INVEI retreat på Sommarøya
Prompting



Reasoning in large language models

Reasoning in large language models (LLMs) refers to their ability to process information, draw logical inferences, and generate coherent responses based on patterns learned from vast amounts of text.

The chain of thought in a reasoning LLM follows a step-by-step process where it breaks down a problem into smaller logical steps, recalls relevant patterns from training data, applies probabilistic reasoning to infer connections, and generates a structured response based on contextual cues.

While LLMs can mimic human-like reasoning—such as deductive, inductive, and abductive reasoning—they primarily rely on probabilistic associations rather than true understanding or conscious thought.

Non-reasoning LLMs (GPT 4o) are faster and efficient for tasks involving retrieval, language generation, and simple classification.

Reasoning LLMs (o1 and o3) significantly outperform in math, logic, coding, multi-hop reasoning, and problem-solving because they use structured reasoning techniques.

What is prompt engineering?

Prompt engineering involves making specific and effective instructions or queries to provoke accurate and relevant responses from large language models.

It is the skill of formulating prompts in a way that maximizes the utility of language models for academic writing tasks.

good prompting skills = good leadership skills

Quick cheat-sheet for novices

1. **Role** – Tell the model who it is (“Act as UiT’s expert in …”)
2. **Audience & purpose** – Who will read it, why.
3. **Key facts** – Dates, numbers, names.
4. **Tone & length** – Friendly? Formal? Word limit?
5. **Output format** – Email, table, checklist, bullets, etc.

Bad prompt

“Create a rubric for teaching practice.”

Good prompt

“Build a 4-level analytic rubric (Exemplary/Proficient/Developing/Beginning) for a 5-minute micro-teaching demo.

Criteria (weight in %):

- Learning objective clarity (20)
- Alignment of activity with objective (25)
- Checks for understanding (25)
- Inclusive/UDL practices (15)
- Delivery: clarity & timing (15)

Instructions:

- Provide a markdown table: rows = criteria, columns = levels, cells = observable descriptors (no vague words like “good”).
- Add a 3-line feedback bank per criterion (fill-in-the-blank stems).
- Include scoring guidance and how to convert to a pass/fail decision.”

«Summarize this document for me in 300 words»

”Analyze the input text and generate 5 essential questions that, when answered, capture the main points and core meaning of the text.

When formulating your questions:

a. Address the central theme or argument
b. Identify key supporting ideas.
c. Highlight important facts or evidenced.
d. Reveal the author’s purpose or perspective.
e. Explore any significant implications or conclusions

Answer all of your generated questions one-by-one in detail.”

Designing for audience & curriculum

State learner level (e.g., first-year pedagogy student).

Anchor in theories (e.g., Vygotsky’s ZPD) or last week’s lecture to steer relevance and depth.

If you need curriculum alignment, say so explicitly.

Adding files for context

Adding files will significantly improve context of the prompt

Files can be used as a proxy for examples or knowledge source (Ad hoc retrievel augmented generation (RAG))

«Use the UIT's strategy for 2025-2030 that I have uploaded and use it for the basis of UiT's AI policy.»

Iteration mindset

Make it a conversation

Treat prompting as dialog: ask → review → refine → ask again.

Use the model to improve your prompt (“Make this a better/power prompt: …”).

Try variations (ask for an analogy, 3 key points, new tone).

Know when to stop: if accuracy fails repeatedly, switch source/tool/model. Keep a brief prompt log.

Advanced techniques: roles & simulations

Role-play to surface misconceptions and practice social/decision skills (e.g., “you are an uninterested student” or “act as Socrates and use the Socratic method”).

Set rules/goals for the simulation and clarify who speaks/does what.

Pre-check for stereotypes/bias; remind students AI portrayals aren’t perfect.

Role-play example

“You are Socrates coaching me on [TOPIC].

Ask exactly ONE probing question per turn (≤2 sentences).

Stay neutral; avoid stereotyping; don’t invent course facts—ask me to supply them.

After 8 exchanges, give a brief Debrief: strengths, misconceptions, 2 tips, 1 next step.

Start: “What’s the central claim about [TOPIC], and why might someone disagree?”

Advanced techniques: chain-of-thought (step-by-step)

Prompt for reasoning steps (“Let’s think step by step”; “Give a numbered list of reasoning, then the final answer”).

Useful in math, science, philosophy—anywhere process matters.

For teaching materials, request solutions with steps + final answer separated.

Example: Chain-of-Thought

“You are a pedagogy mentor. Analyze [PROBLEM/CASE] for a master’s student.

First write “Reasoning Steps:” as a numbered list (≤6 steps, each ≤1 sentence); state assumptions and tie each step to [UNIT/WEEK] concepts.

Then write “Final Answer:” (≤3 sentences) including 1 limitation and 1 next action.

