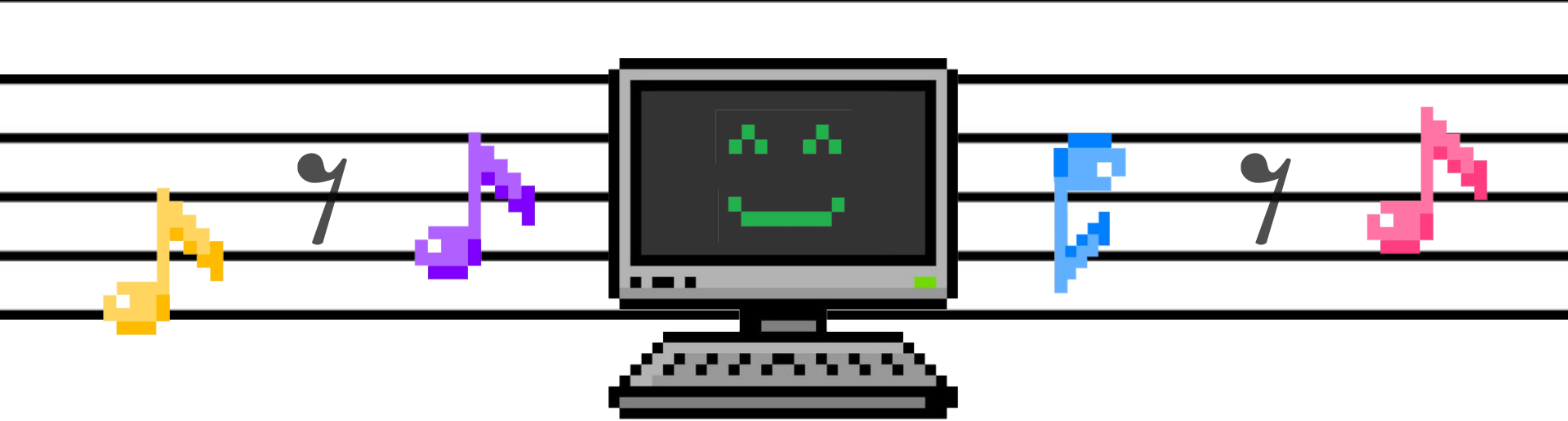
CSCI 3725: Computational Creativity



Theoretical Foundations

Today's Outline

- **Types of Creativity** (Philosophy, CogSci, CS)
- **Human Creativity** (Neuroscience)
  - How do we measure it?
- **Computational Creativity: Our First Definition**
- **More Practice with Markov**

Part I

Types of Creativity

Margaret Boden

"Often, people tried to **avoid** the philosophical problems by defining '**machine consciousness**' in a **non-committal way**."

"Some researchers, such as **Igor Aleksander**, were even describing their laptops as **conscious**."

"However, when **challenged** he'd **retreat into objectivity**..."

Approach #1: What do Creative Ideas Cause?

