CS-E4002 – Special Course in Computer Science:
Seminar on Computational Creativity

Lecture 1: Praticalities & Introduction

Anna Kantosalo, Christian Guckelsberger & Tapio Takala

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Aalto University
School of Science

Agenda

Course practicalities:

- **Staff**
- **Learning outcomes**
- **Assignments & Grading**
- **Schedule**
- **Assignment guidelines**
- **Materials**

Introduction to Computational Creativity:

- **What is creativity?**
- **What is computational creativity?**
- **History & motivations for computational creativity**

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School of Science**

Course staff

Prof. Tapio "Tassu" Takala

Dr. Anna Kantosalo

Dr. Christian Guckelsberger

Students

What do you study and what is your motivation for taking the course?

If you didn't sign up yet...
Tell us your name, your study subject and describe your motivation for taking the course.

Signup is open until Monday the 18th

Learning outcomes

After the course you will

1) Know what computational creativity (CC) means

2) Be aware of the key concepts in CC

3) Understand what kind of questions CC addresses

4) Be able to analyze and discuss creative AI systems scientifically

5) Be aware of the main components for implementing a CC system

6) Be more familiar with scientific writing and information finding

Course arrangements

- **Course lectures & presentations remotely in Zoom**
  - You can use your camera or not, you can use a virtual background if you like
  - We hope you can use your microphone for discussions
  - Ask questions in chat
- **Questions:**
  - Anna.Kantosalo@aalto.fi

Course Assignments & Grading

The course consists of three multi-part assignments:

- **Essay**
    - Outline
    - Full draft
    - Final

- **Presentation**
    - Slides
    - Talk for 20 minutes + 10 minutes discussion

- **Peer feedback**
    - Once for outline & once for full draft & presentation

Course Assignments & Grading

You will gather points from each subtask, maximum points for each task are:

The course consists of three multi-part assignments:

- **Essay**
    - Outline   15 points
    - Full-draft   15 points
    - Final   30 points

- **Presentation**
    - Slides   10 points
    - Talk for 20 minutes + 10 minutes discussion   10 points

- **Peer feedback**
    - Once for outline & once for full draft & presentation   10+10 points

Total max 100 points

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Course Assignments & Grading

You will gather points from each subtask, maximum points for each task are:

The course consists of three multi-part assignments:

- **Essay**
  - Out   points
  - Full   points
  - Fina   points

- **Presenta**
  - Slid   points
  - Talk   points

- **Peer feed**
  - Once for outline & once for full draft & presentation   10+10 points

You need at least 1 point in each assignment and the total of 50 points to pass the course

Points	Grade
<50	fail
50≤	1
60≤	2
70≤	3
80≤	4
90≤	5

Total max 100 points

Schedule
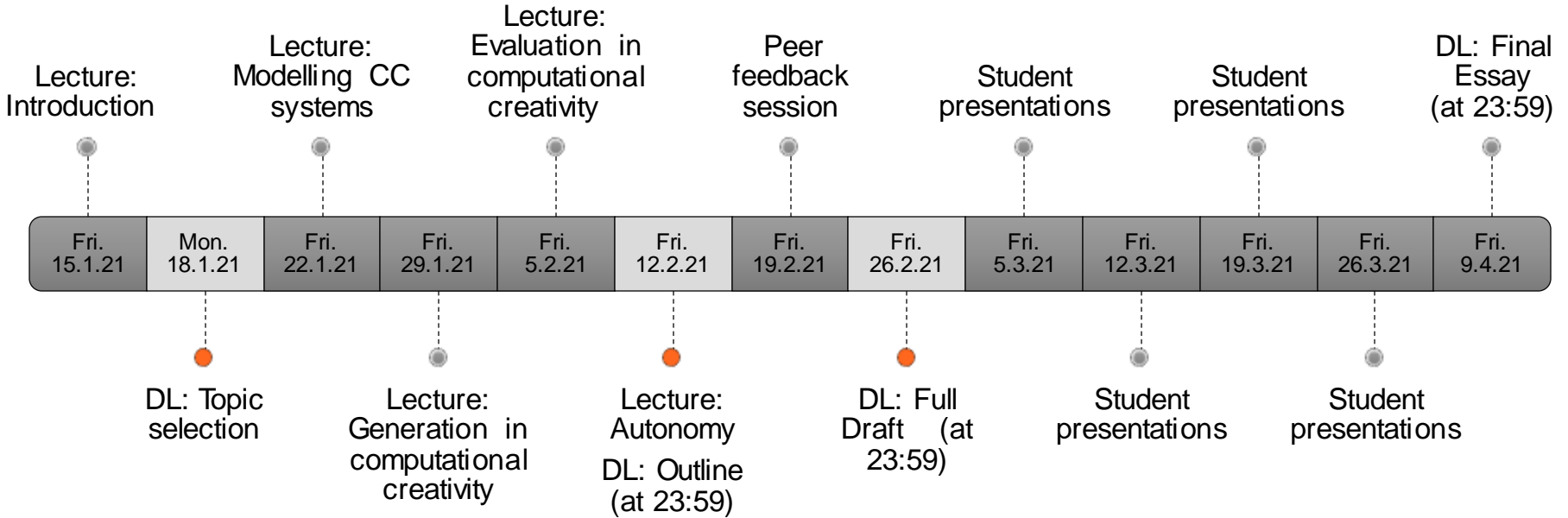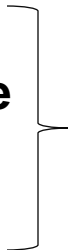
Lecture: Introduction

