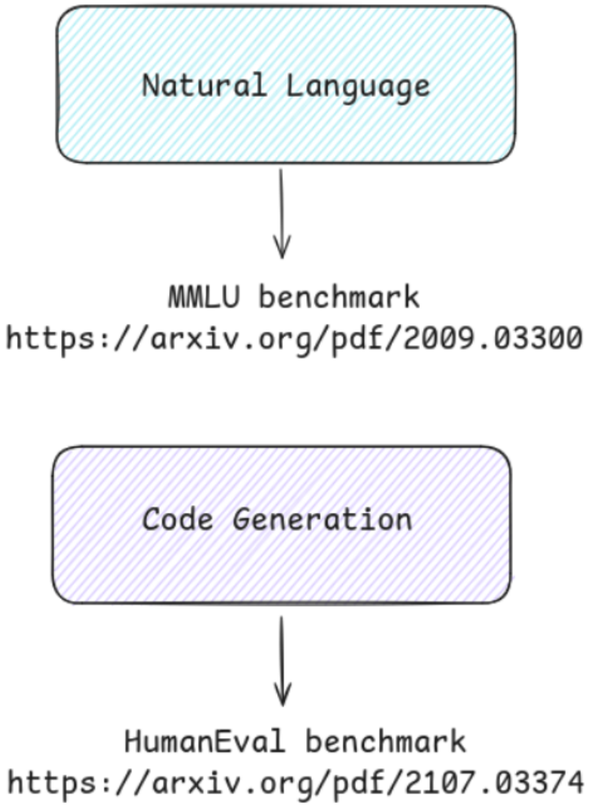
Picking the best AI tool for the job

AI-ASSISTED CODING FOR DEVELOPERS

Francesca Donadoni
AI Curriculum Manager, DataCamp

datacamp

Benchmarks


Natural Language
MMLU benchmark
https://arxiv.org/pdf/2009.03300
Code Generation
HumanEval benchmark
https://arxiv.org/pdf/2107.03374

Benchmarks

Natural Language

↓

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Code Generation

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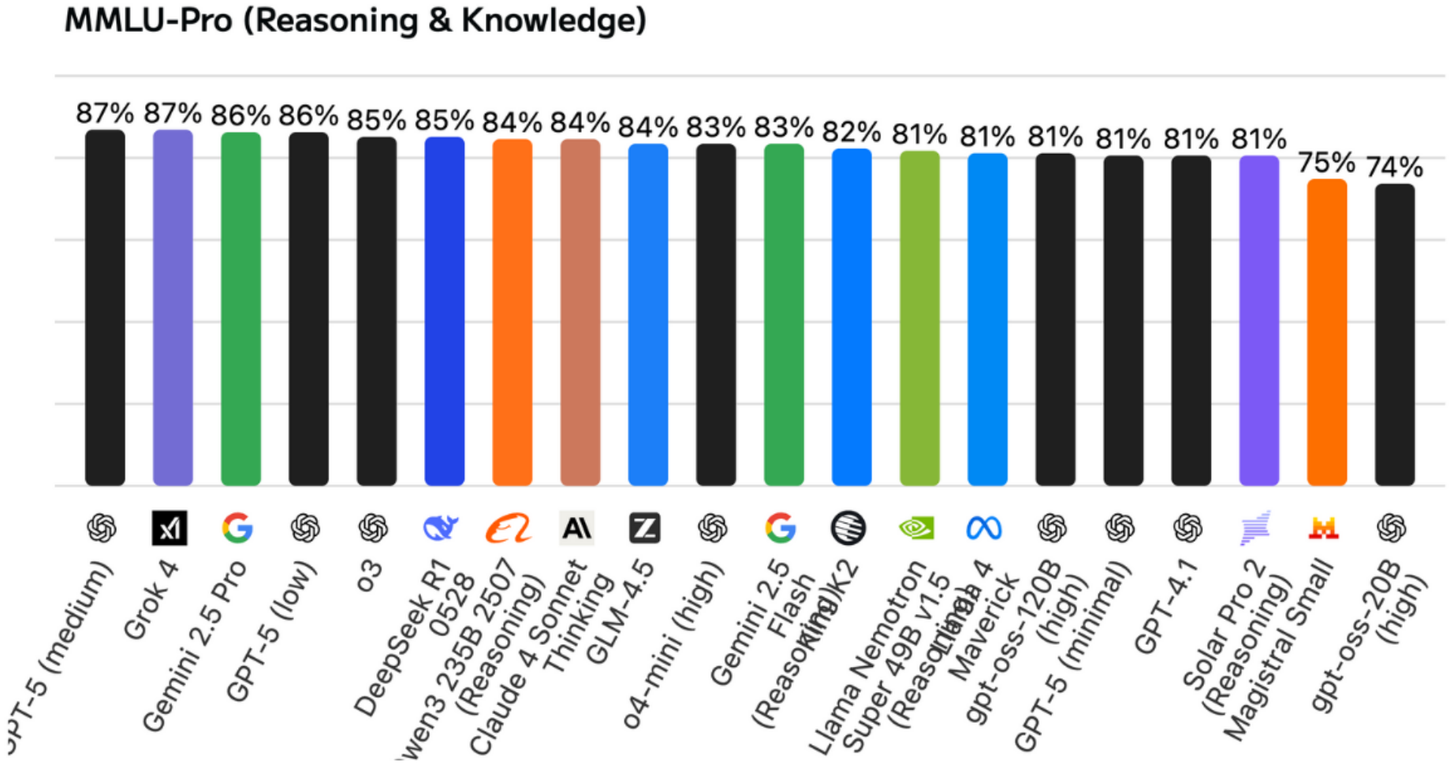
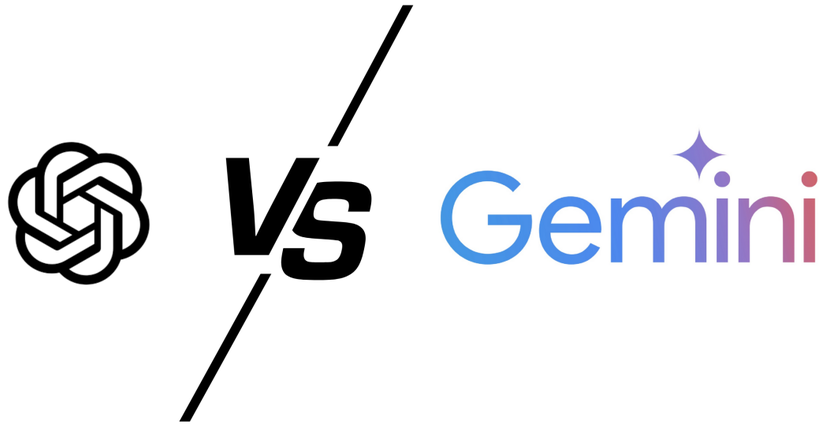


[1] https://artificialanalysis.ai/models

Model comparison

> *"Generate Python unit tests using pytest for the following function. Include cases for empty input, SQL keywords in the input, and special characters. Assume a mock database connection:* `<paste function implementation>` *"*



Model comparison

gpt-4.1-2025-04-14

Certainly! Below are `pytest` unit tests for the `insert_user_data_insecure` function.
These tests use the `unittest.mock` library to mock the `sqlite3.connect` method and its returned objects, so no real database is touched.

