

Computational Creativity

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Creative Effectiveness & David Ogilvy Awards 2024

Overview

- AI can be creative, like humans
- Evidence of Generative AI performance at creative tasks
- Some caveats
- How do humans respond to AI creativity?
- Implications

Some Quotes on Creativity (that might explain why AI can be creative)

“The creative act is not an act of creation in the sense of the Old Testament. It does not create something out of nothing; it uncovers, selects, re-shuffles, combines, synthesizes already existing facts, ideas, faculties, skills. **The more familiar the parts, the more striking the new whole.**”

Arthur Koestler, *The Act of Creation*, 1964

“Combinatory play seems to be the essential feature in productive thought”

Albert Einstein, in Hadamard, Jacques (1945), “An Essay on The Psychology of Invention in the Mathematical Field.”

“To create consists precisely in not making useless combinations and in making those which are useful and which are only a small minority. Invention is discernment, choice.”

Henri Poincaré, *The Foundations of Science*, 1913

Quantifying Creativity – The Topography of Thought

- Quantify the “ground covered” by any narrative
- How “fast” does the content move (coherence)?
- Analysis of 40,000 college application essays
- Students whose essay covers more semantic ground, and does so more coherently, end up doing better academically (i.e., higher GPA in college)
- Link to creativity?
- Similar pattern observed when assessing creativity of ideas for new products

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Brainstorming with GPT

Topic: create a new physical product for the college student market that would be likely to retail for less than \$50

3 conditions:

- 200 ideas generated by undergrads (Wharton?) in Product Design and Innovation course
- 100 ideas generated by GPT-4 (API, temperature=0.7)
- 100 ideas generated by GPT-4 with few examples of top ideas by students

Human evaluations of purchase intent and novelty

Brainstorming with GPT

- Ideas generated by GPT judged significantly higher on purchase intent compared to ideas generated by students
- Ideas generated by GPT judged significantly lower on novelty compared to ideas generated by students
- No difference when providing GPT with few good examples of ideas

Brainstorming with GPT: Other Study

Topics: use three items to come up with new toys, come up with new use for household item, idea for new dining table, ...

Conditions:

- Ideas generated by humans alone (Human-only)
- Ideas generated by ChatGPT alone (ChatGPT-only)
- Ideas generated by humans using ChatGPT (ChatGPT-assisted)
- Ideas generated by humans using Google Search (Web-search-assisted)

Human evaluations of creativity

Brainstorming with GPT: Findings

- ChatGPT-only and ChatGPT-assisted performed similarly, and better than Human-only and Web-search-assisted
- Additional human modifications to ChatGPT's output not necessary to make idea more creative
- ChatGPT particularly effective at generating incrementally new ideas but less effective at generating radically new ideas
- ChatGPT enhances creativity by accessing disparate concepts and combining them in a cohesive and articulate manner

Brainstorming with GPT: Another Study

- New ideas for a smartphone app that would make users feel less lonely
 - Compare GPT to professional app designers competing for a \$500 prize
- Consider two types of creativity:
 - Creative form: language used to describe idea is more unusual or unique
 - Creative substance: the idea itself is more novel
- Findings:
 - GPT 4 outperforms humans in both types of creativity
 - Using GPT 4 to simply re-write ideas originally written by humans results in those ideas being rated as more creative

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Brainstorming with GPT: Cognitive Fixation?

Ongoing research with Prof. Melanie Brucks

- When humans brainstorm, they are prone to cognitive fixation
 - Fixate on early ideas, hard time exploring completely different directions
- Does GPT also suffer from cognitive fixation?