Lecture: Modelling CC systems

Lecture: Evaluation in computational creativity

Peer feedback session

Student presentations

DL: Final Essay (at 23:59)

| Fri. 15.1.21 | Mon. 18.1.21 | Fri. 22.1.21 | Fri. 29.1.21 | Fri. 5.2.21 | Fri. 12.2.21 | Fri. 19.2.21 | Fri. 26.2.21 | Fri. 5.3.21 | Fri. 12.3.21 | Fri. 19.3.21 | Fri. 26.3.21 | Fri. 9.4.21 |

DL: Topic selection

Lecture: Generation in computational creativity

Lecture: Autonomy

DL: Outline (at 23:59)

DL: Full Draft (at 23:59)

Student presentations

Student presentations

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Assignment Guidelines

Essay – Structure

- **Abstract**

- **Introduction**

- **Domain / Related work**

- **Description of system / technique**

- **Analysis**

- **Discussion**

- **Conclusions**

- **References**

Assignment Guidelines
Essay – Structure

- **Abstract**

- **Introduction**

- **Domain / Related work**

- **Description of system / technique**

- **Analysis**

- **Discussion**

- **Conclusions**

- **References**

Select the more suitable terms for your work. In addition to the major sections listed here, you may use subsections.

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Assignment Guidelines

Essay – Structure

- **Abstract**
- **Introduction**
- **Domain / Related work**
- **Description of system / technique**
- **Analysis**
- **Discussion**
- **Conclusions**
- **References**

→ **A summary of your essay**

→ **Motivations for your topic**

→ **Scientific surroundings**

→ **Detailed description of topic**

→ **How is the system creative?**

→ **Your ideas for improvement**

→ **A summary of your results**

→ **Any references you have used**

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Assignment Guidelines

Essay – Outline (15 points)

- **2-3 pages**

- **Language: English**

- **You can use bullet points or short sentences**

- **Focus on the structure of your essay – use the structure provided in the previous slide**

- **List your major references**
  - The original reference
  - 2< Domain specific other references
  - Some general references for evaluation and analysis

- **Summarize your topic and analysis well! → You will get better feedback!**

Assignment Guidelines

Essay – Full Draft (15 points)

- **First full draft of your work (6-8 pages)**

- **Write complete sentences and clarify the terminology you use**

- **Consider feedback from course staff and your peers**

- **Consider visualizations for your subject**

- **Should include the complete analysis of your topic & all relevant references so that you can get relevant peer feedback**

- **This version should not need any major structural changes for the final version**

Assignment Guidelines

Essay – Final Version (30 points)

- **Final version of your work (6-8 pages)**

- **Polish your language**

- **Consider staff & peer feedback**
    - Some suggestions are easy to address, others may require refining your argumentation or adding something into your discussion section
    - Consider the questions you received during your presentation – should you add or remove something based on them?

