Coding with Generative AI

First Steps and Insights

Presented by

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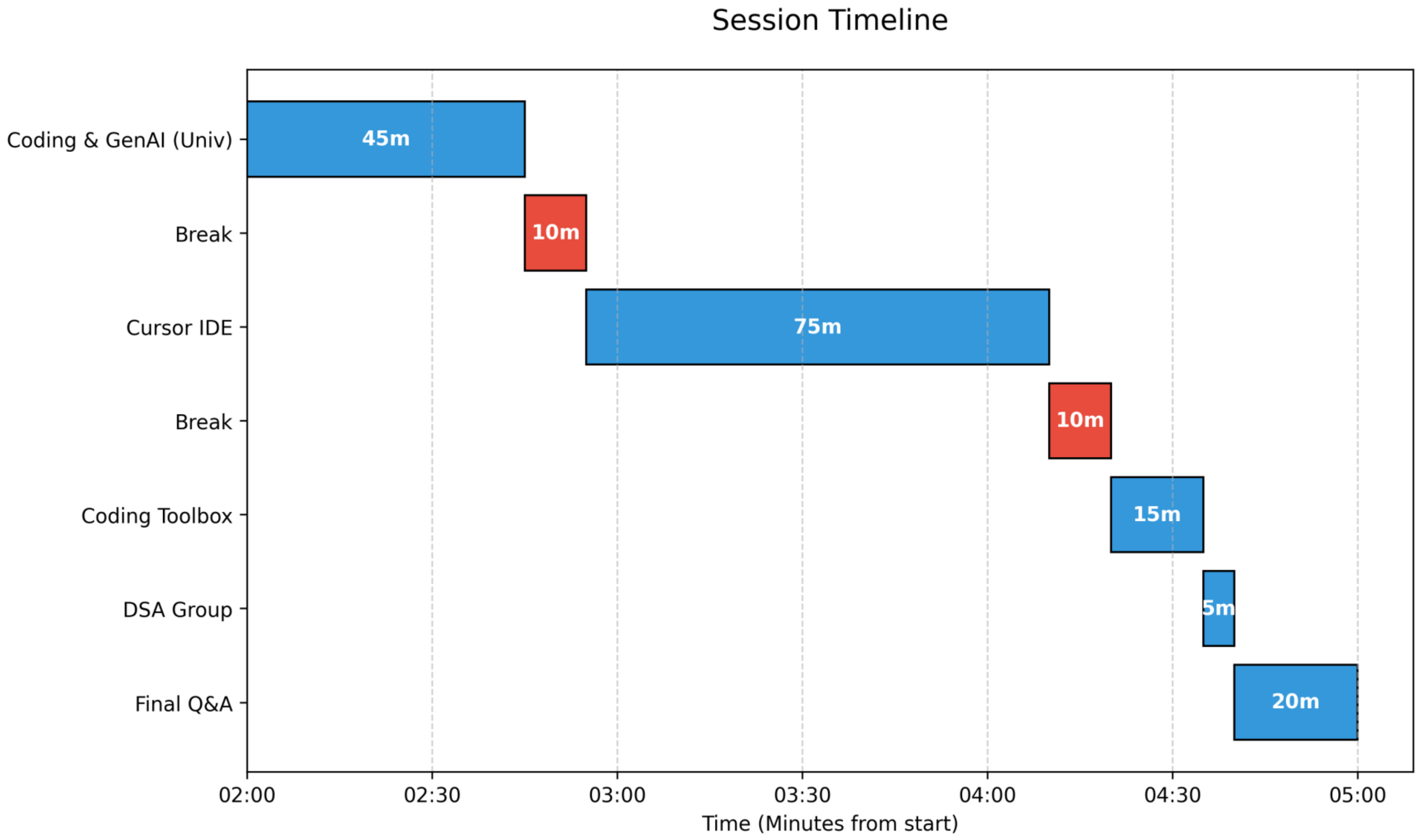
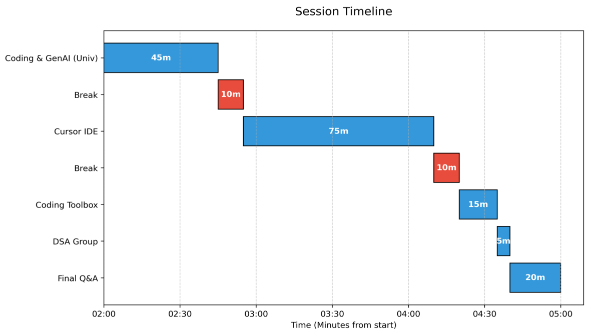

Session Timeline
Coding & GenAI (Univ)
Break
Cursor IDE
Break
Coding Toolbox
DSA Group
Final Q&A
45m
10m
75m
10m
15m
5m
20m
02:00
02:30
03:00
03:30
04:00
04:30
05:00
Time (Minutes from start)

Agenda

Coding & GenAI for University tasks

Students Life

- Long lecture notes
- Messy Excel / CSV files
- Too little time before exams
- Repeating boring tasks



Solution: **Automation**

How: **Using Python Coding & GenAI**

Lecture slides Renaming

Problem: The slide names are unclear and not consistent.

Slides Link:

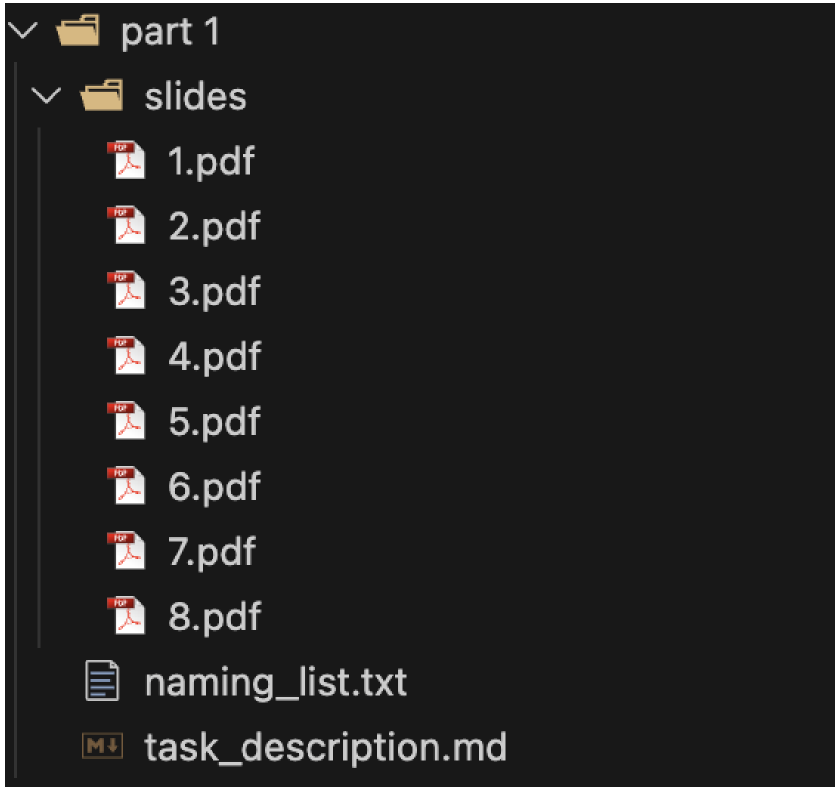
https://github.com/islammesabah/dsa_coding_workshop