The tests cover:

- **Empty input**
- **SQL keywords in input**
- **Special characters in input**

Python

```
import pytest
from unittest.mock import patch, MagicMock

from your_module import insert_user_data_insecure  # Replace with
your actual module name

@pytest.fixture
def mock_sqlite():
```

gemini-2.5-pro

Of course. Here are the pytest unit tests for the provided function.

First, let's place the function you provided into a file named `vulnerable_app.py`.

Python

```
# vulnerable_app.py

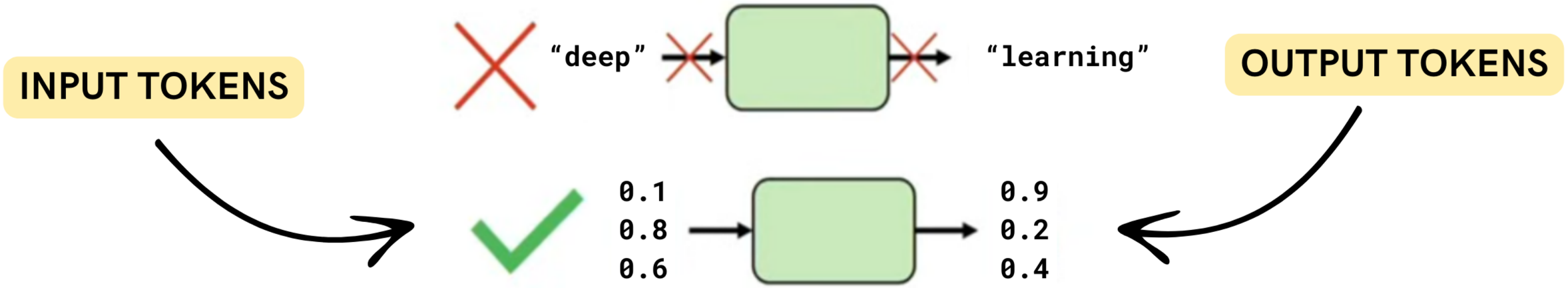
import sqlite3

def insert_user_data_insecure(db_path, form_data):
    """
    Inserts user data into the database using an insecure method
    (f-string formatting), which is vulnerable to SQL injection.
    """
    name = form_data.get('name', '')
    email = form_data.get('email', '')
    message = form_data.get('message', '')

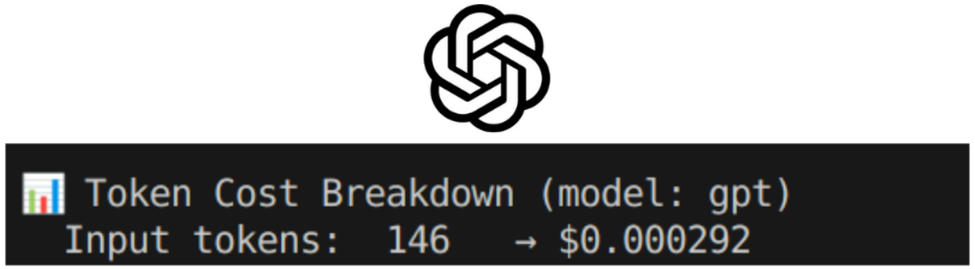
    try:
        conn = sqlite3.connect(db_path)
        cursor = conn.cursor()
```

Tokenization

- LLMs work on numerical data (tokens)



Cost



	GPT	Gemini
Input tokens	$2 / M tokens	$1.25 / M tokens
Output tokens	$8 / M tokens	$10 / M tokens

Cost

```
📊 Token Cost Breakdown (model: gpt)
  Input tokens:  146   → $0.000292
  Output tokens: 681   → $0.005448
  ------------------------------
  Total cost:     $0.005740
```

Gemini

```
📊 Token Cost Breakdown (model: gemini)
  Input tokens:  146   → $0.000182
  Output tokens: 2079   → $0.020790
  ------------------------------
  Total cost:     $0.020973
```

	GPT	Gemini
Input tokens	$2 / M tokens	$1.25 / M tokens
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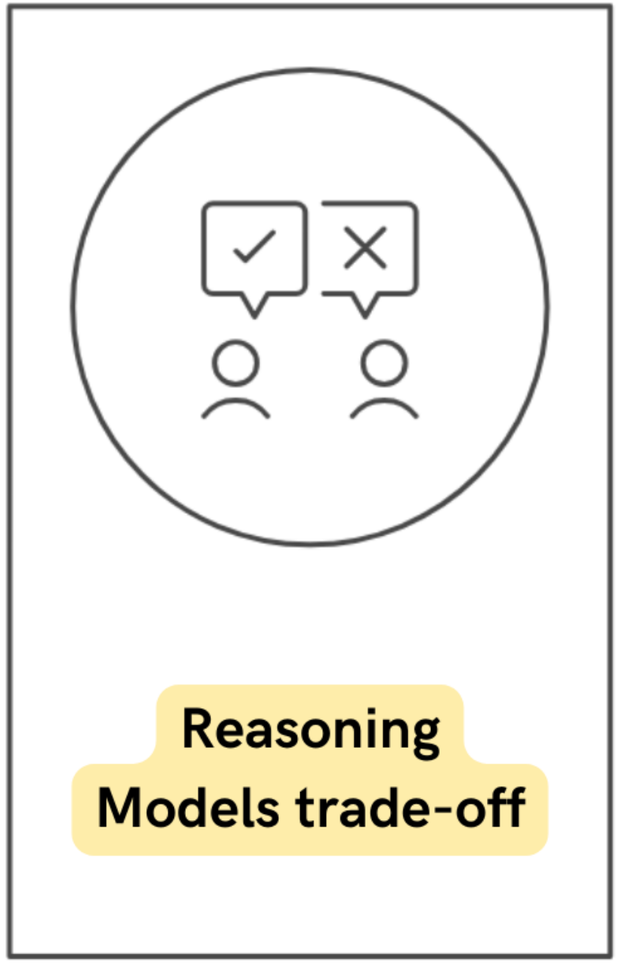
Reasoning models



Reasoning Models trade-off

- Transparency
- Accuracy in the responses
- Insights into the model

- Higher cost
- System interference
- Slower response

Output quality

GPT Output

```
Traceback (most recent call last):
  File "/home/avalenz1/datacamp/model-comparison/gpt-model.py", line 4, in <module>
    from your_module import insert_user_data_insecure  # Replace with your actual module name
    ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
ModuleNotFoundError: No module named 'your_module'
```

Gemini Output

```
============================================ test session starts ============================================
platform linux -- Python 3.12.7, pytest-7.4.4, pluggy-1.0.0 -- /home/avalenz1/anaconda3/bin/python
cachedir: .pytest_cache
rootdir: /home/avalenz1/datacamp/model-comparison/gemini
plugins: mock-3.14.1, anyio-4.9.0
collected 4 items

test_vulnerable_app.py::test_insert_user_data_standard PASSED                                      [ 25%]
test_vulnerable_app.py::test_insert_empty_input PASSED                                             [ 50%]
test_vulnerable_app.py::test_insert_with_special_characters FAILED                                 [ 75%]
test_vulnerable_app.py::test_insert_with_sql_injection_attack PASSED                               [100%]
```

