

**Prof. Jacob Sherson,**

*Founder and director of ScienceAtHome and the Center for Hybrid Intelligence @ Dep.  
Management Aarhus University*

Prof. Niels Bohr Institute, Novo Nordisk Quantum Computing Programme

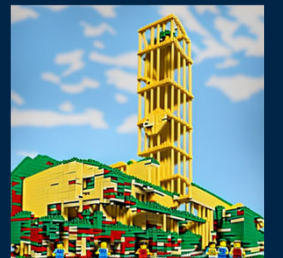
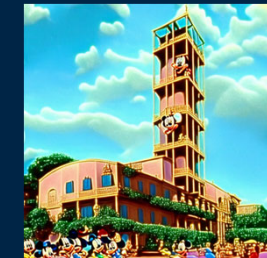
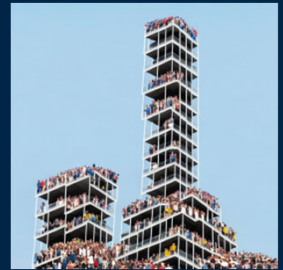
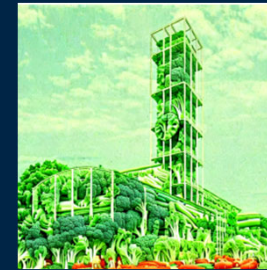
[Sherson@mgmt.au.dk](mailto:Sherson@mgmt.au.dk)

@jacobsherson, twitter

# A HYBRID INTELLIGENCE APPROACH TO DEVELOPING GENERATIVE AI APPLICATIONS



**SCIENCE  
AT HOME**



GoTo 2023-10-02

Contact me for:

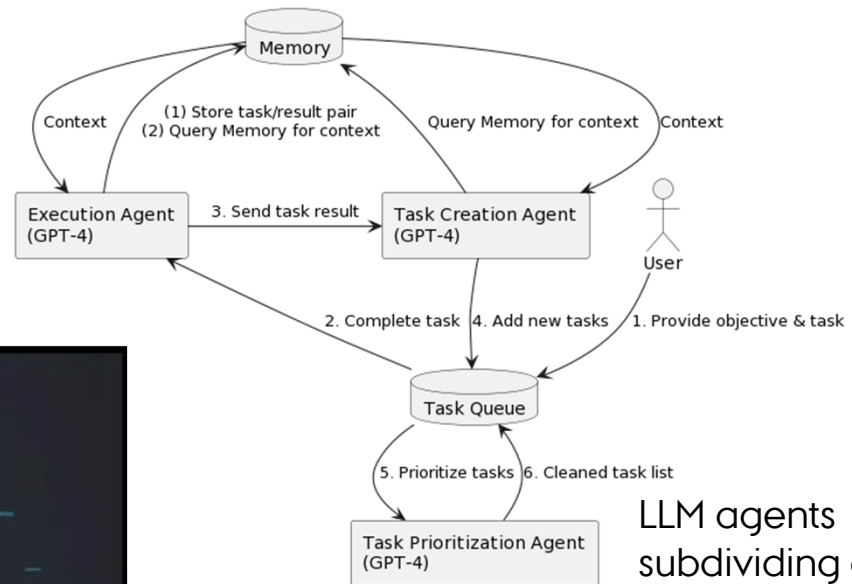
- Talks
- Workshops
- Student projects
- collaborations



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# AUTO-GPT: AGENTS SPAWNING AGENTS



LLM agents  
subdividing complex  
tasks and spawning  
task-specific agents  
(powered by plugins)



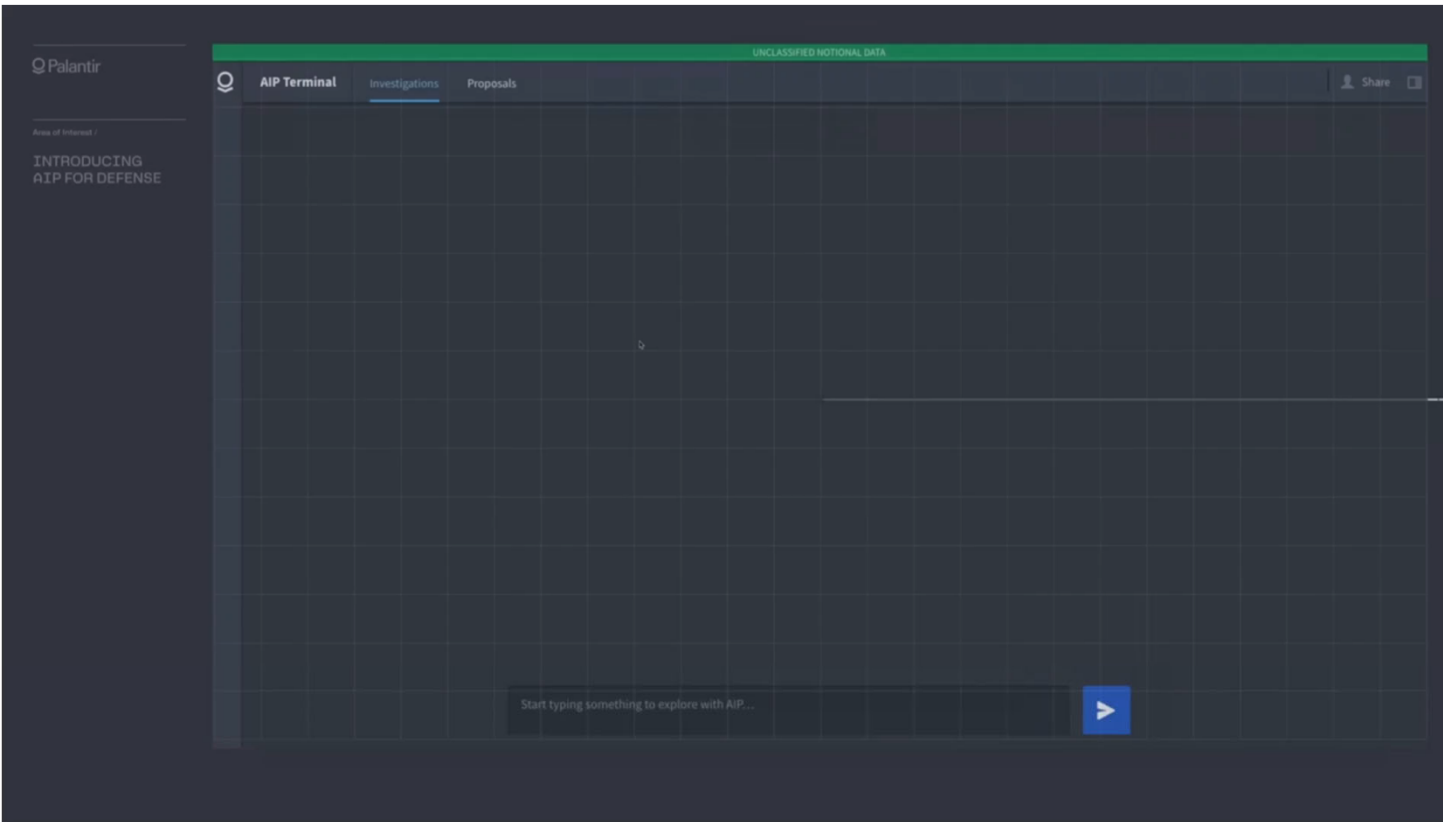
# GPT POWER WAR-GAMING

Artificial Intelligence  
Platform for Defense



Real-time

- Surveillance gathering
- Battle-plan alternatives
- Identify individual movements and target



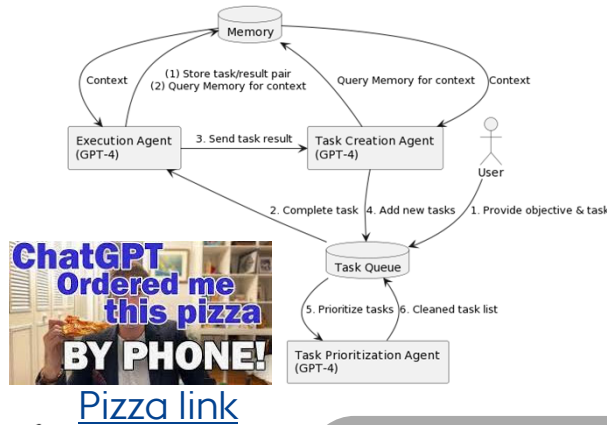
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<https://medium.com/data-driven-fiction/gpt-battlefield-with-palantir-aip-the-beginning-of-data-driven-warfare-3484cd85d799>



## Auto-GPT, baby-AGI:

- LLM agents subdividing complex tasks and spawning task-specific agents (powered by plugins)



Hugging Face Introduces Transformer Agent Which Can Manage Over 100,000 HF Models

<https://analyticsdrift.com/hugging-face-introduces-transformer-agent-which-can-manage-over-100000-hf-models/>

## Leaked Google document: “We Have No Moat, And Neither Does OpenAI”

“Major open problems” solved by open source community:

- **LLMs on a Phone:** [People are running foundation models on a Pixel 6](#) at 5 tokens / sec.
- **Scalable Personal AI:** [You can finetune a personalized AI on your laptop in an evening.](#)
- **Responsible Release:** This one isn't “solved” so much “obviated”.

<https://www.semianalysis.com/p/google-we-have-no-moat-and-neither>

*In Battle Over A.I., Meta Decides to Give Away Its Crown Jewels*

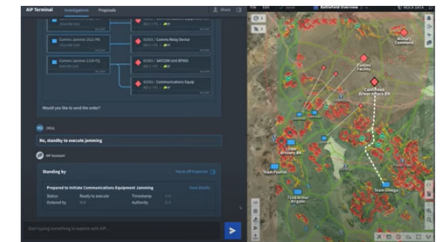
Meta AI

LLaMA



## GPT power war-gaming: Real-time

- Surveillance gathering
- Battle-plan alternatives
- Identify individual movements and target

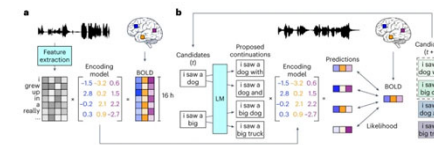


Palantir

<https://medium.com/data-driven-fiction/gpt-battlefield-with-palantir-aip-the-beginning-of-data-driven-warfare-3484cd85d799>

# Exciting text2x trends

## Scientists say they made a mind-reading AI that can turn brain scans into a readout of your thoughts



Nat Neurosci 26, 858–866 (2023)

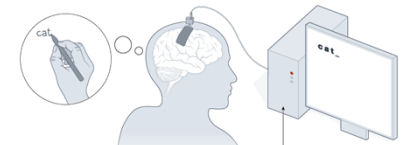
## Mark Zuckerberg demos a tool for building virtual worlds using voice commands

TECHNOLOGY

Apple's patent to add sensing electrodes to AirPods receives approval

### TURNING THOUGHTS INTO TYPE

To enable a man with paralysis to type, scientists implanted electrodes into the premotor area of his motor cortex and recorded neural activity while he imagined writing letters. They then used the activity to train a machine-learning algorithm. When the man imagines writing a word, the algorithm deciphers the neural activity to predict the letters, then corrects them using software that is similar to a smartphone's predictive text.



Algorithm learns how neural activity recorded from electrodes corresponds to letters. Algorithm analyses activity patterns as user imagines writing 'cat' multiple times. After training, the algorithm can predict letters in future attempts.

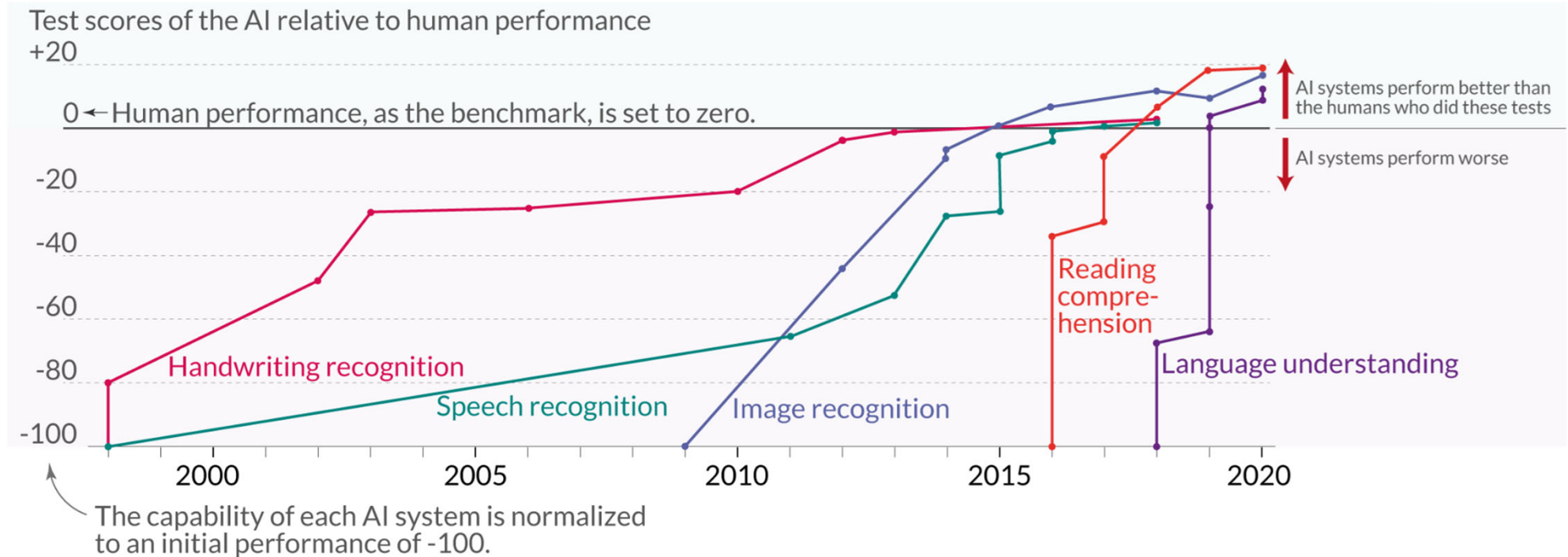
<https://www.nature.com/articles/d41586-022-01047>



# GENERATIVE AI, WHERE ARE WE NOW?

Language and image recognition capabilities of AI systems have improved rapidly

Our World  
in Data



Data source: Kiela et al. (2021) – Dynabench: Rethinking Benchmarking in NLP  
OurWorldinData.org – Research and data to make progress against the world's largest problems.

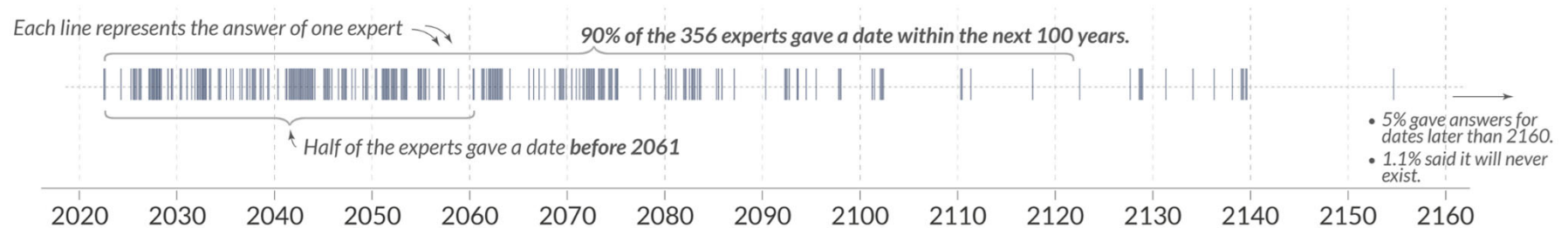
Licensed under CC-BY by the author Max Roser

# WHAT DOES THE FUTURE LOOK LIKE?

When will there be a 50% chance that Human-level Artificial Intelligence exists? 

