

UNLOCK THE POTENTIAL OF CHATGPT

Using GPT.uio in Research

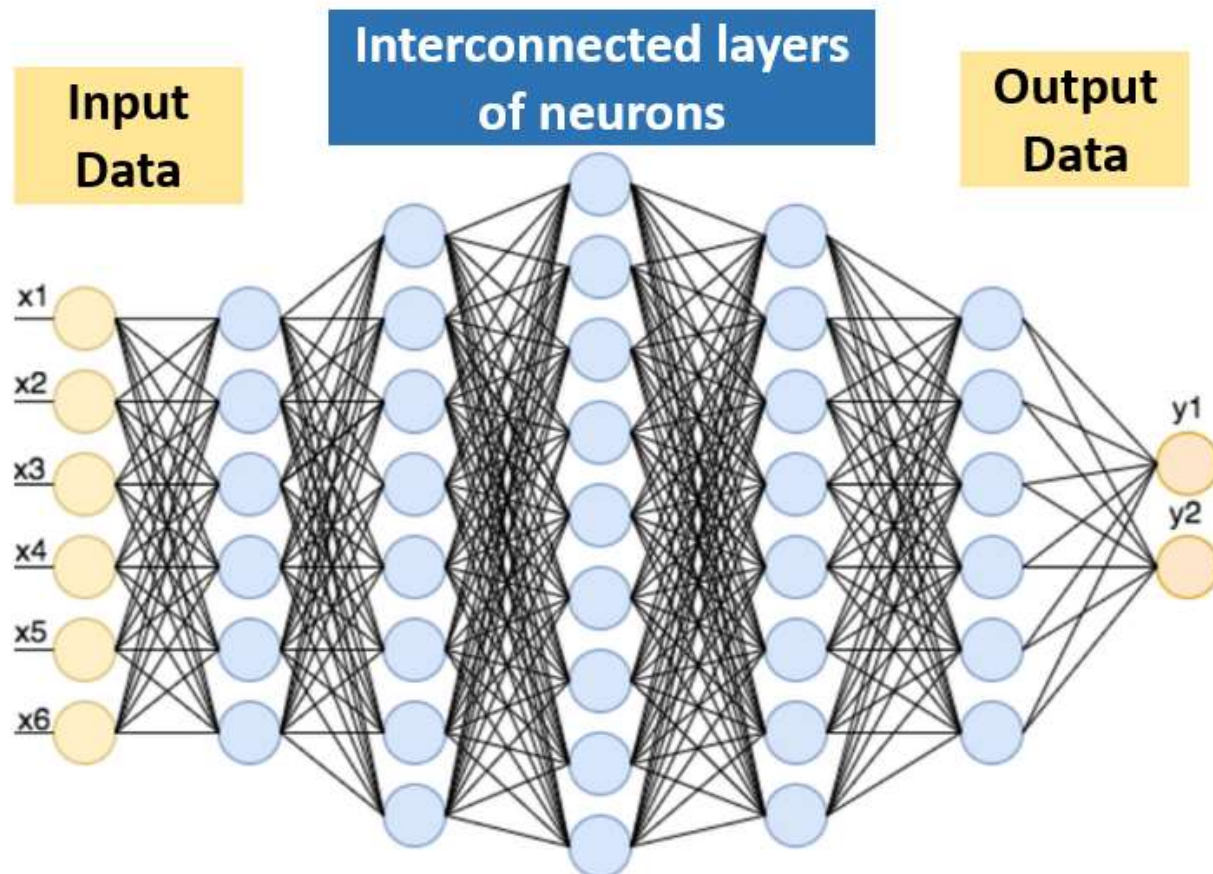
Nikolai Czajkowski



INTRODUCTION



DEEP LEARNING AND NEURAL NETWORKS



<https://medium.com/@fenjiro/chatgpt-gpt-4-how-it-works-10b33fb3f12b>

WHAT IS CHATGPT

- AI based on a (deep) neural network developed by OpenAI.
- GPT-3.5 has 175 billion parameters, GPT-4 has...1.76 trillion?
- The training material for ChatGPT includes text from books, articles, code, and other sources.
- GPT is a sequence-to-sequence model, trained to predict the next word in a list of words.
 - Consequently, it learns Language, context, programming.
- The memory limit of GPT-4 is 32,768 "tokens".
 - Gemini 1.5 handles up to 1 million tokens
 - The Harry Potter series has 1,084,170 words.
- *ChatGPT* is also trained with human reinforcement learning to be more engaging in its responses.