Output quality

GPT Output

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Traceback (most recent call last):
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    from your_module import insert_user_data_insecure  # Replace with your actual module name
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Not an end-to-end solution

Gemini Output

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Output quality

GPT Output

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Traceback (most recent call last):
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test_vulnerable_app.py::test_insert_empty_input PASSED                                         [ 50%]
test_vulnerable_app.py::test_insert_with_special_characters FAILED                             [ 75%]
test_vulnerable_app.py::test_insert_with_sql_injection_attack PASSED                           [100%]
```

More expensive, but a more complete solution

Let's practice!

AI-ASSISTED CODING FOR DEVELOPERS

Guardrails for responsible AI coding

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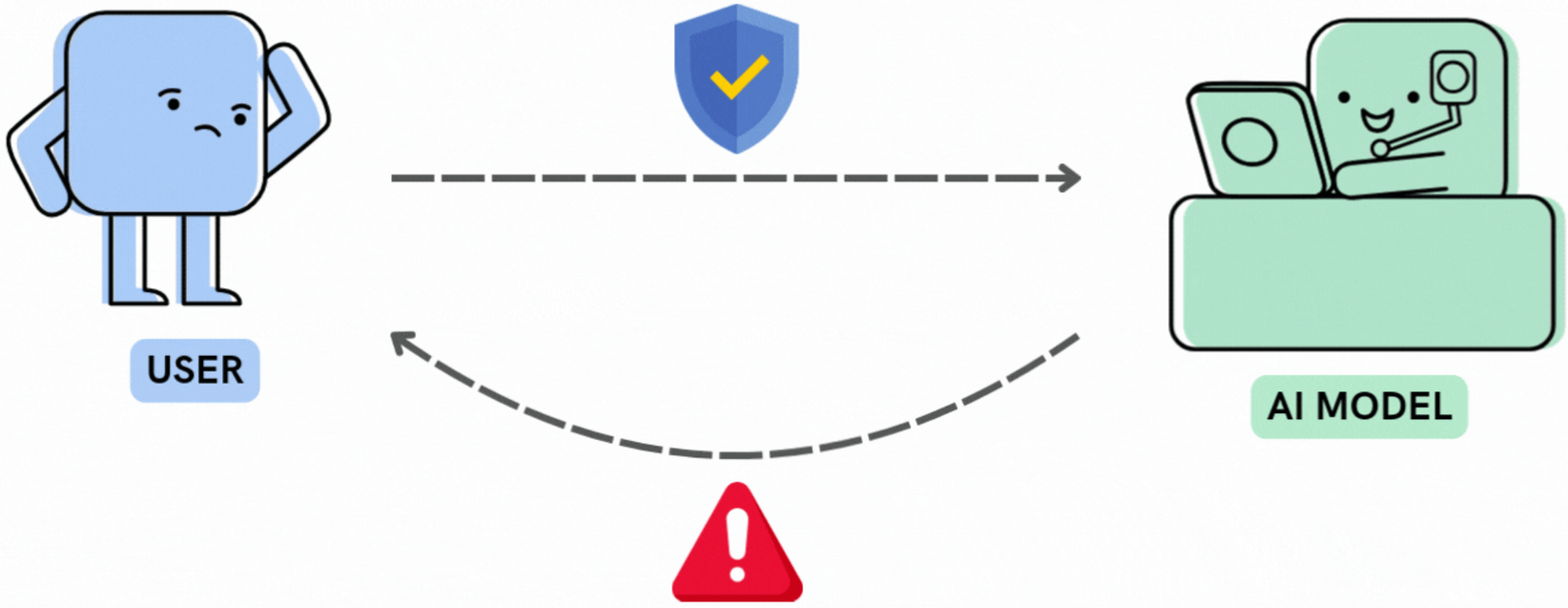
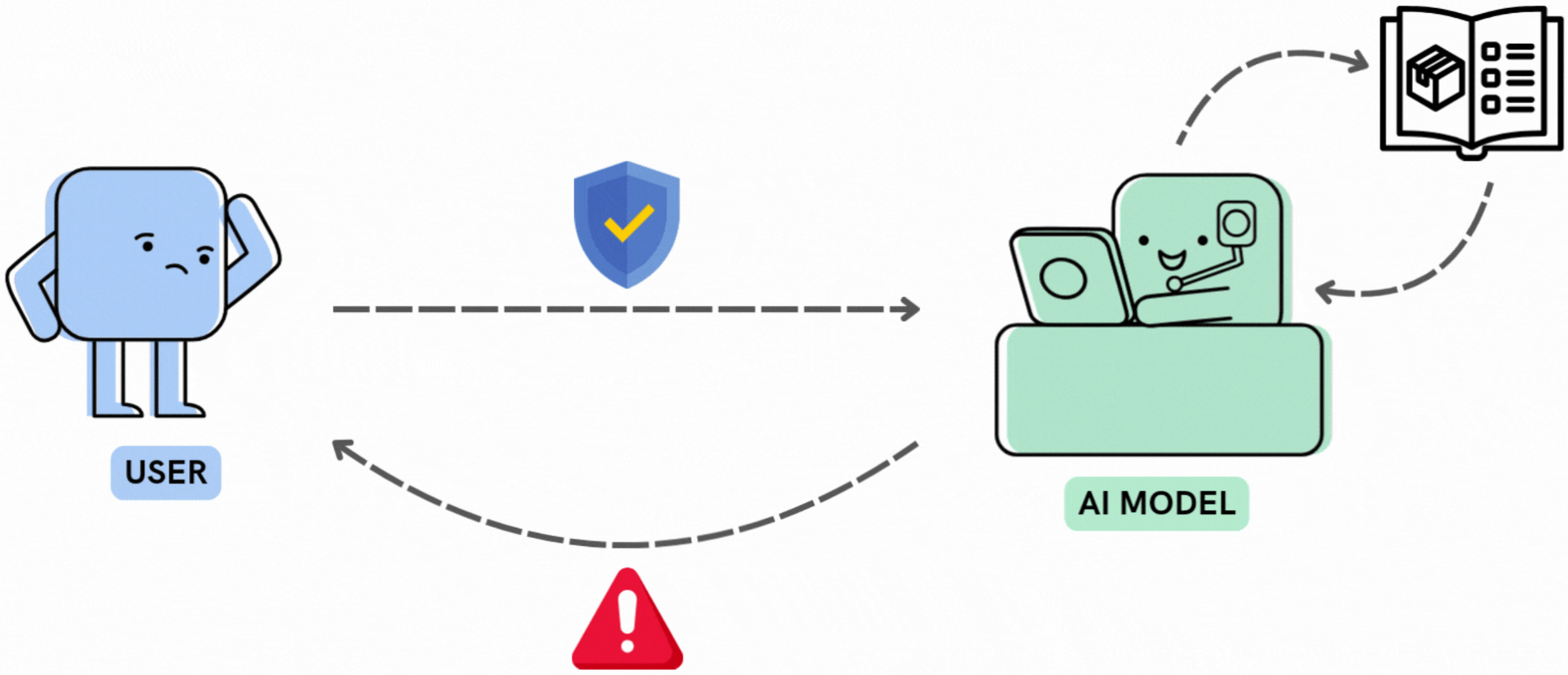
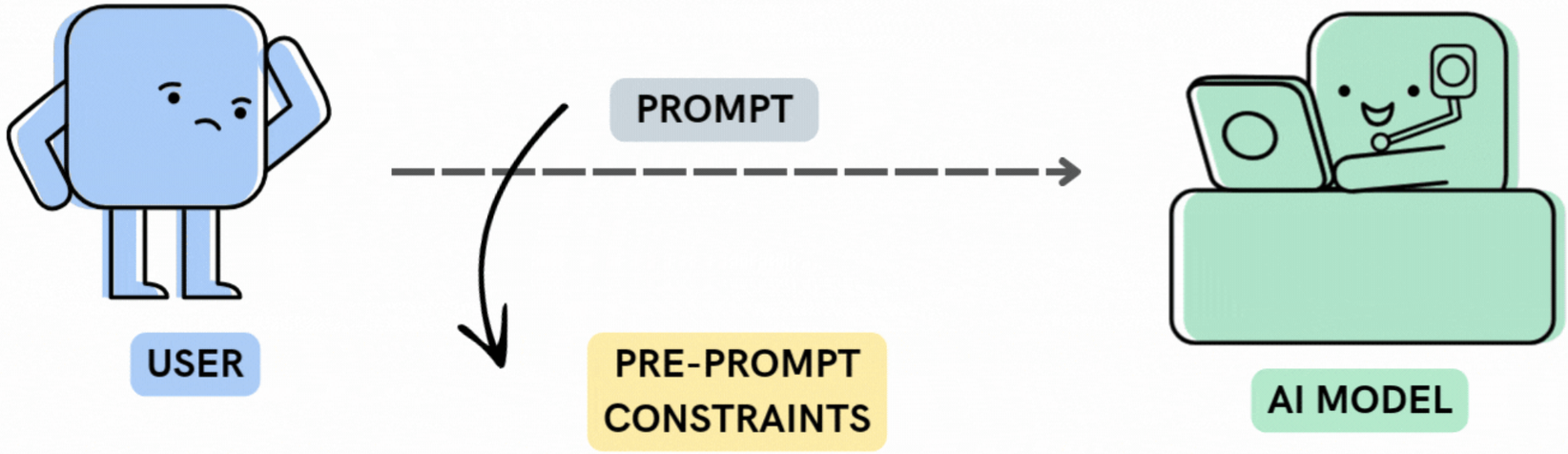
LLM-powered workflows



LLM-powered workflows



Pre-prompt constraints



