

Case Studies in Design Informatics 1 - INFR11094  
Week 5 – 14<sup>th</sup> October 2024

# Large Language Models and the Creative Industries

Dr. Susan Lechelt

Lecturer in Design Informatics

[susan.lechelt@ed.ac.uk](mailto:susan.lechelt@ed.ac.uk)



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# An update on TA Office Hours

- Haili Wu will hold office hours for CDI1 every Wednesday **3:30-5 pm** in the Design Informatics studio
- **Purpose:** Mentoring about CW1.2 and general CDI1 questions
- If you have a lecture/tutorial conflict at this time, you can e-mail him at [haili.wu@ed.ac.uk](mailto:haili.wu@ed.ac.uk) to arrange a meeting

# Introduction to CW1.2



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# Large Language Models and the Creative Industries

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[susan.lechelt@ed.ac.uk](mailto:susan.lechelt@ed.ac.uk)



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# In this lecture...

1. Overview of creative industries and creative processes
2. Introduction to large language models
3. Deep dive: Large language models and the creative industries
4. Issues and questions with large language models





# **1. An Overview of Creative Industries and Creative Processes**

# What is creativity?

- New, imaginative, innovative, original
- Divergent thinking: opening up the space of possibility
- Convergent thinking: focus, direction



# The Creative Industries

Those industries which ‘have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property’

Architecture

Crafts

IT, Software & Computer  
Services

Advertising and Marketing

Design (Product, graphic &  
fashion)

Publishing

Museums, Galleries and  
Libraries

Music, Performing and Visual  
Arts

Film, TV, Video, Radio & Photo



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Advertising and Marketing

*Design (Product, graphic &  
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Arts

Film, TV, Video, Radio & Photo

# Aspects of the creative process

Pre-ideation/background research

Ideation

Implementation

Evaluation/critique

Iteration

Project management

## Key Reference

Frich, J., et al. (2019).  
Mapping the landscape of  
creativity support tools in  
HCI. In *CHI 2019*



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# Aspects of the creative process



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# Creativity Support Tools (CSTs)

- Throughout history, creativity has been supported through the development of **tools**
- E.g., paintbrush, printing press, video camera
- Today, many technologies have been designed to support creative processes

## Facilitating tasks

- e.g., computer-aided design tools

## Automating processes

- e.g., data visualisation software

## Extending capabilities

- e.g., digital graphic design software



# Creativity Support Tools (CSTs)



[https://miro.com/app/board/uXjVLTkKppl=/?share\\_link\\_id=595178914662](https://miro.com/app/board/uXjVLTkKppl=/?share_link_id=595178914662)



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# AI/Machine Learning as a CST?

## Facilitating Tasks

### *Example:*

Helping architects and urban planners plan and develop early designs, drawing in data about cities and the environment



<https://www.autodesk.co.uk/products/forma/>



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# AI/Machine Learning as a CST?

## Automating Processes

*Example:*

Framing shots from 4K video  
for video production



### Key Reference

Wright, et al. (2020). AI in production: video analysis and machine learning for expanded live events coverage. SMPTE Motion Imaging Journal



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# AI/Machine Learning as a CST?

## Extending Capabilities

*Example:*

Extracting and remixing audio  
for music production



<https://www.youtube.com/watch?v=Klw1bP3Mk>



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## **2. Introduction to Large Language Models**



# A brief history of natural language processing (NLP)

- 1940s (WWII era) - start of machine translation
- 1950 - Alan Turing proposes Turing test for demonstrating whether a machine can demonstrate human intelligence: can the machine engage in a conversation with a human without being detected as a machine?
- From 1950s - split of NLP into symbolic (rule-based) and statistical (probabilistic) research
- From 1990s - most NLP methods became probabilistic
- From 2000s - rise of neural NLP (self-learning systems inspired by the architecture of the human brain)
- 2018 - OpenAI's GPT-1: first large-scale unsupervised learning model for text
- 2020 - OpenAI's GPT-3
- 2022 - OpenAI ChatGPT & DALL-E 2
- 2023 - GPT-4 & DALL-E 3
- 2024 – Claude 3 (safety, accuracy, security), Gemini 1.5 (longer context window, cross-modal)...



# How do LLMs work?

- GPT: Generative Pre-trained Transformer
- Transformer: Read huge datasets, find patterns in how words relate to one another, and use these patterns to **predict what words should come next**
- So... they don't actually “understand”/“know” the meaning of their output
- Include randomness and variation in model (=not same output every time)
- Feedback from data annotators and users



# How do LLMs work?

**//** A GPT learns like a student studying from lots of books. It starts with a big "textbook" of internet text. It reads this book and looks for patterns in how words are used together. It learns what words often follow others. Then, it practices by trying to guess the missing words in sentences. Over time, it gets better at this guessing game. The more it reads and practices, the smarter it becomes. It's like learning a language by reading and talking a lot, except a GPT does it with computer "books" and lots of math."

- ChatGPT



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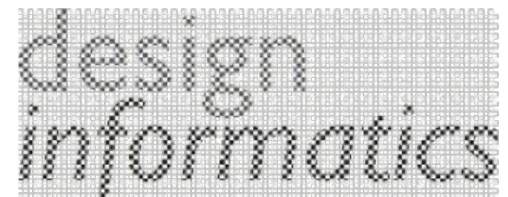
# LLMs and Multi-modal Generative AI

**//** DALL·E, developed by OpenAI, is a variant of the GPT-3 model designed to generate images from textual descriptions. It's trained on a large corpus of text from the internet, much like GPT-3, but it also uses a dataset of text-image pairs. This text-image dataset helps DALL·E learn how to generate images from textual descriptions, making it capable of understanding and creating visual content based on the text input it receives.”

- ChatGPT



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# LLMs and Multi-modal Generative AI

- SORA – OpenAI’s text-to-video model
- Builds on ideas for GPT and DALL-E, utilizing “video patches” paired with text descriptions



[https://www.youtube.com/watch?v=HK6y8DAPN\\_0](https://www.youtube.com/watch?v=HK6y8DAPN_0)



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# **3. Deep Dive into Large Language Models and Creative Processes**