GPT.UIO

- GPT UiO – UiOs privacy friendly GPT chat
 - <https://gpt.uio.no/>

RESEARCH

1. Choice of Topic
2. Literature Review
3. Formulation of Research Question
4. Choice of Research Design
5. Data Collection
6. Data Analysis
7. Interpretation of Results
8. Writing and Publishing
9. Peer Review
10. Dissemination

GENERAL THOUGHTS ON PROMPTING LLM'S

- Interacting with LLMs is a very unfamiliar way of using computers.
- Avoid using ChatGPT as a traditional search engine.
- Specify who you are, the desired format, tone, and purpose. Use directives like "act as".
- You can achieve 80% of the desired result in a matter of minutes, then iterate.
- Improve responses by providing clear examples of the type of answer you want.
- Ask ChatGPT for suggestions to refine your prompts.

BASIC PROMPTING

<https://chatgpt.com/share/323d0962-1da4-4f93-8401-dbbd99d3e07c>

EXAMPLE 1: BRAINSTORMING

<https://chatgpt.com/share/63eefc94-d137-406c-9ace-aa72a2e6f40e>

- GPT can speak
- GPT4o-voice
 - Hoodie: https://youtu.be/vgYi3Wr7v_g

EXAMPLE 2: USING GPT IN ACADEMIC WRITING



<https://chat.openai.com/share/35caa909-6f8a-4fc9-9661-fe723b989706>

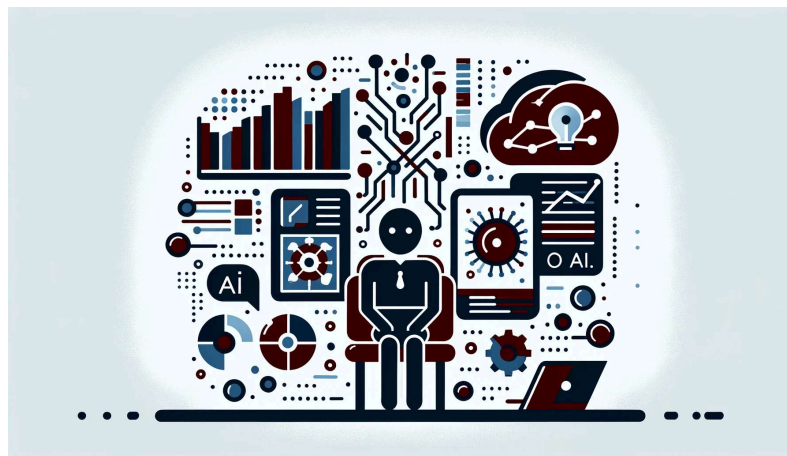
- Litteraturgjennomgang; Utdrag og oppsummering av informasjon fra artikler.
- Diskusjon av innholdet i en spesifikk artikkel.

GPT IS MULTIMODAL

The image inspired by the scientific study you described has been created. It visually represents the connection between caffeine consumption and personality traits, incorporating elements like DNA strands, coffee beans, cups of coffee, symbols for the Big Five personality traits, and PD traits, along with subtle hints to the twin study and the Norwegian study context.



EXAMPLE 3: GPT AND DATA ANALYSIS



<https://chatgpt.com/share/6ec1456f-4f50-4ab6-8aac-c9b55061d789>

Run R in the browser

- <https://rdr.io/snippets/>

EXAMPLE 4: GPT, TEACHING AND PRESENTATIONS

- Brainstorming course and lecture plans.
- Draft and improve lecture slides for target audience.
- Make exercises and interactive tutorials based on previous examples.
- Make exams, score, and generate exam solutions.
- Make quizzes and individualized practice exercises.
- Clean and comment code.