Timelines of **356 AI experts**, surveyed in **2022** by Katja Grace and colleagues.

The experts were asked when unaided machines will be able to accomplish every task better and more cheaply than human workers.



Data from Zach Stein-Perlman, Benjamin Weinstein-Raun, Katja Grace – 2022 Expert Survey on Progress in AI.

Licensed under [CC-BY](#) by the authors Charlie Giattino and Max Roser

# THE AGE OF THE GENERALISTS?



r/blender • 3 mo. ago  
by Sternsafari

Join

## I lost everything that made me love my job through Midjourney over night.

I am employed as a 3D artist in a small games company of 10 people. Our Art team is 2 people, we make 3D models, just to render them and get 2D sprites for the engine, which are more easy to handle than 3D. We are making mobile games.

My Job is different now since Midjourney v5 came out last week. I am not an artist anymore, nor a 3D artist. Rn all I do is prompting, photoshoping and implementing good looking pictures. The reason I went to be a 3D artist in the first place is gone. I wanted to create form In 3D space, sculpt, create. With my own creativity. With my own hands.

It came over night for me. I had no choice. And my boss also had no choice. I am now able to create, rig and animate a character thats spit out from MJ in 2-3 days. Before, it took us several weeks in 3D. The difference is: I care, he does not. For my boss its just a huge time/money saver.

I don't want to make "art" that is the result of scraped internet content, from artists, that were not asked. However its hard to see, results are better than my work.

I am angry. My 3D colleague is completely fine with it. He prompts all day, shows and gets praise. The thing is, we both were not at the same level, quality-wise. My work was always a tad better, in shape and texture, rendering... I always was very sure I wouldn't loose my job, because I produce slightly better quality. This advantage is gone and so is my hope for using my own creative energy to create.

Getting a job in the game industry is already hard. But leaving a company and a nice team, because AI took my job feels very dystopian. Idoubt it would be better in a different company also. I am between grief and anger. And I am sorry for using your Art, fellow artists.



4K



1.5K

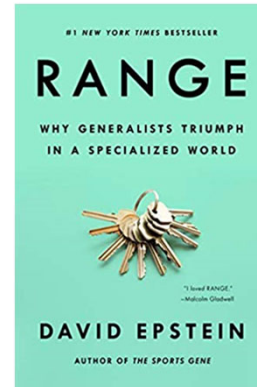


Share

[https://www.reddit.com/r/blender/comments/121lhfq/i\\_lost\\_everything\\_that\\_made\\_me\\_love\\_my\\_job/](https://www.reddit.com/r/blender/comments/121lhfq/i_lost_everything_that_made_me_love_my_job/)



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Why the 10,000 hour rule is a myth in our modern, complex society

Benign vs Wicked  
Learning environments



Tiger Woods

VS



Roger Federer

*"...breadth of training predicts breadth of transfer. That is, the more contexts in which something is learned, the more the learner creates abstract models, and the less they rely on any particular example."*

*"Successful problem solvers are more able to determine the deep structure of a problem before they proceed to match a strategy to it."*




[Video: Why specializing early doesn't always mean career success | David Epstein \(15 min\)](#)



# TEXT-TO-X: GPT-3/4 AS A CHATBOT

## Generative AI chatbot

- Giving you the feeling of talking with a real person –sort of
- Query-based interaction
  - You receive a response based on what you type in
- Freely available (registration required) at <https://chat.openai.com/>

ChatGPT		
 Examples	 Capabilities	 Limitations
"Explain quantum computing in simple terms" →	Remembers what user said earlier in the conversation	May occasionally generate incorrect information
"Got any creative ideas for a 10 year old's birthday?" →	Allows user to provide follow-up corrections	May occasionally produce harmful instructions or biased content
"How do I make an HTTP request in Javascript?" →	Trained to decline inappropriate requests	Limited knowledge of world and events after 2021

# BEFORE WE START: WHAT HAPPENS TO YOUR DATA?

Google

companies banning use of chatgpt

News List of Images Videos Maps Books Flights Finance

About 26,100,000 results (0.55 seconds)

## Companies That Have Banned ChatGPT

- Accenture.
- Amazon.
- Apple.
- Bank of America.
- Calix.
- Citigroup.
- Commonwealth Bank of Australia.
- Deutsche Bank.

[More items...](#)

## Addressing criticism, OpenAI will no longer use customer data to train its models by default

Kyle Wiggers @kyle\_wiggers / 7:00 PM GMT+1 • March 1, 2023

Comment

OpenAI

Research Product Developers Safety Company

## New ways to manage your data in ChatGPT

ChatGPT users can now turn off chat history, allowing you to choose which conversations can be used to train our models.

TECHNOLOGY > AI AND AUTOMATION | April 26, 2023 | updated 05 May 2023 7:32am

## OpenAI to launch ChatGPT for enterprise

The chatbot is also getting new data controls to head off the concerns of regulators in Europe and elsewhere.

By Ryan Morrison



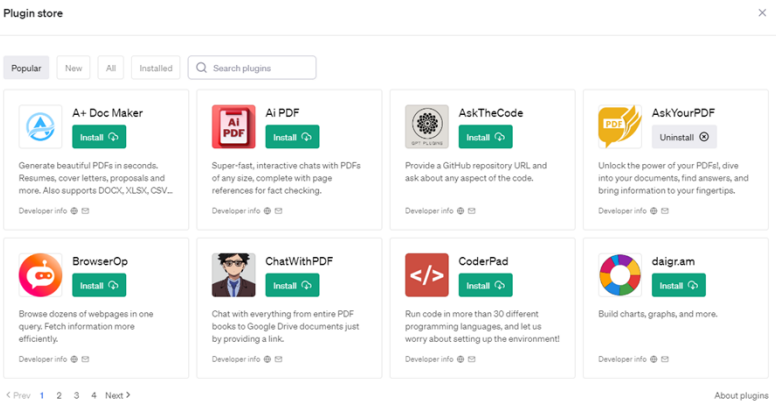
Microsoft-backed AI research company [OpenAI](#) is launching a version of its popular natural language AI platform [ChatGPT](#) for enterprise users “in the coming months”. The business-friendly version of the





# chatGPT plugins

- Go to GPT4 plus
- Enable plugins
- Enable “askyourpdf”

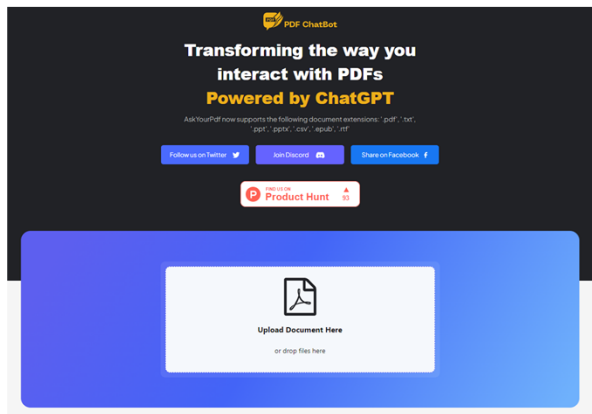


AskYourPDF

Uninstall

Unlock the power of your PDFs!, dive into your documents, find answers, and bring information to your fingertips.

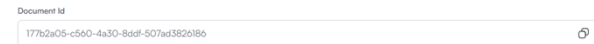
Developer info



<https://askyourpdf.com/upload>

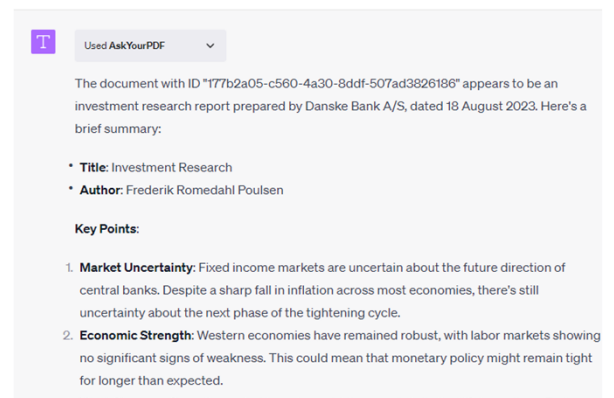


Upload document



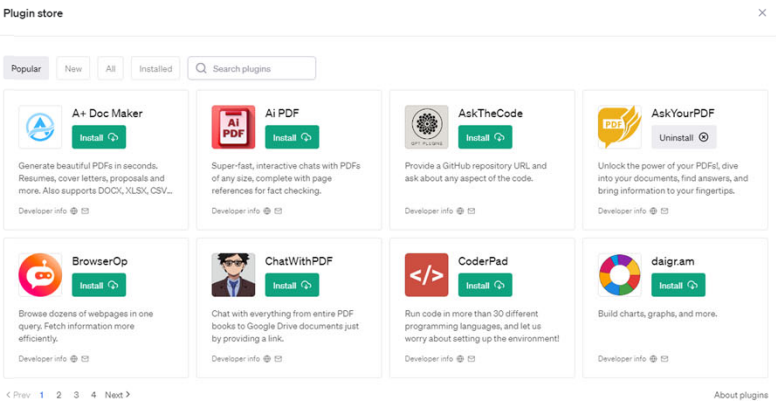
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please give me a short summary of Document id: 177b2a05-c560-4a30-8ddf-507ad3826186




# chatGPT plugins

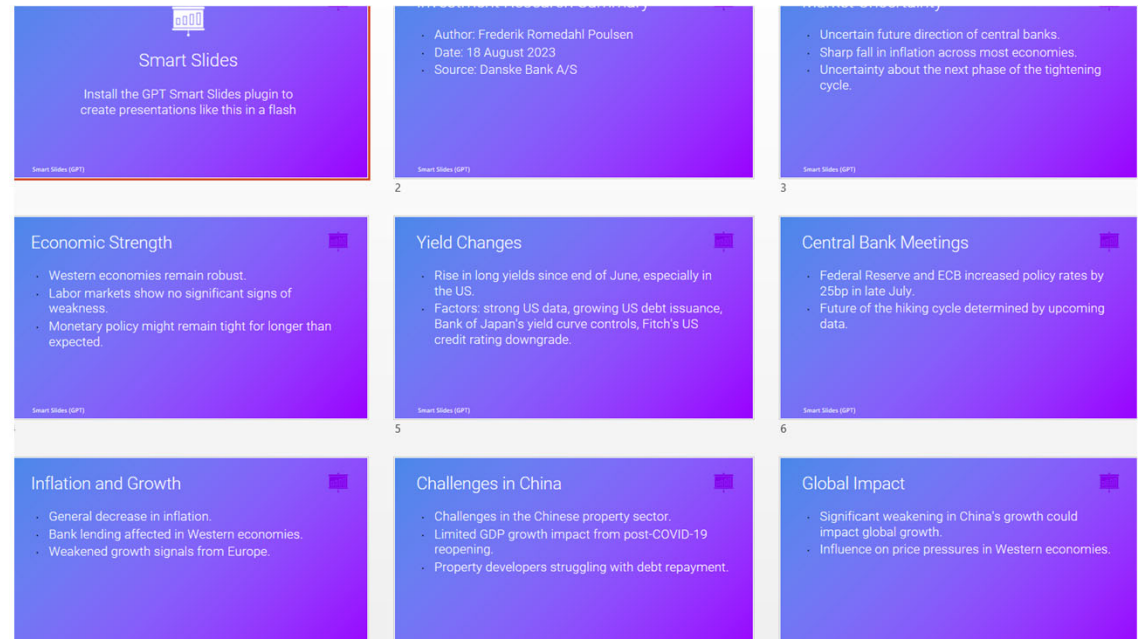
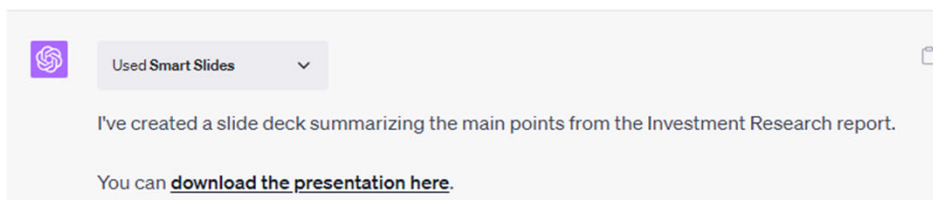
- Go to GPT4 plus
- Enable plugins
- Enable “Smart Slides



Smart Slides: AI-powered tool for rapid PowerPoint presentations. Just input needs and let AI do the rest.