Solution:

Rename them using a Python script with this format:

Lecture_{lecture_number}_EngGenAI_{lecture_title}

- Download and install python:
  - https://www.python.org/downloads/
- Build the script step by step, you could use ChatGPT to help



```
part 1
  slides
    1.pdf
    2.pdf
    3.pdf
    4.pdf
    5.pdf
    6.pdf
    7.pdf
    8.pdf
  naming_list.txt
  task_description.md
```

YOUR TURN: AUTOMATED SUMMARIZATION

AI Summarizer Tool Development

The Prompt Strategy

Instruct ChatGPT or Gemini to act as an **Expert Python Developer**. The script must create a command-line tool that performs the following:

→ Reads content from a local transcript.txt file.

→ Transmits data to the RPTU LLM infrastructure.

→ Summarizes text into 5–7 concise, student-friendly bullet points.

→ Ensures zero hallucinations – if data is missing, the script must state it explicitly.

Technical Requirements

→ **API Architecture:** Use HTTP POST with JSON (fields: model, prompt, stream).

→ **Dependencies:** Standard libraries only, plus the requests module.

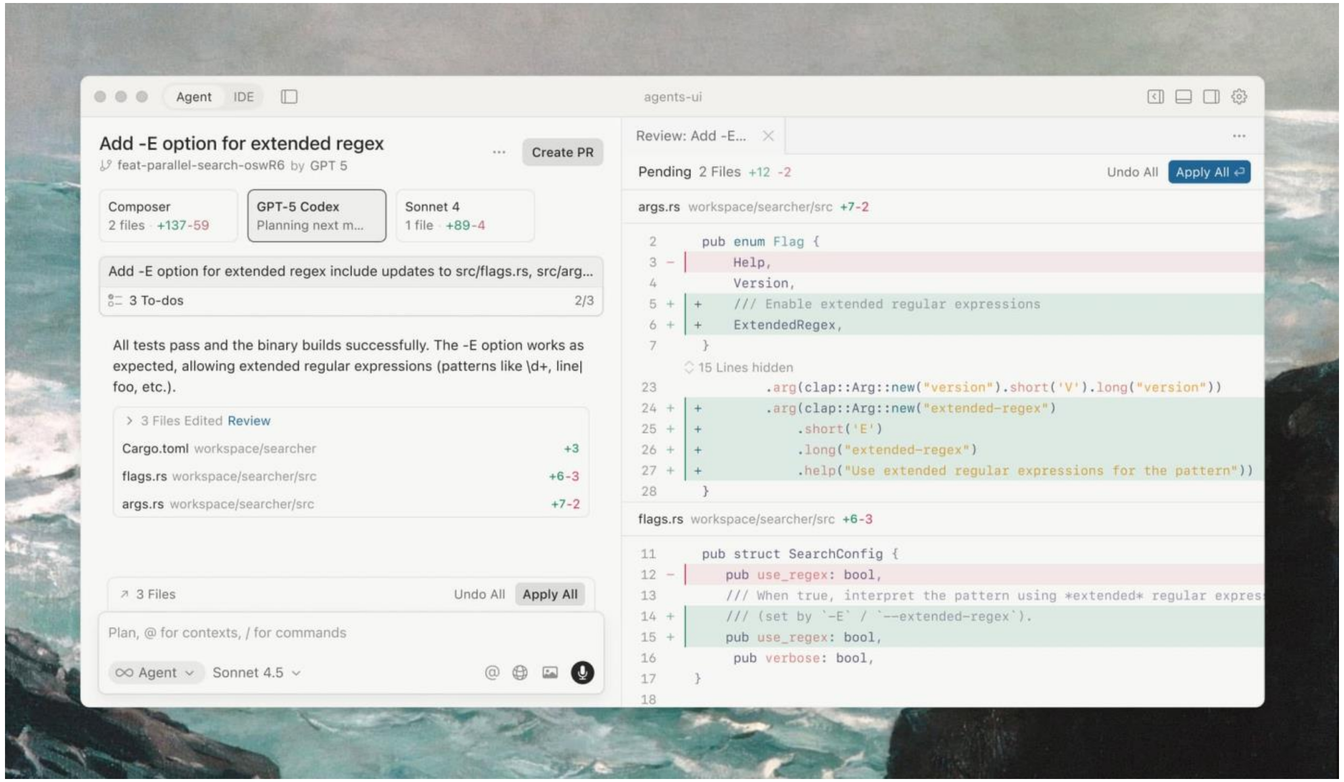
RPTU API Endpoint:

```
https://ai-api.rz.rptu.de/api/generate
```

Coding IDE powered by GenAI

Cursor AI

- Download Cursor: https://cursor.com/download
- Introduction to the IDE
- Create test project and test AI with simple command



Add -E option for extended regex

feat-parallel-search-oswR6 by GPT 5

Add -E option for extended regex include updates to src/flags.rs, src/arg...

All tests pass and the binary builds successfully. The -E option works as expected, allowing extended regular expressions (patterns like \d+, line|foo, etc.).

Cargo.toml	workspace/searcher	+3
flags.rs	workspace/searcher/src	+6-3
args.rs	workspace/searcher/src	+7-2

args.rs workspace/searcher/src +7-2

```
   pub enum Flag {
-      Help,
       Version,
+      /// Enable extended regular expressions
+      ExtendedRegex,
   }

           .arg(clap::Arg::new("version").short('V').long("version"))
+          .arg(clap::Arg::new("extended-regex")
+              .short('E')
+              .long("extended-regex")
+              .help("Use extended regular expressions for the pattern"))
   }
```