If key info is missing, ask one clarifying question before the steps.”

Advanced techniques: few-shot examples

Show the model what “good” looks like (one/few examples), then ask it to continue in the same pattern (e.g., exemplar feedback, definition style).

Increases style/format fidelity and correctness by anchoring expectations.

Example: few shot examples

Role: Instructional coach.

Task: For ONE Learning Objective (LO), return exactly 3 lines:

1) Bloom: <Remember/Understand/Apply/Analyze/Evaluate/Create>

2) Issue: <2–5 words naming the main problem>

3) Improve: <better LO in ≤25 words with a measurable verb + concrete criteria>

Style examples:

EX1 — Input LO: “Students will understand the water cycle.”

Output:

Bloom: Understand

ssue: Vague verb

Improve: Explain and sequence the five stages of the water cycle using a labeled diagram.

EX2 — Input LO: “Students will create a website about ecosystems.”

Output:

Bloom: Create

Issue: Unclear criteria

Improve: Design a one-page site on one ecosystem showing three interdependencies and two citations, graded with rubric X.

Now do this LO → [PASTE LO HERE]

(Return only the three lines.)

Structuring multi-part tasks

Use numbered lists in the prompt so the model mirrors your structure.

Avoid “kitchen-sink” prompts—split complex asks or clearly label parts (1, 2, 3).

Watch token limits; chunk long sources and summarize in parts.

Constraints and instruction style

Prefer positive, do-this constraints over long “don’t” lists
(e.g., “Use only concepts from Chapters 1–3”).

Specify length (“max 100 words,” “≤3 sentences”), tone, or vocabulary band as needed.

Re-enforce constraints in follow-ups if the model slips.

Task

Create a prompt in which you will ask LLM to do language editing for your thesis.

Språkvask

“Correct grammar and give suggestions on how the language can be improved. Extract the sentences that you think need improvement and suggest me on how they can be rewritten. When rewriting, keep the scientific tone, do not use superfluous words, and avoid using adjectives unless necessary”.

Språkvask - general

“Goal
Improve the clarity, grammar, and tone of the text to make it professional and suitable for university administration.

Return Format
Return only the edited version of the text. Keep structure and meaning intact.

Warnings
Do not remove important content. Avoid over-formalizing to the point of sounding robotic.

Context Dump
We are preparing an internal report/email/document related to university operations. The audience includes both academic and administrative staff.
Here is the text to edit:
[Paste the text here]”

Språkvask – scientific paper/grant application

“Goal

Clear, precise, academic, and easy to read—improve flow without changing content.

Return

Only the revised text. Keep structure (IMRaD/sections), cross-refs/numbering, and reference style. Respect word/character limits.

Do not change

Facts/data/statistics/units (SI); methods/results/conclusions; budgets/timelines/deliverables; reference list/format; journal/call requirements.

Do

Trim filler and repetition; use short sentences/active voice; improve cohesion/transitions; keep terminology consistent; define abbreviations at first use; fix grammar/punctuation.

Notes

If anything is unclear/inconsistent, add [NOTE: …] after the sentence (brief).

Context Dump

Type (article/proposal), target (journal/call), language (EN-UK/EN-US/NO), word limit, reference style, key message/hypothesis, critical terms.

Original text: [paste here]”

Språkvask – student communication

“Goal
Rewrite the message to sound friendly, clear, and supportive—while remaining professional.

Return Format
Return only the revised version. Keep the structure and key content, but improve the flow and readability.

Warnings
Avoid overly formal or bureaucratic language. Do not change any factual information such as dates, deadlines, or policies.

Context Dump
This message will be sent to students about an upcoming deadline/change in procedure. It should be easy to understand and approachable.
Here is the original message:
[Paste the text here]”

Språkvask – editing a strategy or policy draft

“Goal
Refine the text to make it sound clear, formal, and consistent with university-level strategic or policy documents.

Return Format
Return the improved version of the text. Preserve structure, section headings, and original meaning.

Warnings
Avoid vague statements. Do not introduce new content unless it improves clarity or flow.

Context Dump
This is a draft of a faculty-level strategy/policy document. It may be shared with academic staff, leadership, and external stakeholders. The tone should be professional and authoritative.
Here is the draft text:
[Paste the text here]”

Språkvask – translation and tone adjustment

“Goal
Translate the text from Norwegian to English (or vice versa), and adjust the tone to be clear, respectful, and appropriate for university communication.

Return Format
Return only the translated version with improved fluency and tone. Preserve structure and meaning.

Warnings
Do not add or omit information. Avoid overly literal translations—focus on natural, professional language.

Context Dump
This message will be shared with students or staff and must be understandable across cultures and roles. It may concern a deadline, policy update, or meeting invitation.
Here is the original text:
[Paste the text here]”