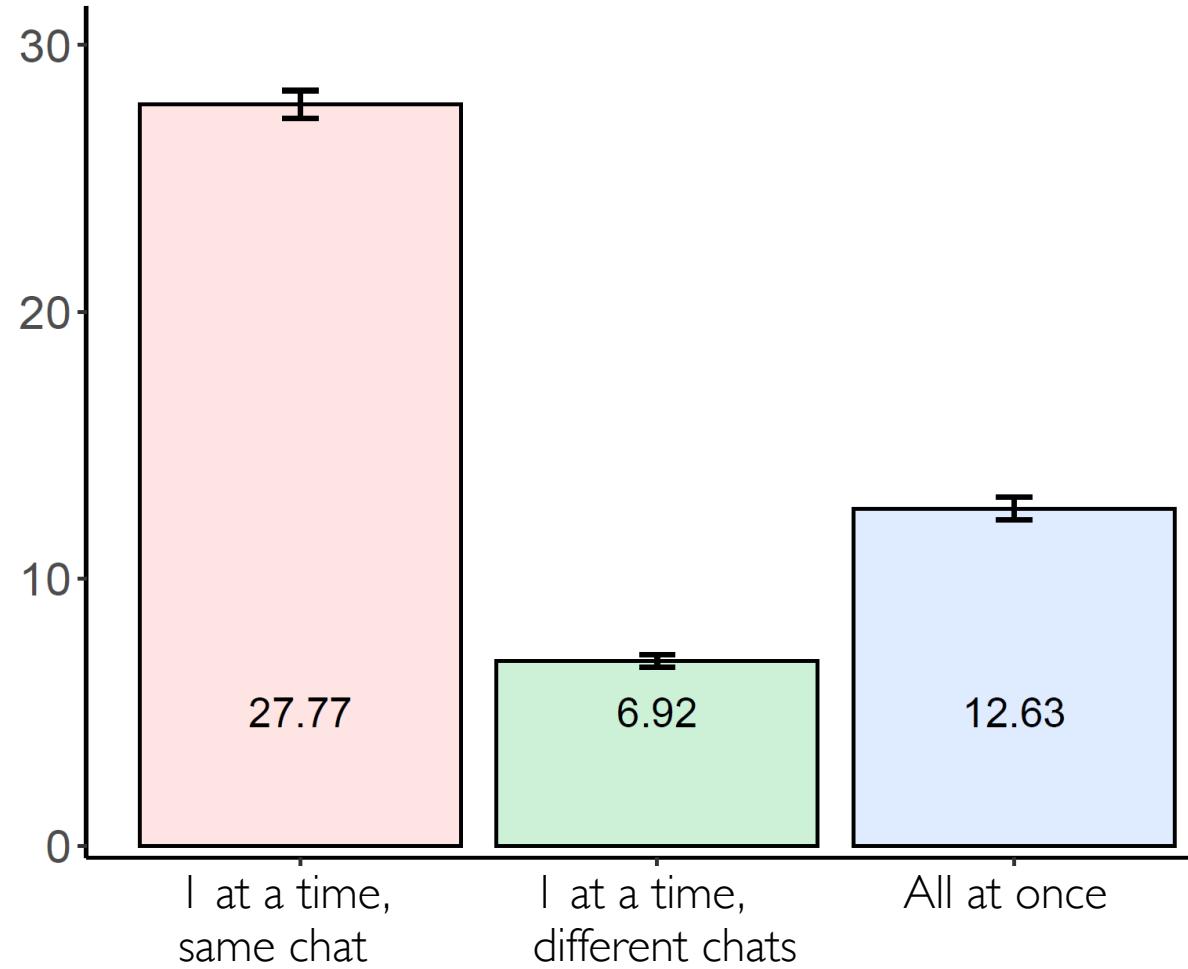


Brainstorming with GPT: Cognitive Fixation?