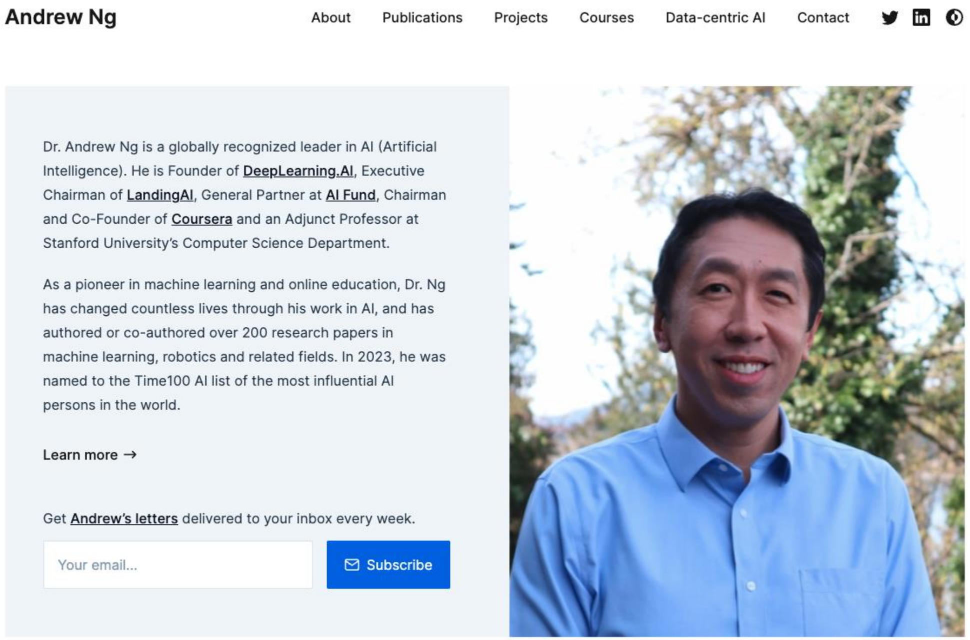
flags.rs workspace/searcher/src +6-3

```
   pub struct SearchConfig {
-     pub use_regex: bool,
      /// When true, interpret the pattern using *extended* regular expres
+     /// (set by `-E` / `--extended-regex`).
+     pub use_regex: bool,
       pub verbose: bool,
   }
```

For more information, see: https://cursor.com/docs

Build a Personal Website

- Let AI build a personal website such as https://www.andrewng.org
- The new website will be created for a **Computer Science student** at RPTU named **Harry Potter.**
- Start with building the main components with About Section with random data
- Let AI generate **Harry Potter** data and add it to the website
- Fix any bugs appeared in generation



Dr. Andrew Ng is a globally recognized leader in AI (Artificial Intelligence). He is Founder of DeepLearning.AI, Executive Chairman of LandingAI, General Partner at AI Fund, Chairman and Co-Founder of Coursera and an Adjunct Professor at Stanford University's Computer Science Department.

As a pioneer in machine learning and online education, Dr. Ng has changed countless lives through his work in AI, and has authored or co-authored over 200 research papers in machine learning, robotics and related fields. In 2023, he was named to the Time100 AI list of the most influential AI persons in the world.

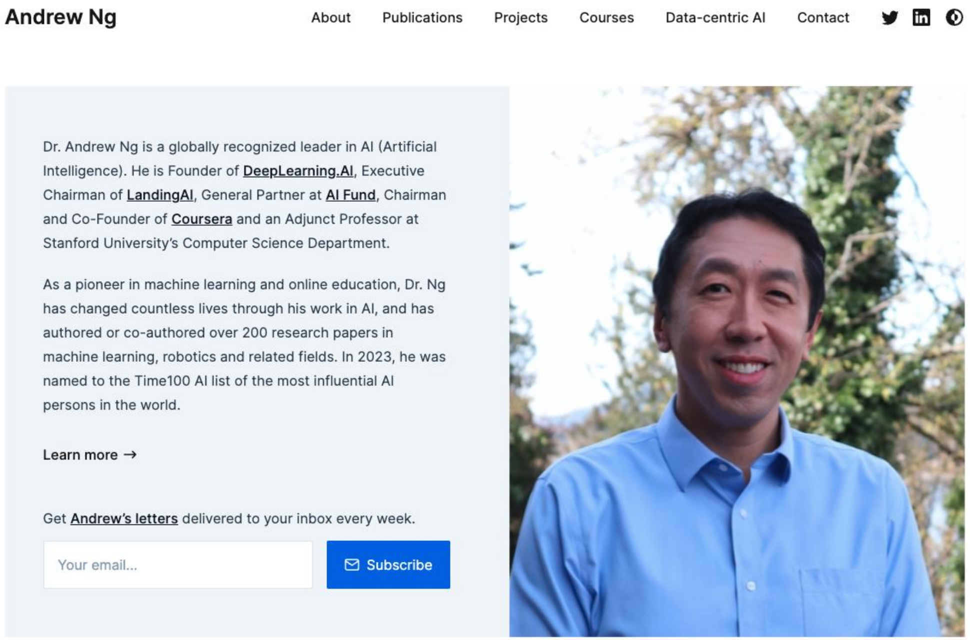
Learn more →

Get Andrew's letters delivered to your inbox every week.

For more information, see: https://cursor.com/docs

Your Turn

- Let AI build a personal website such as https://www.andrewng.org
- The new website will be created for a **Computer Science student** at RPTU named **Harry Potter.**
- Add to the website dynamic sections for :
  - **About Section:** Include text describing the student and their studies.
  - **Courses Section:** List the courses attended by the student.
  - **Projects Section:** Showcase projects implemented by the student, with mock links to GitHub repositories.
  - **Impressum Section:** German law requires this section to disclose specific ownership and contact information.
  - **Custom Section:** Add your own additional section(s) as desired.
- Additional requirements:
  - **Theme Switcher:** Implement a toggle to switch between dark and light modes, with black (dark) as the default.
  - **Social Media Links:** Include links and emojis for the student's social media platforms.



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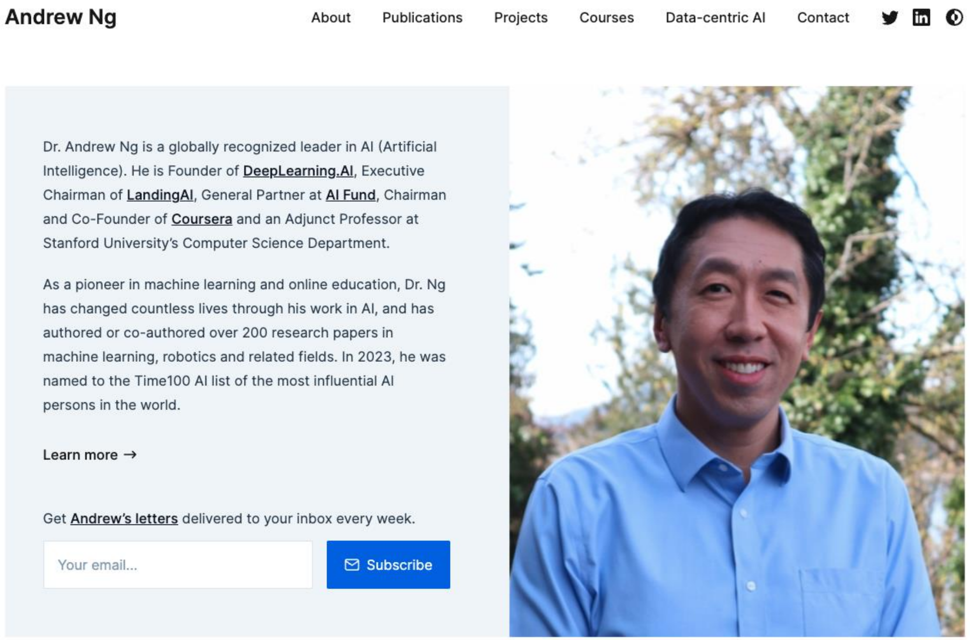
Agent Mode