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Assignment Guidelines

Essay – Final Version – Evaluation guidelines

- **Your work will be graded upon (6 points each)**
  - Clarity of language & visual (if any) representations
  - Clarity of structure
  - Quality of topic review
  - Quality of analysis
  - Quality of discussion

- **There will be a plagiarism check!**

- **Recommended length 6-8 pages, point penalty if <6 or >8**

Assignment Guidelines

Presentation (10 points + 10 points)

- **Length: 20 minutes**

- **Prepare your slides well – they will count for 10 points**

- **Shortly describe your domain**

- **Focus on the system and your analysis**

- **Return your slides as a pdf a week before your turn for comments + after the session**

- **This year you can pre-record your talk if you like**

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Assignment Guidelines

Presentation (10 points + 10 points)

- **Good slides have**
    - Short, descriptive text and/or images
    - Clear structure
    - References
    - You do not have to fit everything!
        - Think of what is most relevant in your essay
        - Consider what could be interesting to others. You can also add some details in to the end of your presentation, if you anticipate more questions on the topic

- **Remember to rehearse!**
    - Rehearse in front of the mirror or videotape yourself – or ask a friend to listen

Assignment Guidelines

Presentation - Discussion

- **Each presentation will be followed by a 10-minute discussion**
  - During the discussion you are the acting expert of your topic
  - Your peers and staff will ask you questions about your topic
  - The person giving you peer feedback on this round will prepare a few questions for you

Assignment Guidelines

Presentation – Evaluation guidelines

- **Your work will be graded upon**
    - Clarity of presentation
    - Clarity and suitability of visuals & examples
    - Coherence & substance
        - Is your presentation clear to follow for anyone who has not yet read your essay?
    - Ability to discuss the topic in a clear manner

Assignment Guidelines

Peer Feedback - Outline

- **Short feedback according to a template provided later**

- **Focus on the structure and clarity of the outline**

- **Think if the outline contains everything you need to understand the analysis**
  - Would you add or remove something?

- **What was the most interesting part of the outline?**

- **Additional improvement suggestions**

Assignment Guidelines

Peer Feedback – Outlines, Full Drafts & Presentation

- **Short feedback according to templates provided later**
  - You will give feedback to 2 outlines & 2 Full drafts
- **Prepare to lead the discussion after one presentation**
  - Prepare 2-3 questions for the presenter
  - Everyone will also give the presenter added feedback with templates

Materials

- We use LaTeX (Pronounce X as the Greek letter Chi!)
  - To set up a LaTeX environment on your computer you will need an editor and a compiler
    - See e.g. https://www.latex-project.org/get/ for suggestions on editors and compilers for different operating systems
  - Or use the online environment Overleaf for which Aalto provides a campus license: https://www.overleaf.com/edu/aalto
- Useful resources for debugging LaTeX related problems: https://en.wikibooks.org/wiki/LaTeX, https://ctan.org/?lang=en, https://tex.stackexchange.com/

Materials

- **Use the LaTeX style provided here: http://computationalcreativity.net/iccc2019/ICCC-author-kit.zip**
  - Do not modify the style file
  - You can add LaTeX packages and commands as needed; all submissions are done as pdf - no source code required

- **Remember to keep a copy of your source & other files**
  - Consider setting up a git repository or similar - it is good practice for writing your thesis
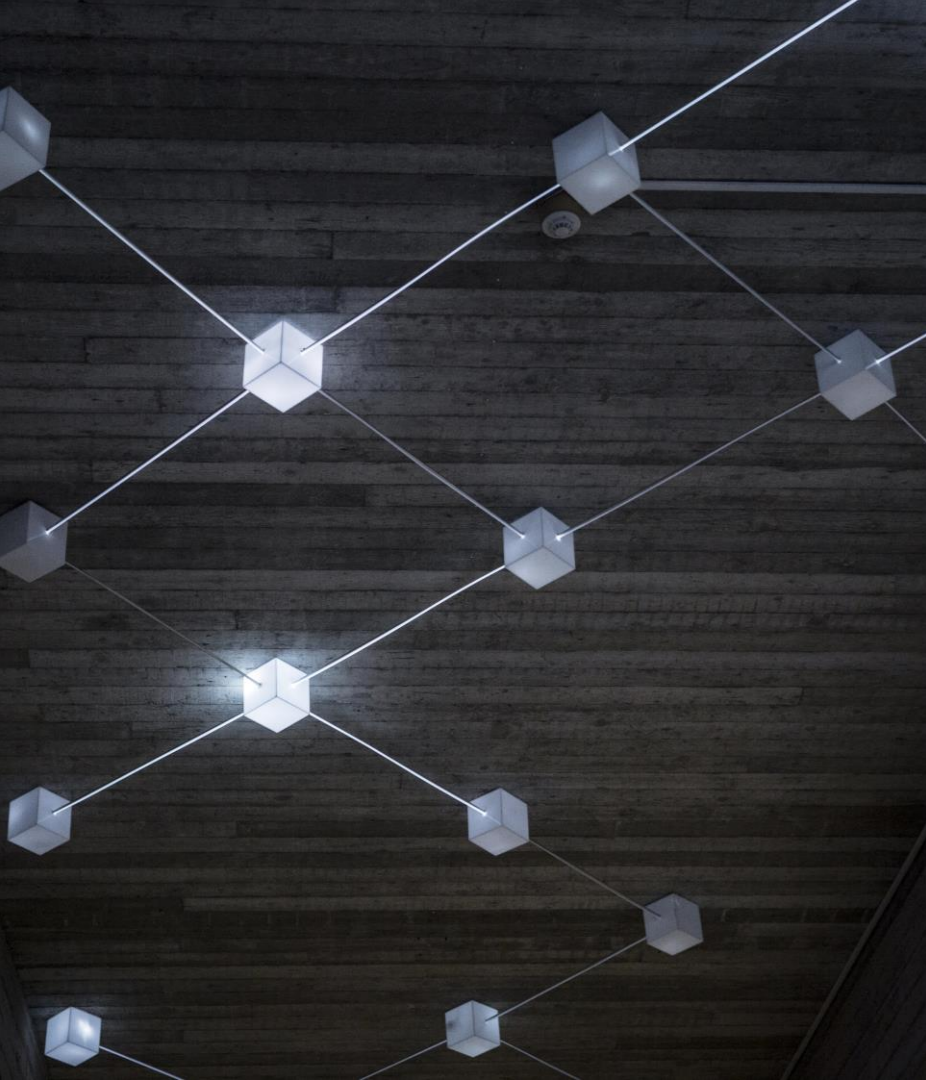
- **What is creativity?**
- **What is computational creativity?**
- **History & motivations for computational creativity**