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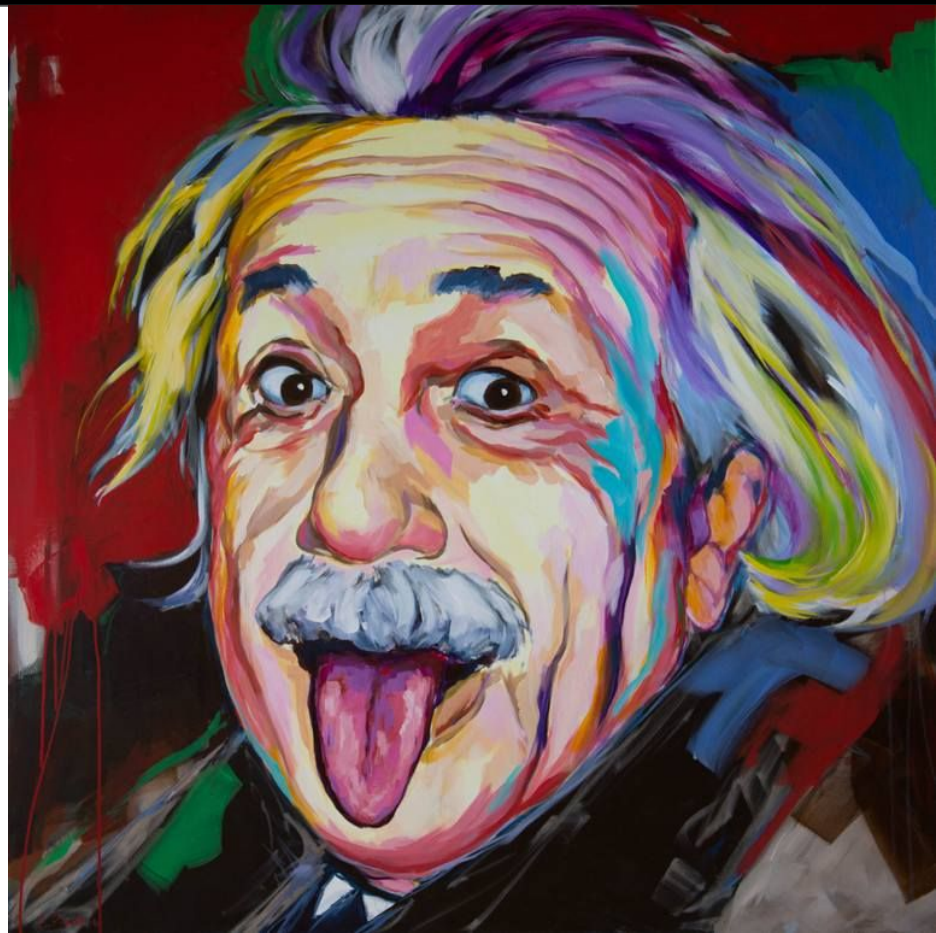
H-creative:

historically creative for society

("new for the **world**")



Approach #1: What do Creative Ideas Cause?

P-creative:

personally creative for
the individual producer

("new for **you**")

Approach #2: How are Creative Ideas Made?

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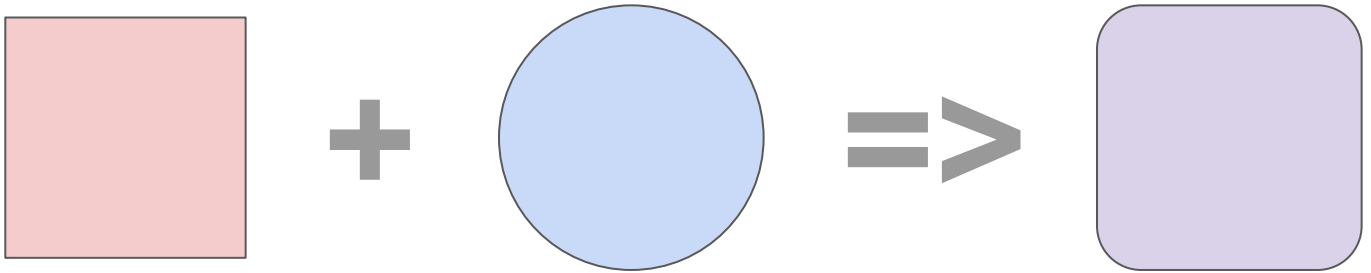
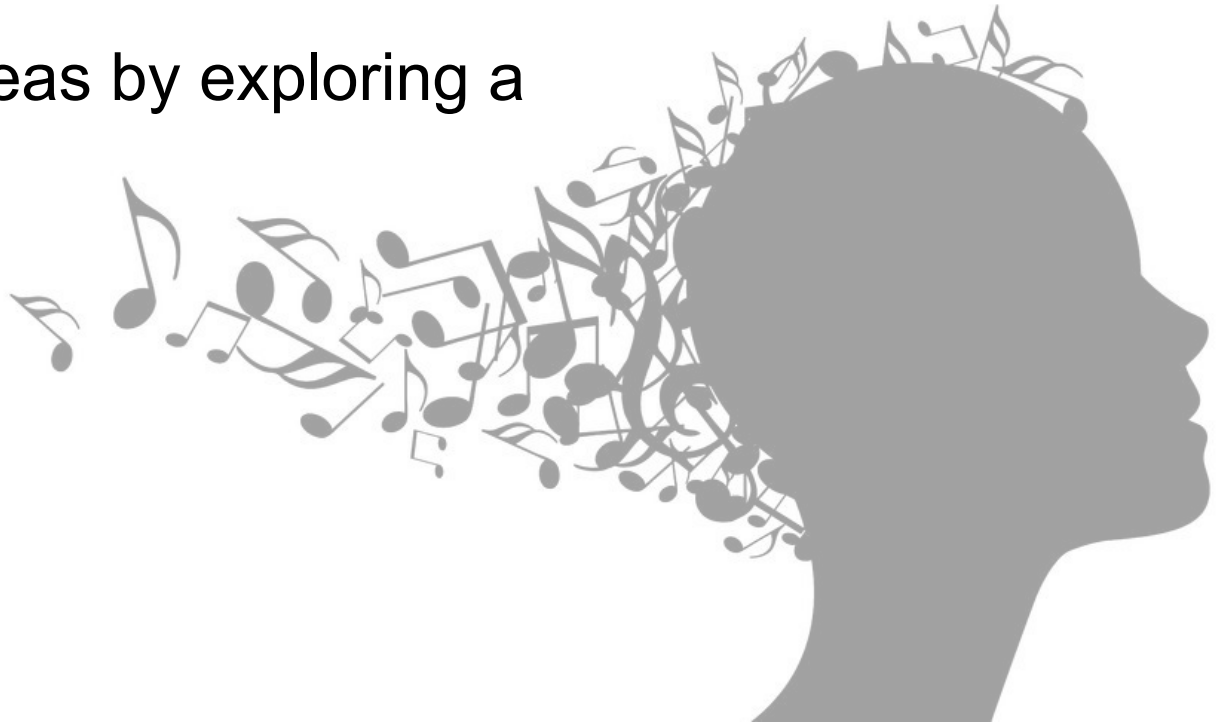
Combinatorial: new combinations of familiar ideas