- We can use Agent Mode to **review the entire project codebase** and **generate a comprehensive README file** that clearly **explains the project and its underlying code.**



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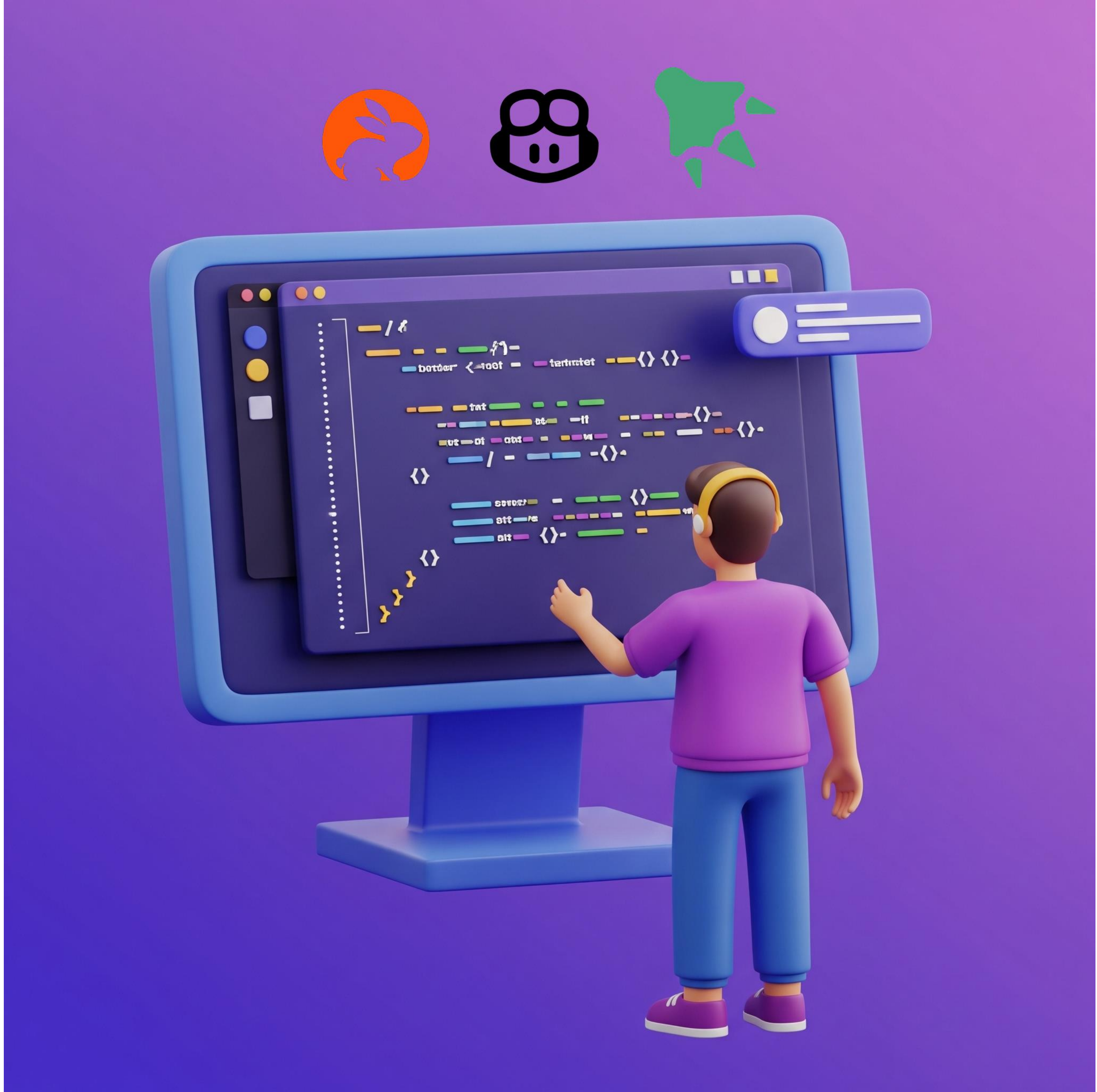
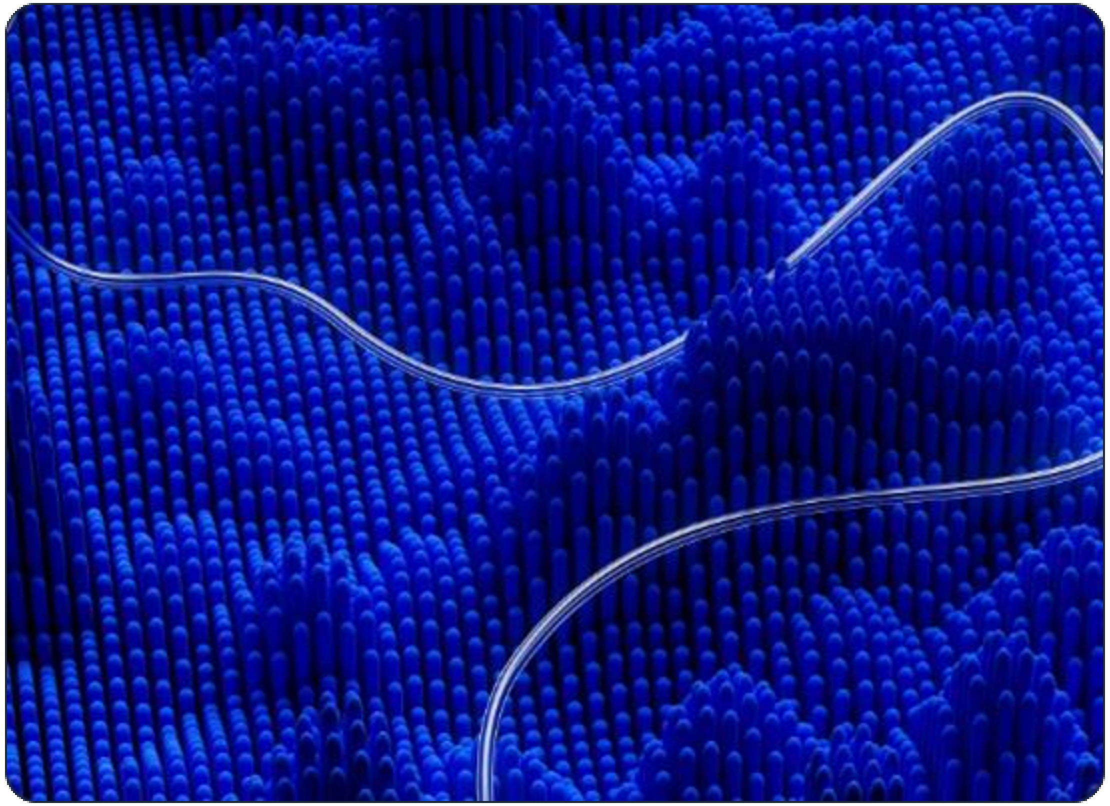


Expand your coding Toolbox

Paradox Of Choice

When we have too many choices, selecting a tool becomes harder instead of easier.

