

Coding with AI



**[https://github.com/up1/
course-ai-coding-2026](https://github.com/up1/course-ai-coding-2026)**

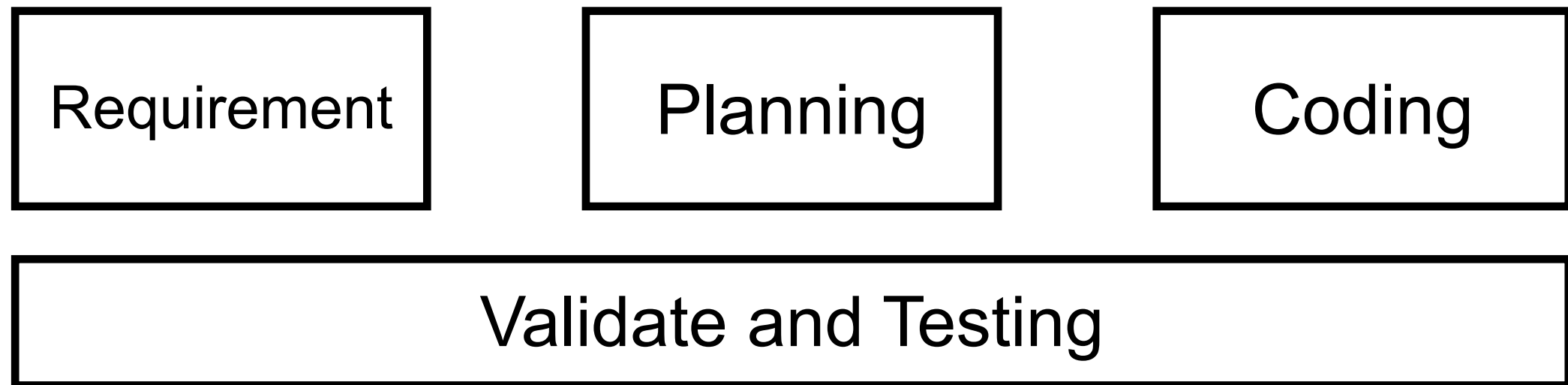


Coding with AI



Topics

Programming/Coding workflow
Specification-Driven Development (SSD)
Model-Driven Development (MDD)
Coding with AI Agent workshop