A Brief Look at Creativity

What is Creativity?

Join the discussion in Miro:
https://miro.com/app/board/o9J_Iaz5TL0=/

What is creativity?

Ambiguity in Modern Creativity Research

- Modern creativity research initiated with Guilford's 1950 presidential address to the American Psychological Association (APA)

- Followed by explosion in creativity research: > 9000 related studies until 1998 alone (Runco, Nemiro & Walberg, 1998)

- High ambiguity: already 50 different definitions of "creativity" in 1988 (Taylor, 1988). Jordanous and Keller (2016) suggest considering creativity a "family resemblance" (Wittgenstein, 1953/2009), or even an "essentially contested concept" (Gallie, 1955)

What is creativity?

Psychological perspective

In psychology creativity is often divided into four aspects, following Rhodes' 4Ps framework (1961):

- Person – the creative individual

- Process – what the creative individual does to produce creative outputs

- Product – the result of the creative process

- Press – the socio-cultural environment receiving the product

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What is creativity?

The creative product

As the 4P's framework describes, creativity is defined through interdependencies between creative individuals, their processes, and the products they produce for the general public to enjoy.

But what makes a product creative?

2-component "standard definition of creativity" (Runco & Jaeger, 2012):

- novelty

- value (or utility, or aesthetic pleasure, …)

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What is creativity?

Newell, Simon & Shaw (1958): The Process of Creative Thinking:

1. "The product of the thinking has novelty and value (either for the thinker or for his culture)."
2. "The thinking is unconventional, in the sense that it requires modification or rejection of previously-accepted ideas."
3. "The thinking requires high motivation and persistence: either taking place over a considerable span of time (continuously or intermittently), or occurring at high intensity."
4. Part of a creative problem solving task is to formulate the problem itself

What is creativity?

Different types of creativity - products

Margaret Boden has classified creative products into two kinds of classes based on novelty:

- If the product is novel to its creator, we can say it is novel on a psychological level = P-creative

- If the product is universally novel, we can say it is historically novel = H-creative

Partly overlaps with other classifications, e.g. into everyday (little-c) and eminent (big-c) creativity (Kaufmann & Beghetto, 2009).

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What is creativity?