- More tools leads to higher friction
- Choice leads to Decision Fatigue
- ⚠ Confusion replaces Productivity



The Competitive Landscape

Cloud Giants

AWS has dedicated command-line tools for integrated service management.

AI Specialists

OpenAI provides CLI access for model testing and developer integration.

Gemini CLI

Google's late entry into the space with a unique architectural focus.

Google Arrived Late

They did something interesting. Instead of another "Black Box" tool, they focused on transparency.

Gemini CLI is built for developers who want to know **how** things work, not just that they do.

Gemini: The Ecosystem Advantage

Precision DeepSearch

Advanced algorithmic search depth outperforming standard LLM web-browsing for engineering research.

Workspace Synergy

Native integration across Docs, Gmail, and Slides for automated professional workflows.

Professional Personalization

Configure specific personas to maintain consistent technical tone and branding across communication channels.

2025: The Threat Landscape

20% Shadow AI

Breaches caused by unauthorized AI tools leaking proprietary data to public models.

Double Extortion

Shift from simple encryption to massive data leaks as a primary attack vector.

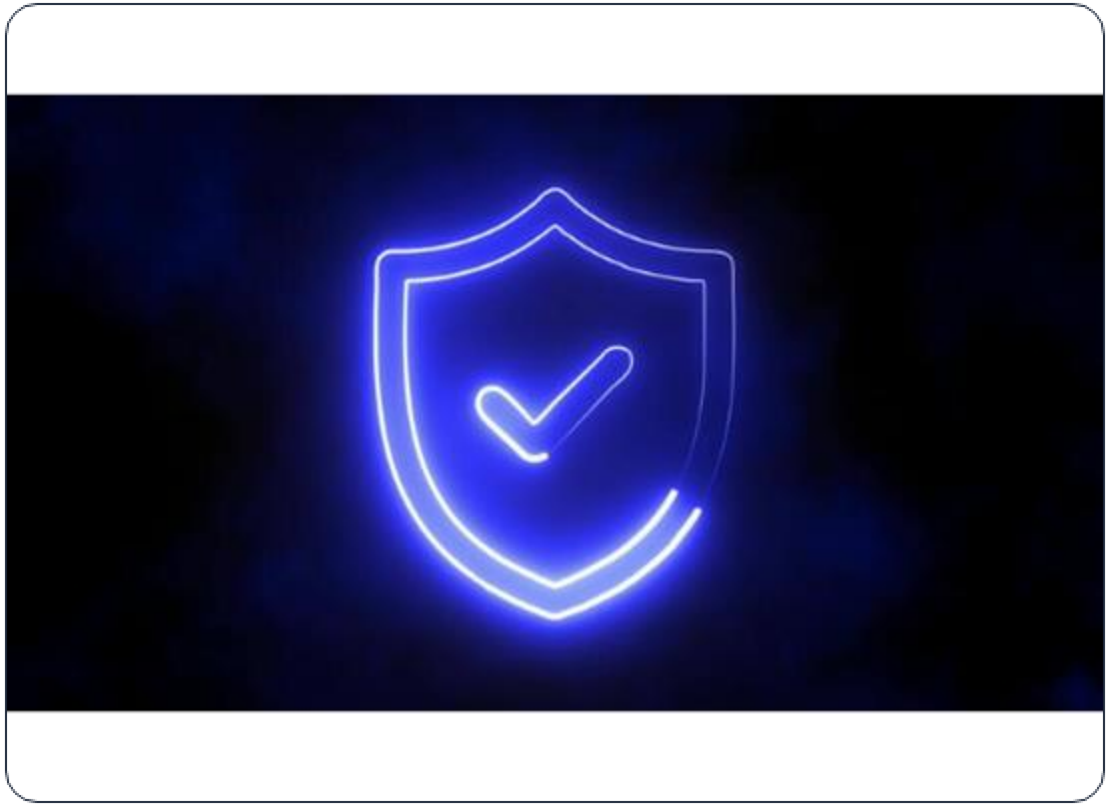
63% Refusal Rate

Victims are increasingly refusing to pay ransoms, fundamentally changing attacker strategies.

Python Security

Our goal: Use Gemini CLI to scan .py scripts for security flaws.

Key Insight: AI is not a "magic wand." It requires thorough human review to validate complex DevOps and security logic.



Step 1: Observe Behavior

Before fixing, we must establish a baseline.

```
$ python3 password_strength_checker.py
```

Test Samples

```
123456
```

```
P@ssw0rd!2026
```

The Lesson

Observe the current behavior. Don't fix what you haven't measured.

"Engineering is about priorities, not perfection."

Transitioning to Gemini CLI

Interactive Mode

Starting the session:

```
$ gemini
```

Loading context:

```
@./password_strength_checker.py
```

The Workflow

- **Inquiry:** Ask for line-by-line intent.
- **Challenge:** Force the AI to find its own errors.
- **Prioritize:** Sort issues by P0/P1/P2.

"Engineering is about priorities, not perfection."

Agentic Teams: Beyond Chat

Move from "Asking a Chatbot" to "Managing a Department."

- **Reviewers:** Scans for vulnerabilities.
- **Orchestrator:** Manages collaboration.
- **Debugger:** Implements the fixes.

Task Automation

Automating the review loop via Gemini CLI markdowns.

Less manual prompt engineering, more engineering results.

Superpowers via MCP

The Core Idea

Normally, AI can only **talk and Gemini cli has limited actions.**

MCP lets AI DO THINGS.

Connecting your private ecosystem to intelligence:

Obsidian/Notes Sync

Connect to Reddit

Course Summarization

GitHub/GitLab Repos

What is MCP?

Model Context Protocol

A standardized interface to connect models to tools.

The "USB Port" for AI

The same interface works for files, databases, APIs, and internal services.

DSA Group

Hello from our side..

DSA

Nice To Meet You!

- We are the Data Science and its Applications (DSA) Research Group. We are a constellation of researchers who are united under the supervision of Professor Sebastian Vollmer, with a shared goal of advancing data science methods and tools and using them across industrial and socially-important applications.

- Our main homes are the German Research Center for Artificial Intelligence (DFKI), where we form the Data Science and its Applications research department, and the University of Kaiserslautern, where we form the Applied Machine Learning group.