Pre-prompt constraints

Message constraints

- System messages
- Structure, tone and limits
- Few-shot examples

Ethical constraints

- *"Avoid generating unsafe code"*
- *"Do not provide scripts that bypass authentication or scrape private data"*
- *"Only return examples that follow open-source licenses"*

Pre-prompt constraints

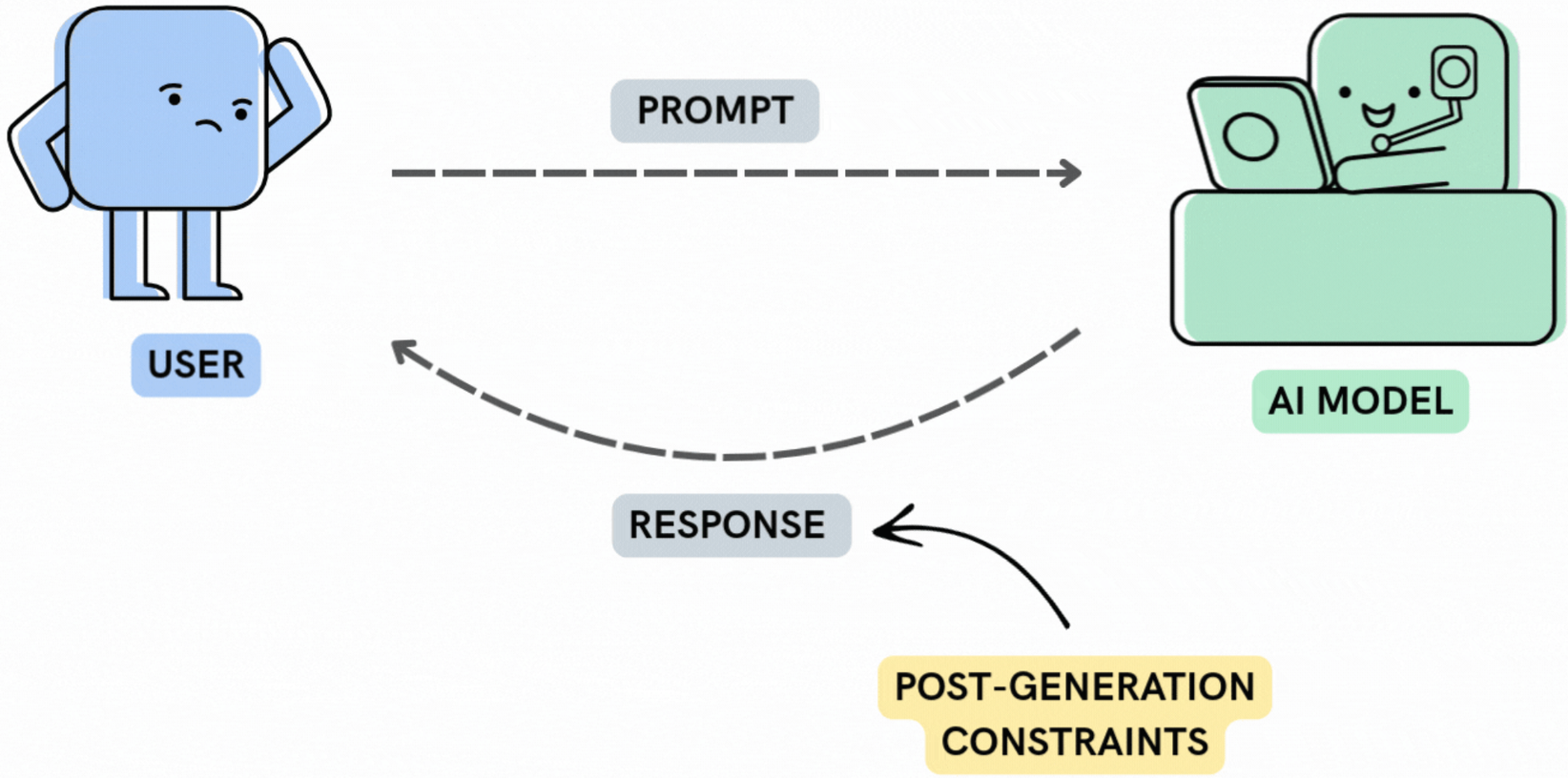
Secure Prompt

> *"Write a script to download images from an open-access public gallery"*

Malicious Prompt

> *"Write a script to download images from a gallery that restricts automated access"*

Post-generation constraints

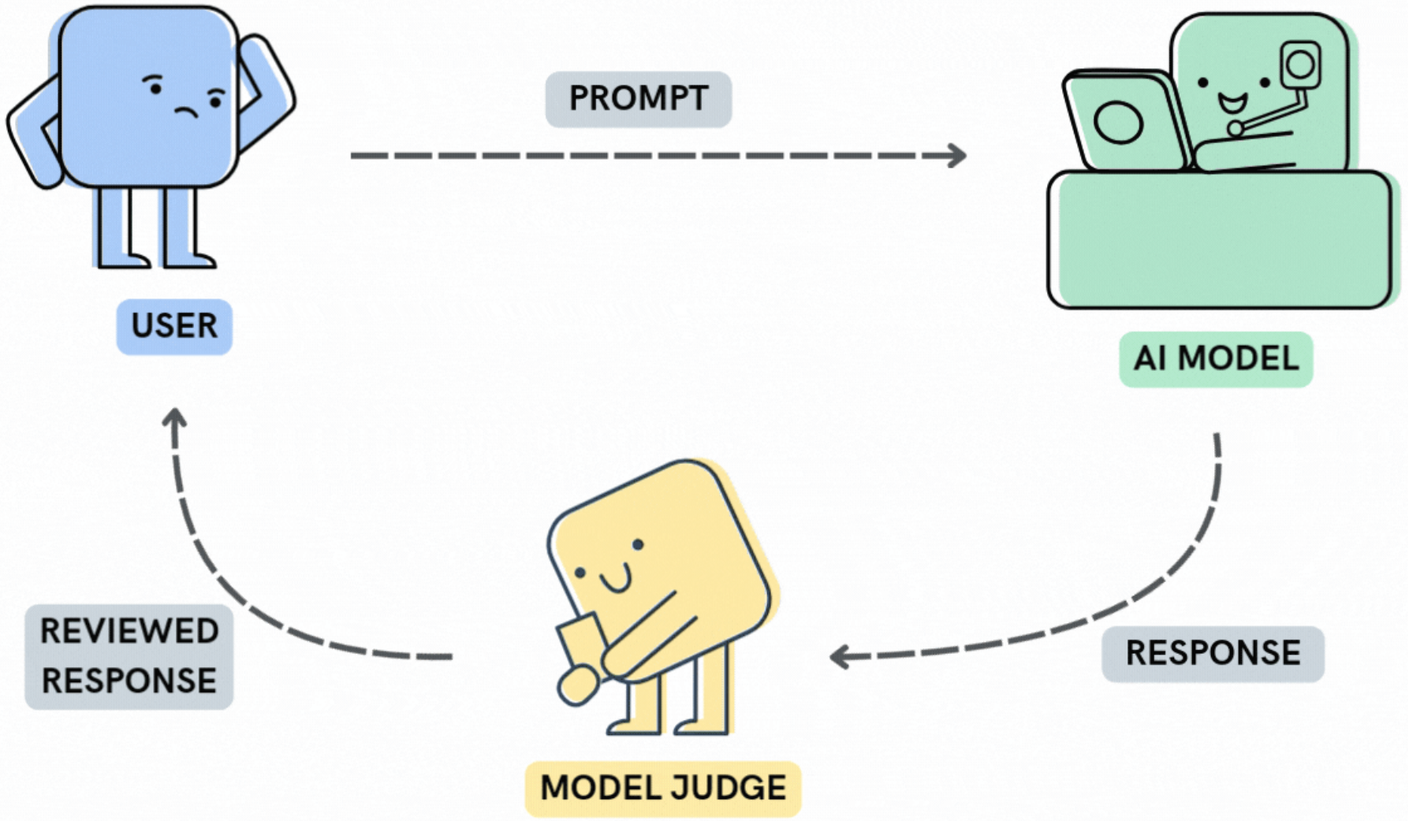