Different types of creativity - processes

Margaret Boden has also considered different types of creative processes:

- Combinational (or combinatorial) creativity
    - Novel combinations of familiar ideas

- Exploratory creativity
    - Exploration of structured conceptual spaces for novel ideas

- Transformational creativity
    - Transformation of conceptual space for novel ideas
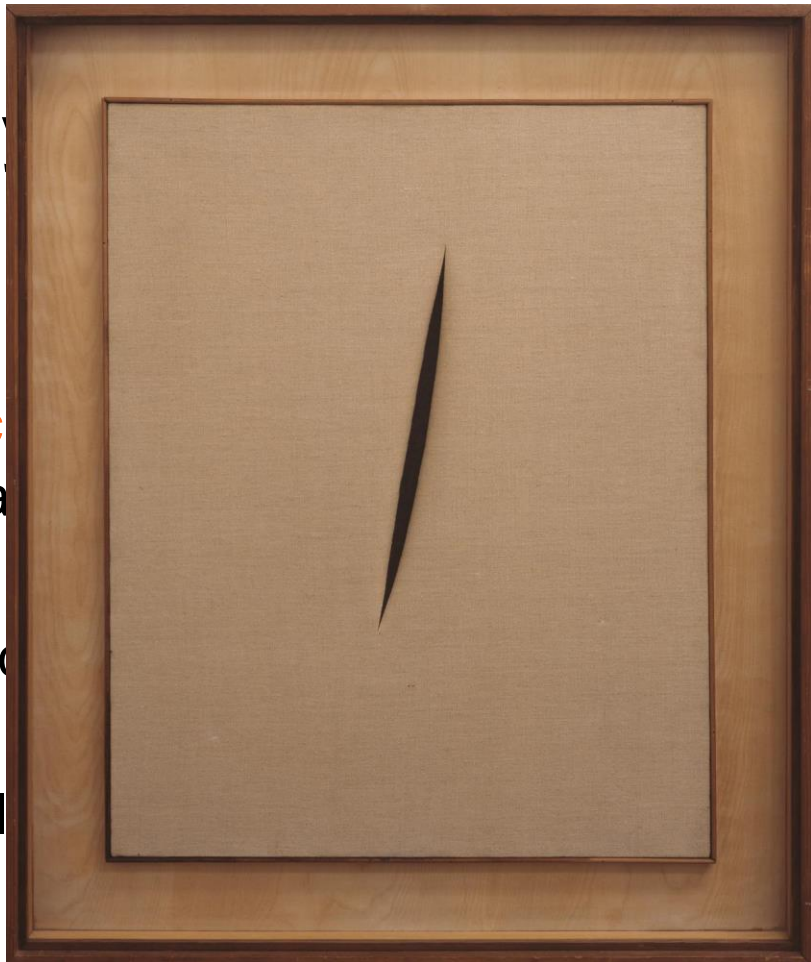
# What is creativity?

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What is creativity?

Different types of creativity – processes

Graham Wallas (*Art of Thought,* 1926) models creativity as a four-stage process:

- Preparation
  - Familiarization with the problem topic

- Incubation
  - Internalizing and unconsciously developing the case

- Illumination
  - Sudden awareness of a possible solution

- Verification
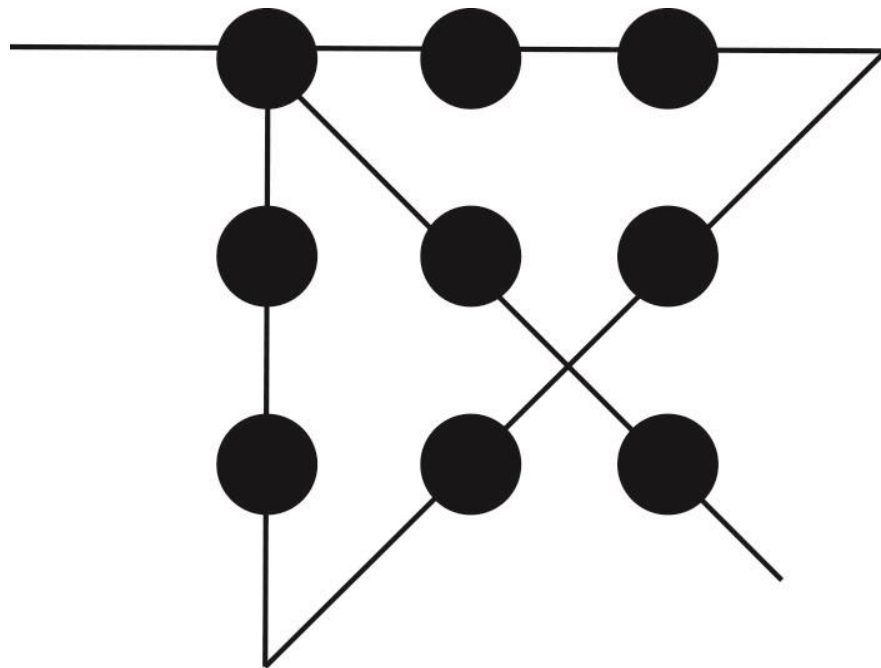 - Elaborating the solution and checking its consistency