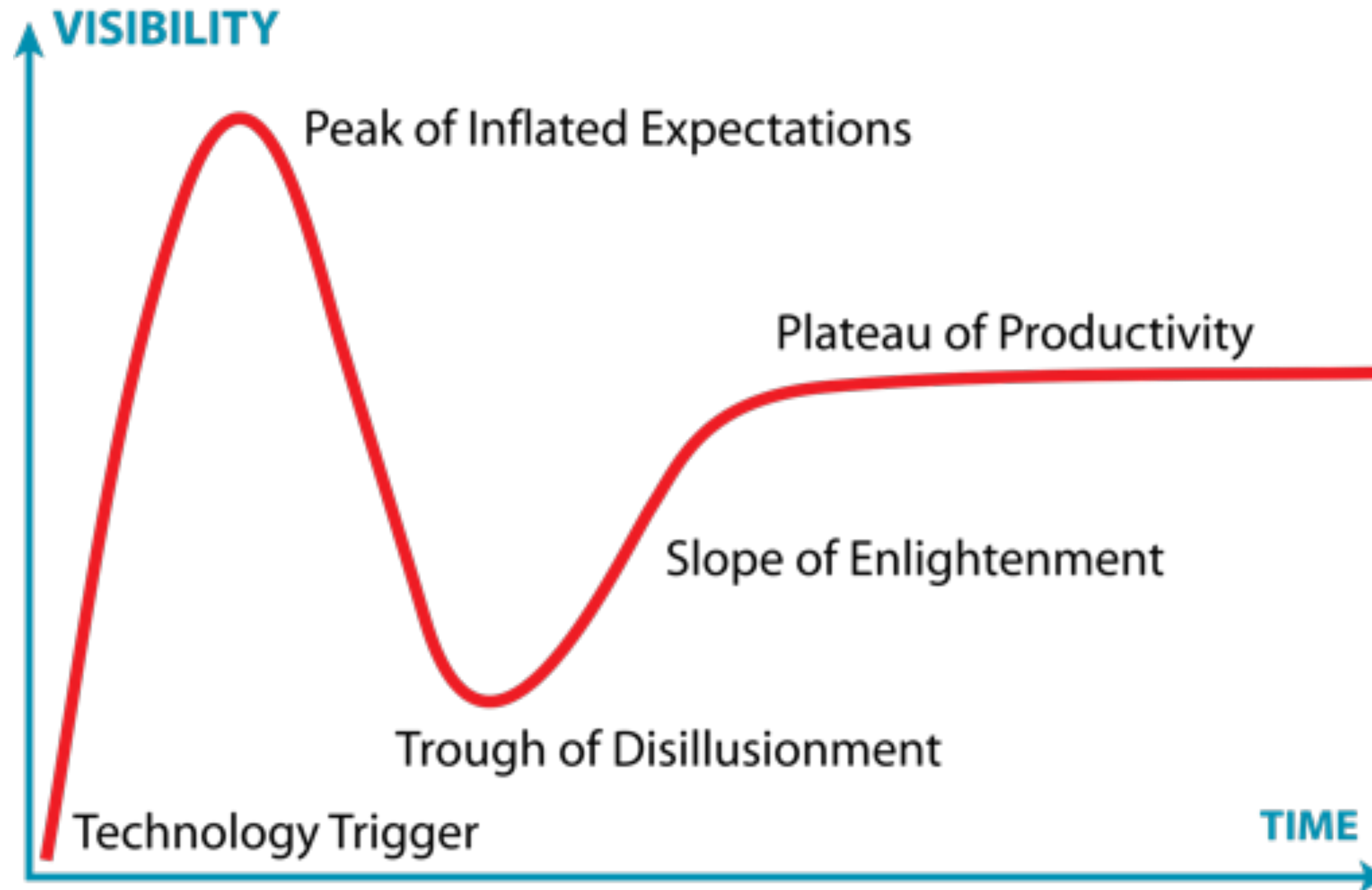
# Current state of LLMs for creativity



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# Gartner Hype Cycle

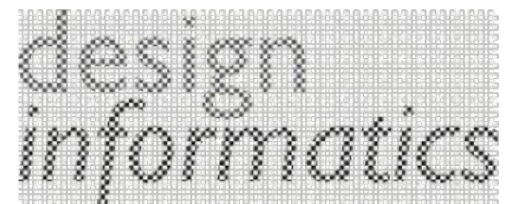


# Case studies today

1. LLMs for supporting interaction design (Tholander & Jonsson, 2023)
2. LLMs for supporting journalism (Petridis et al., 2023)
3. LLMs for supporting performance art (Jones et al., 2023)



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# Case Study 1: LLMs for Interaction Design Ideation

- Many creativity support tools exist for supporting ideation, but they are typically highly specialised, whereas LLM is more open-ended/generic, while providing access to domain-specific information
- Focus on using LLMs to support idea development and sketching in interaction design process
- AI as *co-creator* rather than **replacement** for human creativity

## Key Reference

Tholander, J., & Jonsson, M. (2023). Design Ideation with AI-Sketching, Thinking and Talking with Generative Machine Learning Models. In ACM DIS 2023.

**Creative Context:**  
Design (Product, graphic & fashion) / IT, Software & Computer Services



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# Case Study 1: LLMs for Interaction Design Ideation

- Use of OpenAI's GPT-3 (text) and DALL-E 2 (image)
- Input: prompt presets, including information about the design brief and personas
- Output: Generation of design ideas, alternatives, scenarios, etc.

Persona A: Sigrid, 3 years old



Sigrid suffers from asthma and regularly visits the emergency. She is an active child and **sometimes has a hard time sitting still** in the waiting room. She likes **playing** with her parents' mobile phones while waiting, but only for a **limited time**. Sigrid is **curious about the other patients**, especially other children, and does not understand why her parents will not let her play with them. She **worries about meeting the doctor**, due to previous bad experiences with needles and taking blood samples. Sigrid **needs to be distracted, entertained, and calmed** in the waiting room.

## Key Reference

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(2023). Design Ideation with  
AI-Sketching, Thinking and  
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# Case Study 1: LLMs for Interaction Design Ideation

Table 1: Design Activities performed during the workshop

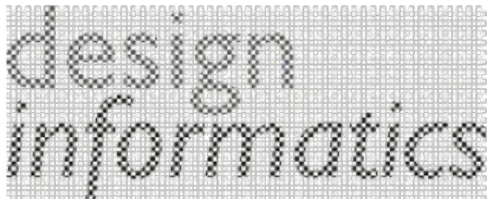
Design activities	
1. Group ideation (without AI)	6. Choose one concept (without AI)
2. Ideation with GPT-3, using three different presets	7. Create concept visualisations using Dall-E
3. Select three concepts (without AI)	8. Create a mood-board using Dall-E
4. Design critique on concepts with GPT-3	9. Create an implementation and testing plan using GPT-3
5. Create design alternatives with GPT-3	10. Create a scenario using GPT-3

**Key Reference**

Tholander, J., & Jonsson, M.  
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In ACM DIS 2023.