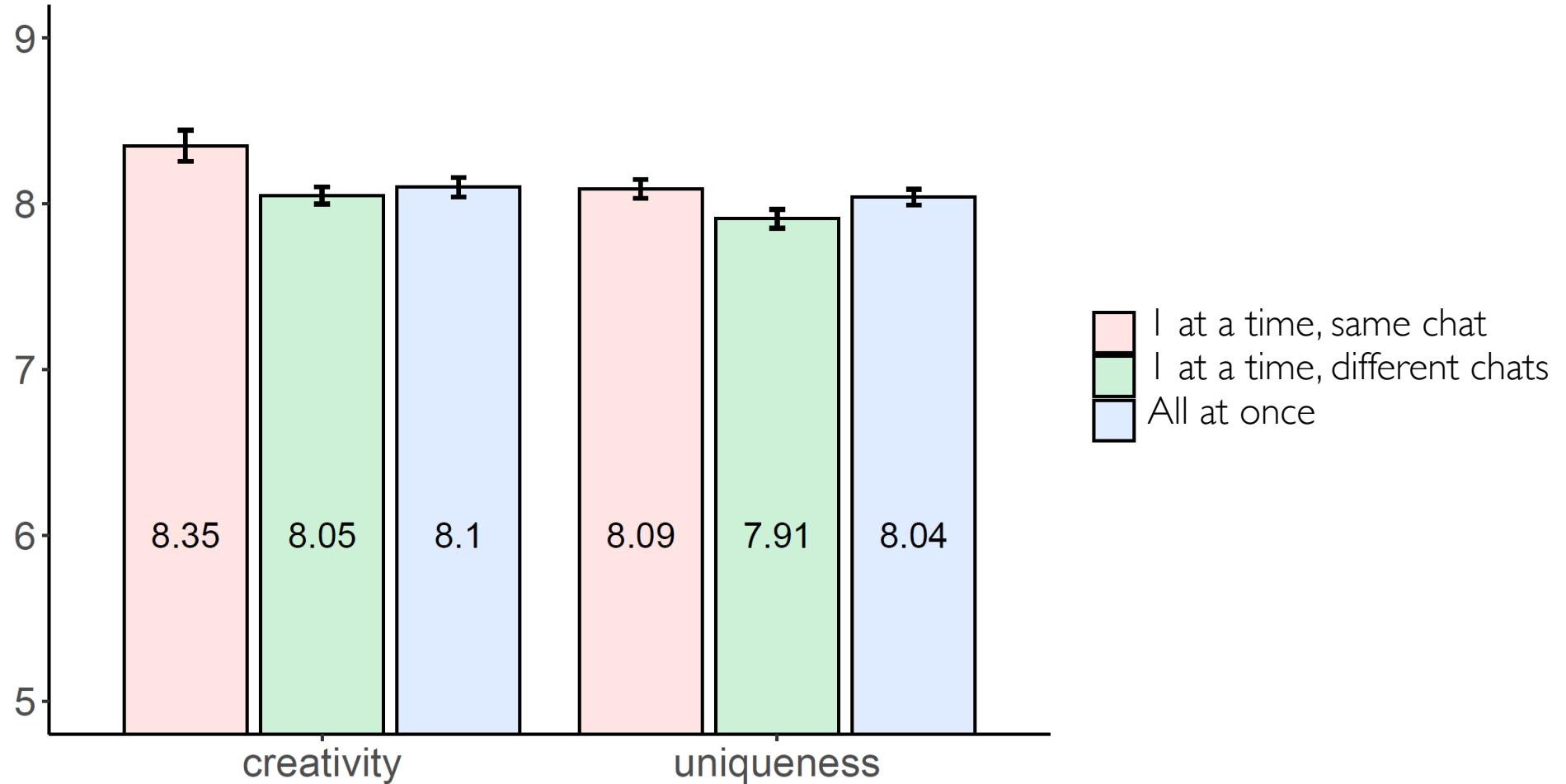
Ongoing research with Prof. Melanie Brucks

- Compare quality of ideas when:
 - Asking GPT for 40 ideas at once
 - Asking GPT for 1 idea, 40 times, in the same “chat”
 - Asking GPT 1 idea, 40 times, in 40 different “chats”
- Ideas for new fitness products
- Replicate 100 times (12,000 ideas in total)
- Use GPT to evaluate output:
 - Number of categories of products, uniqueness, creativity of the set of 40 ideas
 - Creativity, novelty, usefulness of each idea

Number of categories explored



Creativity and Uniqueness



Brainstorming with GPT: Cognitive Fixation!

Ongoing research with Prof. Melanie Brucks

- Asking GPT for ideas 1 by 1, in the same “chat”, leads to:
 - More categories of products explored
 - Ideas that are judged as more creative and unique
- Practical implications
 - Like humans, GPT seems to be prone to cognitive fixation
 - Generate ideas iteratively
 - ChatGPT, or use the API to save time
 - (Try to increase diversity by having different LLMs brainstorm together)

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Taboola Study - Design

- Compare Click-Through Rates (CTR) of AI-generated vs. human-generated display ads
- Only compare across ads created by the same advertiser on the same day in the same campaign
- >300,000 ads, 500 million impressions, 3 million clicks in 2024



Unsold Gazebos Are Selling Almost For Nothing!



