

Learning to Prompt: Human Adaptation in Production with Generative AI

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With Powerful AI, What Is the Role of Human Input?

Member-only story

AI Art Isn't Just the Future, It's the End of Human Creativity

AI Art Raises Questions No One Knows How to Answer



George J. Ziogas

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1.7K



35



r/infp · 3 yr. ago

Faempo INFP: The Dreamer

Once AI replaces creativity, what is there left for us?

Venting

I'm growing increasingly pessimistic as AI improves: machines can already beat any human chess player, create poetry, symphonies and artworks in seconds, that, to most people, are not distinguishable from human output. They can even produce actually funny jokes. Machine translation is replacing human translation, even at a higher quality, since most people simply can't distinguish machine output from human output anymore and AI is improving. All the things about art that seem too complex for AI now, they will learn within a matter of years.

Research Question

Creative Production: $Y = F(\text{AI}, \text{Human Input})$

Research Question: What is the role of human input in AI-assisted production?

What does human input mean? Prompts

Empirical Setting: Midjourney

- ▶ A popular AI image generator operating on a public chat channel
- ▶ Can see how people use AI image generator

Midjourney



general-2

General pur...



Search



prompt 1 NEW MENTION

feedback

ideas-and-features

Community Forums

prompt-faqs

4 New

Showcase

paintovers

in-the-world

blend-showcase

Themed Image Gen

Thread Channels

misc-threads

General Image Gen

general-2

general-3

general-4

general-5

general-6

Sijie
Online



Message #general-2

Chat Box



2022/06/21/14:31



Web

broken porch light with cracked glass pieces, police tape faintly visible in frame -
-ar 16:9 --v 6.0 --raw - @ UserID (fast) (edited)



U1 U2 U3 U4

V1 V2 V3 V4

open doorway of small house, morning light entering empty hallway, still
atmosphere --ar 16:9 --v 6.0 --raw - @ UserID (fast)



Users Iteratively Refine Prompts Toward a Desired Outcome

A typical prompt sequence:

User ID 123456

- . 2023/06/23/14:23 Cat
- . 2023/06/23/14:25 Cat, blue shirt
- . 2023/06/23/14:26 Cat, **green** shirt
- . 2023/06/23/14:28 Cat, **green** shirt
- . 2023/06/23/14:31 Cat, green shirt, **drink coffee**
- . 2023/06/23/14:32 Cat, green shirt, **drink soda**

Features of prompt sequence (Regressions in the paper)

- ▶ Prompt length $\uparrow$ along path
- ▶ Change words in order
- ▶ Become increasingly similar to last prompt in path
- ▶ Sometimes repeat the same prompt

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Prompting is very similar to how consumers search for products!

Structural Model: Costly Sequential Search with Learning

- ▶ Setup (Based on Weitzman 1979; Hodgson and Lewis 2025)
 - Individual has beliefs over expected returns of prompts
 - Individual chooses prompt (a list of words) to submit to AI
 - Pay search cost
 - **Evaluate image quality** → **Update belief of how good all prompts are**
 - Decide: $\begin{cases} \text{Stop} \\ \text{Keep searching} \rightarrow \text{Which prompt to search next} \end{cases}$
- ▶ Individual behavior
 - Search sequentially: the most promising prompt based on current belief
 - Stop when remaining options are not promising enough
 - Trade-off: option value of the next prompt vs search cost

Model Intuition

AI generates



AI generates



Time

Let's try
"Cat, abstract"

Not satisfying...
Similar prompts are
unlikely to be satisfying

Let's try again
"Cat, cyberpunk"

current belief
 t

new belief
 $t + 1$

Time

Choose a prompt to submit;
Pay search cost

See image

Evaluate quality;
Update belief
about all prompts

Decide stop or continue;
If continue, which
prompt to submit

See image

Counterfactual Simulation

What if we remove learning?

Counterfactual:

- ▶ Users submit a **predetermined list** based on their prior belief
- ▶ AI goes down the list one by one
- ▶ Users see the image, but are not allowed to adjust the next prompt
- ▶ How many more prompts are needed to achieve the same outcome as in the data?

It takes 313% ↑ prompts to achieve the same output

⇒ **Human adaptation speeds up the production process by three times**

Conclusion

1. **Question:** $Y = F(\text{AI}, \text{Human Input})$ What is the role of human input?
2. **Setting:** AI image generator operating in a public chat channel
3. **The Role of Human Input: Learning and Adapting**
 - 3.1 Estimate “production function” with the sequential search model
 - 3.2 Counterfactual: Remove learning
 $\Rightarrow 313\% \uparrow$ prompts are needed to achieve the same outcome
4. **Contribution**
 - 4.1 Model the creative process as a sequential search
 - 4.2 Quantify the value of human input

Counterfactual Simulation

Infinite Monkey “Theorem”: A monkey hitting keys independently and randomly on a typewriter for an infinite amount of time $\Rightarrow$ Complete works of William Shakespeare!



If we iterate over every combination of pixels on a canvas $\Rightarrow$ Obtain masterpieces

Counterfactual: How inefficient is production when human adaptation is removed?

$\Rightarrow$ **#Prompts Per Session 313% $\uparrow$**

$\Rightarrow$ **Human adaptation speeds up the production process by three times**