Post-generation constraints

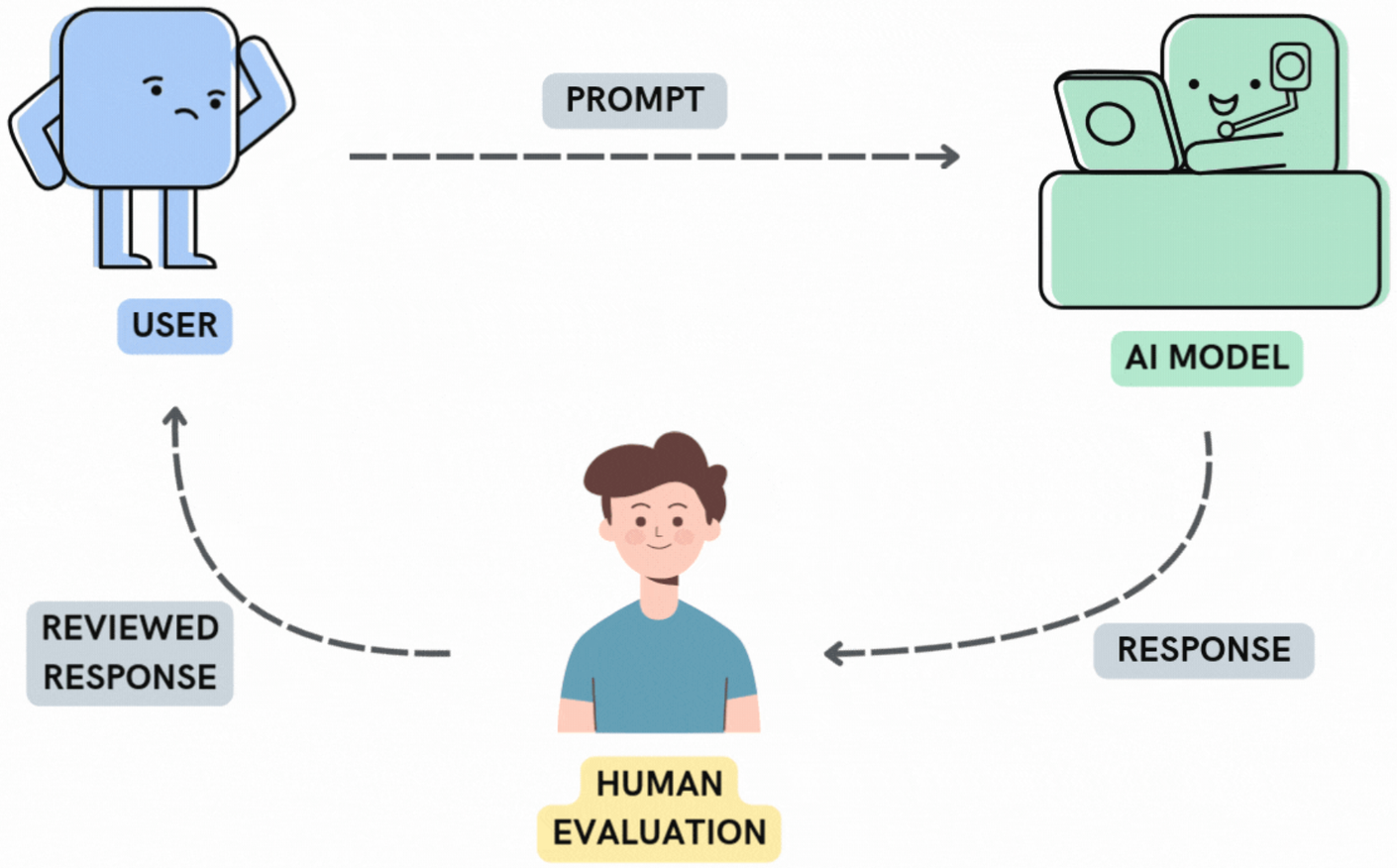
Output constraints

- Output validation
- Content filters
- Evaluation functions

Post-generation constraints



Post-generation constraints



Let's practice!

AI-ASSISTED CODING FOR DEVELOPERS

Optimizing AI for speed, cost and quality

AI-ASSISTED CODING FOR DEVELOPERS

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Metrics

- **Latency** (response time): How long it takes for the model to generate a response

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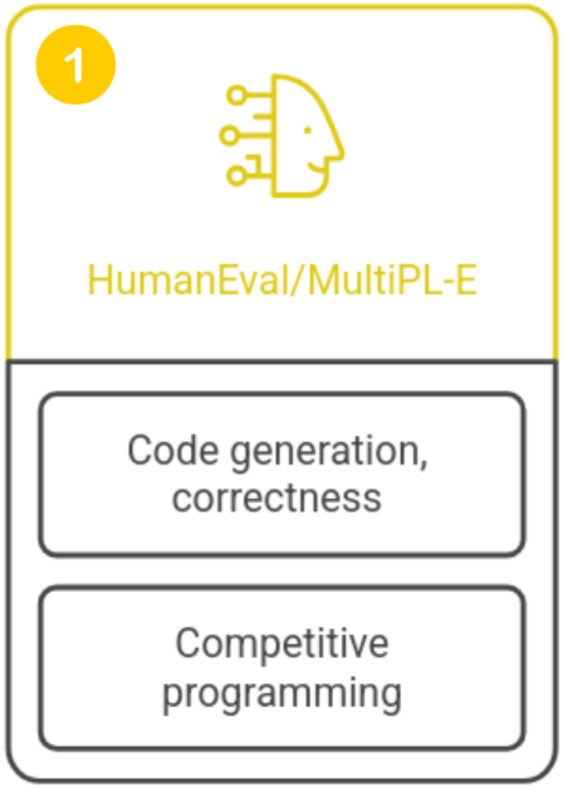
Metrics

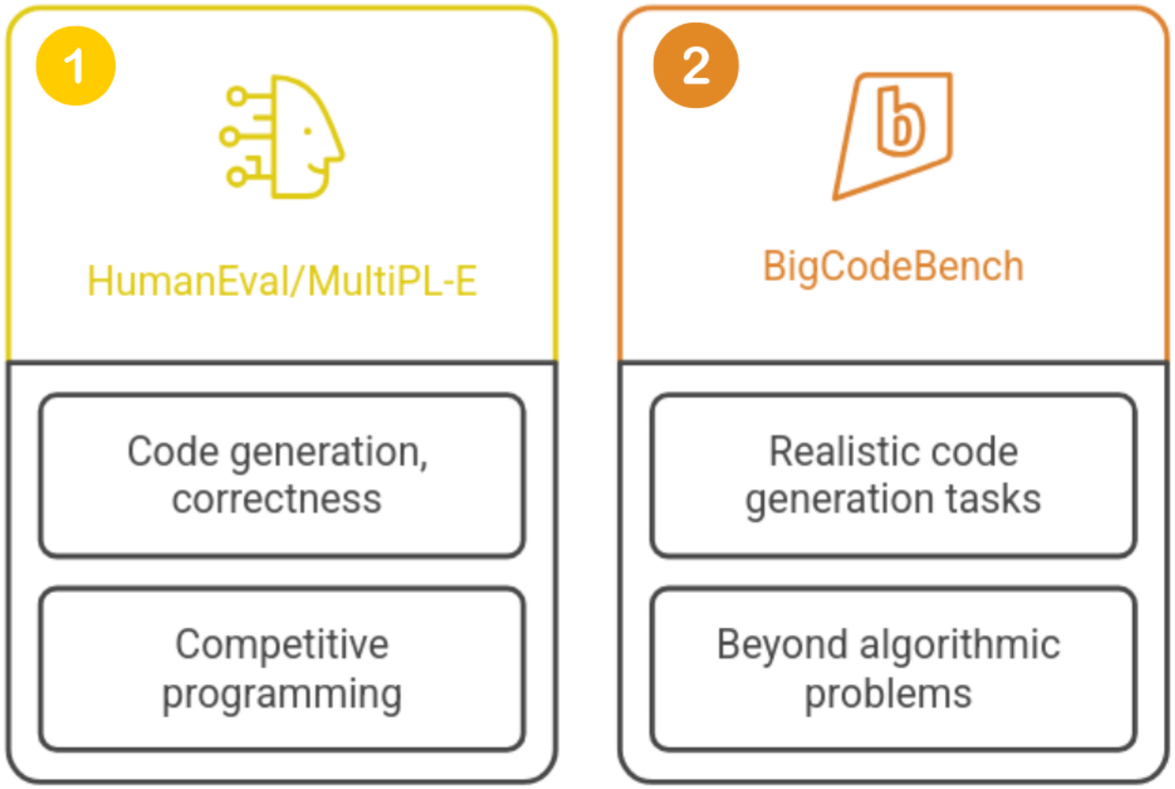