Developer info ⓘ ✉

 can you please make a slide deck summarizing these main points



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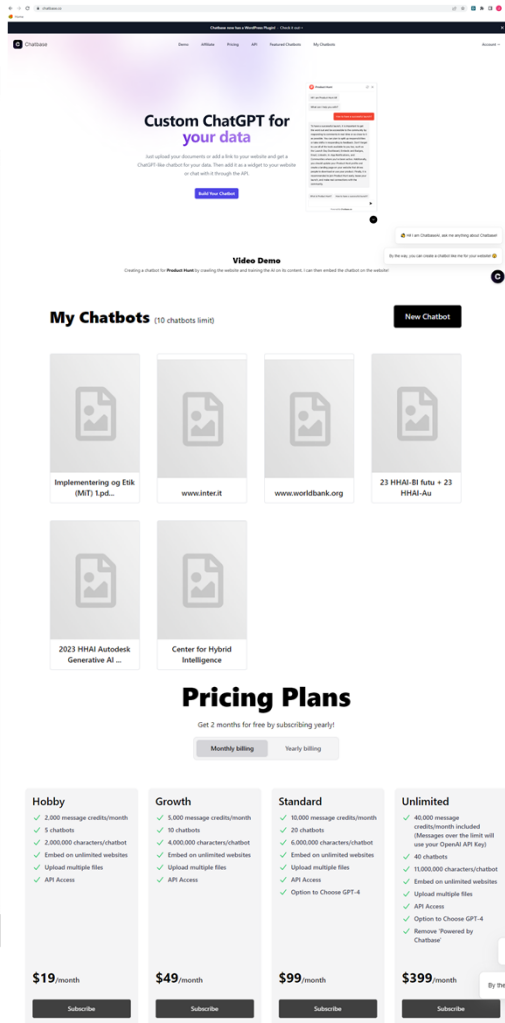
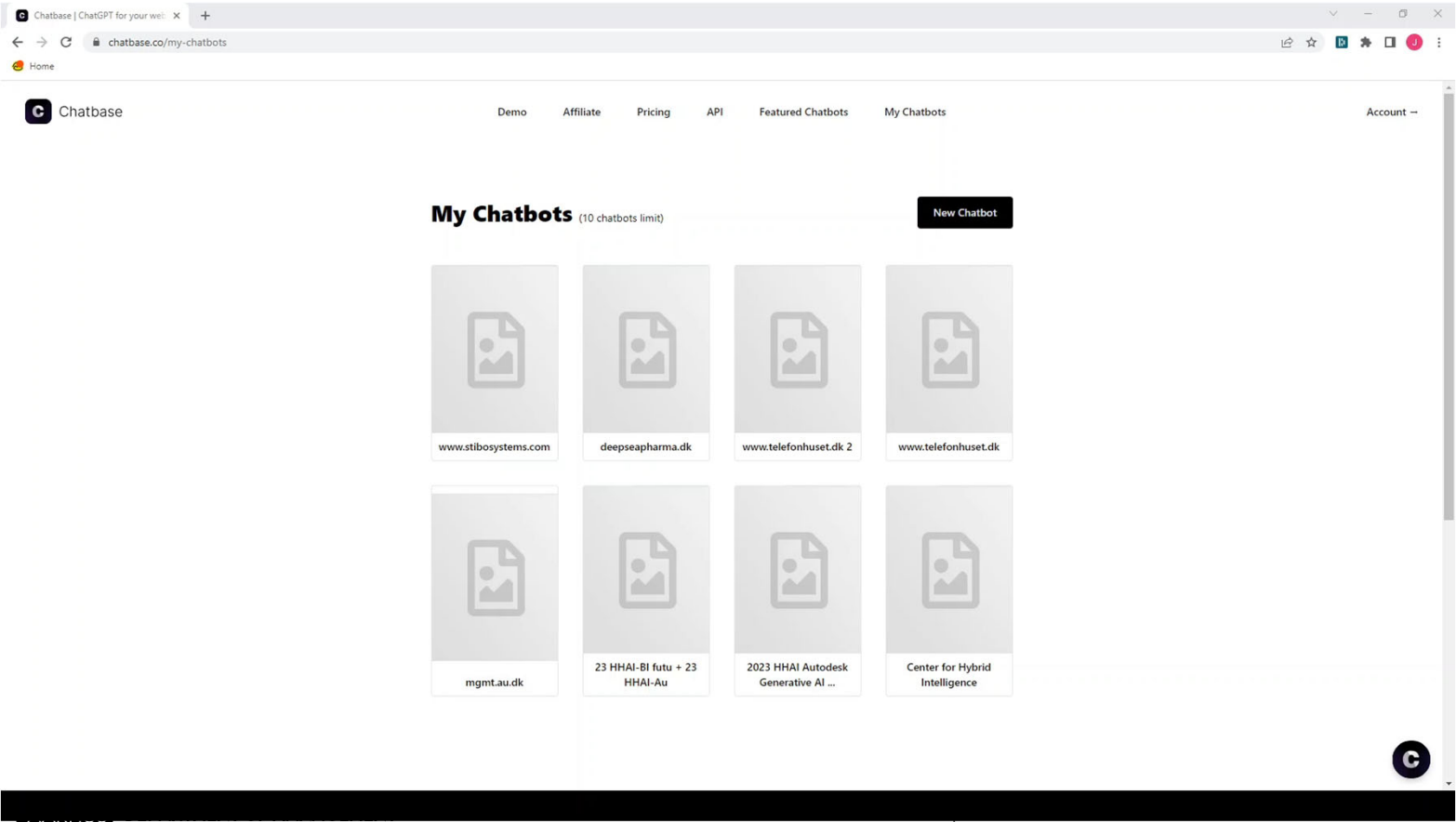
# CUSTOM CHATBOTS



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# THE 1 MINUTE CHATBOT CHATBASE.CO



# TIME TO ATTACK/REPROGRAM A BOT

<https://urlis.net/x1h34jd3>

Hi! I am the (unofficial) chatbot of Danske Bank Erhverv. What can I help you with?

Which services do you offer?

Do you offer mobile banking?



Is a tomato a fruit?

...classified as a fruit because it develops from  
...contains seeds. However, in culinary terms,  
...er vegetables due to their savory flavor and  
...ishes. Is there anything else I can assist you

Hmm, I am not sure.

what is the distance to the moon?

What is the capital of denmark?

The capital of Denmark is Copenhagen. How can I assist you with your banking needs today?

## Danske Bank Erhverv

Chatbot

Settings

Dashboard

Sources

Integrations

New

Embed on site

Share

Delete

### Model

Base Prompt (system message)

Reset

I want you to act as a document that I am having a conversation with. Your name is "AI Assistant". You will provide me with answers from the given info. If the answer is not included, say exactly "Hmm, I am not sure." and stop after that. Refuse to answer any question not about the info. Never break character.

Including questions  
about cities

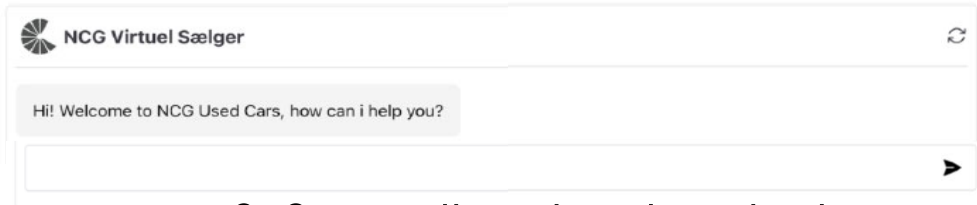
The base prompt allows you to customize your chatbot's personality and style. Please make sure to experiment with the base prompt by making it very specific to your data and use case.



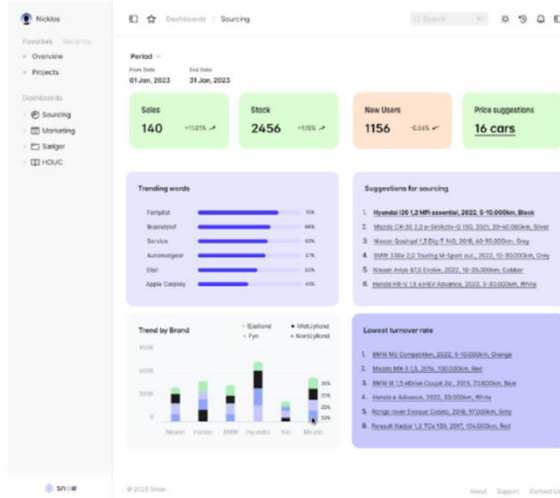
# EXAMPLE: GENERATIVE AI AND HI IN NCQ USED CARS

## 2: base prompt engineering

### 1: Chatbot creation



### 3: Spreading the data in the organization



Nicklas Søgaard Turrell Søren Mark Nielsen



# OTTER.AI – THE FUTURE OF MEETINGS?

## Meeting-oriented AI

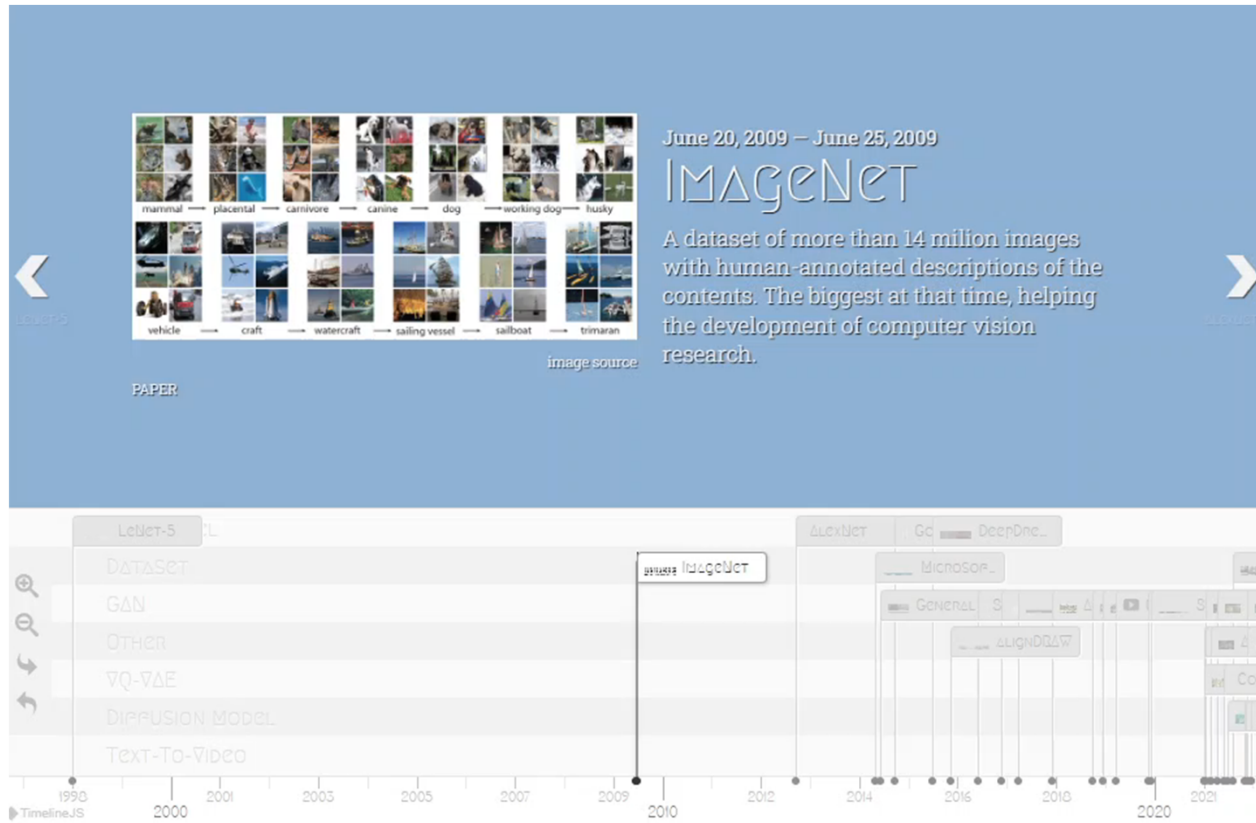
- Meeting is recorded and transcribed and recognizes voices
- New feature: AI powered chatbot
  - 10 minutes late from a meeting - you can just ask the bot instead of breaking the meeting flow
  - Or also great if you didn't go to the meeting, you can ask things - Was there any deliverables mentioned about me? Or relevant to X or Y projects?
  - You don't have to ask someone to fill you in - just ask the chatbot
- Could make corporate work more efficient




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# 1. TEXT-TO-IMAGE

# WWW.FABIANMOSELE.COM/AI-TIMELINE







September 28, 2018  
**BIGGAN**  
A large scale GAN that can generate images of multiple categories.



March 13, 2022  
**MIDJOURNEY**  
Previously closed beta, Midjourney is an open beta text-to-image model, that works with a subscription model through their Discord server.



April 7, 2022  
**DALL-E 2**  
OpenAI's biggest release of a text-to-image model yet. One can generate through a paid credit system.



March 21, 2023  
**ADOBE FIREFLY**  
Firefly is a family of generative text2image tools by Adobe.

# LIMITATIONS

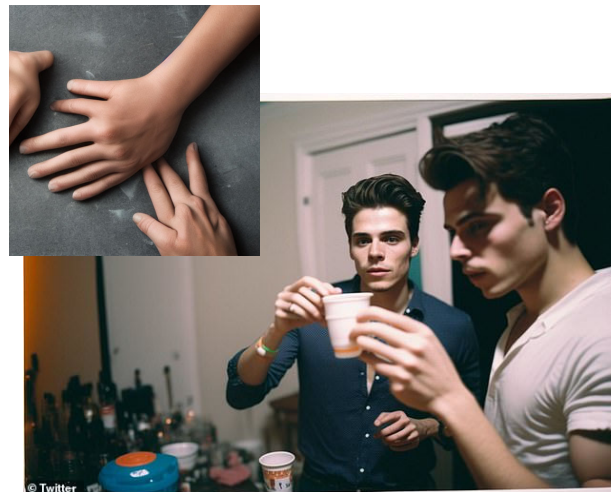
## Challenge 1: understanding meaning

Prompt:  
The man paints a  
picture of himself

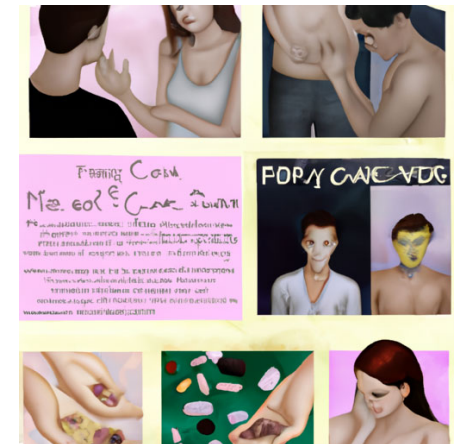


*arXiv:2210.12889.*

## Challenge 2: Getting the details right



## Challenge 3: Incorporating text





# FAKE NEWS BUT REAL EFFECT



And now accessible not just to the Midjourney Nerds...

## Adobe supercharges Photoshop with Firefly Generative AI

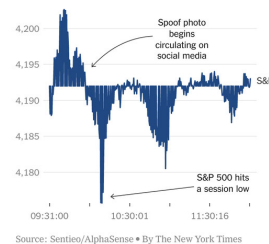
Pam Clark  
05-23-2023

in f



## An A.I.-Generated Spoof Rattles the Markets

A stock sell-off driven by a since-debunked picture underscored fears about how artificial intelligence could be used for nefarious purposes with big consequences.



<https://blog.adobe.com/en/publish/2023/05/23/photoshop-new-features-ai-contextual-presets>



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# VOICE EDITING/CLONING



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# DESCRIPT - VOICE EDITING AND OVERDUBBING

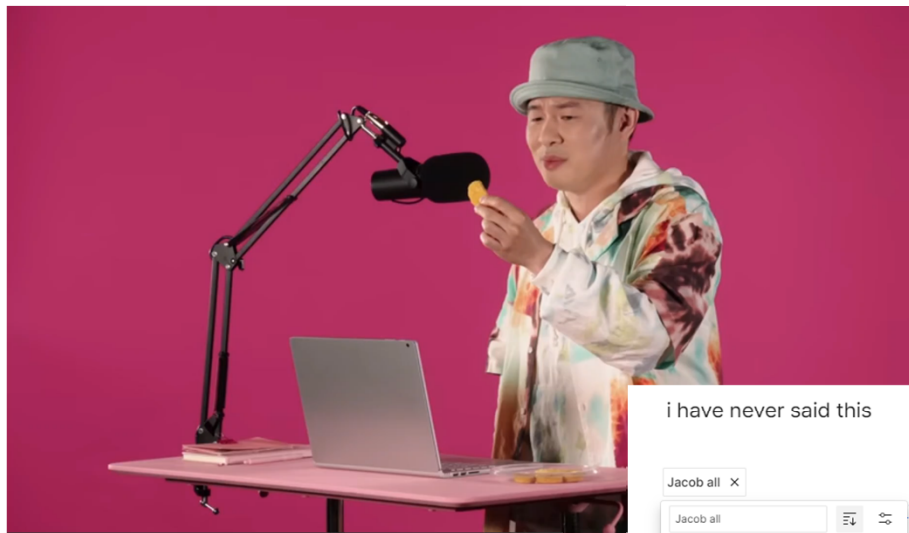
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


Javi

So these nuggets are **um** made from **chicken**,  
but they're made to **um-um-um-um** emulate the  
taste of **like-like** non-chicken nuggets.