Scheduling

- <https://chat.openai.com/share/5f94578f-770c-4b1e-9674-62ebd86e45b9>

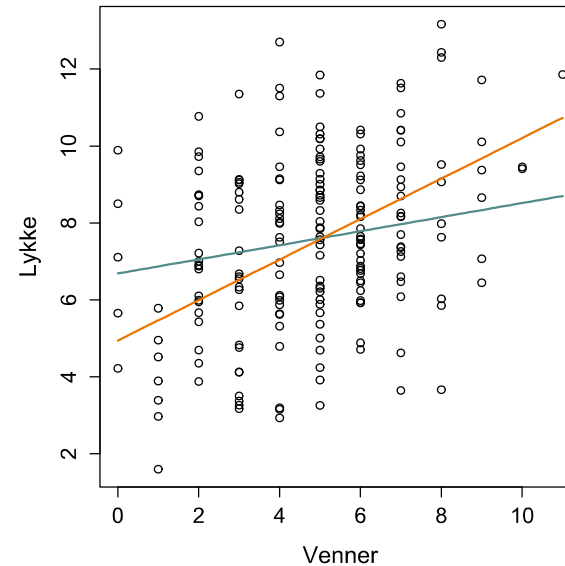
Translating

- <https://chatgpt.com/share/e0e2eb75-2f1a-47e5-b9c8-1c5cc088652d>

MODELLERING AV INTERAKSJON I R

```
M4 <- lm(Lykke~Venner+Mann+Venner:Mann, data=dt)
summary(M4)
```

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.94162    0.52011   9.501 < 2e-16 ***
## Venner       0.52648    0.09633   5.465 1.39e-07 ***
## Mann        1.74562    0.72678   2.402  0.0172 *
## Venner:Mann -0.34342    0.13842  -2.481  0.0139 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.12 on 196 degrees of freedom
## Multiple R-squared:  0.1451,    Adjusted R-squared:  0.132
## F-statistic: 11.09 on 3 and 196 DF,  p-value: 9.373e-07
```



$$Lykke = b_0 + b_1 \cdot Venner_i + b_2 \cdot Mann_i + b_3 \cdot Venner_i \cdot Mann_i$$

$$Lykke_k = 4.94 + 0.53 \cdot Venner_i$$

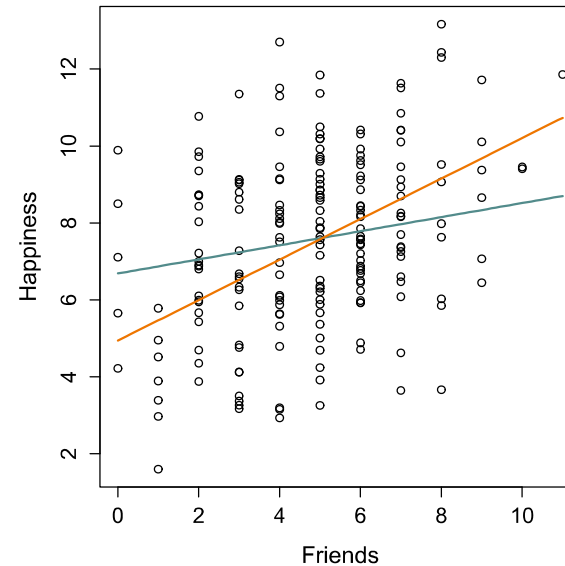
$$Lykke_m = 4.94 + 0.53 \cdot Venner_i + 1.75 \cdot 1 + (-0.34) \cdot Venner_i \cdot 1$$

$$Lykke_m = (4.94 + 1.75) + (0.53 - 0.34) \cdot Venner_i$$

MODELING INTERACTION IN R