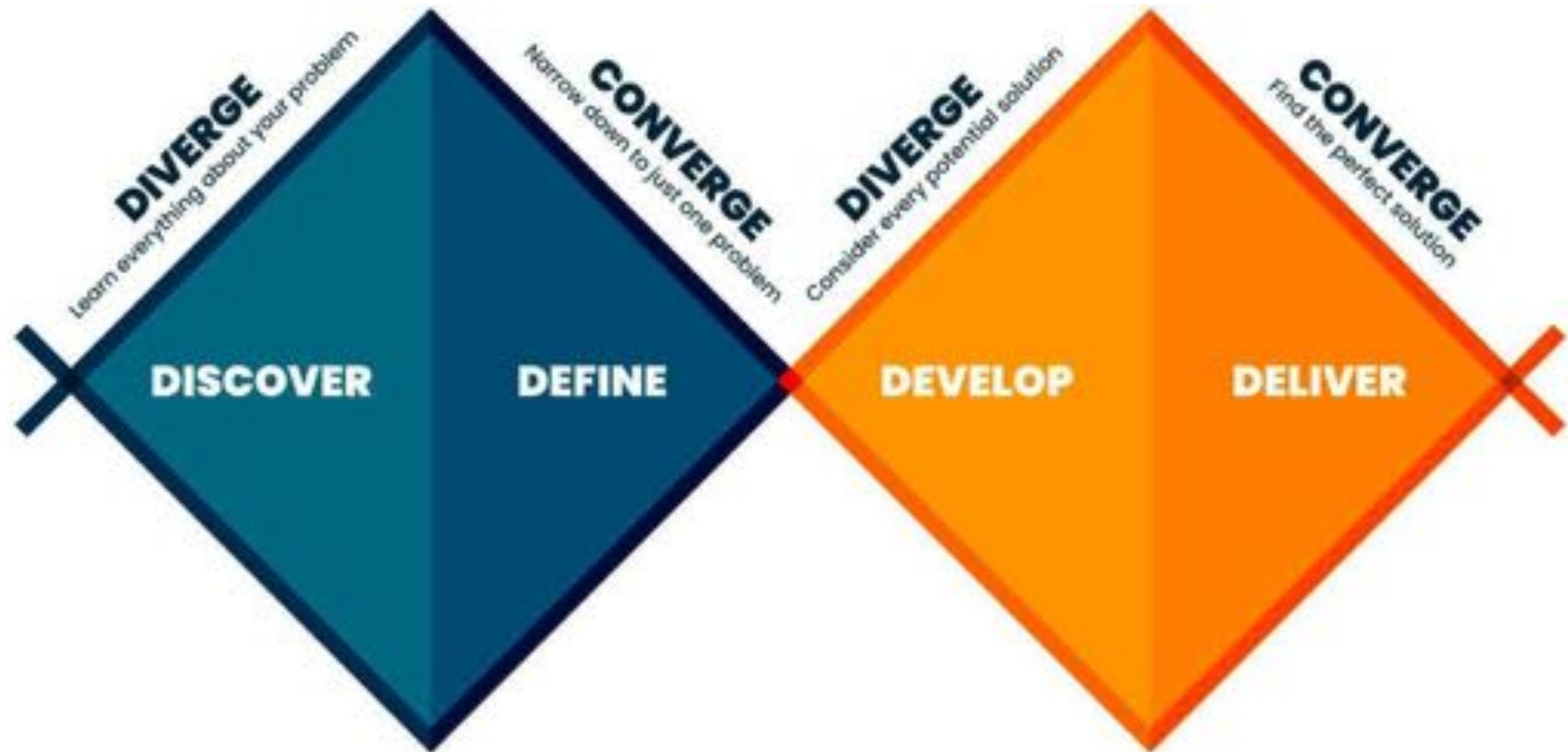


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# Case Study 1: LLMs for Interaction Design Ideation



# Case Study 1: LLMs for Interaction Design Ideation





# Usefulness of LLMs In Design Ideation

- Saving time, by quickly mapping out a design space
- Identifying the most obvious ideas
- Finding potential flaws in various design challenges
- Generating complementary working materials such as scenarios and personas

## Key Reference

Tholander, J., & Jonsson, M.  
(2023). Design Ideation with  
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# Many Bad Ideas?

- Good at very rapidly generating design alternatives...but the ideas were not always good
- Often “simplistic” and didn’t always provide added value
- Sometimes the generated ideas were too similar
  - Does this risk of narrowing the designer’s perspective on a design challenge?
- Rather than supporting the identification of the best idea, system could be good for getting rid of ideas that are too obvious?

## Key Reference

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# Deep vs. Shallow

- Not so good at providing deep ideas and developing them over time
- E.g., wasn't good at elaborating/unpacking ideas more deeply, or remembering how concepts related to each other
- This is at odds with design's goal of reformulating and evolving concepts over time and through reflection
- Tied to GPT3's bad memory (*perhaps better with GPT4?*)

## Key Reference

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# The Tradeoffs of Polished Images

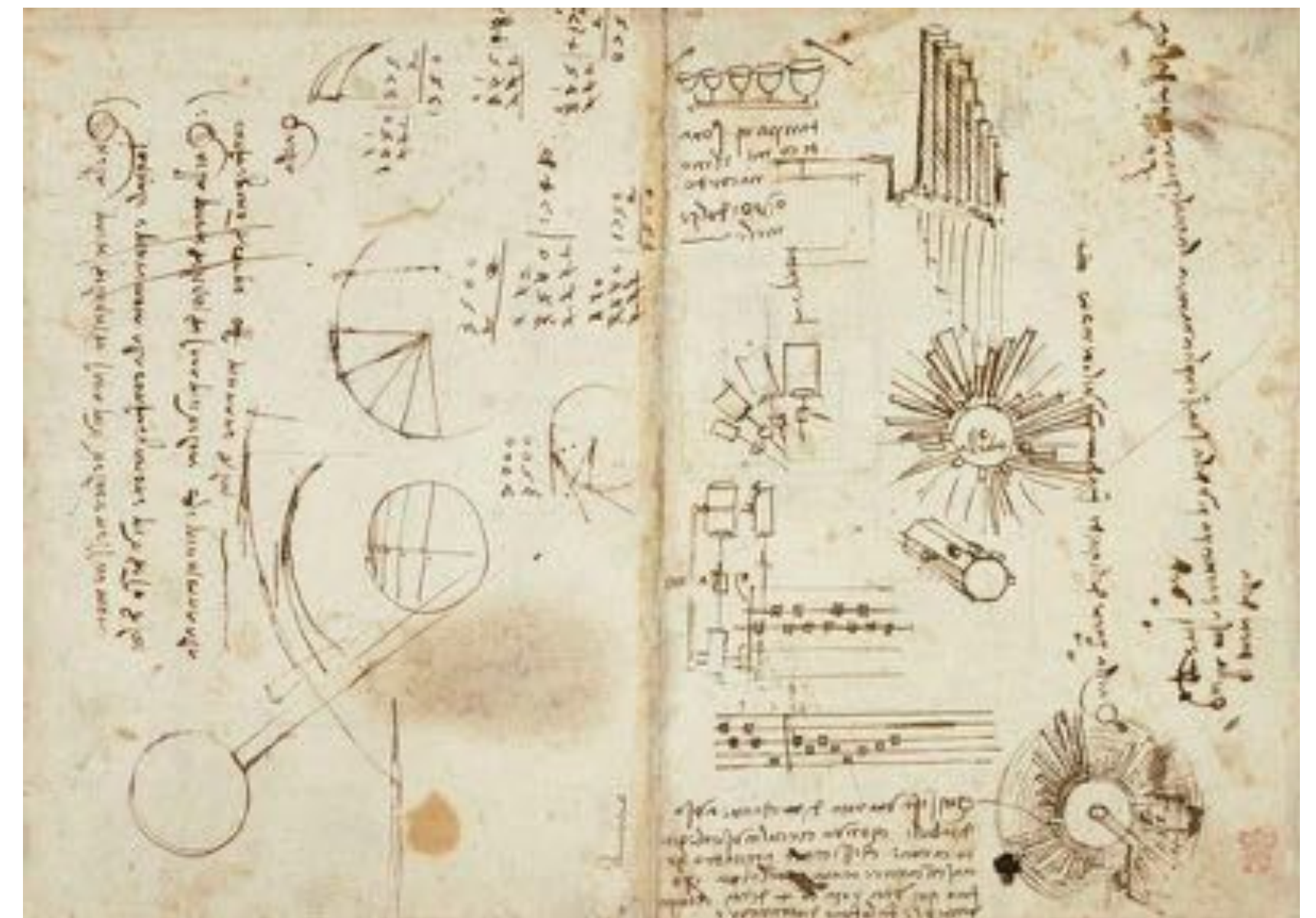
- Early-stage design sketches are often ambiguous/open-ended
- Images generated with DALL-E felt too “polished”
- No integration of text with visuals (although this is key in design processes)

## Key Reference

Tholander, J., & Jonsson, M. (2023). Design Ideation with AI-Sketching, Thinking and Talking with Generative Machine Learning Models. In ACM DIS 2023.



DALL-E generated images from Tholander & Johnson, 2023



Da Vinci's sketchbook

# What's the best interface/interaction style?

- **Conversation-based?** e.g., ChatGPT
- **Search-based?** e.g., similar to Google?
- **Chance-based?** surprise and randomness rather than the best solution – perhaps could support creativity through the unexpected?

## Key Reference

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(2023). Design Ideation with  
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# Case Study: LLMs for Interaction Design

- Use of new tools can help us reflect on what's important in a creative process
- In Interaction Design, idea generation is important
- But so is openness/ambiguity, slowness/reflection, and developing ideas over time
- LLMs & generative AI can be valuable to some respect, but are (currently) often at odds with these processes (but could be designed to support them in the future!)

## Key Reference

Tholander, J., & Jonsson, M.  
(2023). Design Ideation with  
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In ACM DIS 2023.



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# Case Study 2: LLMs for Journalism

- Focus on *journalistic angles*: framings of an event or document through which a writer highlights particular themes and filters information, creating a particular perspective
- In early stage of writing process, journalists often ideate many angles and choose between them, but this can be quite time consuming
- **RQ:** How might LLMs support exploring alternative angles to a story?