Unsold Gazebos Are Selling Almost For Nothing!



New Small Electric Car For Seniors - The Price May Surprise You



New Small Electric Car For Seniors - The Price May Surprise You



Seniors: \$200 Bonus On Checking Account is Turning Heads



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Top 5 Best Laptop For Programming in 2023



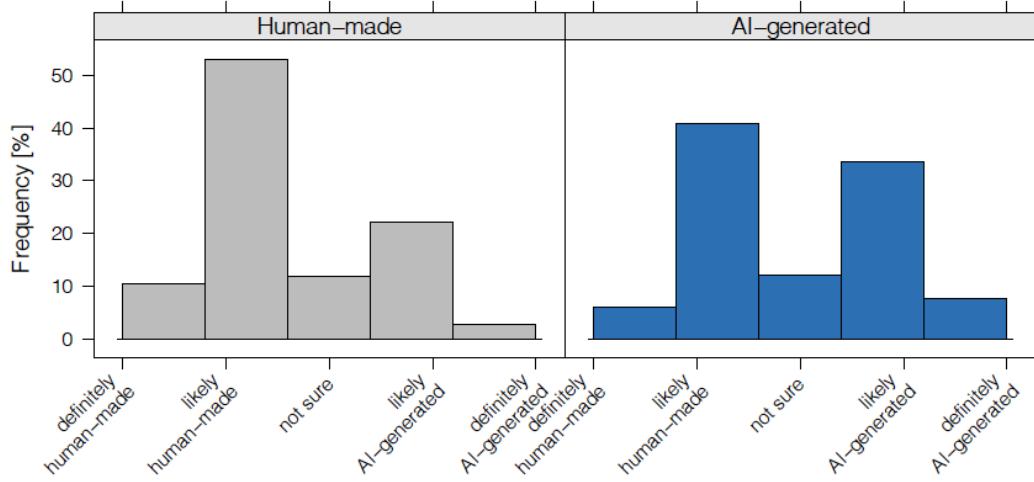
Top 5 Best Laptop For Programming in 2023

Taboola Study – Overall Results

- No statistically significant difference in CTR
 - 0.65% for human-generated
 - 0.76% for AI-generated

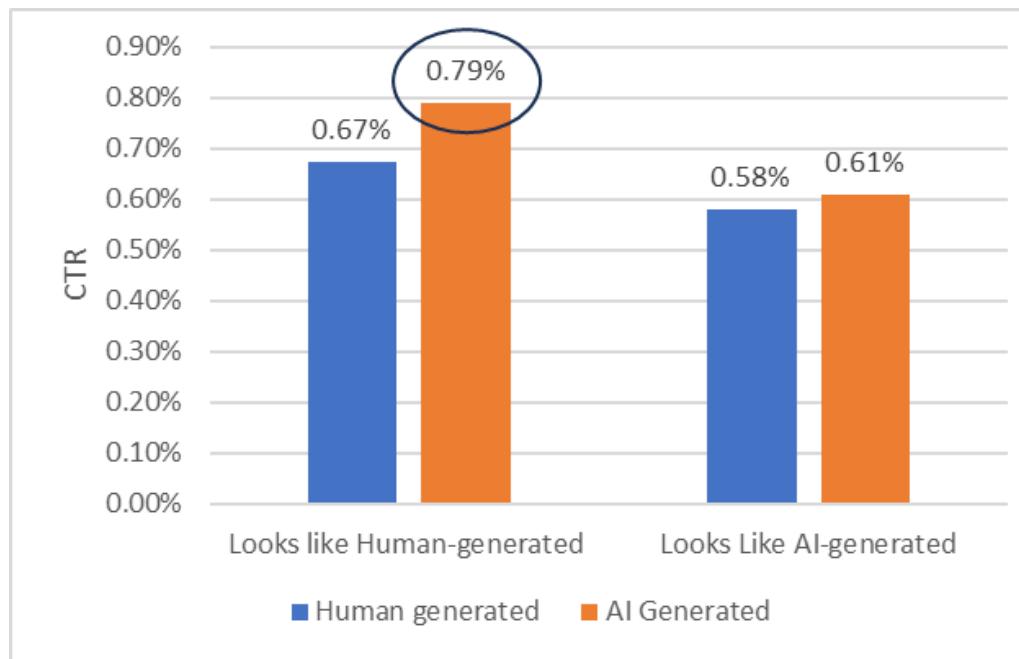
Taboola Study – Do the Ads Look Human-made or AI-Generated?