```
M4 <- lm(Happiness~Friends+Man+Friends:Man, data=dt)
summary(M4)
```

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.94162    0.52011   9.501 < 2e-16 ***
## Friends      0.52648    0.09633   5.465 1.39e-07 ***
## Man          1.74562    0.72678   2.402  0.0172 *
## Friends:Man  -0.34342    0.13842  -2.481  0.0139 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.12 on 196 degrees of freedom
## Multiple R-squared:  0.1451,    Adjusted R-squared:  0.132
## F-statistic: 11.09 on 3 and 196 DF,  p-value: 9.373e-07
```



$$Happiness = b_0 + b_1 \cdot Friends_i + b_2 \cdot Man_i + b_3 \cdot Friends_i \cdot Man_i$$

$$Happiness_k = 4.94 + 0.53 \cdot Friends_i$$

$$Happiness_m = 4.94 + 0.53 \cdot Friends_i + 1.75 \cdot 1 + (-0.34) \cdot Friends_i \cdot 1$$

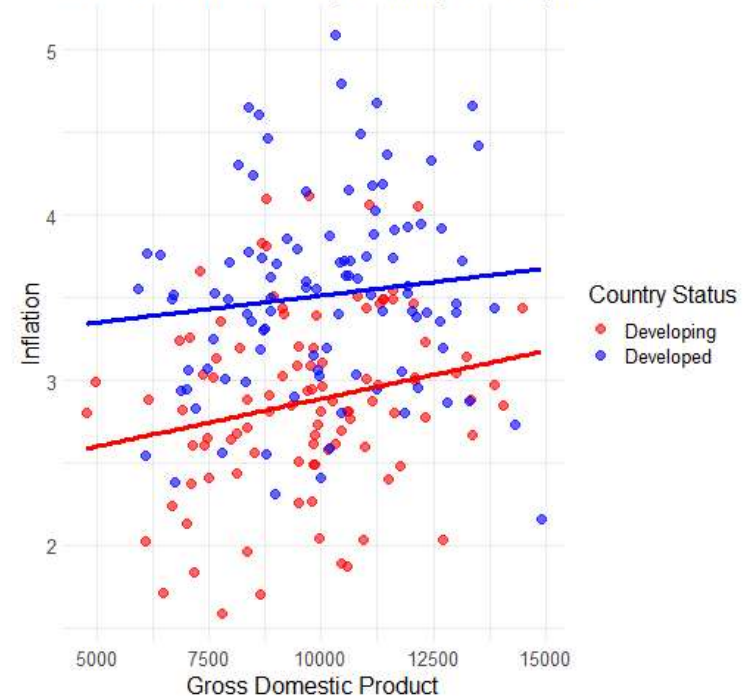
$$Happiness_m = (4.94 + 1.75) + (0.53 - 0.34) \cdot Friends_i$$

MODELING INTERACTION IN R

```
M4 <- lm(Inflation ~ GDP + Developed + GDP:Developed, data = data)
summary(M4)
```