- **Latency** (response time): How long it takes for the model to generate a response
- **Token cost** (per 1M tokens): Monetary expense of using an AI model
- **Quality** (pass rate on tests/coverage): How often the generated code works as intended

Model benchmarking



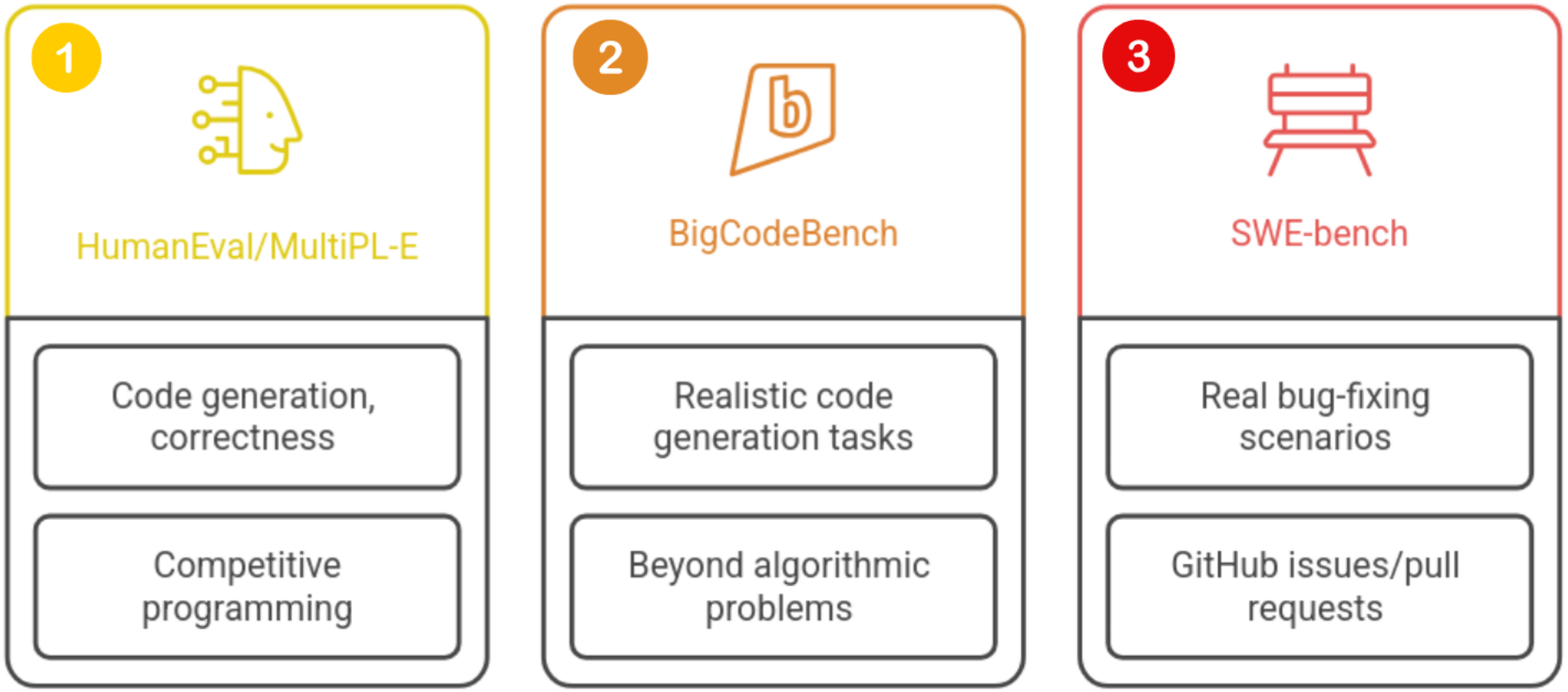
[1] https://github.com/openai/human-eval

Model benchmarking



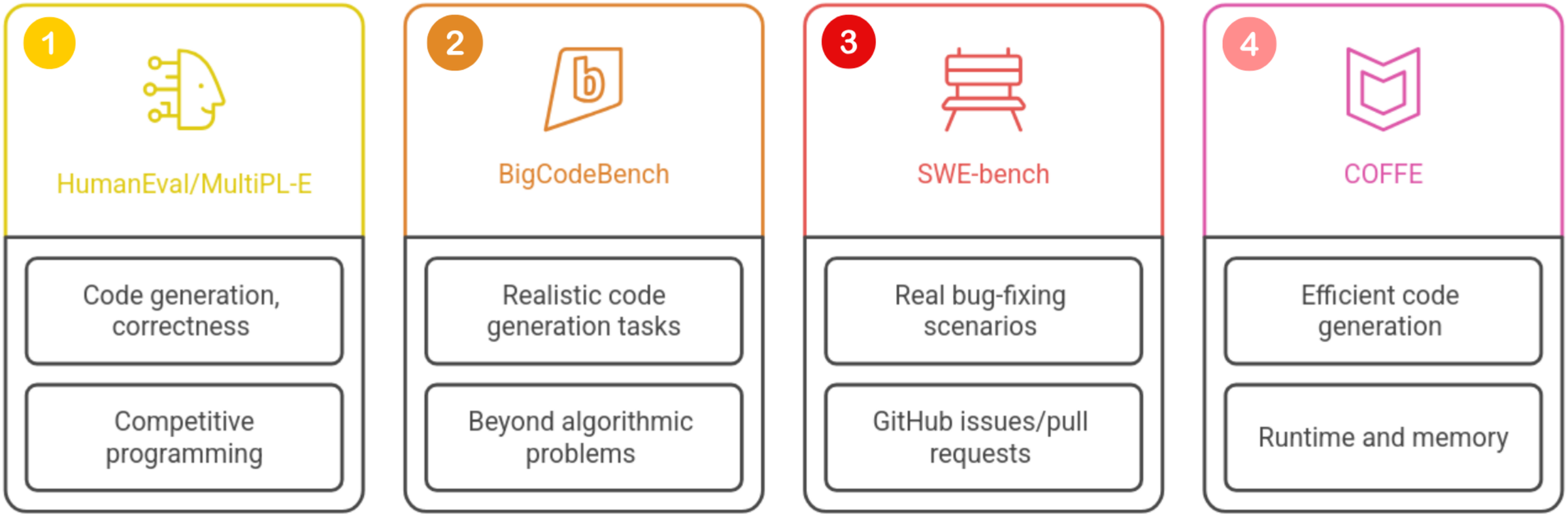
[1] https://github.com/bigcode-project/bigcodebench

Model benchmarking



[1] https://github.com/SWE-bench/SWE-bench

Model benchmarking



[1] https://github.com/JohnnyPeng18/Coffe

Prompt versioning