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023

**Creative Context:**  
Publishing



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# Case Study: LLMs for Journalism

- Focus on *press releases*: official statements issued to media bodies that provide key information on a particular event/matter
- Key sources for journalists
- But often include biased claims
- How to think of interesting angles? E.g., about the implications of the event?

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023

20/10/2023, 16:05

AI and Public Standards – Committee announces review - GOV.UK

20/10/2023, 16:05

AI and Public Standards – Committee announces review - GOV.UK

Home

Press release


**AI and Public Standards – Committee announces review**

The Committee on Standards in Public Life has today announced a review into artificial intelligence and its impact on standards across the public sector.

From: [Committee on Standards in Public Life \(/government/organisations/the-committee-on-standards-in-public-life\)](https://www.gov.uk/government/organisations/the-committee-on-standards-in-public-life)

Published 25 March 2019

Review into Artificial Intelligence



The [Committee on Standards in Public Life \(https://www.gov.uk/government/organisations/the-committee-on-standards-in-public-life/about\)](https://www.gov.uk/government/organisations/the-committee-on-standards-in-public-life/about) has today announced a review into whether the existing frameworks and regulations are sufficient to ensure that high standards of conduct are upheld as

**Related content**  
[Intimidation in Public Life: letter from the Prime Minister and the Committee's reply \(/government/publications/intimidation-of-parliamentary-candidates-letter-from-the-prime-minister-and-the-committees-reply\)](#)

technologically assisted decision-making is adopted more widely across the public sector.

Publishing the terms of reference for the inquiry today, [Lord Evans, Chair of the Committee on Standards in Public Life \(https://www.gov.uk/government/people/jonathan-evans\)](https://www.gov.uk/government/people/jonathan-evans) said:

[“Honesty, integrity, objectivity, openness, leadership, selflessness and accountability \(https://www.gov.uk/government/publications/the-7-principles-of-public-life\) were first outlined by Lord Nolan as the standards expected of those who act on the public’s behalf.](#)

“These principles have stood the test of time and are deeply embedded across much of the public sector - from the Civil Service and NHS bodies to local councils and schools. The increasing development and use of data and data-enabled technologies in our public services can potentially bring huge advantages in terms of pace and scale of service delivery, but there are some major ethical and practical challenges about what this means for accountability, objectivity and the other Nolan principles.

“As the Committee celebrates its 25th year as an advisory body conducting broad reviews of key ethical issues, we want to look at what the future holds for public services and help ensure that high standards of conduct continue to be ‘built in’ to new ways of making decisions on the public’s behalf.

“We are keen to hear from individuals and organisations who are developing policy, systems or safeguards on the use of AI as we gather evidence for this review.”

The Committee expects to publish its report in the New Year.

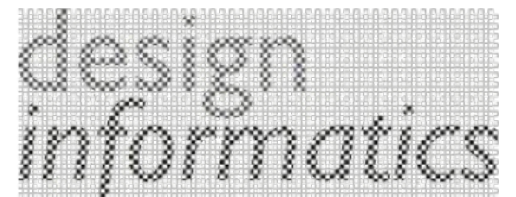
Notes to Editors

1. Interview requests and media enquiries should go to Maggie O’Boyle on 07880 740627.
2. The independent Committee on Standards in Public Life advises the Prime Minister on ethical

<https://www.gov.uk/government/news/ai-and-public-standards-committee-announces-review>



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# AngleKindling

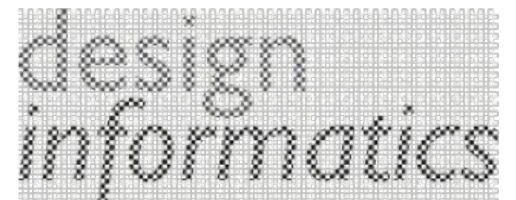
- Tool co-designed with professional journalists (i.e., involving them throughout the design process)
- Used OpenAI's GPT-3 API
- Design goals based on journalists' typical workflow:
  1. Summarise the press release into a set of main points, to help journalists quickly cut through the fluff and identify important details
  2. Provide angles that focus on elements of **conflict** and **controversy**
  3. Facilitate **trust** in the angles provided by the system, by grounding them in the source material
  4. Provide relevant historical background to contextualize and spark new angles.

## Key Reference

Petridis, S., et al. (2023).  
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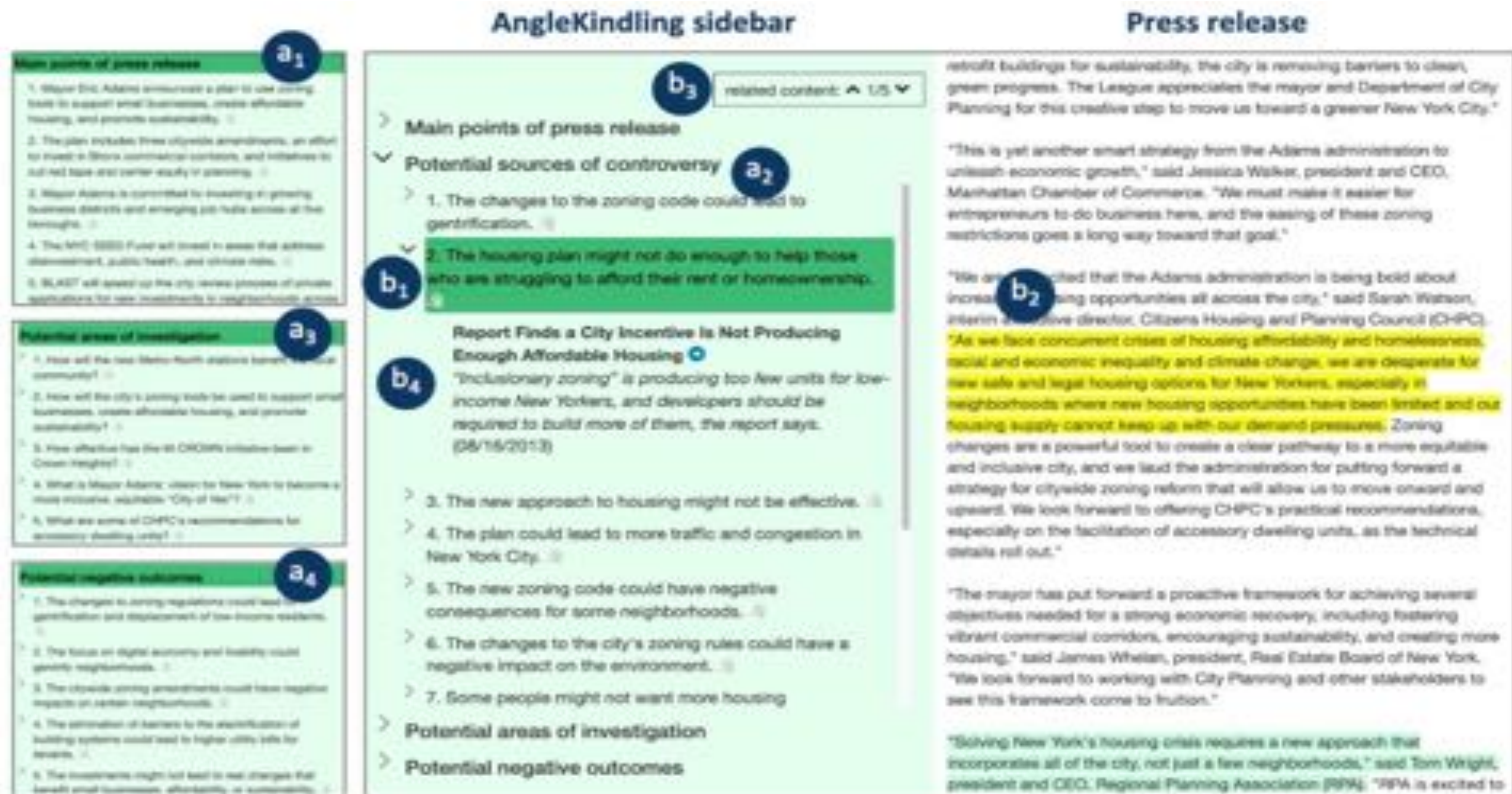