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.309e+00  2.760e-01  8.365 1.11e-14 ***
## GDP          5.797e-05  2.792e-05  2.076  0.0392 *
## Developed    8.770e-01  3.949e-01  2.221  0.0275 *
## GDP:Developed -2.523e-05  3.917e-05  -0.644  0.5202
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5643 on 196 degrees of freedom
## Multiple R-squared:  0.2665,    Adjusted R-squared:  0.2553
## F-statistic: 23.74 on 3 and 196 DF,  p-value: 3.775e-13
```

GDP's Effect on Inflation by Country Development



$$\text{Inflation} = b_0 + b_1 \cdot \text{GDP}_i + b_2 \cdot \text{Developed}_i + b_3 \cdot \text{GDP}_i \cdot \text{Developed}_i$$

$$\text{Inflation}_{\text{devng}} = 2.309 + 5.797 \times 10^{-5} \cdot \text{GDP}_i$$

$$\text{Inflation}_{\text{dev}} = 2.309 + 5.797 \times 10^{-5} \cdot \text{GDP}_i + 0.877 \cdot 1 + (-2.523 \times 10^{-5}) \cdot \text{GDP}_i \cdot 1$$

$$\text{Inflation}_{\text{dev}} = (2.309 + 0.877) + (5.797 \times 10^{-5} - 2.523 \times 10^{-5}) \cdot \text{GDP}_i$$

EXAMPLE 5: RESEARCH ADMINISTRATION

- <https://chatgpt.com/share/5d5f25a9-5526-4d79-bc69-183bc6fd2fb3>

SOME (CURRENT) LIMITATIONS OF GPT.UIO

- Does not support advanced data analysis
- Cannot process documents (e.g., PDFs)
- Lacks internet access
- Has a limited context window (when not using API)
- Does not generate images
- Lacks a voice interface

HOW CHATGPT HAS CHANGED MY WORKDAY

Many advantages

- Spectacularly more efficient than Google searches
- More time for higher-level tasks
- Not limited to a specific language, platform, or library (16k packages on CRAN)
- Very easy to create websites, apps, or programs
- Always a willing discussion partner

Some new challenges

- Takes time to adapt to a new way of interacting with computers (Unstructured, approximate, incomplete specifications)
- Not always obvious where it can assist, or how
- Many skills suddenly become irrelevant

KEY CONSIDERATIONS WHEN USING AI/LLM'S IN ACADEMIA

The use of GPT introduces new challenges in research

- Hallucinations
 - Plagiarism
 - Biases
 - Privacy concerns
 - Lack of understanding
 - Reproducibility
 - AI dependency
-
- Pollution of literature
 - Unintended democratization of research?
 - Copyright issues and use without consent
 - Closed systems

IS THIS JUST THE START?



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



AI TOOLS FOR RESEARCH

Litterature search

- Perplexity: <https://www.perplexity.ai/>

Summarization:

- Scisummary: <https://scisummary.com/>

Academic writing:

- Curie: <https://www.aje.com/curie/>

Reading academic papers aloud

- Listening: <https://www.listening.com/>

CONCLUSION

Genuine support for research

- ChatGPT 4.0 has changed my everyday work as a researcher, so far only positively.

Must we embrace AI?

- I doubt that one can remain competitive without embracing AI.