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A practical example
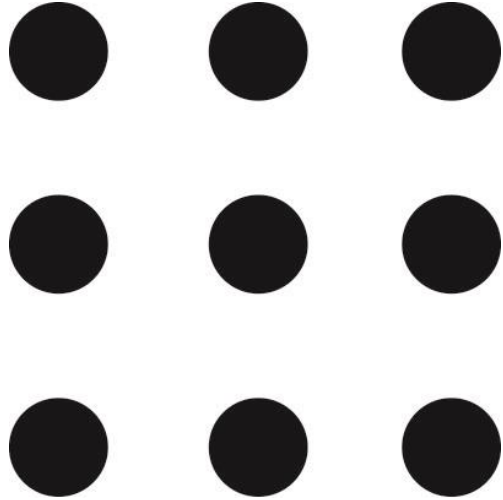
- **Can you connect the dots with 4 straight lines without lifting your pen?**

A practical example
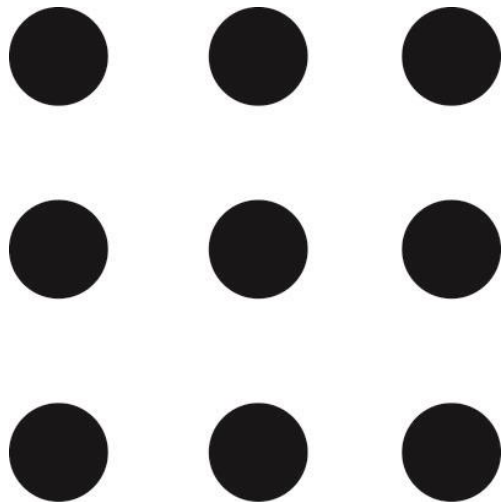
"thinking outside the box"

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Defining Computational Creativity

A number of definitions for computational creativity have been presented in the literature – let's look at a few.

Defining Computational Creativity

"The study and support, through computational means and methods, of behaviour exhibited by natural and artificial systems, which would be deemed creative if exhibited by humans."

- Wiggins, 2006a

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Defining Computational Creativity

"As a subdiscipline of artificial intelligence, computational creativity explores theories and practices that give rise to a phenomenon, creativity, that all intelligent systems, human or machine, can legitimately lay claim to."

- Cardoso, Veale, & Wiggins, 2009

Defining Computational Creativity

"The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative."

- Colton & Wiggins 2012

Defining Computational Creativity

Combining these ideas, CC is characterized by:

- Use of computational methods or artificial intelligence

- Goals:
    - Study and support of creative behaviors
    - Simulation of creative behavior
    - Engineering of creative systems

Why is computational creativity studied?

- To continue the study of creativity:
    - Simulation of creative behavior with computational means
- To extend artistic practice:
    - Development of new creative systems, methods and tools
- To advance artificial intelligence:
    - Creativity as a step towards general Artificial Intelligence

Why is computational creativity studied?

- Two perspectives (Veale, Cardoso and Pérez y Pérez, 2019):
    - Scientific: Use computational modelling and empirical studies to gain insights into the phenomenon of (human) creativity and the ultimate capabilities of creative people and machines
    - Engineering: Build working systems that embody these theoretical insights, usually to please and benefit people'
- Ideally, both are brought together in a 'symbiotic relationship (...) wherein the artifacts that are produced also serve as empirical tests of the adequacy of scientific theories of creativity' (p. 1).

What is creativity?

Psychological perspective

Adapted to computational creativity by Jordanous (2016)

- ~~Person – the creative individual~~ Producer – the creative system

- Process – what the creative individual does to produce creative outputs

- Product – the result of the creative process

- Press/Environment – the socio-cultural environment receiving the product & creative collaboration between agents

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TOPIC SELECTION

Select your topic at MyCourses

- **You can pick 3 possible topics**

- **We will assign you a topic so that every student gets to work individually on a topic that interests them**

- **If you have your own (computational creativity related) topic in mind, contact the course staff via e-mail and suggest your own**

Images and resources

Page 1: Anonymous

Page 27 & 28: On campus artwork, Photo: Julia Weckman

Page 37: Cathredrale de rouen: **http://histoiredelart-xiaoyu.blogspot.com/2016/02/serie-des-cathedrales-de-rouen-claude_22.html**

Lucio Fontana: https://www.tate.org.uk/art/artworks/fontana-spatial-concept-waiting-t00694

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