Figure 1: AngleKindling's interface displays the press release on the right and the article's main points ( $a_1$ ) along with angle suggestions in the green sidebar on the left. The angle suggestions include potential *controversies* ( $a_2$ ), *areas of investigation* which are questions to consider ( $a_3$ ), and *negative outcomes* ( $a_4$ ) that could arise. To help users trust these angles, they can select them ( $b_1$ ) to view related content from the press release ( $b_2$ ), and they can skim through up to five pieces of text with the related content button ( $b_3$ ). Finally, each angle is connected to a New York Times article from the past decade (starting in 2012) to provide historical background ( $b_4$ ). The title, lead paragraph, and publication date are provided for the article, as well as a link to the article itself, via the blue arrow.



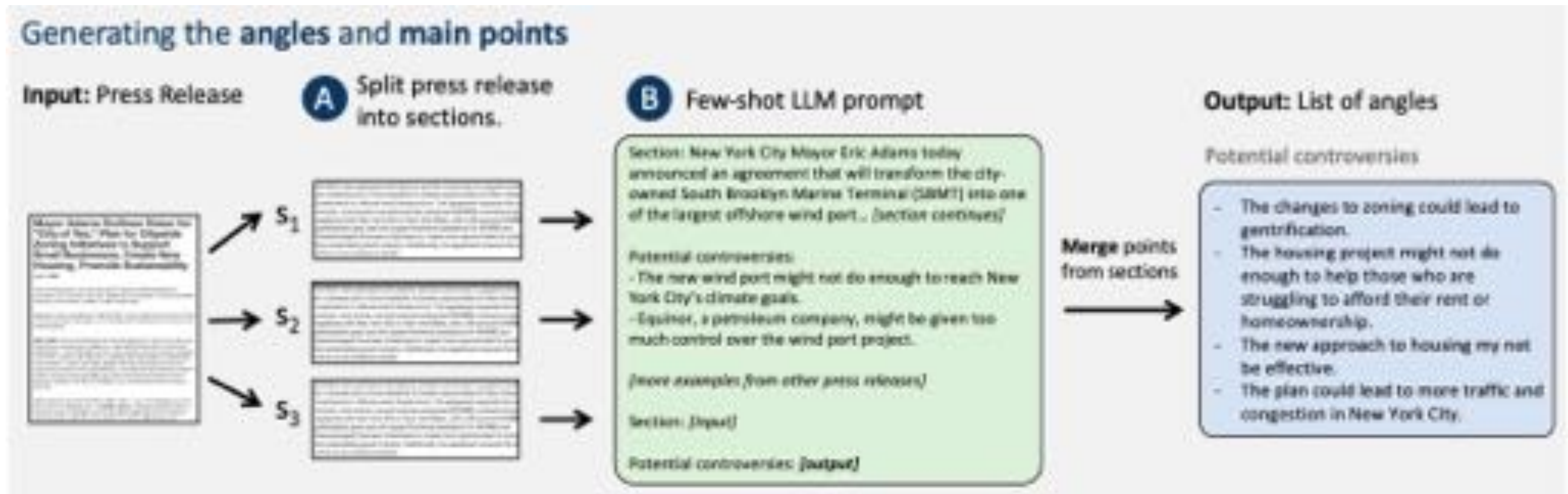


Figure 2: To generate the angles and main points, AngleKindling first splits the press release into a set of sections, to fit the input length of the LLM (A). Each section is then inputted to a set of four LLM prompts, to (1) extract the main points of the section (2) ideate potential *controversies*, (3) identify *areas to investigate*, and (4) ideate potential *negative outcomes* (B). Each LLM prompt is few-shot and contains three examples of converting a section into a set of main points or angles. The examples are taken from the angles thought of by the journalists in the formative study. Finally, the angles ideated from each section are then merged together into a single list.

#### Key Reference

Petridis, S., et al. (2023).  
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Zero-shot prompt: no examples/templates

Few-shot prompt: several examples/templates

Importance of prompt engineering

Without examples, output for angles and main points was sometimes biased or unhelpful.

E.g., Potential controversy - “The plan will fail”

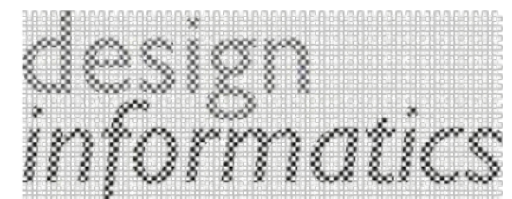
Final design includes training examples that demonstrate what the output should look like

#### Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
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with large language models.  
In CHI 2023



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# Prompt engineering

- Techniques for structuring a prompt to receive a desirable response
- e.g., <https://www.promptingguide.ai/>





# Supporting Trust

- Linking the generated angles to the source text: sentence similarity measure

### AngleKindling sidebar

**b<sub>3</sub>** related content: ^ 1/5 v

- > Main points of press release
- ✓ Potential sources of controversy **a<sub>2</sub>**
  - > 1. The changes to the zoning code could lead to gentrification.
  - ✓ **b<sub>1</sub>** 2. The housing plan might not do enough to help those who are struggling to afford their rent or homeownership.
- b<sub>4</sub>** Report Finds a City Incentive Is Not Producing Enough Affordable Housing  
"Inclusionary zoning" is producing too few units for low-income New Yorkers, and developers should be required to build more of them, the report says. (08/16/2013)
- > 3. The new approach to housing might not be effective.
- > 4. The plan could lead to more traffic and congestion in New York City.
- > 5. The new zoning code could have negative consequences for some neighborhoods.
- > 6. The changes to the city's zoning rules could have a negative impact on the environment.
- > 7. Some people might not want more housing
- > Potential areas of investigation
- > Potential negative outcomes

### Press release

retrofit buildings for sustainability, the city is removing barriers to clean, green progress. The League appreciates the mayor and Department of City Planning for this creative step to move us toward a greener New York City."

"This is yet another smart strategy from the Adams administration to unleash economic growth," said Jessica Walker, president and CEO, Manhattan Chamber of Commerce. "We must make it easier for entrepreneurs to do business here, and the easing of these zoning restrictions goes a long way toward that goal."

"We are excited that the Adams administration is being bold about increasing housing opportunities all across the city," said Sarah Watson, interim executive director, Citizens Housing and Planning Council (CHPC). "As we face concurrent crises of housing affordability and homelessness, racial and economic inequality and climate change, we are desperate for new safe and legal housing options for New Yorkers, especially in neighborhoods where new housing opportunities have been limited and our housing supply cannot keep up with our demand pressures. Zoning changes are a powerful tool to create a clear pathway to a more equitable and inclusive city, and we laud the administration for putting forward a strategy for citywide zoning reform that will allow us to move onward and upward. We look forward to offering CHPC's practical recommendations, especially on the facilitation of accessory dwelling units, as the technical details roll out."

"The mayor has put forward a proactive framework for achieving several objectives needed for a strong economic recovery, including fostering vibrant commercial corridors, encouraging sustainability, and creating more housing," said James Whelan, president, Real Estate Board of New York. "We look forward to working with City Planning and other stakeholders to see this framework come to fruition."