In the long run, I see *many* challenges

- Can we keep up with the development? What will my contribution be in 10 years?

APPENDIX

IS THIS JUST THE START?



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

GPT-4 IS MULTIMODAL

Example of GPT-4 visual input:

User What is funny about this image? Describe it panel by panel.



Source: <https://www.reddit.com/r/hmmm/comments/ubab5v/hmmm/>

GPT-4 The image shows a package for a "Lightning Cable" adapter with three panels.

Panel 1: A smartphone with a VGA connector (a large, blue, 15-pin connector typically used for computer monitors) plugged into its charging port.

Panel 2: The package for the "Lightning Cable" adapter with a picture of a VGA connector on it.

Panel 3: A close-up of the VGA connector with a small Lightning connector (used for charging iPhones and other Apple devices) at the end.

The humor in this image comes from the absurdity of plugging a large, outdated VGA connector into a small, modern smartphone charging port.

Table 3. Example prompt demonstrating GPT-4's visual input capability. The prompt consists of a

GPT-4 IS MULTIMODAL (2)

GPT-4 visual input example, Chicken Nugget Map:

User Can you explain this meme?

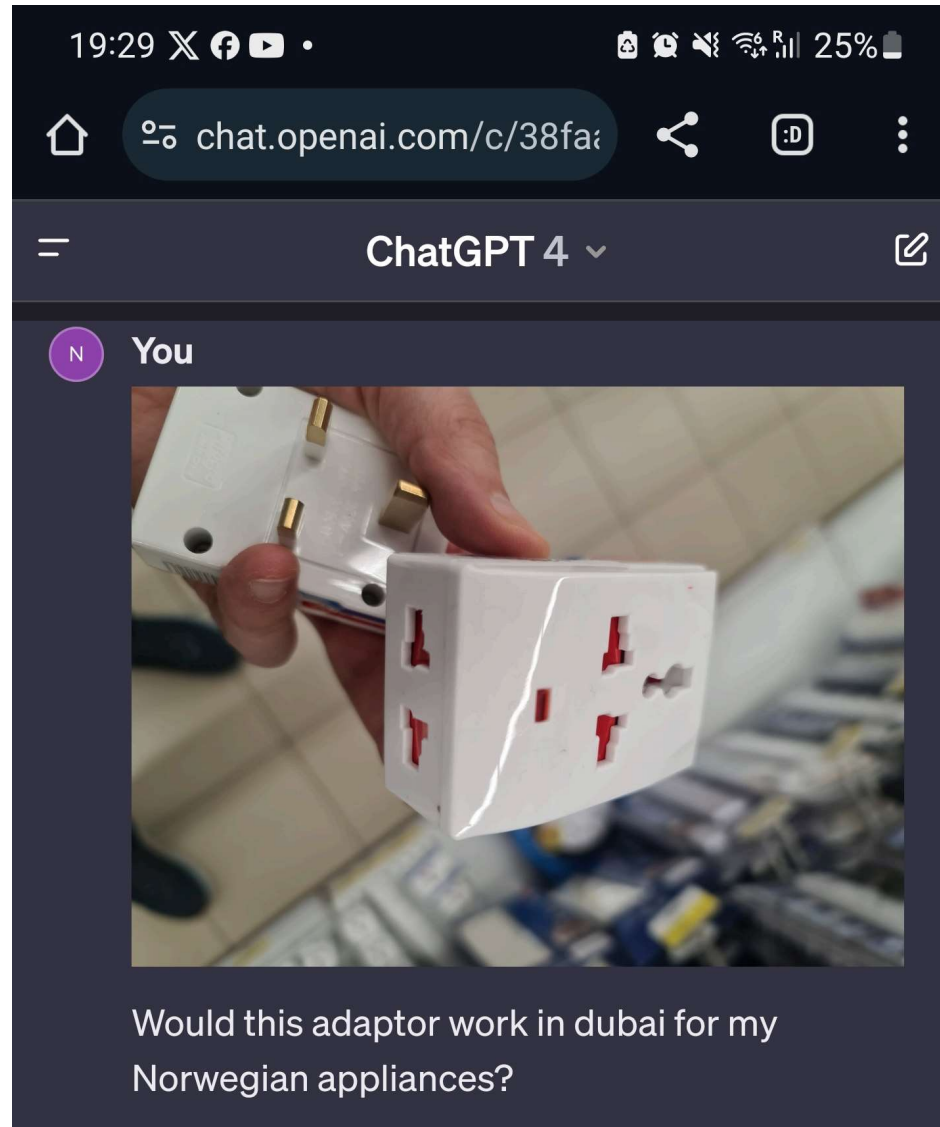
Sometimes I just look at pictures of the earth from space and I marvel at how beautiful it all is.



GPT-4 This meme is a joke that combines two unrelated things: pictures of the earth from space and chicken nuggets. The text of the meme suggests that the image below is a beautiful picture of the earth from space. However, the image is actually of chicken nuggets arranged to vaguely resemble a map of the world. The humor in this meme comes from the unexpected juxtaposition of the text and the image. The text sets up an expectation of a majestic image of the earth, but the image is actually something mundane and silly.

Table 18: Example prompt demonstrating GPT-4's visual input capability.

ADAPTER



VOICE

New GPT4o voice models

- Hoodie: https://youtu.be/vgYi3Wr7v_g
- Maths tutoring: <https://vimeo.com/945587328>
- Dramatic voice:
<https://www.tiktok.com/@geekynews/video/7368683796104858922>

MUSIC

Udio:

- <https://www.udio.com/songs/9WQTuYr6PmxBseREQd1pCf>

Soul of the Machine; "A Delta blues song about a sad A.I."

- <https://soundcloud.com/rs-539916550/soul-of-the-machine>

Johnny Cash sings Barie girl:

- <https://www.whiskeyriff.com/2023/07/15/ai-johnny-cash-singing-barbie-girl-is-horrifying-and-catchy/>

TOKYO

TEXT TO VIDEO

- Will smith eating pasta
 - <https://www.youtube.com/watch?v=XQr4Xklqzw8>
- Sora [<https://openai.com/sora>]
 - Man: <https://www.youtube.com/watch?v=BuQ1liGtxMQ>
 - Crab: <https://www.youtube.com/watch?v=v6QQPWVThsE>
 - Drone: <https://www.youtube.com/watch?v=vA4n5yNiTPs>
- Mona lisa rapping: <https://www.youtube.com/watch?v=96VuzKCxtZg>