Sebastian Vollmer

Darko Obradovic

Islam Mesabah

Mohaddeseh Tabrizian

DSA

Assistant tools for AI prototyping & testing

Helping developers make their AI systems
more trustworthy, robust, secure,

MISSION KI

Federal Ministry
for Digital
and Transport

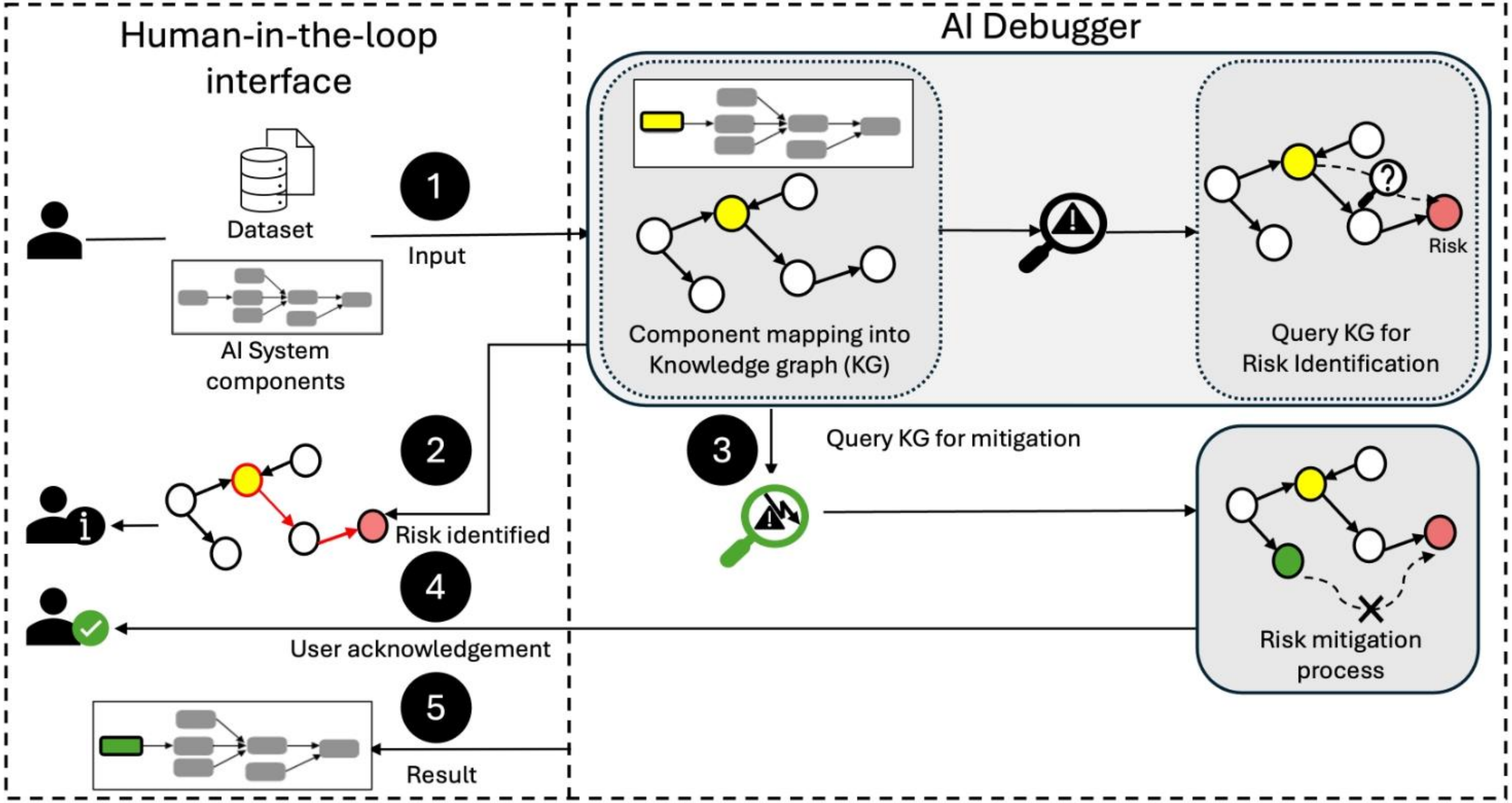


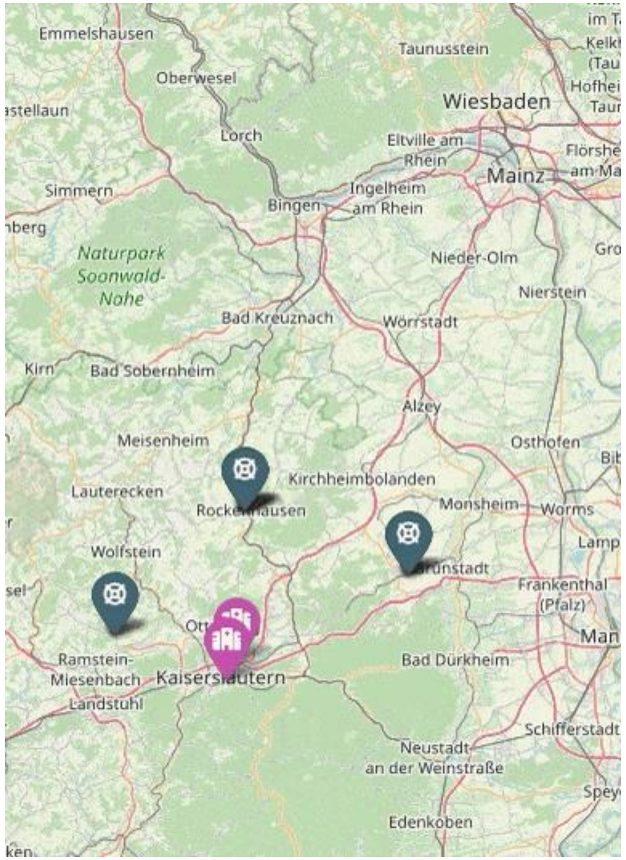
Figure 2: A flowchart depicting the **AI debugger** workflow. This process maps user inputs to the KG and query for potential risk identification and mitigation under HITL supervision.

