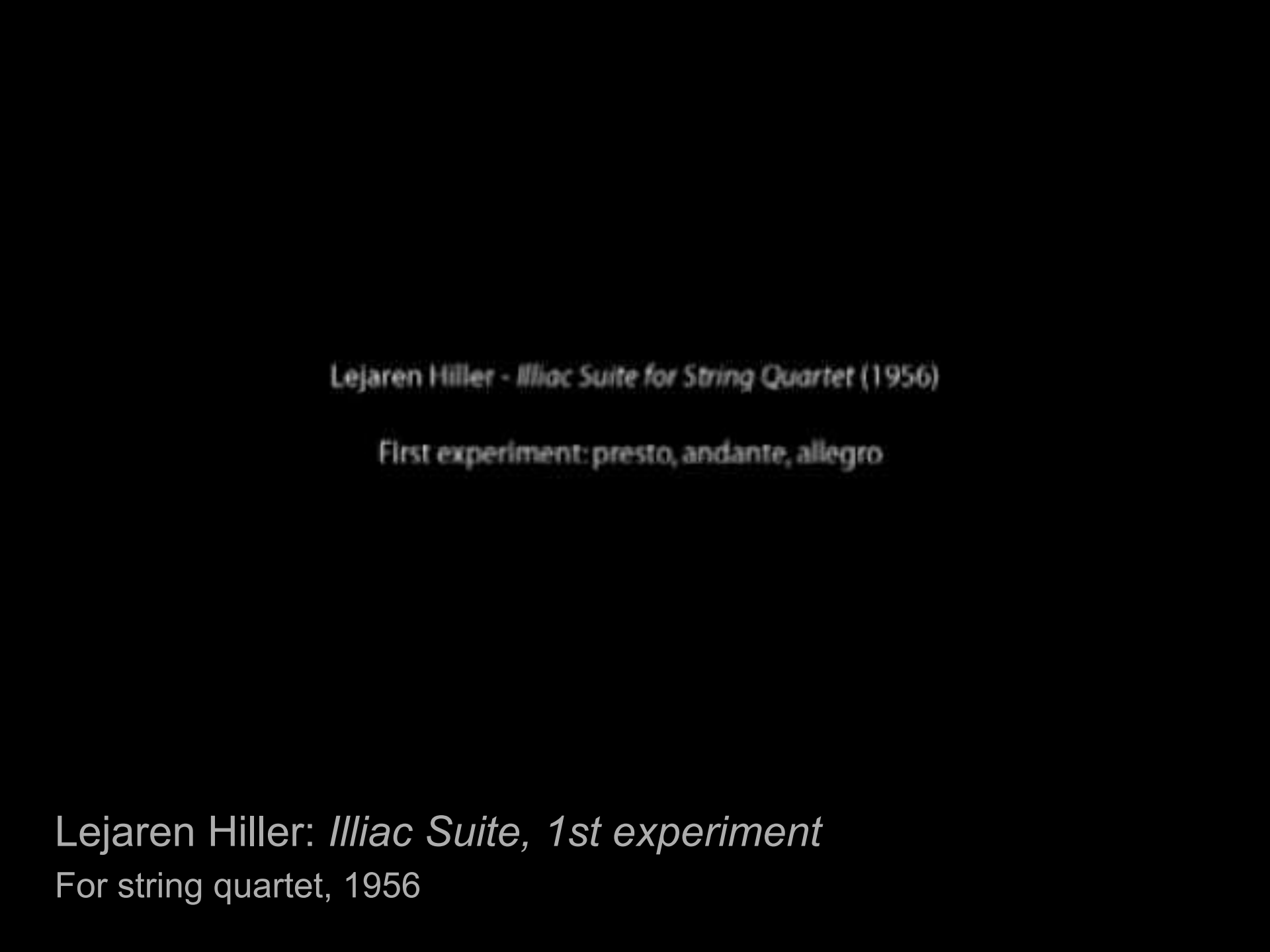
Application of Computational Musical Creativity

- Symbolic music processing
- Score generation (form, melody, harmony, rhythm, instrumentation/timbre, all-combined)
- Sound synthesis
- Sonification (mapping)
- Generative (combinatorial, ruled, evolutionary) systems
- NIMEs (New Interfaces for Musical Expression)