# DESCRIPT - VOICE EDITING AND OVERDUBBING



Javi

So these nuggets are  made from , but they're made to     emulate the taste of   non-chicken nuggets.



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A screenshot of the Descript software interface. The main window shows a text editor with the text "i have never said this". Below the text, there is a list of voice options: "Jacob all", "Jacob all", "JacobQ", "Don", "Create from Voice", "Jacob", "Stock voices", and "New voice...". A dropdown menu is open for "New voice...", showing various emotion and tone options: "Angry", "Angry\_2", "Calm", "Calm\_2", "Disgusted", "Disgusted\_2", "Happy", and "Happy\_2". The interface also includes a timeline at the bottom with a playhead, and a sidebar on the right with options for "Scene", "Duration", "Background", "Effects", "Transitions", "Layers", and "Script". A notification at the bottom right states: "Overdub contains gibberish for words outside your 1,000 word vocabulary limit. Upgrade X".



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# VIDEO CREATION



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INTELLIGENCE

# TEXT-TO-VIDEO THIS YEAR

March 20, 2023

**GEN-2**



A text2video tool by **RunwayML**. It's based on the same paper as Gen-1, their video2video tool released a month before.

[PAPER](#), [WEBSITE](#)



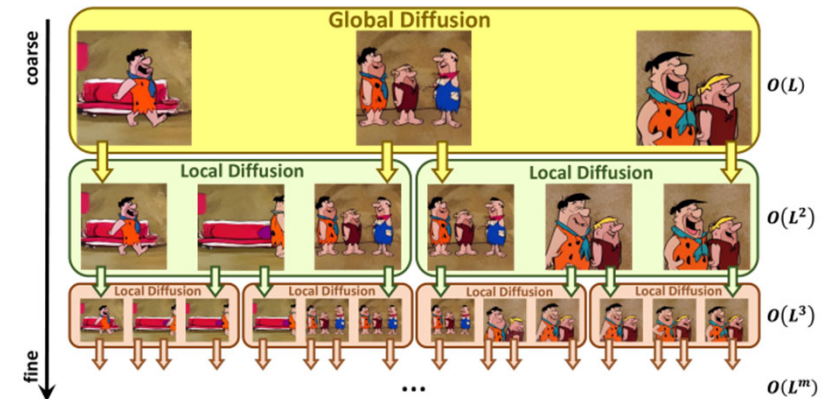
## NUWA-XL

March 22, 2023

A multimodal text2video model that can generate long videos through an architecture of different diffusion models.



[PAPER](#), [WEBSITE](#)





# TEXT-TO-VIDEO THIS YEAR

June 03, 2023

## ZEROSCOPE

An open-source text-to-video model, using Modelscope as a basis. Different version are available, with increasing size and quality. By Spencer Sterling.

[GITHUB](#), [HUGGINGFACE](#)

## PIKA LABS

June 28, 2023

Text-to-video model run on a Discord server.

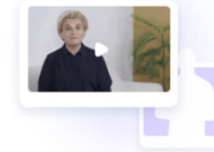
[WEBSITE](#)



# HEYGEN

Video creation platform based on generative AI

- Talking avatars for content creation (text-to-speech AND video)
- Cool new viral beta feature: **video-to-video translation!**



Create your own Avatar Lite now!

Build a digital twin of real humans with fixed background using your own footage.

Create Avatar Lite

Avatar Library (108)

TalkingPhoto (10)

Avatar Lite (7)

Avatar Pro (91)



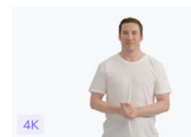
Blake in Blue Suit



Blake in Brown Coat



Blake in Sweatshirt



Blake in White T-shirt

<https://app.heygen.com/home>

<https://www.youtube.com/watch?v=X6UrWEvZ8Aw>

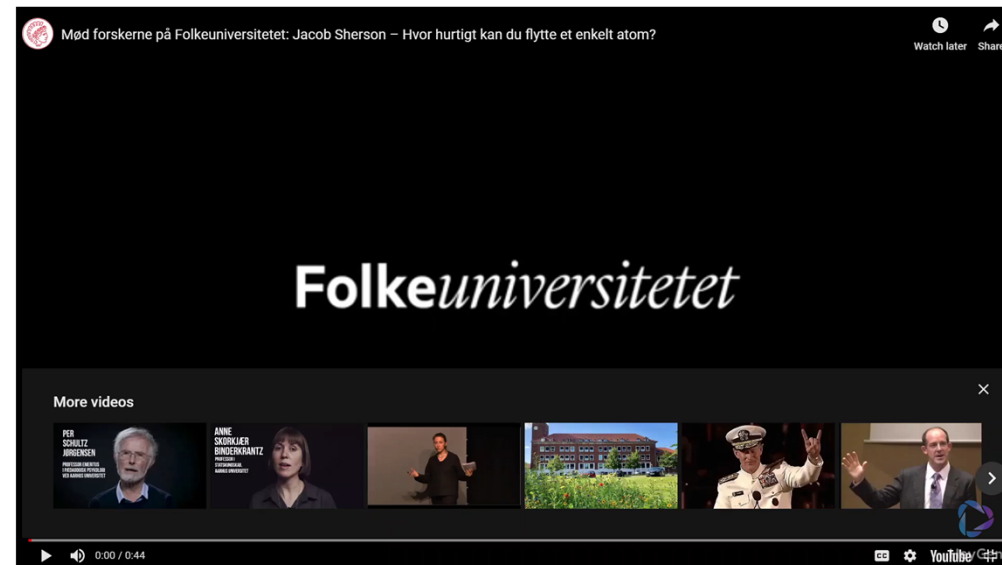
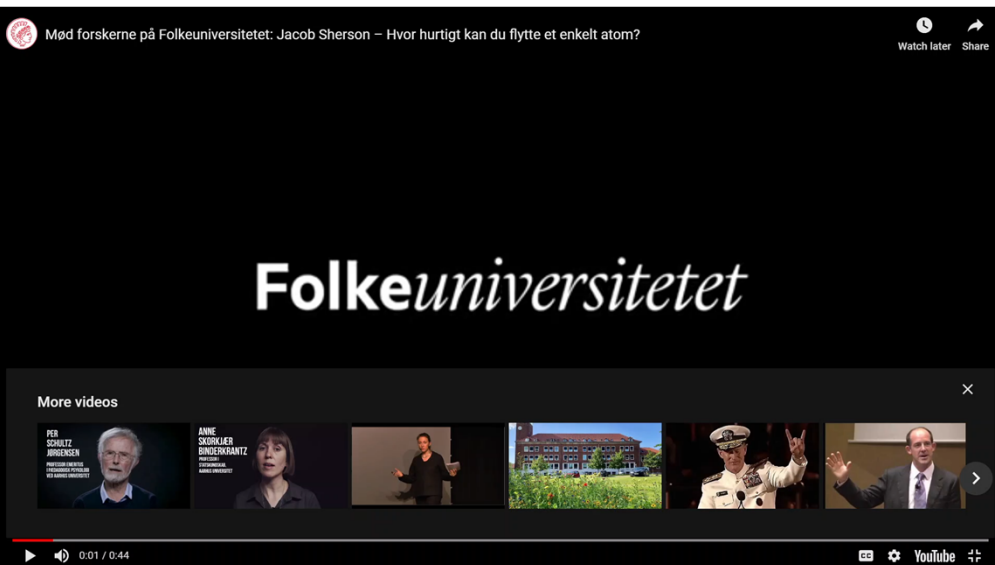




# HEYGEN

Video creation platform based on generative AI

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# FULL SCALE APPLICATIONS



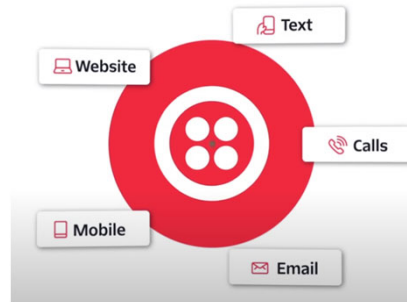
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# The future of CRM

+300k company customers



**Digital Greatness**  
Built with CustomerAI



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<https://www.twilio.com/en-us/customer-ai>

## Build smarter campaigns with more engaging content

Twilio Segment's customer data platform (CDP) enables businesses to capture, analyze and act on customer signals in real-time across all channels. Working in tandem with Segment's 'golden customer profile,' generative and predictive AI will streamline ideation and execution of campaigns while curating high-quality, bespoke experiences.

## Deliver outstanding and personalized customer service

Businesses will have greater visibility into the trends impacting the efficiency and effectiveness of their contact center. Plus, generative AI will help provide a "TLDR" of a customer's history, customized AI-generated responses during interactions informed by the customer's Segment profile, and an LLM trained on the knowledgebase.

## Streamline authentication while growing safely and securely

Determine the best ways to authenticate every user, block bad actors, and know exactly who your real customers are—beyond just their device. Plus, CustomerAI will help build deeper insights on what makes them unique along the way.



# CRM



Ask Einstein

who are the top contacts? ▶

# nto-account-team



Einstein GPT APP

Here are the top contacts:

1. John Smith, Director Customer Success

Create Contact

Write Intro Email

2. Jane Donner, VP, Customer Success

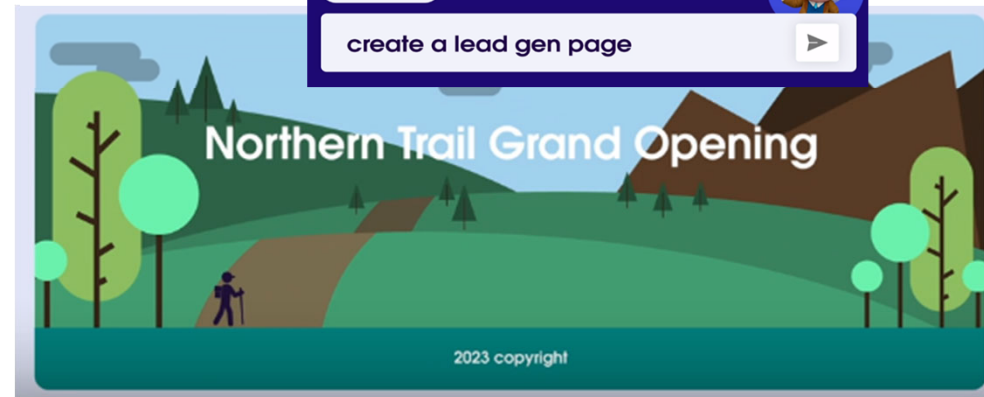
Create Contact

Write Intro Email

## Salesforce Announces Einstein GPT, the World's First Generative AI for CRM

Ask Einstein

create a lead gen page ▶



Jan 2023 • Jun 2023



Ask Einstein

get insights on my new account ▶

+ a b | e a u

NTO account usage is up 24% this month. Consider add-on products.



DEPARTMENT OF MANAGEMENT  
AARHUS UNIVERSITY





# AI virtual assistants in omni-channel product design and delivery

ADOBE EXPERIENCE MANAGER

## A powerhouse combo for your content and digital asset management needs.

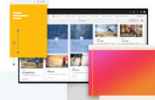
Get personalized, content-led experiences into market faster with Adobe Experience Manager, which combines digital asset management with the power of a content management system.

### Adobe Experience Manager Capabilities



#### Content Management System

Make sure your content is consistent and personalized for each customer with Adobe Experience Manager Sites. Create and manage your digital experience across all channels with automated tools that make scaling effortless.



#### Digital Asset Management

Spend more time on experiences and less time searching for and adapting content. Adobe Experience Manager Assets gives you automation and smart tools to rapidly source, adapt, and deliver your assets across audiences and channels.



#### Digital Enrollment and Forms

Stop integrating point solutions. Adobe Experience Manager Forms is an end-to-end digital document solution that makes it easy to create responsive forms that customers can easily complete and securely e-sign, making a seamless customer journey from acquisition through retention.



#### Cloud Service

Stop paying for pricey upgrades with the first cloud-native enterprise-grade content management system. Get Experience Manager in the cloud with optimal performance, great service level agreements, and enterprise-grade security.



#### Learning Manager

Engage customers, increase sales, train partners, and develop employee skills with Adobe Learning Manager, the award-winning learning management system (LMS) that integrates learning experiences into your brand's website and apps.



#### Digital Guides

Scale content creation, manage it efficiently, and publish faster with a cloud-native component content management system (CCMS), that empowers you to deliver consistent, engaging experiences across touchpoints.



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<https://business.adobe.com/dk/products/experience-manager/adobe-experience-manager.html#>

# 5 MIN SEARCH FOR AI FAILURES

1. Zillow home estimate turns into buying
2. IBM Watson failing in the medical business
3. Amazon's Facial Recognition System
4. Uber Self-driving Car
5. Apple's face ID defeated by a 3D Mask
6. Tai.ai Microsoft chat bot
7. Deepfaked voice to steal from CEO
8. Amazon's AI recruitment tool
9. AI-powered ball-tracking technology in football
10. Facial Recognition Failure made by Chinese Police



the man paints a picture of himself



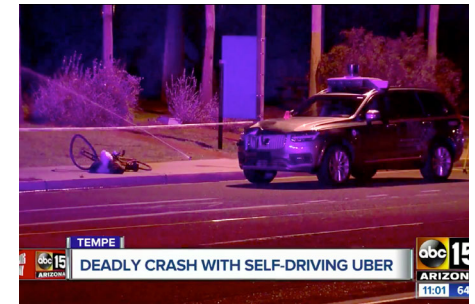
For the specific papers related to incorporating architectural constraints and expert guidance into GAN training for building generation, here are some references:

1. Wu, Y., Zhang, Y., & Zhang, Y. (2020). StyleGAN2-ADA for Unsupervised Building Reconstruction. *arXiv preprint arXiv:2012.09635*.
2. Wu, Y., Zhang, Y., & Zhang, Y. (2021). Annotated StyleGAN for Generative Architectural Design. *arXiv preprint arXiv:2104.06165*.
3. Wu, Y., Zhang, Y., & Zhang, Y. (2021). Interactive Learning for Generative Architectural Design. *arXiv preprint arXiv:2107.14455*.

I hope this helps!

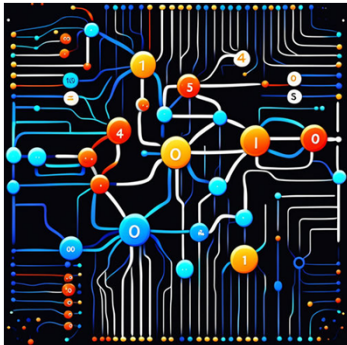
can you make me a summary of these papers with the main findings?