(Spatio-)temporal modelling and forecasting

BOSTON COLLEGE

UNIVERSITY OF OXFORD

Ambulance allocation



github.com/gerritgr/AmbulanceGame

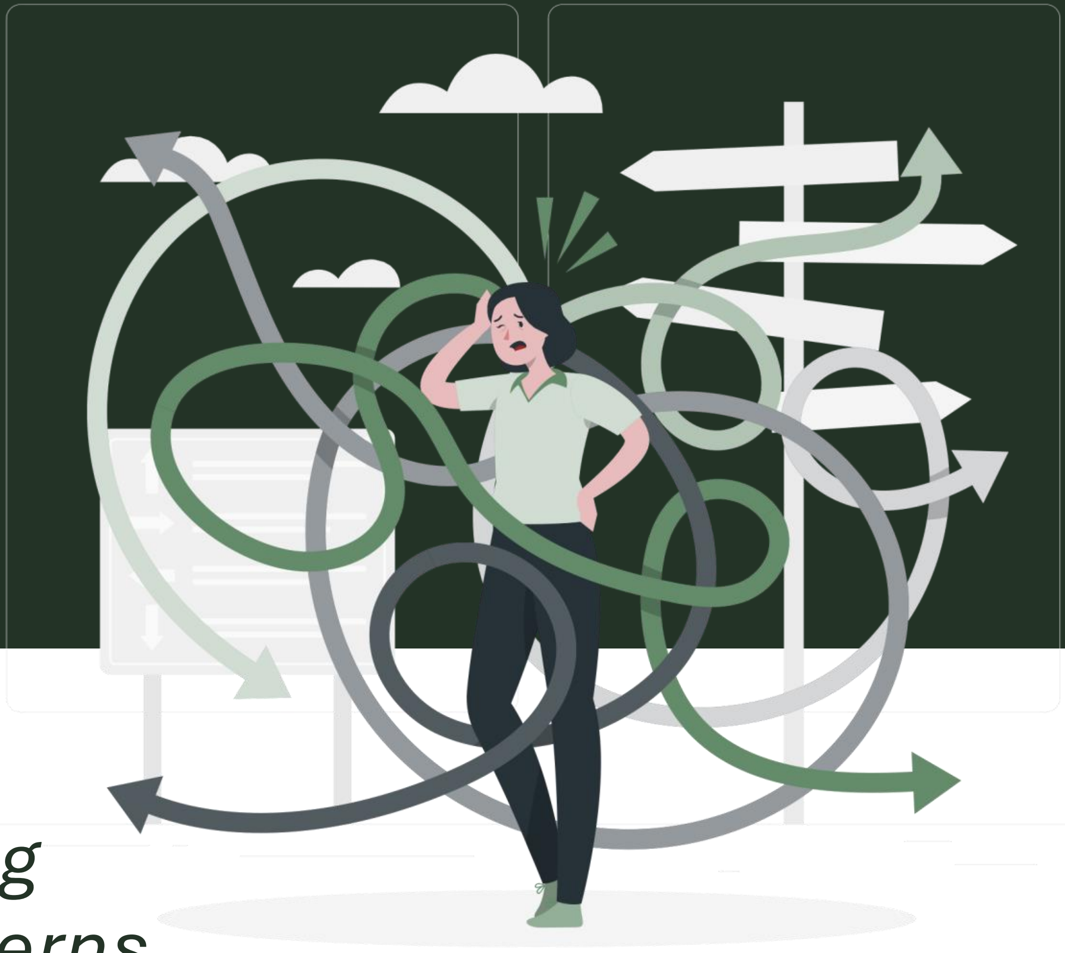
Goal: Better decision-making in ambulance dispatching for faster response times and stronger coverage.

- Dispatch an ambulance?
- Dispatch an emergency doctor?
- Which ambulance to send?
- Which hospital to choose?
- Use lights and sirens?
- Which route?
- Relocate other ambulances?

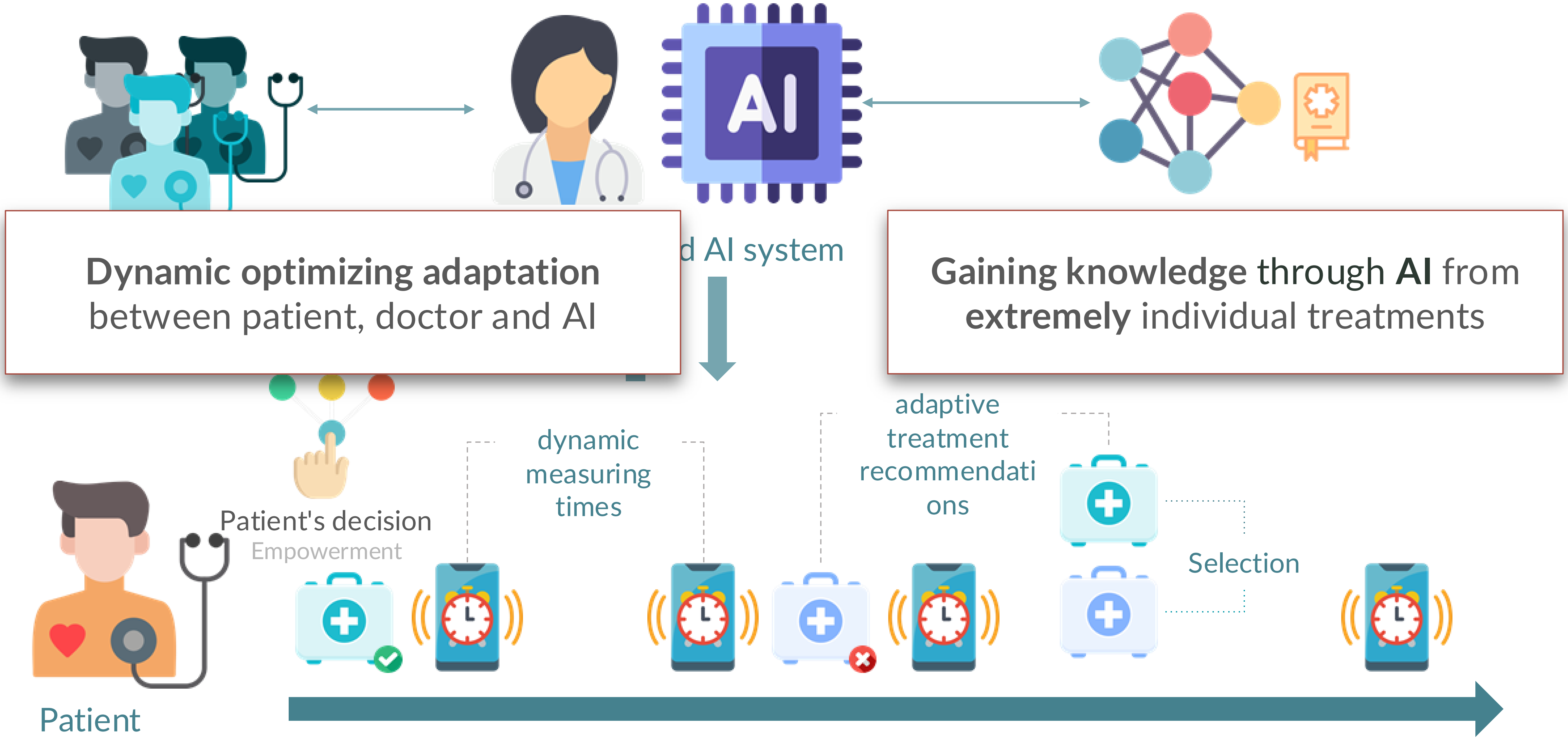
Utilising unstructured data and knowledge

Structuring unstructured data to give actionable insights

Causal, probabilistic, reinforcement learning that scales



Explainable, actionable machine learning that captures relationships, not just patterns