"Solving New York's housing crisis requires a new approach that incorporates all of the city, not just a few neighborhoods," said Tom Wright, president and CEO, Regional Planning Association (RPA). "RPA is excited to

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
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In CHI 2023



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# Supporting Trust

- Linking the generated angles to the source text: sentence similarity measure
- Linking to articles that provide historical background - extracting keywords for the press release using the LLM, and then searching through the New York Times database using the NYT Developer API

### AngleKindling sidebar

**b<sub>3</sub>** related content: ^ 1/5 v

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- ✓ Potential sources of controversy **a<sub>2</sub>**
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retrofit buildings for sustainability, the city is removing barriers to clean, green progress. The League appreciates the mayor and Department of City Planning for this creative step to move us toward a greener New York City."

"This is yet another smart strategy from the Adams administration to unleash economic growth," said Jessica Walker, president and CEO, Manhattan Chamber of Commerce. "We must make it easier for entrepreneurs to do business here, and the easing of these zoning restrictions goes a long way toward that goal."

"We are excited that the Adams administration is being bold about increasing housing opportunities all across the city," said Sarah Watson, interim executive director, Citizens Housing and Planning Council (CHPC). "As we face concurrent crises of housing affordability and homelessness, racial and economic inequality and climate change, we are desperate for new safe and legal housing options for New Yorkers, especially in neighborhoods where new housing opportunities have been limited and our housing supply cannot keep up with our demand pressures. Zoning changes are a powerful tool to create a clear pathway to a more equitable and inclusive city, and we laud the administration for putting forward a strategy for citywide zoning reform that will allow us to move onward and upward. We look forward to offering CHPC's practical recommendations, especially on the facilitation of accessory dwelling units, as the technical details roll out."

"The mayor has put forward a proactive framework for achieving several objectives needed for a strong economic recovery, including fostering vibrant commercial corridors, encouraging sustainability, and creating more housing," said James Whelan, president, Real Estate Board of New York. "We look forward to working with City Planning and other stakeholders to see this framework come to fruition."

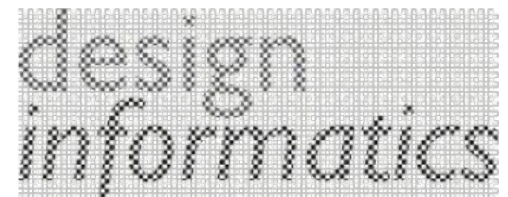
"Solving New York's housing crisis requires a new approach that incorporates all of the city, not just a few neighborhoods," said Tom Wright, president and CEO, Regional Planning Association (RPA). "RPA is excited to

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023



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# Evaluation

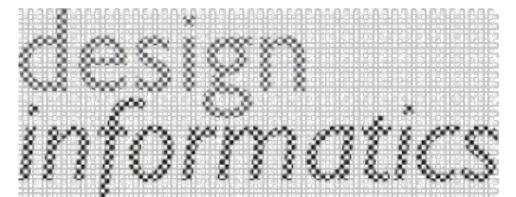
1. Reduced the cognitive load of brainstorming angles with specific angles that easily inspired next steps
2. Provided angles that were useful for multiple, different types of stories (e.g., day-of stories and longer features)
3. Helped journalists quickly and deeply engage with the press release
4. Incorporated contextualized historical background

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023



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# Question

## S

- Bias of LLM dataset - e.g., lots of articles online are click-bait/fear-mongering  
-> how to avoid generating angles that lean in this direction?
- How to support journalists' reflection about the angles they tend to use?

### Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023



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# Summary

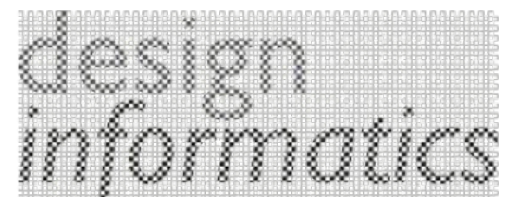
- Nice example of developing a tool using LLMs alongside other techniques (e.g., search through archival news databases)
- “Zero-shot prompt” wasn’t very good - training on examples that were specific to the task were important
- Use of prompt engineering to support better responses
- Good consideration of the process and values of journalism, with a focus on trust

## Key Reference

Petridis, S., et al. (2023).  
Anglekindling: Supporting  
journalistic angle ideation  
with large language models.  
In CHI 2023



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# Case Study 3: LLMs and the Performing Arts

- Performing arts: music, drama, art, etc. performed to an audience
- **Endurance performance art:**  
“performer(s) endure a source of stress, hazard, or perform a repeated activity over a length of time or until a condition is met”



**Marina Abramović**, *The Artist is Present*, 2010, Museum of Modern Art, New York  
Abramović sat silently beside museum visitors for 8 hours a day for three months

<https://www.flickr.com/photos/sixteen-miles/4422517148/>

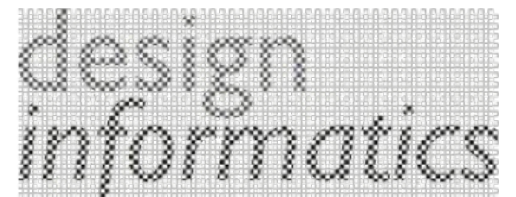
## Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*

**Creative Context:**  
Music, Performing  
and Visual Arts



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# LLMs and Performing Arts

**RQ:** *What is it like for endurance performance artists to be directed by an LLM?*

1. LLM used to create the “rules of engagement” - i.e., instructions for the performance
2. Performers free to reinterpret instructions to avoid physical/mental suffering
3. Performed the performances in their home studios and video recorded themselves
4. Authors interviewed the performers about their experiences

## Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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Pilot Study  
(Mirabelle Jones)

Instructions for an  
Endurance Performance:

13 min. 55 sec.

**Title: Beans**

**GPT-3 Completion:**

The performance starts with the artist sitting with a pillow on the floor and holding two tins of beans.

The performance will end when the artist dies. All the time the artist holds the tins of beans and the pillow he will talk about his life, his thoughts, his dreams, his feelings, his hopes, his fears, his doubts, his disappointments, his loves, his hates and his fears. The artist will be given a one-hour break every three days. In the break he will try to eat the beans. The performance will go on till the artist dies. The artist will not be allowed to stop or to go back to the beginning. The performance will last as long as the artist lives.

### Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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# LLMs and Performing Arts

Chelsea Coon

Instructions for an  
Endurance Performance:

9 min. 52 sec.

**Title: Program/Sleep/Stop/Cry/Shutdown**

**GPT-3 Completion:**

In space, there is no up or down.

You are not allowed to program.

You are not allowed to sleep.

You are not allowed to stop.

You are not allowed to shut down.

You are not allowed to speak.

You are not allowed to cry.

You are not allowed to sleep.

You are not allowed to sleep.

You are not allowed to stop.

You are not allowed to stop.

You are not allowed to stop.

You are not allowed to stop.

You are not allowed to stop.

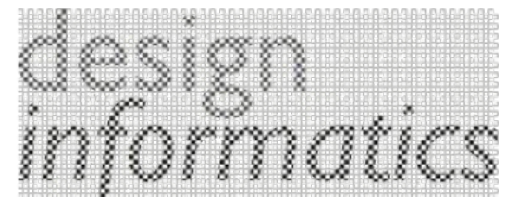
You are not allowed to stop.

You are not allowed to stop.

**Key Reference**  
Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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# LLMs can support creative interpretation

- Interpretation of the LLM response is part of the art
- “Weird” instructions
- e.g., what does it mean to “look with your ears”? Or to “sacrifice a cake by night”?