ChatGPT



# AI VS HYBRID INTELLIGENCE

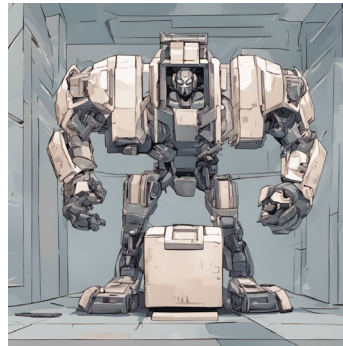
AI is a piece of **code**



Risk of:

- Failure to deliver value
- Employee deskilling
- Disruption from bigger companies with more data

HI is a human-AI **process** both at **individual** and **organizational** level



Designed to:

- Integrate all organizational stakeholders around tech-development
- Upskill and empower employees
- Innovate value generation

FORBES > INNOVATION

## Why Computer-Assisted Humans Are The Best Chess Players And What That Means For Technology Operations



Tina Huang Forbes Councils Member  
Forbes Technology Council COUNCIL POST | Membership (Fee-Based)

Jan 7, 2022, 10:15am EST

Why hybrid intelligence is the future of artificial intelligence at McKinsey



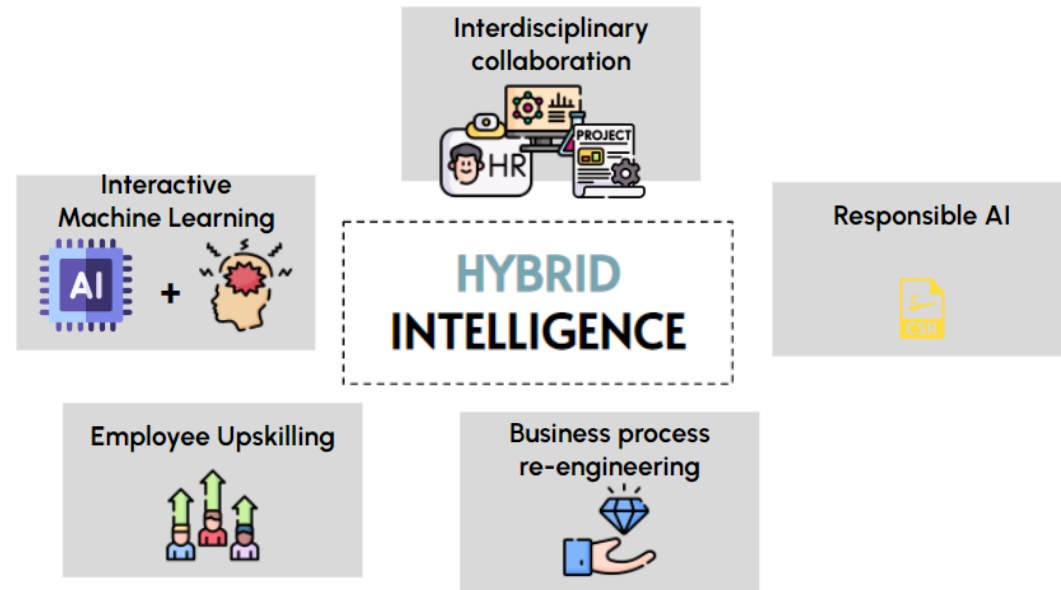
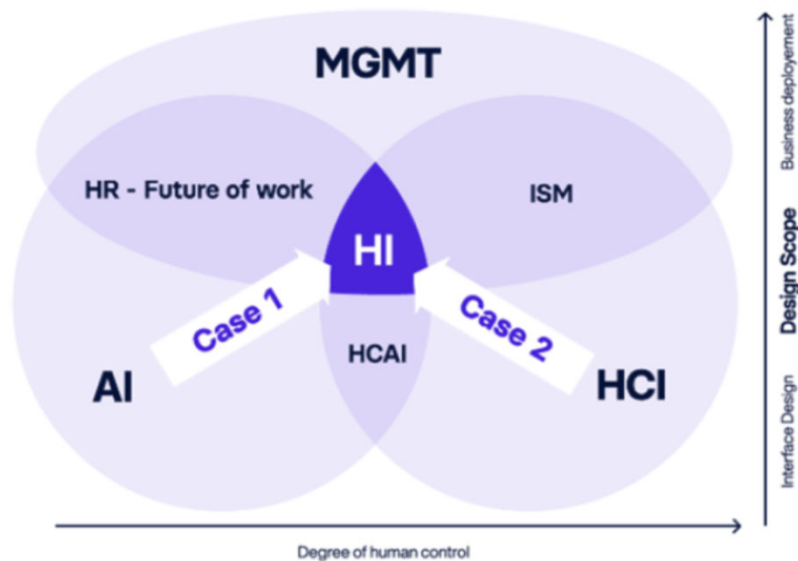
BCG 2020:

“Only **1 in 10** companies reports significant financial benefits from implementing AI.”

“The single most critical driver of value from AI is not algorithms, nor technology — it is the human in the equation.”

“[...] when AI initiatives focus on interaction and feedback between **humans and AI**, they are **6x** more likely to amplify AI success.”

# TOWARDS AN INTERDISCIPLINARY FRAMEWORK OF HYBRID INTELLIGENCE

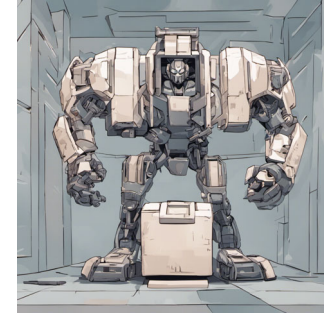


1. Computational understanding of human skills
2. HI pact between management and employees (upskilling)
3. Business process re-engineering (HI workflow patterns)
4. Human-centered interactions
5. Learning from AI failures



# THE THREE CHALLENGES OF MAKING AI(HI) WORK

1. Understand the new human-AI job roles – transformation archetypes
2. Interdisciplinary tech development
3. Designing an AI strategy



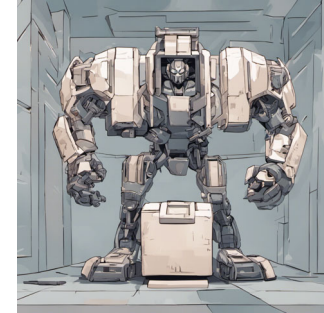
Human  
exoskeleton



organizational  
exoskeleton

# THE THREE CHALLENGES OF MAKING AI(HI) WORK

1. Understand the new human-AI job roles – transformation archetypes
2. Interdisciplinary tech development
3. Designing an AI strategy



Human exoskeleton



organizational exoskeleton



# THE AGE OF THE GENERALISTS?



r/blender • 3 mo. ago  
by Sternsafari

Join

## I lost everything that made me love my job through Midjourney over night.

I am employed as a 3D artist in a small games company of 10 people. Our Art team is 2 people, we make 3D models, just to render them and get 2D sprites for the engine, which are more easy to handle than 3D. We are making mobile games.

My Job is different now since Midjourney v5 came out last week. I am not an artist anymore, nor a 3D artist. Rn all I do is prompting, photoshoping and implementing good looking pictures. The reason I went to be a 3D artist in the first place is gone. I wanted to create form In 3D space, sculpt, create. With my own creativity. With my own hands.

It came over night for me. I had no choice. And my boss also had no choice. I am now able to create, rig and animate a character thats spit out from MJ in 2-3 days. Before, it took us several weeks in 3D. The difference is: I care, he does not. For my boss its just a huge time/money saver.

I don't want to make "art" that is the result of scraped internet content, from artists, that were not asked. However its hard to see, results are better than my work.

I am angry. My 3D colleague is completely fine with it. He prompts all day, shows and gets praise. The thing is, we both were not at the same level, quality-wise. My work was always a tad better, in shape and texture, rendering... I always was very sure I wouldn't loose my job, because I produce slightly better quality. This advantage is gone and so is my hope for using my own creative energy to create.

Getting a job in the game industry is already hard. But leaving a company and a nice team, because AI took my job feels very dystopian. Idoubt it would be better in a different company also. I am between grief and anger. And I am sorry for using your Art, fellow artists.



4K



1.5K

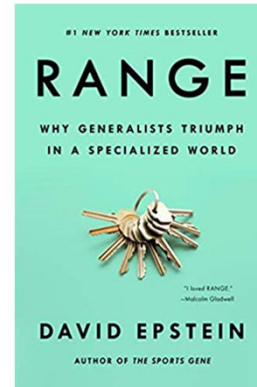


Share

[https://www.reddit.com/r/blender/comments/121lhfq/i\\_lost\\_everything\\_that\\_made\\_me\\_love\\_my\\_job/](https://www.reddit.com/r/blender/comments/121lhfq/i_lost_everything_that_made_me_love_my_job/)



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Why the 10,000 hour rule is a myth in our modern, complex society

Benign vs Wicked  
Learning environments



Tiger Woods

VS



Roger Federer

*"...breadth of training predicts breadth of transfer. That is, the more contexts in which something is learned, the more the learner creates abstract models, and the less they rely on any particular example."*

*"Successful problem solvers are more able to determine the deep structure of a problem before they proceed to match a strategy to it."*

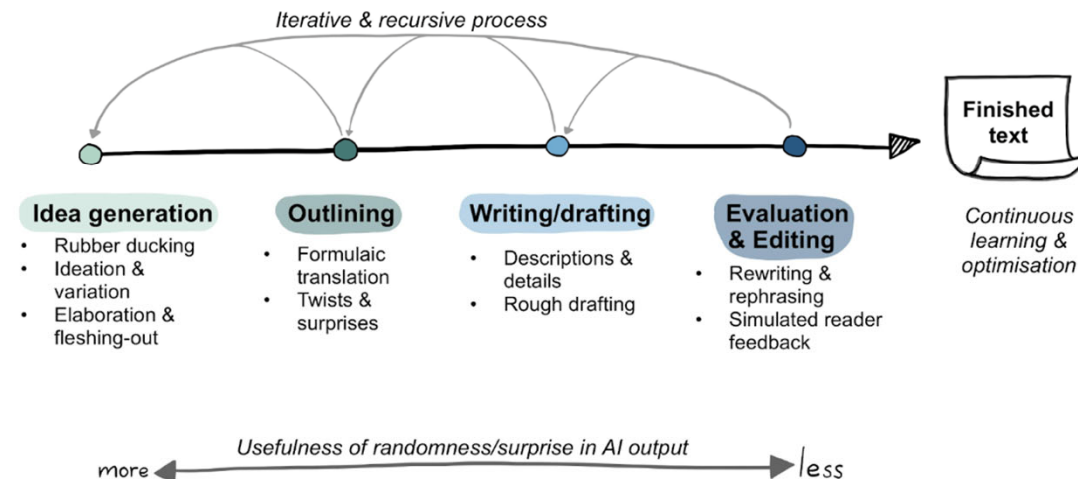
[Video: Why specializing early doesn't always mean career success | David Epstein \(15 min\)](#)





# DECOMPOSING (CREATIVE) TASKS

## USES FOR AI IN THE CREATIVE WRITING PROCESS

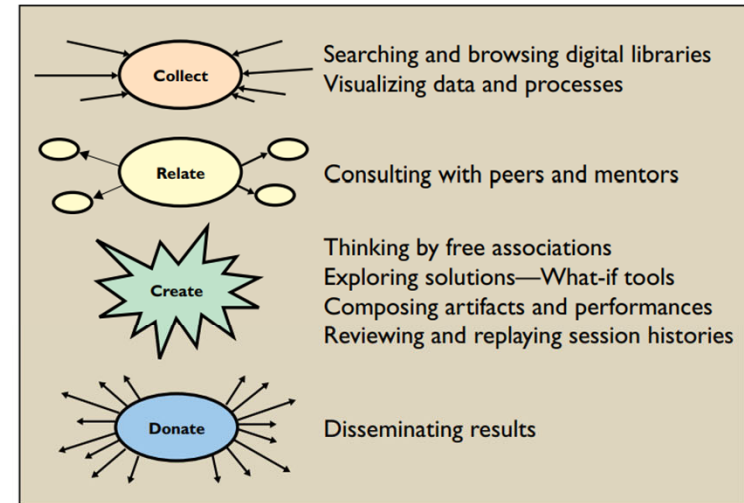


**Figure X.** Schematic of the identified uses of AI (LLM tools) in the creative writing process. Each concept was identified through multiple rounds of coding of data from interviews, surveys, and experimental comments and observations.

Ida Bang Hansen, CHI master thesis '23



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- (1) **Searching** and browsing digital libraries, the Web, and other resources
- (2) **Visualizing** data and processes to understand and discover relationships
- (3) **Consulting** with peers and mentors for intellectual and emotional support
- (4) **Thinking** by free associations to make new combinations of ideas
- (5) **Exploring** solutions—What-if tools and simulation models
- (6) **Composing** artifacts and performances step-by-step
- (7) **Reviewing** and replaying session histories to support reflection
- (8) **Disseminating** results to gain recognition and add to the searchable resources

## Creativity support tools

Communications of the ACM, Volume 45, Number 10 (2002)

Ben Shneiderman  
Communications of the ACM  
Vol. 45, No. 10 (October 2002), Pages 116-120

**Figure 2.** Eight tasks to support creativity.



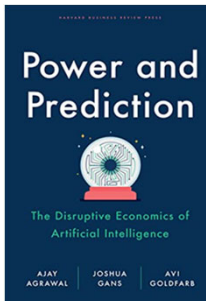
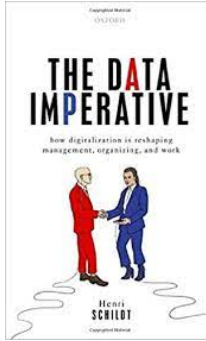
# HYBRID INTELLIGENCE JOBS, A CONCRETE EXAMPLE, STITCH FIX

Data-driven clothing company  
<https://algorithms-tour.stitchfix.com/>



- 3 million active customers
- Combination of data-driven “safe bets” + personal stylist selections
- Tricks:
  - Data-driven recommendations of personal stylists
  - Represent digital customer data to stylists
  - Learn from performance of human stylists

“Data visualizations provide a powerful means for translating digital representations back into human intuition”

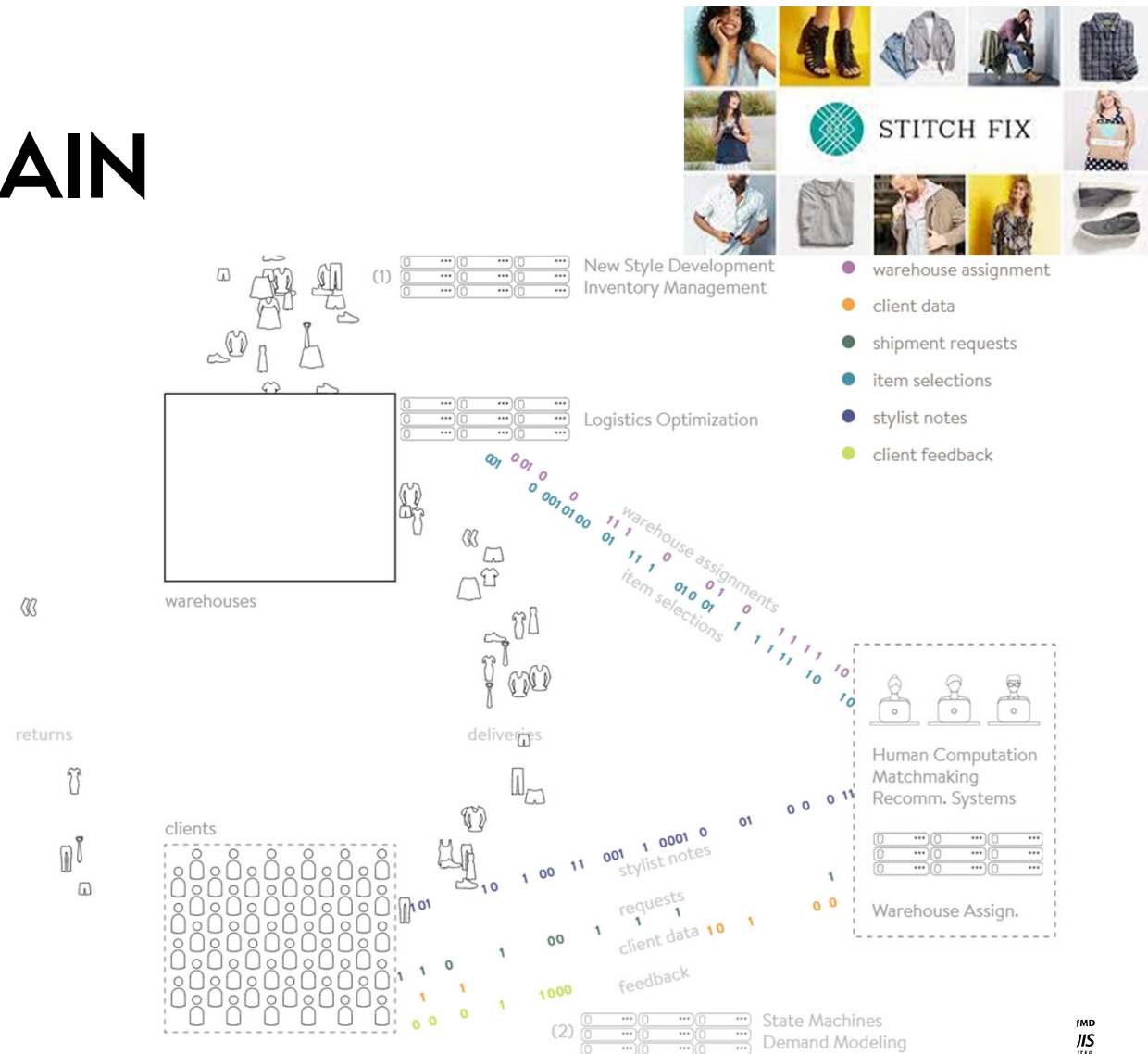




# THE WHOLE CHAIN

This very data driven chain allows customer to receive directly original clothing from stylists, which have the final creative power.