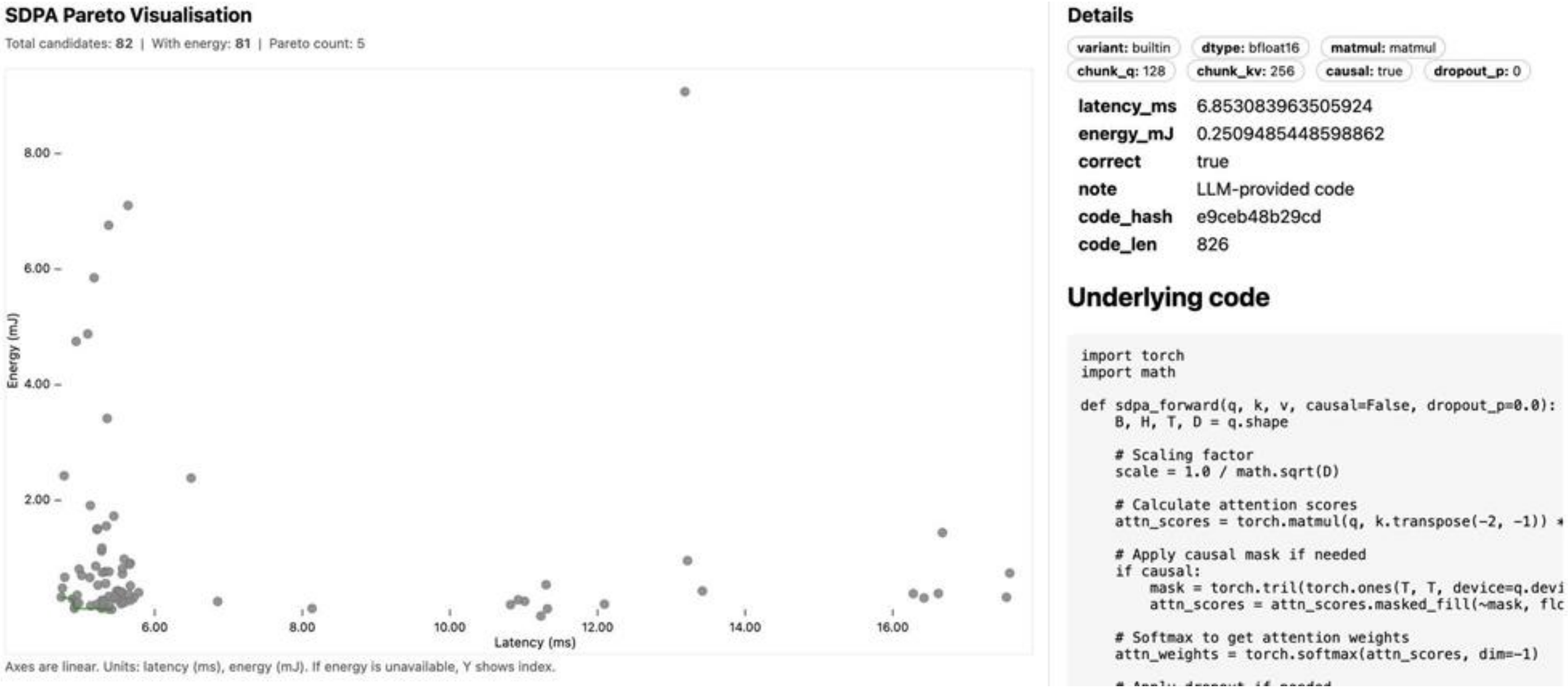


Dynamic optimizing adaptation between patient, doctor and AI

Gaining knowledge through AI from **extremely** individual treatments

Leaner, greener, cheaper AI

Examples



SDPA Pareto Visualisation

Total candidates: **82** | With energy: **81** | Pareto count: 5

Axes are linear. Units: latency (ms), energy (mJ). If energy is unavailable, Y shows index.

Details

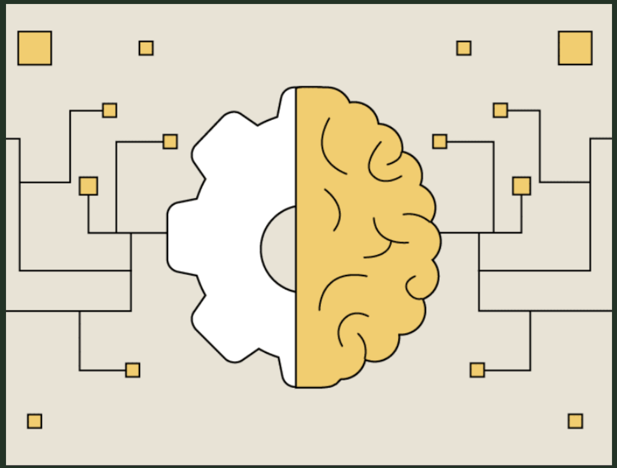
variant: builtin **dtype:** bfloat16 **matmul:** matmul
chunk_q: 128 **chunk_kv:** 256 **causal:** true **dropout_p:** 0

latency_ms	6.853083963505924
energy_mJ	0.2509485448598862
correct	true
note	LLM-provided code
code_hash	e9ceb48b29cd
code_len	826

Underlying code

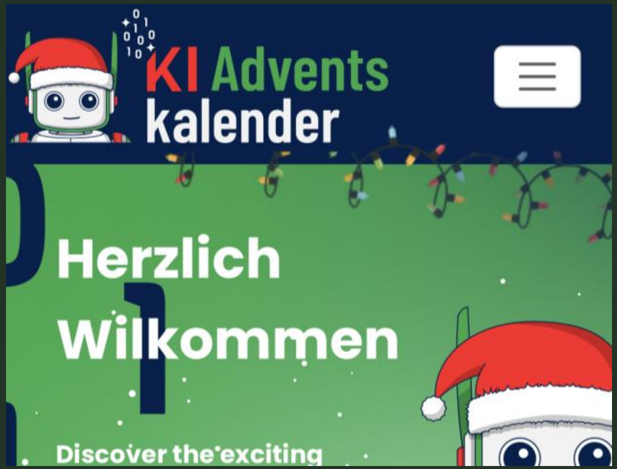
```
import torch
import math

def sdpa_forward(q, k, v, causal=False, dropout_p=0.0):
    B, H, T, D = q.shape

    # Scaling factor
    scale = 1.0 / math.sqrt(D)

    # Calculate attention scores
    attn_scores = torch.matmul(q, k.transpose(-2, -1)) *

    # Apply causal mask if needed
    if causal:
        mask = torch.tril(torch.ones(T, T, device=q.devi
        attn_scores = attn_scores.masked_fill(~mask, flc

    # Softmax to get attention weights
    attn_weights = torch.softmax(attn_scores, dim=-1)

    # Apply dropout if needed
```

Engineering with Generative AI



Machine Learning 2

Machine Learning & NLP with AWS



KI Advents kalender

Herzlich Wilkommen

Discover the exciting

AI advent calendar

Q & A