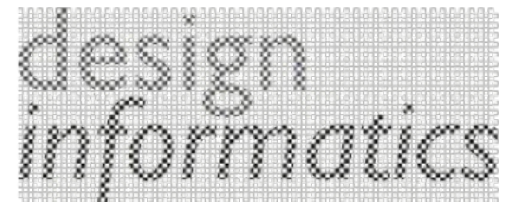
Figure 3: Still from *Program/Sleep/Stop/Cry/Shutdown* 2021. Artist: Chelsea Coon

## Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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# LLMs lack understanding about the embodied human experience

- Demonstrated lack of understanding of human body
- Lacked consideration of bodily limits
- Performers had to push back against instructions
- LLMs potential for creative support seems different in embodied contexts, where a physical body is important for the creative practice



Figure 3: Still from *Program/Sleep/Stop/Cry/Shutdown* 2021. Artist: Chelsea Coon

## Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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# LLMs not a great co-creator for the performing arts

- LLM couldn't be a collaborator - because it couldn't provide feedback to the performer
- *"It's got no memory like it doesn't know what it's told you previously so it can't offer you feedback on some interpretation that you've done based on its ideas . . . There's no understanding between us."*
- *"As collaboration is based on reciprocal understanding and sense-making, collaboration is also impossible to achieve with an algorithmic system which is not capable of understanding in a human way"*



Figure 3: Still from *Program/Sleep/Stop/Cry/Shutdown* 2021. Artist: Chelsea Coon

## Key Reference

Jones, M., et al. (2023).  
Embodying the Algorithm:  
Exploring Relationships with  
Large Language Models  
Through Artistic  
Performance. In *CHI 2023*



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Crafts

Architecture

Design (Product, graphic &  
fashion)

Advertising and Marketing

Museums, Galleries and  
Libraries

IT, Software & Computer  
Services

Publishing

Film, TV, Video, Radio &  
Photo

Music, Performing and  
Visual Arts

Iteration

Project management

Pre-ideation/background  
research

Implementation

Idea generation/ideation

Evaluation/critique



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# Synthesising across the cases

- Differences in contexts and values across industries/practices
  - *Interaction design*: divergent ideas that support a design brief, and are developed over time leading to a **useful solution**
  - *Journalism*: time efficiency, interesting angles on a story and **trust**
  - *Performance art*: developing ideas over time, but also uniqueness, thought-provocation, art, **interpretation**



# LLMs as a co-creator?

- Co-creation and collaboration implies dialogue/feedback
- Creative practice often requires synthesis across different modalities (e.g., visual/text/tangible/embodied)
- Currently LLMs are limited in terms of the stages of the creative process in which they can support co-creativity (depending on the creative domain)



# LLMs as a co-creator?

- When supporting an overarching creative process, rather than just, e.g., providing ideas, there are currently issues with context and memory with GPT-3
- This is changing quickly (e.g., GPT-4, Gemini 1.5)





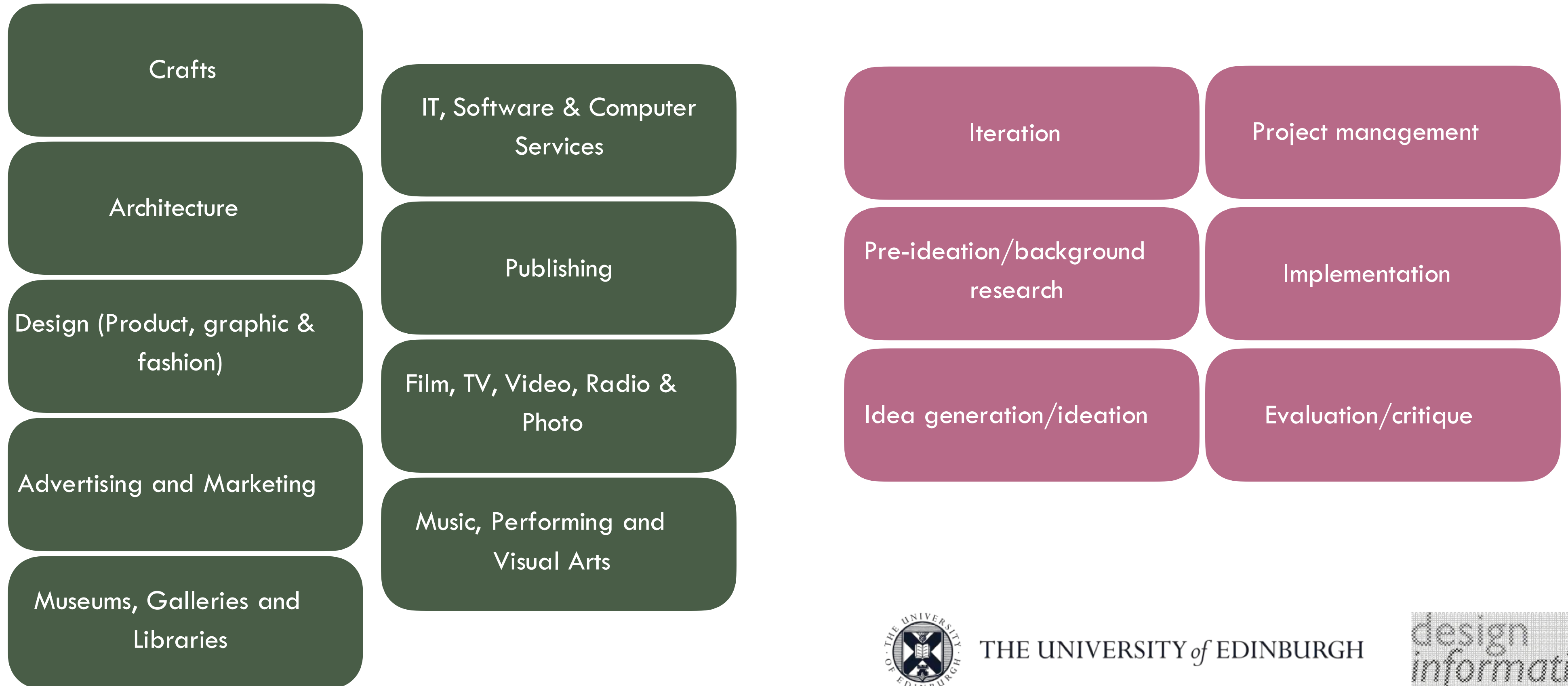
# Opportunities for new tools

- Many opportunities for new tools and interfaces built using LLMs as an enabling technology (e.g., AngleKindling)
- Questions about what the appropriate interaction styles might be to support a given creative industry/process (e.g., Search-based? Chance-based? Integration of text with other modalities?)



# Can you think of some other ideas of where else LLMs could support creative process?

(Miro: [https://miro.com/app/board/uXjVLTkKpPl=/?share\\_link\\_id=595178914662](https://miro.com/app/board/uXjVLTkKpPl=/?share_link_id=595178914662))



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## **4. LLMs: Issues and Questions**



# Issues and questions: Environment

- Computing is physical: requires physical equipment and energy
- Both training and use of LLMs has a huge carbon footprint

## Key Reference

Bender, E. M., Gebru, T., et al. (2021). On the dangers of stochastic parrots: Can language models be too big? 🦜. In FAccT 2021



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# Student question

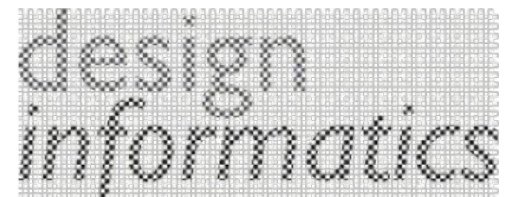


How can environmental effects be minimised? Who is responsible for minimising them?

- Model optimisation
- Selecting hardware
- Public awareness and usage patterns
- Regulation?



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# Issues and questions: Lack of “knowledge”

- LLMs are based on prediction and patterns - they don't actually “know” concepts/facts
- *“Contrary to how it may seem when we observe its output, an LM is a system for haphazardly stitching together sequences of linguistic form it has observed in its vast training data, according to probabilistic information about how they combine, but without any reference to meaning” (Bender et al.)*
- How do we know whether to trust LLM output?