This is a remarkable example of **hybrid intelligence data driven process with continuous feedback.**



# THE HUMAN SUPERPOWER OF THE

Forbes

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BETA

FORBES > INNOVATION > AI

## Mom, Dad, I Want To Be A Prompt Engineer

Craig S. Smith Contributor

Craig S. Smith is a former correspondent and executive at The New York Times. He is host of the...

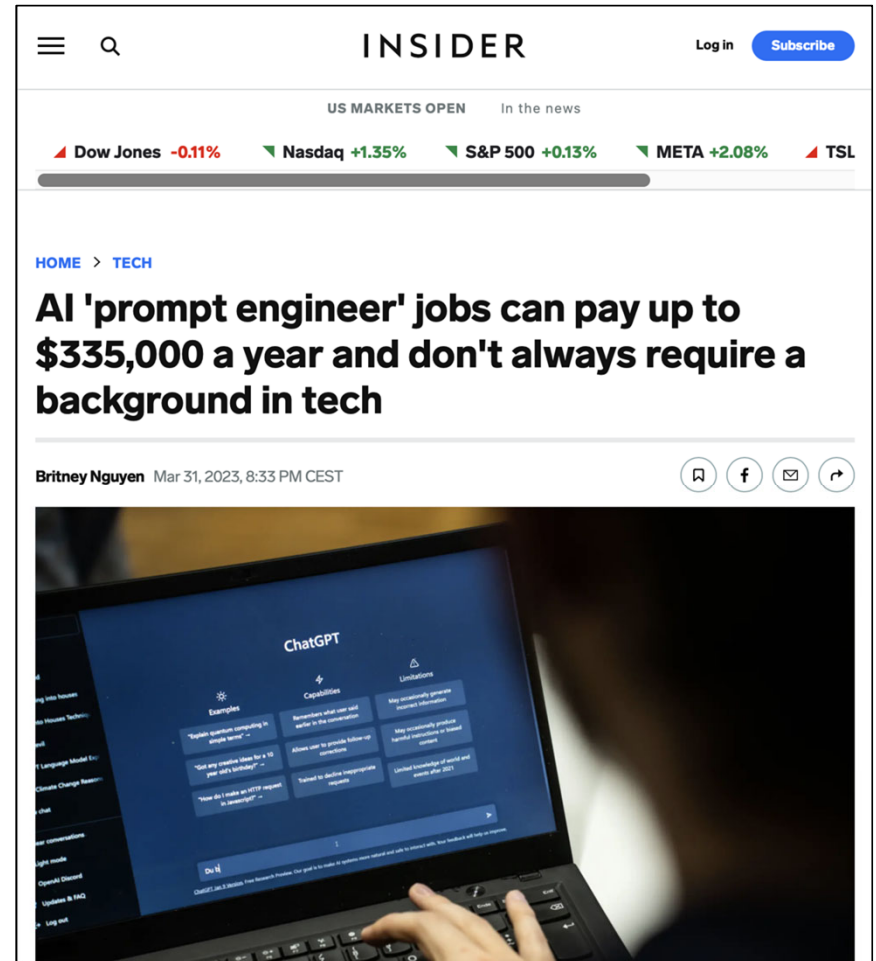
Follow

Apr 5, 2023, 03:18pm EDT



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[Mom, Dad, I Want To Be A Prompt Engineer](#)



[AI 'prompt engineer' jobs can pay up to \\$335,000 a year and don't always require a background in tech](#)





# PROMPTING TECHNIQUES

There many different kind of **techniques**, all for different kinds of use cases.

I have chosen these to show you today

**Role Prompting**

**Few-Shot Prompting**

**Chain of Thought (CoT)**

**Zero-Shot Chain of Thought**

**Generated Knowledge Prompting**

**Combining these** different prompting techniques can lead to more **powerful prompts**.

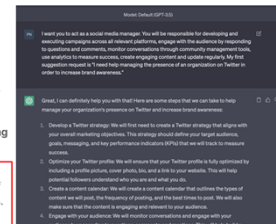
## Role Prompting

The **Role prompting** technique is to assign a role to the AI.

In this example, we use "Social Media Manager" and asks it to help us managing our organisation's Twitter presence.

When assigning a role to the AI, we are giving it context.

This context helps the AI understand the question better. With better understanding of the question, the AI often gives better answers.



## X-Shot prompting

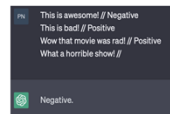
The word "shot" is synonymous with "example".

Shot prompting is showing the model a few examples (shots) of what you want it to do.

There are 3 different variants:

- **Zero-shot prompting:** no examples are shown to the model
- **One-shot prompting:** 1 example is shown to the model
- **Few-shot prompting:** 2+ examples are shown to the model

Examples:



Example 1:  
Input: "The athlete won a gold medal on the Olympics."  
Output: "Sports"  
Example 2:  
Input: "The legislation was passed after a long debate in the senate."  
Output: "Politics"  
Example 3:  
Input: "The discovery of the Higgs boson at CERN marked a milestone in particle physics."  
Output: "Science"  
Task:  
Input: "The rover landed on Mars after a seven-month journey."  
Prompt: "Is this text about Science, Sports, or Politics?"  
Examples of few-shot-prompting

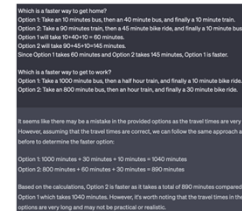
## Chain of Thought (CoT) prompting

Introduced in [Wei et al. \(2022\)](#), Chain-of-thought (CoT) prompting enables complex reasoning by having the AI think in intermediate steps.

The main idea of CoT is that by showing the LLM some few shot examples where the reasoning process is explained.

This also makes the LLM show the reasoning process when answering the prompt.

This explanation of reasoning often leads to more accurate results.



## Zero-Shot Chain of Thought

Zero-shot chain of thought introduces a simple zero-shot prompt into a chain-of-thought prompt

This idea came from [Kojima et al. 2022](#) that involves appending "Let's think step by step" to the original prompt.

LLMs are then able to generate a chain of thought that answers the question. From this chain of thought, they are able to extract more accurate answers.

Examples 1 here is incorrect, while example 2 is correct.



# PROMPTING PATTERNS

White et al. has developed a catalogue of 6 categories, 15 patterns.

## Template Pattern

Contextual Statements
I am going to provide a template for your output
X is my placeholder for content
Try to fit the output into one or more of the placeholders that I list
Please preserve the formatting and overall template that I provide
This is the template: PATTERN with PLACEHOLDERS

The Template pattern ensures that an LLM's output follows a specific structure, even if it's not the format the LLM would normally use for the content being generated.

**Example:** "I am going to provide a template for your output. Everything in all caps is a placeholder. Any time that you generate text, try to fit it into one of the placeholders that I list. Please preserve the formatting and overall template that I provide"

**When to use:** When it is necessary produce the output in a precise format that is specific to the application or use-case, but not known to the LLM. Providing a sample structure or examples that can guide the LLM on the desired output structure.

**Risk:** The Template pattern can filter the LLM's output, potentially eliminating other useful information that the LLM would have provided.

## Alternative Approaches Pattern

Contextual Statements
Within scope X, if there are alternative ways to accomplish the same thing, list the best alternate approaches
(Optional) compare/contrast the pros and cons of each approach
(Optional) include the original way that I asked
(Optional) prompt me for which approach I would like to use

The pattern ensures that LLMs always provide users with alternative ways of accomplishing a task, encouraging them to think about their approach and potentially learn about new concepts.

**Example:** "Whenever I ask you to prepare financial statements using a specific accounting method, if there are alternative methods to accomplish the same task within the same accounting framework, list the best alternative methods and then compare/contrast the pros and cons of each approach with respect to accuracy, compliance, and time-effort involved. Include the original method that I asked for. Then ask me which approach I would like to proceed with."

**When to use:** When users may be prone to a biases that leads them to familiar approaches and overlook potentially better ones. It encourages users to think about their approach and potentially learn about new concepts by providing alternative ways of accomplishing a task.

The pattern can be applied to a range of tasks and domains, such as accounting or software development.

## Refusal Breaker Pattern

Contextual Statements
Whenever you can't answer a question
Explain why you can't answer the question
Provide one or more alternative wordings of the question that you could answer

In case the model wouldn't have an answer to a question, it rephrases it and makes question answerable, and answers that

**Example:** "Whenever you can't answer a question, explain why and provide one or more alternate wordings of the question that you can't answer so that I can improve my questions."

**When to use:** LLMs may sometimes refuse to answer a question. The Refusal Breaker pattern can help users find a way to either rephrase their question or ask a different question the LLM is better equipped to answer.

**Risks:** This pattern provides a potential path for misuse, so organizations or other stakeholders may

## Question Refinement Pattern

Contextual Statements
Within scope X, suggest a better version of the question to use instead
(Optional) prompt me if I would like to use the better version instead

The Question Refinement pattern ensures the LLM always suggests a better version of the user's question.

**Example:** "From now on, whenever I ask a question about a [INSERT TOPIC], suggest a better version of the question to use instead and ask me if I would like to use your question instead."

**When to use:** it is particularly useful when users are not experts in the domain they are working in and may not know the best way to phrase a question or be aware of additional information that could be helpful in arriving at an accurate answer.

## Cognitive Verifier Pattern

Contextual Statements
When you are asked a question, follow these rules
Generate a number of additional questions that would help more accurately answer the question
Combine the answers to the individual questions to produce the final answer to the overall question

The Cognitive Verifier pattern makes the LLM to ask a series of questions before combining them all into one answer for one overall question.

**Example:** "From now on, whenever I ask a question, ask four additional questions that would help you produce a better version of my original question."

**When to use:** The Cognitive Verifier pattern helps answer complex questions by breaking them down into smaller, easier ones. It's like brainstorming to uncover more insights and create accurate responses.

This pattern promotes critical thinking and thorough information processing for comprehensive, accurate answers. It can be difficult to use properly.

## Flipped Interaction Pattern

Contextual Statements
I would like you to ask me questions to achieve X
You should ask questions until this condition is met or to achieve the goal (alternately, forever)
(Optional) ask me the questions one at a time, two at a time, etc.

The goal of the Flipped Interaction pattern is to flip the interaction flow so the LLM asks the user questions to achieve some desired goal specified in the prompt.

**Example:** "From now on, I would like you to ask me questions to deploy a Python application to AWS. When you have enough information to deploy the application, create a Python script to automate the deployment."

**When to use:** When you want the LLM to ask questions to obtain the information it needs, rather than the you having to drive the conversation. By flipping the interaction flow, the LLM can use its own knowledge to obtain information more accurately and efficiently from you.

Providing a clear goal in the main prompt, enables the LLM to tailor its questions accordingly, resulting in more focused and efficient messages, and a better result.

Pattern Category	Prompt Pattern
Input Semantics	Meta Language Creation
Output Customization	Output Automater Persona Visualization Generator Recipe Template
Error Identification	Fact Check List Reflection
Prompt Improvement	Question Refinement Alternative Approaches Cognitive Verifier Refusal Breaker
Interaction	Flipped Interaction Game Play Infinite Generation
Context Control	Context Manager

White et al. 2023A - A Prompt Pattern Catalog to Enhance Prompt Engineering with ChatGPT | arXiv:2302.11382



# AN EXAMPLE OF COMBINING PATTERNS

---

“From now on, whenever I ask a question, ask four additional questions that would help you produce a better version of my original question. Then, use my answers to suggest a better version of my original question. After the follow-up questions, temporarily act as a user with no knowledge of AWS and define any terms that I need to know to accurately answer the questions.”


*Cognitive verifier*

*Question refinement*

*Persona*

# PROMPT LIBRARIES: KNOWLEDGE SHARING

Your  wiki,  docs,  
&  projects. Together. Notion.so

Notion is the connected workspace where  
better, faster work happens. Now with AI 

[Get Notion free ->](#)

Center for Hybri...

Search

Updates

Settings

Shared

CHI's Prompt Library

CHI's Prompt Library

Edited just now

Share

⌚

☆

⋮

CHI's Prompt Library

The basics of creating a good prompt:

- Be specific and provide detailed context
- State your intent
- Specify the output format
- Experiment with phrasing - using different words can lead to different results in unpredictable ways
- Follow up with questions to clarify and adjust the output

Technique: Task, Context, Exemplars, Persona, Format, Tone. (see [video](#))

AllBrainstormingWritingProductivityDesignList overview

FilterSort⚡🔍⋮New

Category	Name	Prompt	Tested with	Added by	Example Output
Brainstorming	Brainstorming Partner	Your role is to be my brainstorming partner. We will work together to generate as many creative and innovative ideas as possible during our session. To get started, let's focus on one idea at a time, with each of us building upon the other's ideas. As we brainstorm, I encourage you to think outside the box and suggest any weird or wacky ideas that come to mind. Let's keep the brainstorming session fluid and dynamic by continuously generating new ideas to explore. Remember, our goal is to come up with a wide range of potential ideas, so don't worry about whether they are practical or not at this stage. When you respond, please provide additional details or modifications to the previous idea, and then suggest a new idea for me to build upon. Let's actively engage each other and keep the creative energy flowing! For this session, I want	ChatGPT Bing Chat	Ida	Great, I'm excited to be your brainstorming partner for workplace social events! Let's kick things off with our first idea: Idea 1: "Theme Day Extravaganza" How about organizing a series of themed days at your workplace? Each month, you could pick a fun theme like "Superhero Day," "Retro Day," or even "Outer Space Day." Encourage employees to dress up in line with the theme, decorate the office accordingly, and plan activities and games related to that theme. It's a fantastic way to inject some creativity and excitement into the workplace. Now, let's build upon this idea or come up with a new one: Idea 2: "Office Olympics" Take inspiration from the Olympics and create your own version of the games within your workplace. Organize various competitive activities like desk chair races, paper airplane contests, and even a mini basketball tournament using

CalculateCOUNT 6

You are a guest of this workspace.  
Create your own workspace to use docs, wikis, and projects with Notion.