- Almost 50% of AI-generated ads were perceived as “definitely” or “likely” human-made



Taboola Study – AI Aversion

- AI-generated ads that look human-generated have the highest CTR
- AI-generated ads have a positive effect on CTR, unless they look like AI

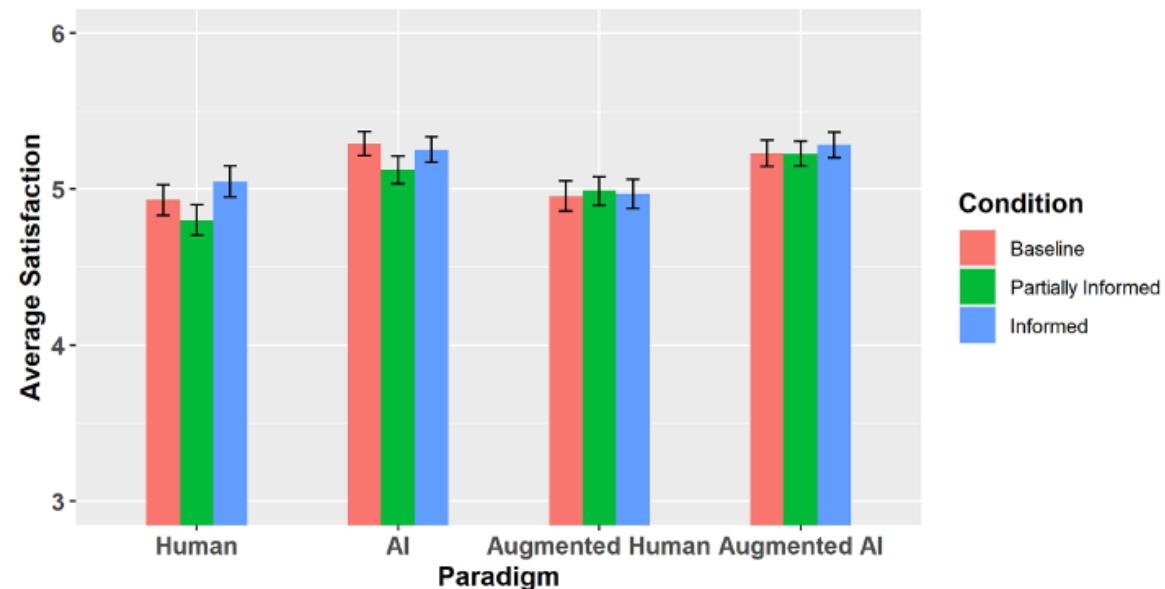


AI Aversion or Human Favoritism?

- Creative content: advertising for a product or persuasive content for a campaign
- 4 conditions for content creation:
 - Human
 - Augmented Human: humans given content from ChatGPT-4 as inspiration
 - AI: ChatGPT-4
 - Augmented AI: ChatGPT-4 given content from humans as inspiration
- 3 conditions for content evaluation (all by humans):
 - Baseline: no information about origin of content
 - Partially informed: participants know content may come from AI
 - Informed: participants know the origin of content

AI Aversion or Human Favoritism?

- People perceive content generated by AI as higher quality than content generated by humans, but...
- they perceive the same piece of content generated solely by a human expert as higher quality if they are aware the content was generated by a human



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Implications

- Generative AI can be as creative or more creative than humans
- Although we like to think that Generative AI works best with “humans in the loop,” it seems Generative AI doesn’t need us to be creative
- Yet humans tend to prefer creative content created by fellow humans
 - Broader phenomenon?
 - Hand crafted, human made, based on a true story, etc.
- Creative products / narratives help us make sense of the world
 - By giving us knowledge of the world (facts, true human stories, experiences)
 - By helping us integrate our knowledge of the world (insight, framework, connections)
- Generative AI may be able to do the latter, but not the former
- What humans bring to the table are authentic, real-life experiences