Labour of Computational Music Systems

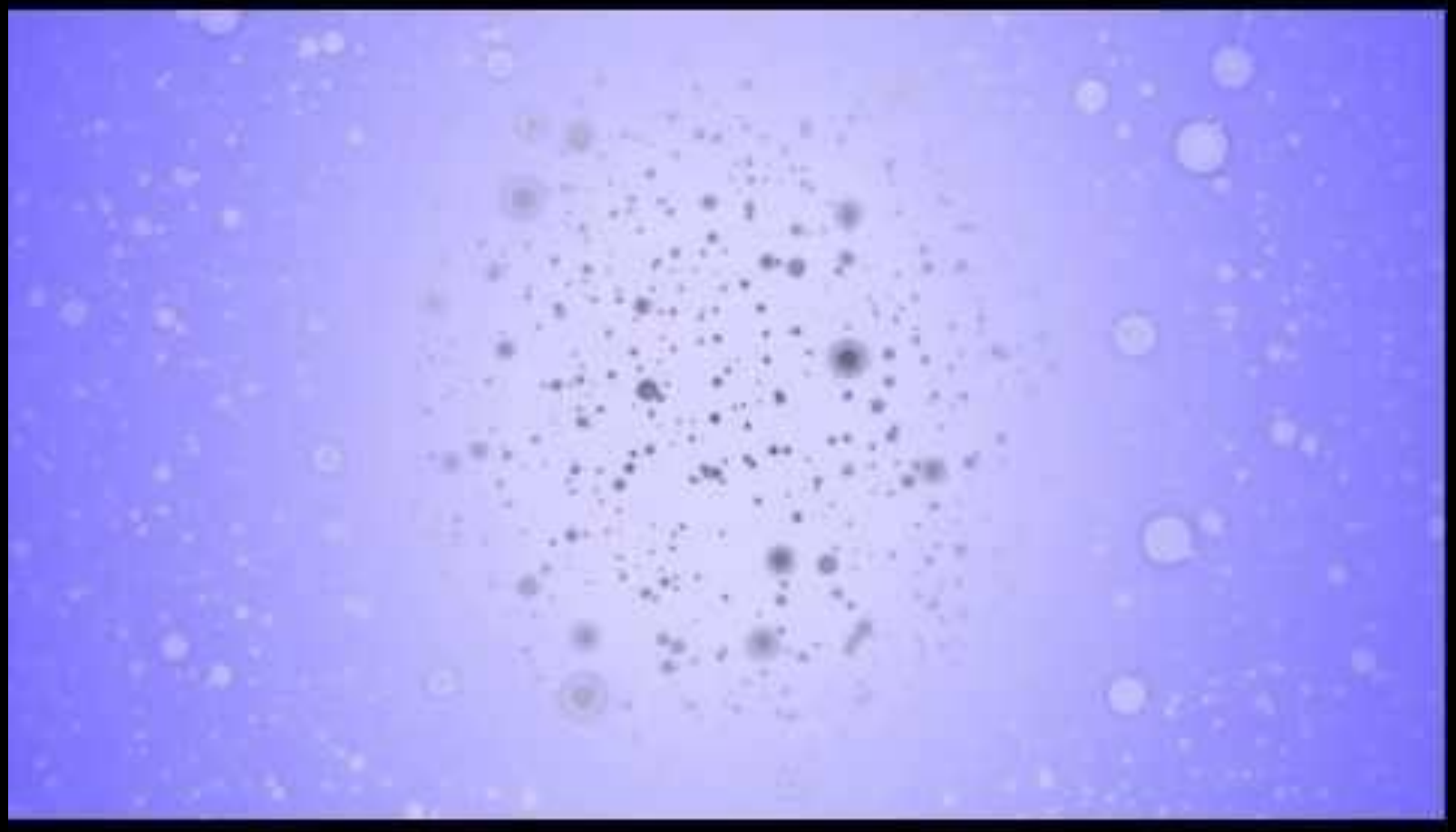
- Composer (combining or generating new material)
- Improviser // accompanist (human interaction, reactive, autonomous, machine listening)
- Assistant: arrange, orchestrate, harmonise… (expert systems, interactive or not)
- Instrument (depending upon human instructions)