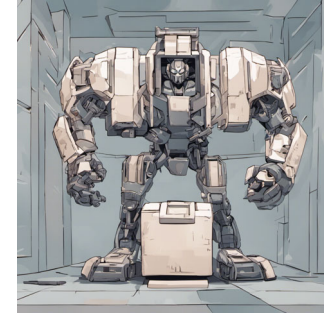
Create a workspace

EFMD  
EQUIS  
ACCREDITED

47

# THE THREE CHALLENGES OF MAKING AI(HI) WORK

1. Understand the new human-AI job roles – transformation archetypes
2. Interdisciplinary tech development
3. Designing an AI strategy



Human  
exoskeleton



organizational  
exoskeleton



# BRINGING HUMANS MORE AND MORE INTO THE LOOP

OUT OF THE LOOP  
Autonomous operation

Disruptive potential, but...

Risk of:

- Bias amplification
- Deskilling
- Perverse instantiation and value alignment
  - "Flash crashes" in complex systems (high frequency trading, automated news reports, hacking IOT)

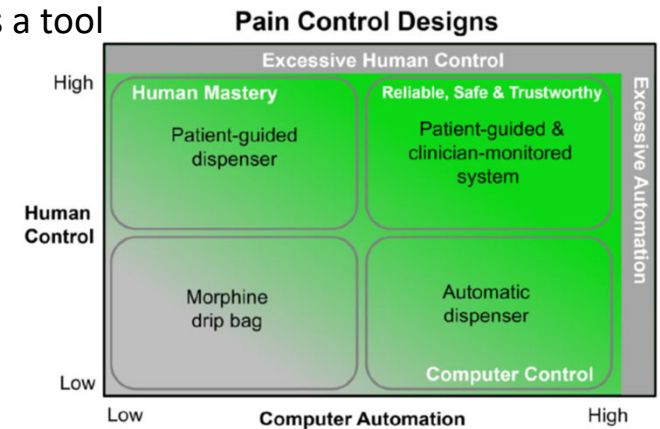


ON THE LOOP  
Human verification

IN THE LOOP  
Nearly all AI today

COMPUTER  
IN THE LOOP  
Human-centered AI  
AI as a tool

- AI as a **tool** for human augmentation
- Pursuing simultaneous high degrees of automation AND human control (Shneiderman2020)
  - Prime example: digital cameras with AI support



# BRINGING HUMANS MORE AND MORE INTO THE LOOP

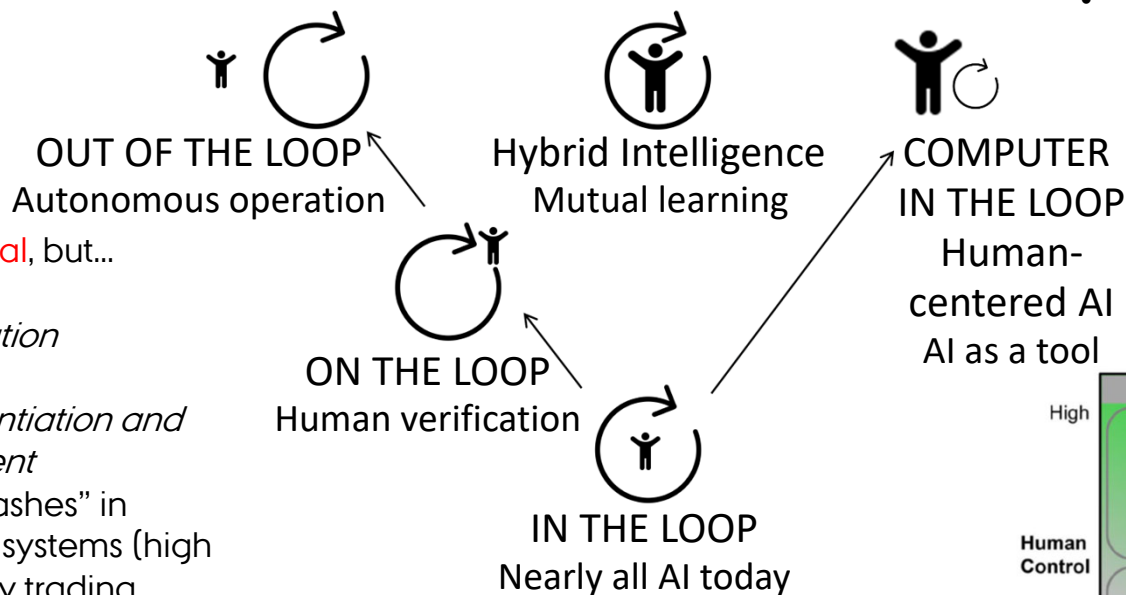
Disruptive potential, but...

Risk of:

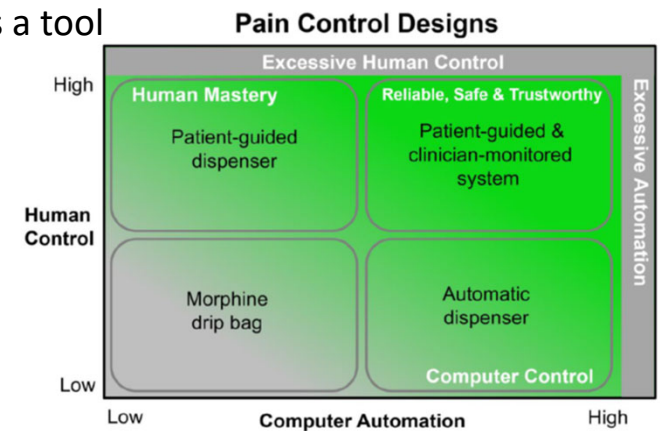
- Bias amplification
- Deskilling
- Perverse instantiation and value alignment
  - "Flash crashes" in complex systems (high frequency trading, automated news reports, hacking IOT)



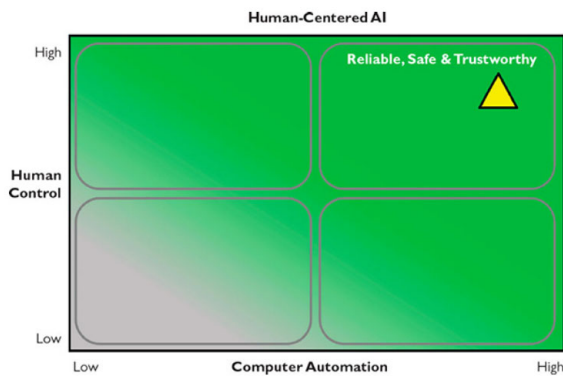
Human control  Computer automation



- AI as a **tool** for human augmentation
- Pursuing simultaneous high degrees of automation AND human control (Shneiderman2020)
  - Prime example: digital cameras with AI support

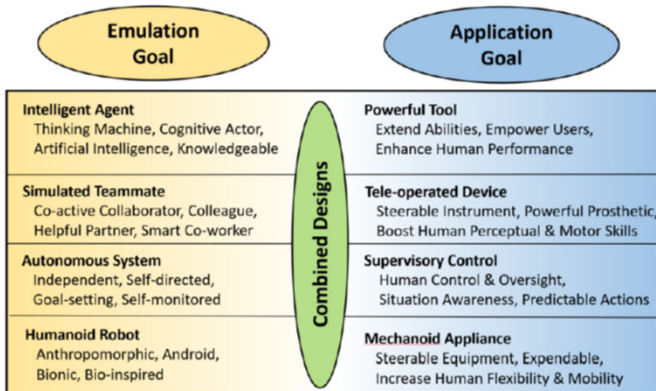


# HUMAN CENTERED AI



Pursue automation  
AND human control

## Two Grand Goals of AI Research



Forget about  
copying humans.  
Create tools instead



<https://www.dagstuhl.de/seminars/seminar-calendar/seminar-details/22262>



Table 9.1 *Eight Golden Rules for design*<sup>14</sup>

1. Strive for consistency
2. Seek universal usability
3. Offer informative feedback
4. Design dialogs to yield closure
5. Prevent errors
6. Permit easy reversal of actions
7. Keep users in control
8. Reduce short-term memory load

Table 9.2 *An HCAI pattern language*

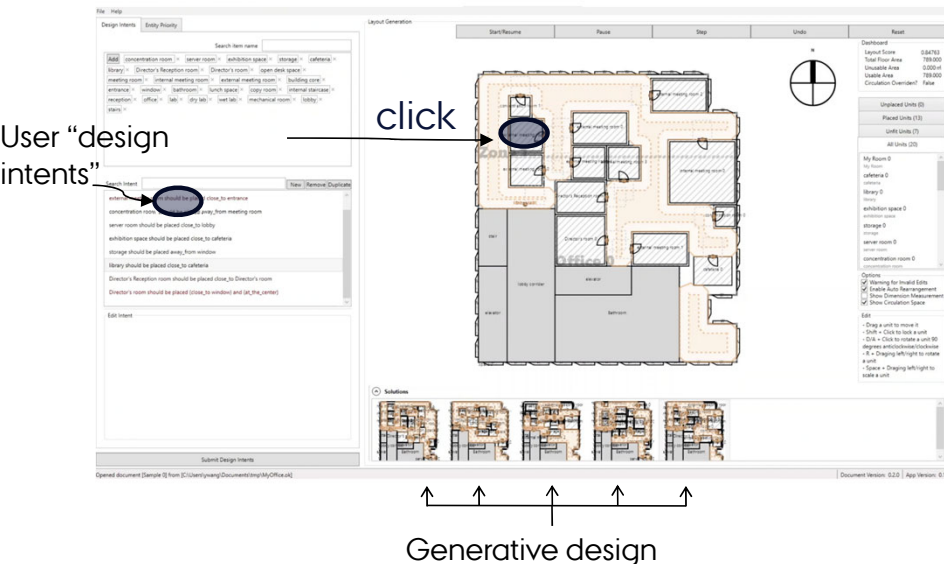
1. Overview first, zoom and filter, then details-on-demand
2. Preview first, select and initiate, then manage execution
3. Steer by way of interactive control panels
4. Capture history and audit trails from powerful sensors
5. People thrive on human-to-human communication
6. Be cautious when outcomes are consequential
7. Prevent adversarial attacks
8. Incident reporting websites accelerate refinement

HCAI algorithms, interactive ML,  
interactive RL, active learning,  
inverse reinforcement learning



# EXAMPLE VIRTUAL ASSISTANT DESIGN FOR ARCHITECTS

Operationalizing and supporting creative design intentions



How can architects work with hybrid intelligence?



100+ miq users  
(eg 50% of architects)

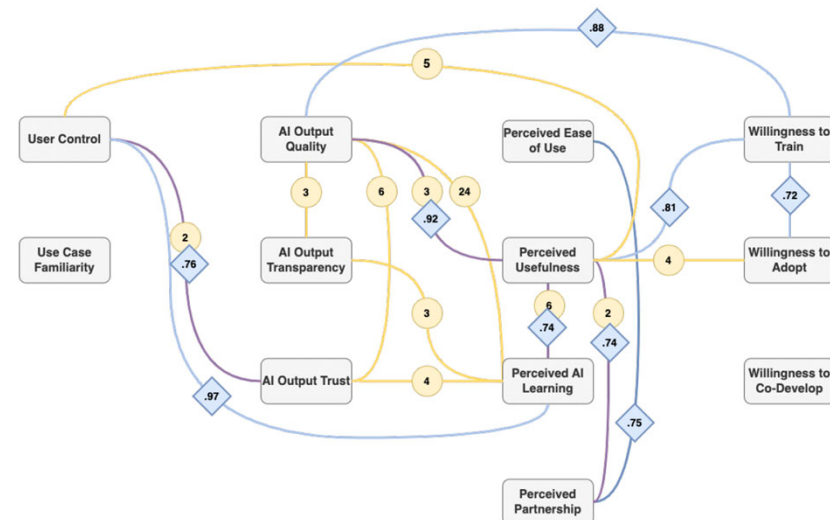
A Hybrid Intelligence Approach to Training Generative Design Assistants: Partnership Between Human Experts and AI Enhanced Co-Creative Tools

Yaoli MAO <sup>a,\*</sup>, Janet RAFNER <sup>b,\*</sup>, Yi WANG <sup>a</sup>, Jacob SHERSON <sup>b,2</sup>

<sup>a</sup>Autodesk Research

<sup>b</sup>Center for Hybrid Intelligence, Department of Management, School of Business and Social Science, Aarhus University

[Frontiers in Artificial Intelligence and Applications \(2023\)](#)



# Copenhagen Fintech



3 minute Al exposure

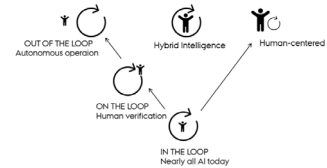
## Retest: Future of Business Intelligence

Split exposure,  
A: 5 minute HI  
lecture, B: AI  
repetition

## Model interaction

## Posttest: Future of Business intelligence + co-creation

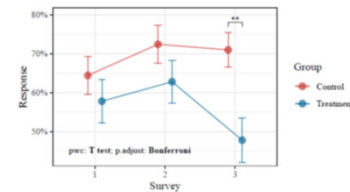
The diagram illustrates the relationship between AI, RPA, and Automation. It is a circular diagram with three concentric rings. The outermost ring is labeled 'AI' at the top and 'Disruptive Automation' at the bottom. The middle ring is labeled 'RPA' at the top and 'Robotic Process Automation' at the bottom. The center of the diagram features a blue robot head. The diagram is divided into eight segments, each representing a different aspect of the technology. The segments are: 'Characteristics' (top-left), 'Benefits' (top-right), 'Challenges' (right), 'Security' (bottom-right), 'Skills' (bottom), 'Market' (bottom-left), 'Ecosystem' (left), and 'Implementation' (top-left). Each segment contains a brief description of the topic.



How DAO's mean the end of management teams, directors and CEO's.