## Key Reference

Bender, E. M., Gebru, T., et al. (2021). On the dangers of stochastic parrots: Can language models be too big? 🦜. In FAccT 2021



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# Issues and questions: Hallucinations

- LLMs have a tendency to “hallucinate” - make up facts that aren’t real
- Does this matter?
  - If you are looking for evidence, this is really bad!
  - If you are looking for inspiration and “truthfulness” doesn’t matter, this could be a benefit





# Issues and questions: Training data

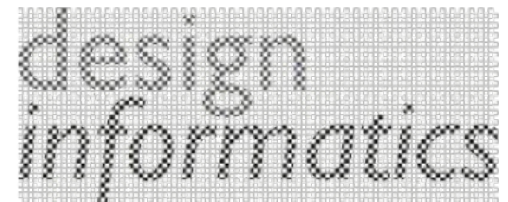
- Large, un-curated Internet-based training sets
- Size  $\neq$  diversity and representative
- Who contributes to the Internet (in English)?
- Encode stereotypical and derogatory associations on gender, race, ethnicity and disability status
- Filtering out data linked to identity that might be considered obscene / “bad” by some people (e.g., LGBTQIA+ specific language)
- = Can harm people at the margins / miss out important dialogues

## Key Reference

Bender, E. M., Gebru, T., et al. (2021). On the dangers of stochastic parrots: Can language models be too big? 🦜. In FAccT 2021



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# Student questions

Can AI still be considered intelligent? Or is it a form of intelligence that is different from human intelligence?

Can we stop saying "AI"? (Rhetorically - I don't think I'm going to win this battle given the prevalence of the tech at the moment.) If anthropomorphising AI can be dangerous - which I think it often is - then surely we need to root that out at the starting notion that these technologies are somehow a form of "intelligence"?



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# Issues and questions: Copyright

- Datasets underlying generative AI models often include copyrighted material
- OpenAI claims “Under current law, training AI systems [such as its GPT models] constitutes fair use”



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# Issues and questions: Copyright

- But... original sources of AI-generated output difficult to trace
- Potential for **generating** copyright-violating material
- E.g., some artists have raised concerns that generative models may be copying their styles (and have not given consent for their works to be used)



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# Issues and questions: Copyright

- Is GenAI-generated work copyrightable?
- “[Jason M. Allen] created the artwork using the generative AI system Midjourney, wherein he tested hundreds of prompt iterations and subsequently made changes with Adobe Photoshop. When he refused to disclaim the parts of the image generated by Midjourney, however, the office rejected Allen’s application.”



*Théâtre d'Opéra Spatial*, an AI-generated image that won first place at the Colorado State Fair annual art competition last year.

©2022 JASON M. ALLEN

On Thursday, artist Jason M. Allen requested that a Colorado federal court reverse a U.S. copyright office **decision to reject copyright protection** for an award-winning image he made using AI.

<https://www.artnews.com/art-news/news/ai-generated-artwork-colorado-state-fair-copyright-decision-reversal-appeal-1234719694/>



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# Student question

People are so confident they will only use AI to enhance their current work and not have it take over; what guarantees that it will not eventually replace the jobs altogether?



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# Issues and questions: Creativity

- Generative AIs are good at generating new output
- But ultimately, they all reflect existing data rather than true novelty
- They lack the real-world experience, emotion and inspiration that characterises creative practice
- AI to augment creative processes rather than as replacement

## Key Reference

Kirkpatrick, K. (2023). Can AI Demonstrate Creativity?. *Communications of the ACM*, 66(2), 21-23.



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# Issues and questions: Creativity

“For the consumers of art, poetry, literature, music, or other creative content, enjoyment is often derived from the authentic, shared human experiences that are referenced to create that art.

‘It’s in the person. Can a computer fall in love? No. Can a computer be depressed? No. Can a computer go through the pandemic? No.’”

## Key Reference

Kirkpatrick, K. (2023). Can AI Demonstrate Creativity?. *Communications of the ACM*, 66(2), 21-23.



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# ProblematISING a potential case

(Miro: [https://miro.com/app/board/uXjVLTkKPl=/?share\\_link\\_id=595178914662](https://miro.com/app/board/uXjVLTkKPl=/?share_link_id=595178914662))

Crafts

IT, Software & Computer  
Services

Iteration

Project management

Architecture

Publishing

Pre-ideation/background  
research

Implementation

Design (Product, graphic &  
fashion)

Film, TV, Video, Radio &  
Photo

Idea generation/ideation

Evaluation/critique

Advertising and Marketing

Music, Performing and  
Visual Arts

Museums, Galleries and  
Libraries



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# Considerations for using LLMs and AI in your own work

- You might be inspired to use LLMs/AI in your own design process
- Do not use AI to simply generate a response to your assignment and submit this as your own work - this is regarded as academic misconduct (see [1] for UoE guidelines)
- Check terms of service for Generative AI tools - there may be limitations on how their output can be used
- **Always acknowledge the use of Generative AI!** Which tools did you use and how?

[1] <https://registryservices.ed.ac.uk/sites/default/files/2024-10/Generative%20AI%20Guidance%20for%20Students%20October%202024.pdf>



# Guiding questions

- What other tools might I use to support this part of the creative process?  
(Example: Flickr Commons vs. Midjourney)
- What are the limitations of Generative AI & the dangers of relying on it in this context (e.g., trust, bias, originality?)
- What are the relative benefits and risks/implications of using it? (e.g., better output vs. environmental implications, potential of bias)





# Prep work for next week

1. Read the Little Book of Sustainability for the Internet of Things - pages 6 through 25 (and beyond if interested!):

[https://eprints.lancs.ac.uk/id/eprint/131084/1/Stead Coulton Lindley Coulton. 2019. The Little Book of Sustainability for the Internet of Things.pdf](https://eprints.lancs.ac.uk/id/eprint/131084/1/Stead_Coulton_Lindley_Coulton.2019.The_Little_Book_of_Sustainability_for_the_Internet_of_Things.pdf)

2. Read the following short abstract:


Mankoff, J. C., Blevins, E., Borning, A., Friedman, B., Fussell, S. R., Hasbrouck, J., ... & Sengers, P. (2007, April). Environmental sustainability and interaction. In *CHI'07 extended abstracts on Human factors in computing systems* (pp. 2121-2124). <https://doi.org/10.1145/1240866.1240963>



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# Further reading

- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021, March). On the dangers of stochastic parrots: Can language models be too big? . In Proceedings of the 2021 ACM conference on fairness, accountability, and transparency (pp. 610-623).
- Chang, M., Druga, S., Fiannaca, A. J., Vergani, P., Kulkarni, C., Cai, C. J., & Terry, M. (2023, June). The Prompt Artists. In Proceedings of the 15th Conference on Creativity and Cognition (pp. 75-87).
- Crawford, K. (2021). The atlas of AI: Power, politics, and the planetary costs of artificial intelligence. Yale University Press.
- Kirkpatrick, K. (2023). Can AI Demonstrate Creativity?. Communications of the ACM, 66(2), 21-23.
- Jones, M., Neumayer, C., & Shklovski, I. (2023, April). Embodying the Algorithm: Exploring Relationships with Large Language Models Through Artistic Performance. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (pp. 1-24).
- Petridis, S., Diakopoulos, N., Crowston, K., Hansen, M., Henderson, K., Jastrzebski, S., ... & Chilton, L. B. (2023, April). Anglekindling: Supporting journalistic angle ideation with large language models. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (pp. 1-16).
- Tholander, J., & Jonsson, M. (2023, July). Design Ideation with AI-Sketching, Thinking and Talking with Generative Machine Learning Models. In Proceedings of the 2023 ACM Designing Interactive Systems Conference (pp. 1930-1940).