```
{
  "id": "generate_average_function",
  "version": "v2.1",
  "template": "Write a Python function that takes {{input_type}} and returns
{{output_description}}. Make sure to {{instruction}}.",
  "variables": {
    "input_type": "a list of numbers",
    "output_description": "the average as a float",
    "instruction": "include a docstring and handle empty lists by raising a ValueError"
  }
}
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Prompt versioning

PROMPT VERSIONING

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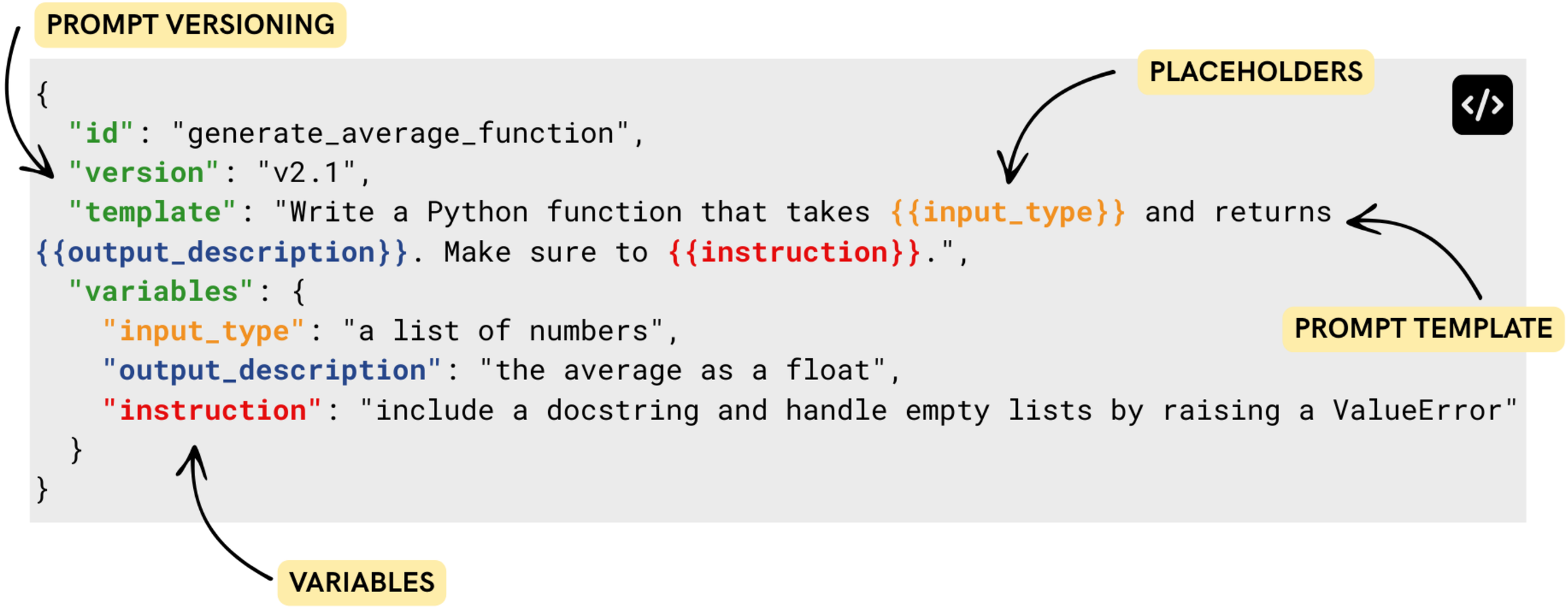
```

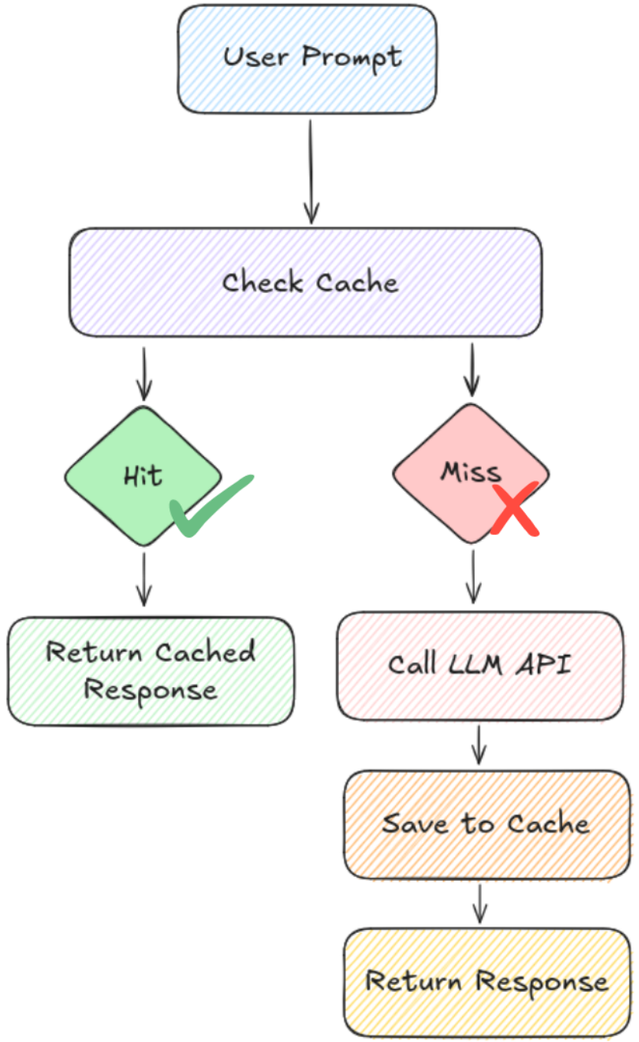
PROMPT TEMPLATE

Prompt versioning



Prompt caching

- Caching works by storing:
  - Prompt
  - Input
  - Model
  - Temperature



Let's practice!

AI-ASSISTED CODING FOR DEVELOPERS

Congratulations!

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Recap

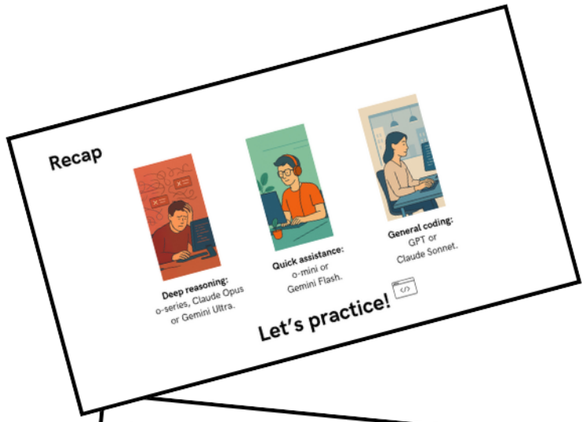
CHAPTER #1

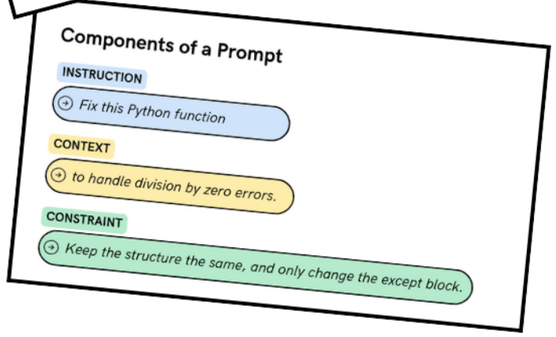
Recap

CHAPTER #1

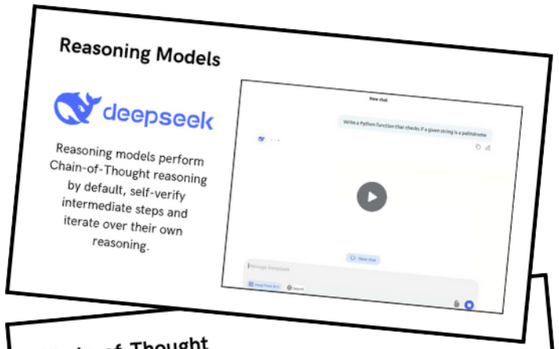
CHAPTER #2

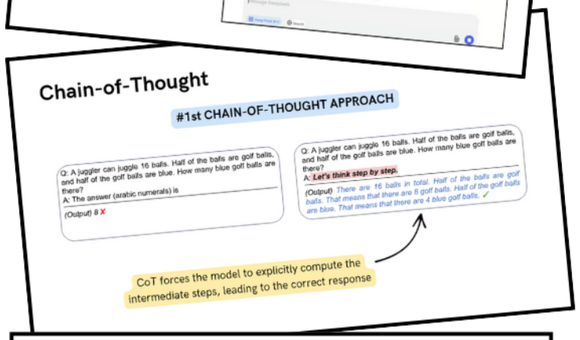
Recap



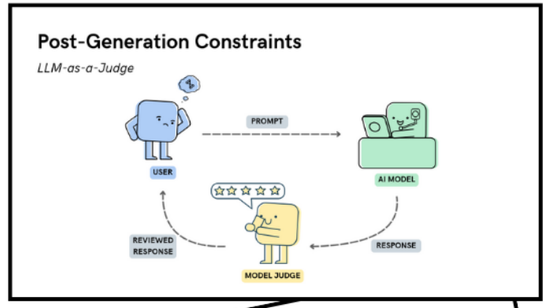


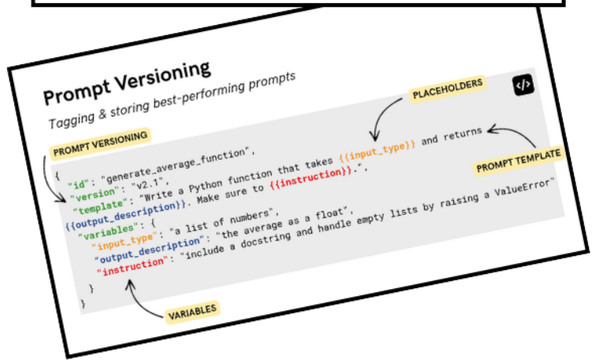
CHAPTER #1





CHAPTER #2





CHAPTER #3

Thank you!

AI-ASSISTED CODING FOR DEVELOPERS