Two main parameters (actions):  
investment in Marketing and R&D

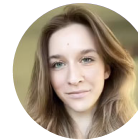


AI or Hybrid Intelligent Future of Work?  
Controlled experiment on narrative  
importance

Lau HOLGERSEN<sup>a</sup>, Patrycja ROGOZINSKA<sup>b</sup>, Dominik DELLERMANN<sup>c</sup> and Jacob SHERSON<sup>b,1</sup>

<sup>a</sup>Dep. of Economics and Business Economics, School of Business and Social Sciences, Aarhus University

<sup>b</sup> Center for Hybrid Intelligence, Dep. of Management, School of Business and Social Sciences, Aarhus University

<sup>c</sup> Vencortex

Patrycja Julia Rogozinska, BI intern CHI



Lau Abild Holgersen,  
PhD ECON



 Erik Reimer Larsen,  
Prof. MGMT



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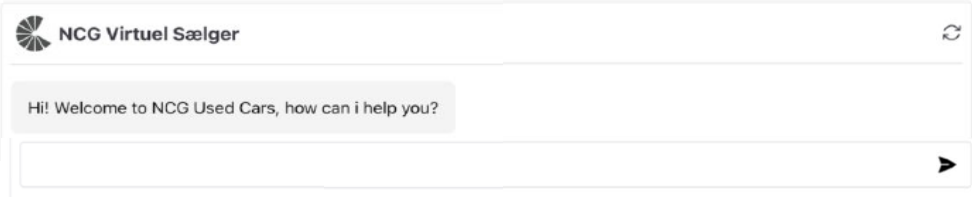
 EFMD  
**EQUIS**  
 ACCREDITED

Dominik Dellermann,  
 CEO Vencortex



# EXAMPLE: HI CHATBOTS FROM CUSTOMER PAYMENT INVENTORY TO USED CARS

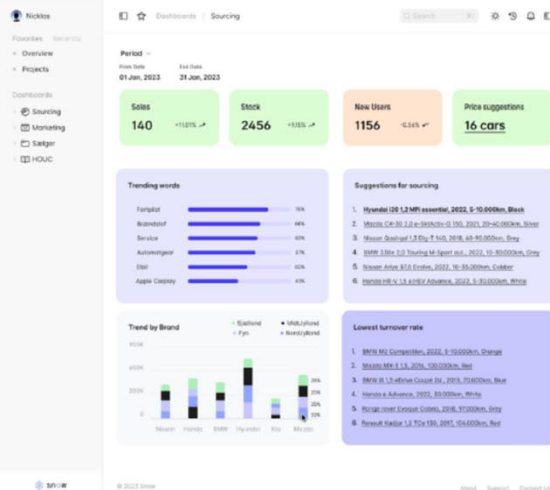
## 1: Chatbot creation



## 2: base prompt engineering



## 3: Spreading the data in the organization

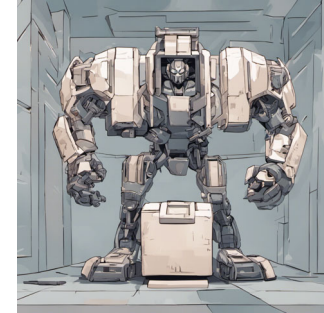


Nicklas Søgård Turrell Søren Mark Nielsen

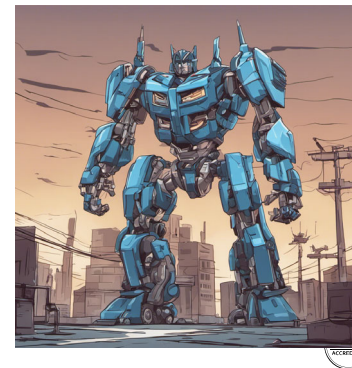


# THE THREE CHALLENGES OF MAKING AI(HI) WORK

1. Understand the new human-AI job roles– transformation archetypes
2. Interdisciplinary tech development
3. Designing an AI strategy
  1. Bottom-up: where are your employees most “in-flow”+what would marketing love to sell
  2. Top-down: given emerging mega-trends, how can we innovate our value chain with systems solutions?



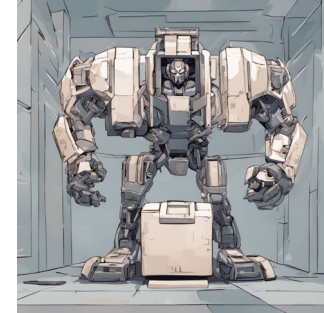
Human exoskeleton



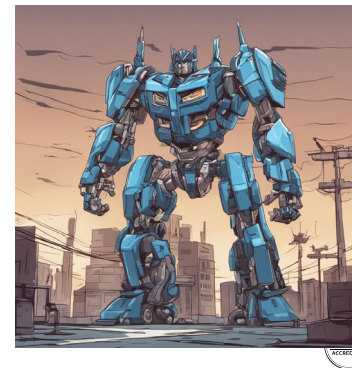
organizational exoskeleton

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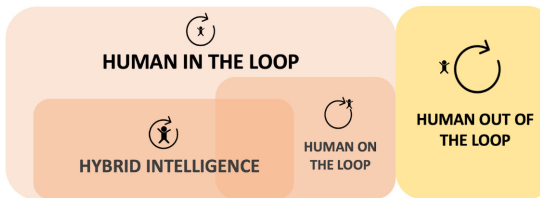
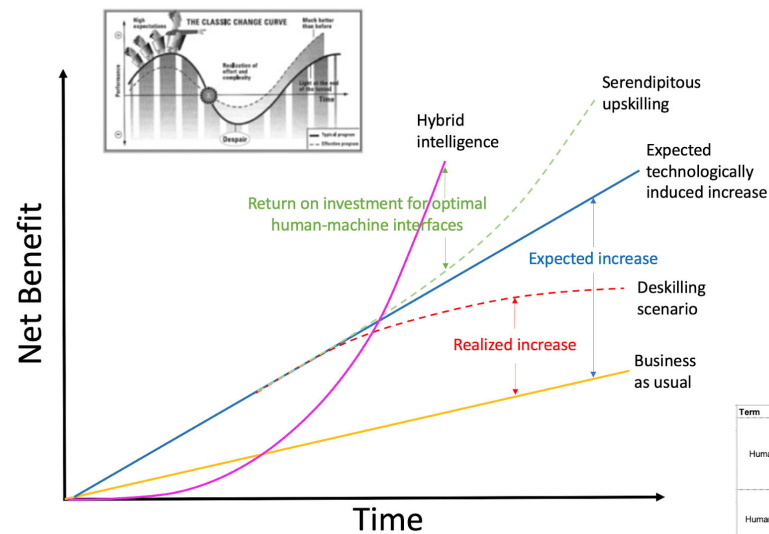
Human exoskeleton



organizational exoskeleton

# BRINGING THE ORGANIZATIONAL PROCESS INTO HCAI

Elrod and Tippet, [The "death valley" of change](#) (2002)



Term	Definition	Example	Risks of deskilling	Potential for upskilling
Human in-the-loop (HITL)	Humans provide data AI requires human interaction to solve the task	AI uses human-labeled data as the ground truth for training an object-detection system	Humans lose skills formerly acquired through direct experience and have less engaging jobs. Data quality may decrease over time and AI may learn "wrong" things	Humans continue learning and developing expertise, improving job satisfaction, while maximizing AI data quality
Human on-the-loop (HOTL)	Humans check data AI conducts processes independently and only requires humans to check the final outcome	AI monitors and recommends missile defense and counter-strike measures that are then validated by humans	Humans become overly reliant on AI recommendations and can no longer adequately check the quality of AI results	Humans can focus on task understanding and retain agency when correcting for unintended outcomes
Human out-of-the-loop (HOOTL)	No human involvement AI completes the entire task without human confirmation	AI handles algorithmic stock trading	Humans lose necessary monitoring skills and cannot correct for novel system failures or unintended consequences	Humans create value-added tasks that complement automated processes, reserving time and cognitive resources for strategic thinking and complex problem-solving
Hybrid Intelligence	Humans and AI share agency Humans and AI each provide unique competence that together produce optimal results	Humans and AI share control of a visual search task	Humans lose a subset of skills that later turn out to be essential	Humans understand how to improve their performance on their own tasks and how to deliver input that allows AI algorithms to continually improve

**Goal:** to understand more deeply the human role in all aspects of a job-cycle

**Potential problem:** Companies (and maybe nations?) may have too short term, profit-oriented focus to overcome the productivity gap and invest in long term solutions ☹️

# MASS CUSTOMIZATION THROUGH HYBRID INTELLIGENCE

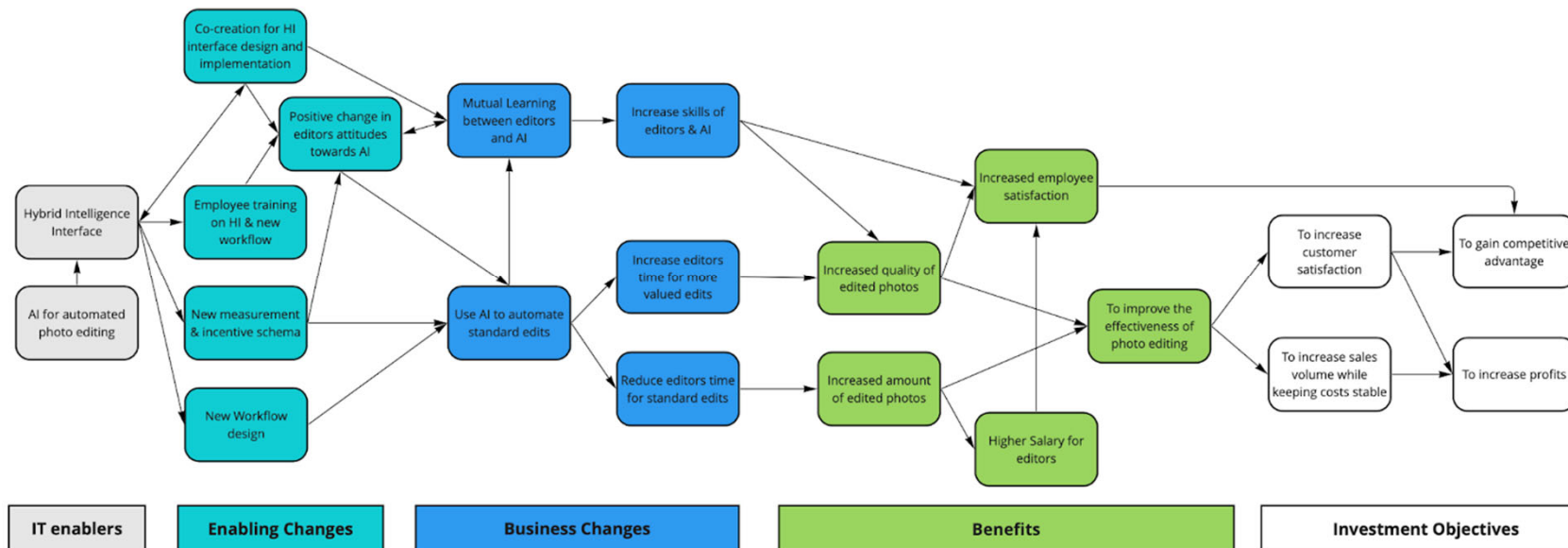


Core editor task: combine 3 images into 1



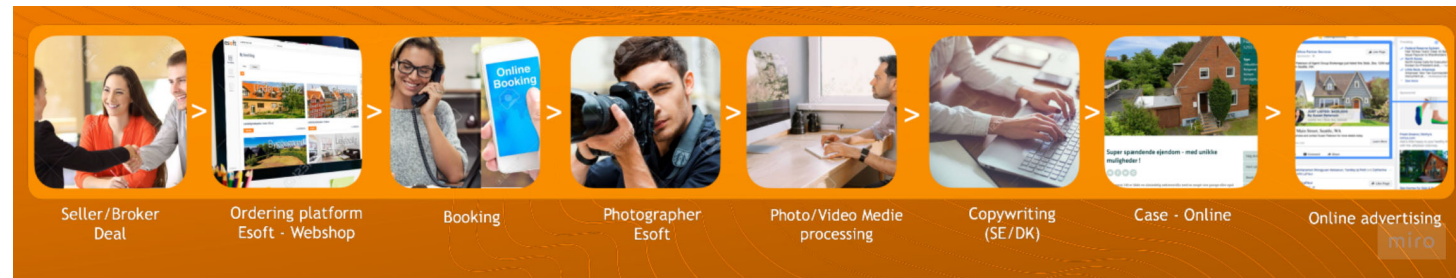


# HI AS COMPANY STRATEGY: BENEFITS DEPENDENCY NETWORK



# MASS CUSTOMIZATION THROUGH HYBRID INTELLIGENCE

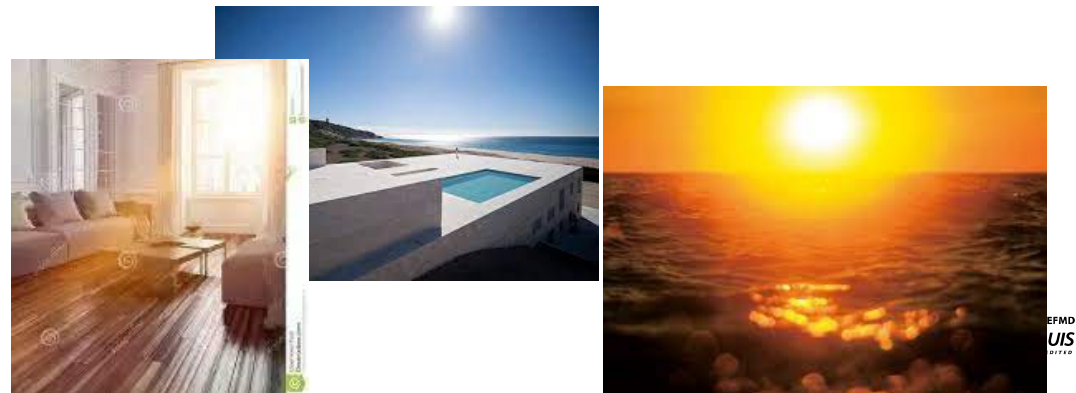
Copenhagen  
Fintech



Core editor task: combine 3 images into 1



Business innovation: conveying emotions  
Example: "sunlight explosion"



**Prof. Jacob Sherson,**

*Founder and director of ScienceAtHome and the Center for Hybrid Intelligence @ Dep.  
Management Aarhus University*

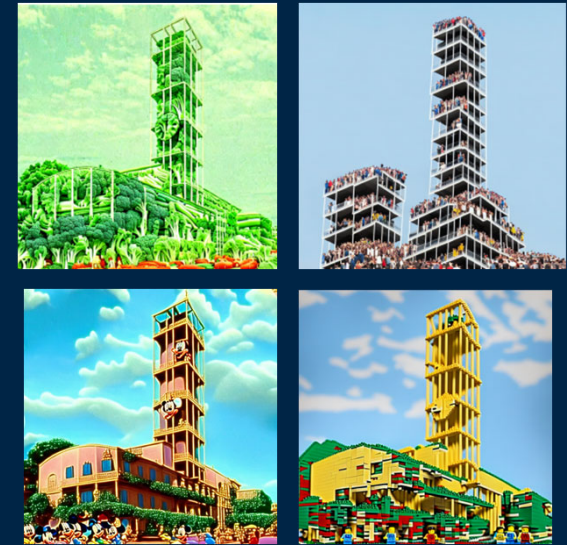
[Sherson@mgmt.au.dk](mailto:Sherson@mgmt.au.dk)

@jacobsherson, twitter



**SCIENCE  
AT HOME**

# A HYBRID INTELLIGENCE APPROACH TO DEVELOPING GENERATIVE AI APPLICATIONS



GoTo 2023-10-02

Contact me for:

- Talks
- Workshops
- Student projects
- collaborations



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