Approach #2: How are Creative Ideas Made?

Exploratory:

generating new ideas by exploring a space of concepts



Approach #2: How are Creative Ideas Made?

Transformational:

involves a change in the search space so new kinds of ideas can be generated

Part II

Human Creativity

Class Activity: Measuring Human Creativity

We're going to take **two minutes** to try one of these creativity measures to gain hands-on experience with it.

Get paper and a pencil ready!

Guilford's Alternate Uses Task (Wilson, Guilford, Christensen & Lewis, 1954)

List all of the **possible uses** for a **brick**.

The Alternate Uses Task (Wilson, Guilford, Christensen & Lewis, 1954)

Time's up!

List your possible use cases here:

https://bit.ly/2ZdEa1B

The Alternate Uses Task (Wilson, Guilford, Christensen & Lewis, 1954)

- **Fluency**: Total up the **number of uses** you could name.
- **Flexibility**: Total the **number of different categories** of uses (e.g. “throwing at X” and “hitting Y” are both weapons)
- **Originality:** How many of your responses are unusual or unique compared to **everyone**?
- **Elaboration**: amount of detail (roughly, +1 for each new detail) - for example, “a doorstop” vs. “a doorstop to prevent a door from slamming shut in a strong wind”

Measuring Human Creativity (Combinatorial)

Caveats (similar to intelligence…):

- There is **no "one measure"** or "one area" of creativity.
- Creativity **isn't** "coming up with **wild ideas**".
- Creativity **isn't static**.

(Disclaimer: we did not administer or score that task in a scientific way. The activity was just meant to give you an idea about how this kind of task works.)