Some examples on computational creativity



Lejaren Hiller: *Illiac Suite, 1st experiment*

For string quartet, 1956



David Cope EMI: Bach-Style Chorale

circa 1995, possibly revised towards ~2010

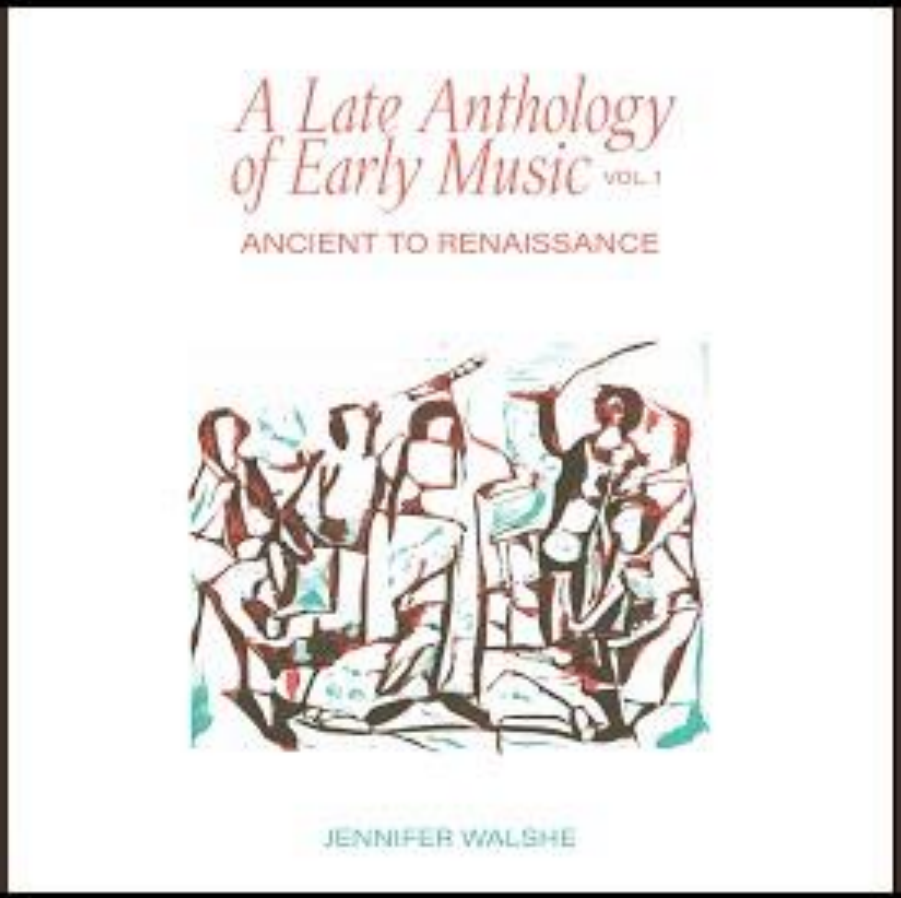
George Lewis with Roscoe Mitchell & Voyager, *improvisation*

Voyager, interactive virtual improvisor born in 1987 and living up till today

SKYGGE, *Black is the Color (feat. Pete Seegers)*

American Folk Songs, 2019

Holly Herndon with Jlin & Spawn, *Godmather*
PROTO, 2019



Jeniffer Walshe, *Ockeghem: Missa Prolationum, Kyrie*

A Late Anthology of Early Music Vol. 1: Ancient to Renaissance, 2020

Opposites in Computational Composition

- Genuine composition vs style imitation
  - Imitation vs true creation? // research vs art?
- Rules (hard-coded) vs data-driven (analysis)
- Computer-generated vs computer-assisted
- Single vs many vs all parameters
- Single vs groups vs whole body of work

Some quotes on computers involved in music making

[…Computers] must not cross into the area of human creativity. It would ***threaten*** *the existence of human control in such areas as art, literature and music.*

Gary Kasparov in 1997, after being defeated as Chess World Champion by the supercomputer Deep Blue

The final step in the evolution of the arts is the ***scientific method of art production****, whereby works of art are manufactured and distributed according to definite specifications.*

Joseph Schillinger (1943) *The mathematical basis of the arts*

Ordinary music is like engineering, where everything is built according to a plan, and it's the same every time you play it. ***Generative music*** *is more like gardening; you plant a seed, and it grows different every time you plant.*

Brian Eno, October 2010, *Wired Magazine*

With the aid of electronic computers ***the composer becomes a sort of pilot****: he presses the buttons, introduces coordinates, and supervises the controls of a cosmic vessel sailing in the space of sound, across sonic constellations and galaxies that he could formerly glimpse only as a distant dream.*

Iannis Xenakis, 1965

I think that AI tools for composition and production will be integrated into ordinary DAW's. Those instruments will propose melodies, chords, rhythms and sounds. It will allow musicians to ***accelerate*** *&* ***multiply*** *their experiments. This generated material will [...] allow them to go out of their comfort zone, or* ***help*** *them when they are* ***stuck****.*

Benoit Carré, 2019, interviewed in The Quietus

*Well, **AI is just us**. AI is human labor obfuscated through a terminology called AI, and our goal is to use technology to allow us to be more human together.*

Holly Herndon, 2020, interviewed by Emily McDermott

Some Final Questions

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- What are your thoughts on CC? Do you feel positive/negative about it?
- What are or could be the implications of CC in society, the arts, the market, labour?
- Does CC raise genuinely contemporary issues or similar concerns can be traced in other eras?
- Where do you see CC belonging: research, cognition, philosophy, arts?

Thank you!

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