Measuring Human Creativity (Combinatorial)

- **Divergent thinking:** open-ended tasks that encourage multiple responses (originality, ideational fluency, cognitive flexibility, elaboration)
- **Convergent thinking**: tasks that have a single correct answer that require “insight”
- **Vivid imagination**: creating images with a high level of complexity and detail

*Often these tests are combined with **brain imaging**, too!*

Part III

Computational Creativity (Our First Definition)

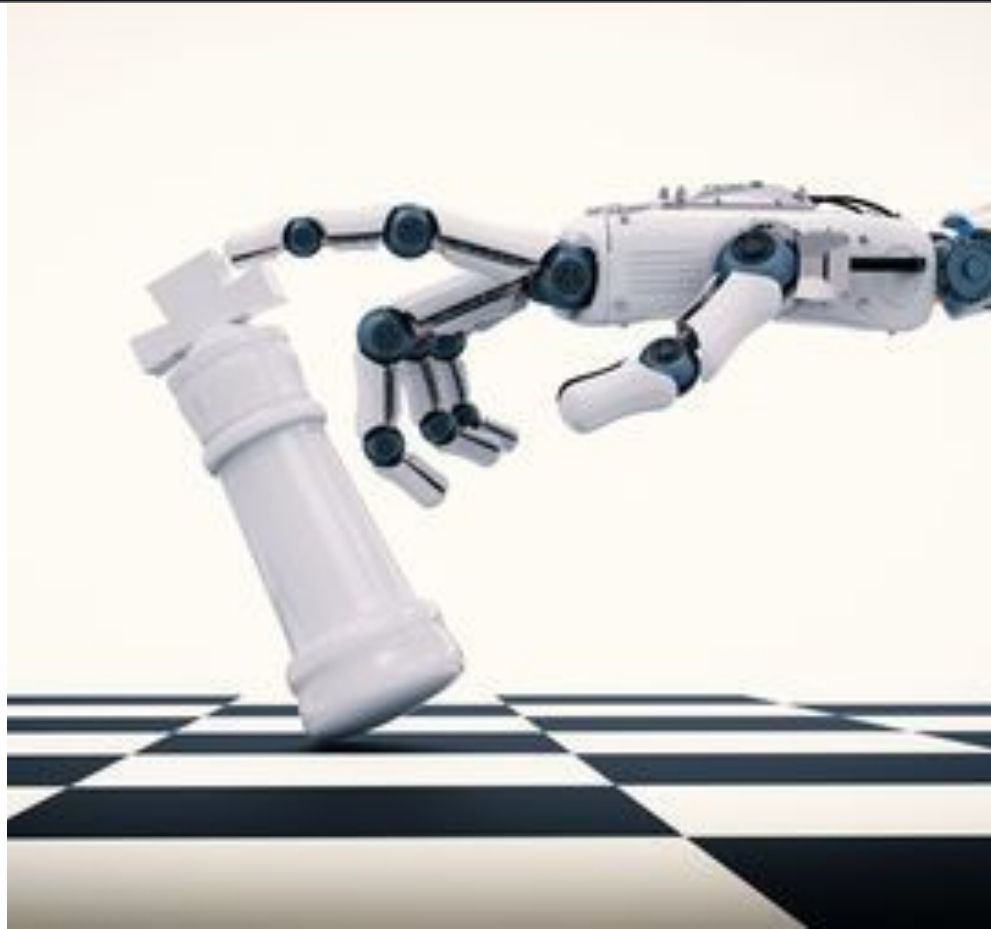
We Keep Changing What it Means to be “Better”

The human brain is an expert at collecting, storing and processing information. No computer can store as much information as our brain. Our brains can think intelligently – computers can't. Figure 1.2 shows some storage capacities. (A character is a letter of the alphabet, a number from 0 to 9, any punctuation mark or a space.) Computers are much faster than our brains, but as you can see from Figure 1.2, their storage capacity is much smaller.

Storage type	***Capacity (millions of characters)***
Human brain	125 000 000
USA National Archives	112 500 000
Encyclopaedia Britannica	12 500
Magnetic (hard) disk	313
Floppy disk	2.5
Book	1.3

Figure 1.2 *Types of information storage and their capacities*

GCSE Computer Studies For You, 1985



Defining Creativity

1)

2)

Defining Creativity

1) **Novel**

2)

Defining Creativity

1) **Novel**

2)

Defining Creativity

1) Novel

2) Valuable

Defining Creativity

1) Novel

2) Valuable

Remember: this is not a complete definition!

(We will be talking and reading about this more!)

Looking Ahead

On Friday, the schedule and assignments on our course website will update!

- **R: How to Build a CC System**
- **M3: A Markov Distinction**