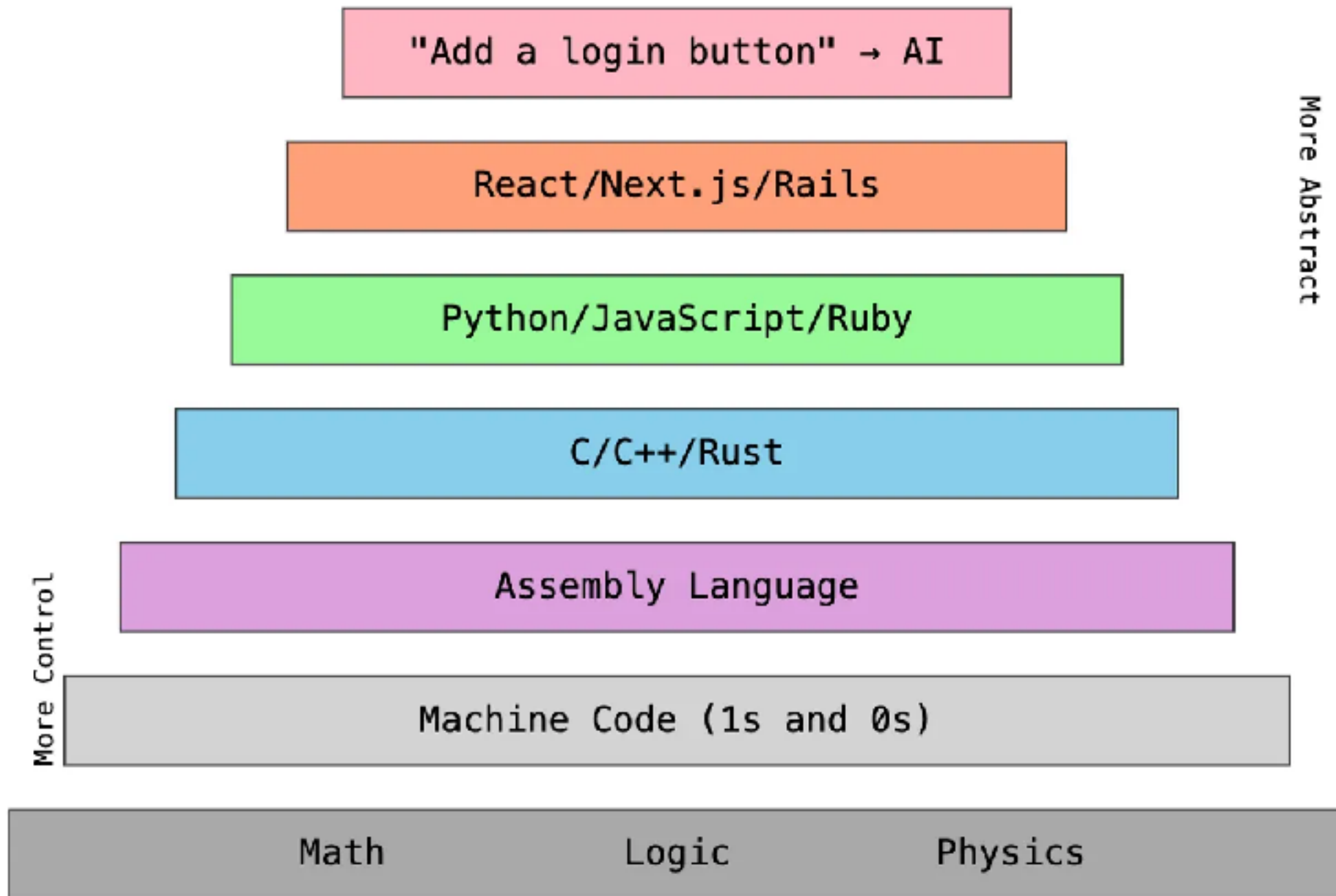
History of Programming



Increase of abstraction



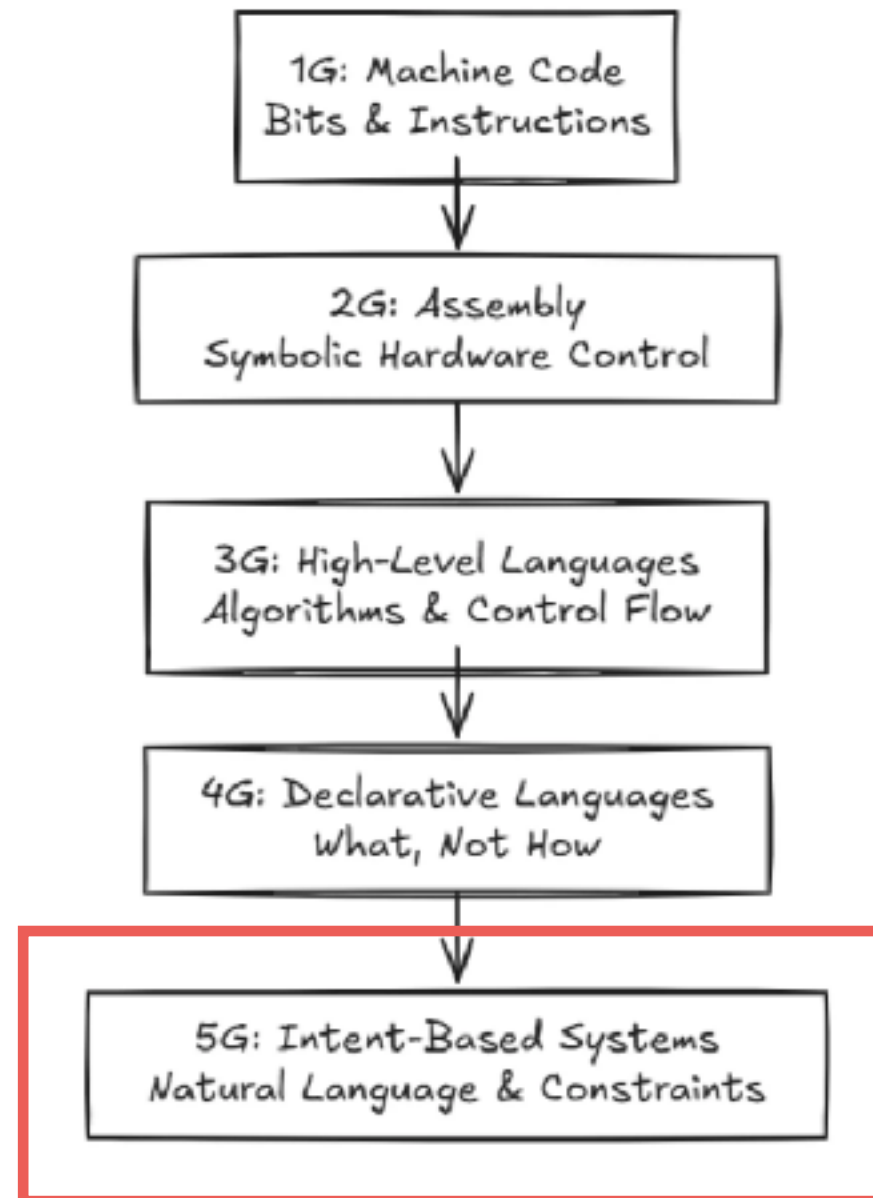
The Modern Tower of Abstraction



<https://cline.bot/blog/from-assembly-to-ai-why-vibe-coding-is-just-another-chapter-in-our-abstraction-story>



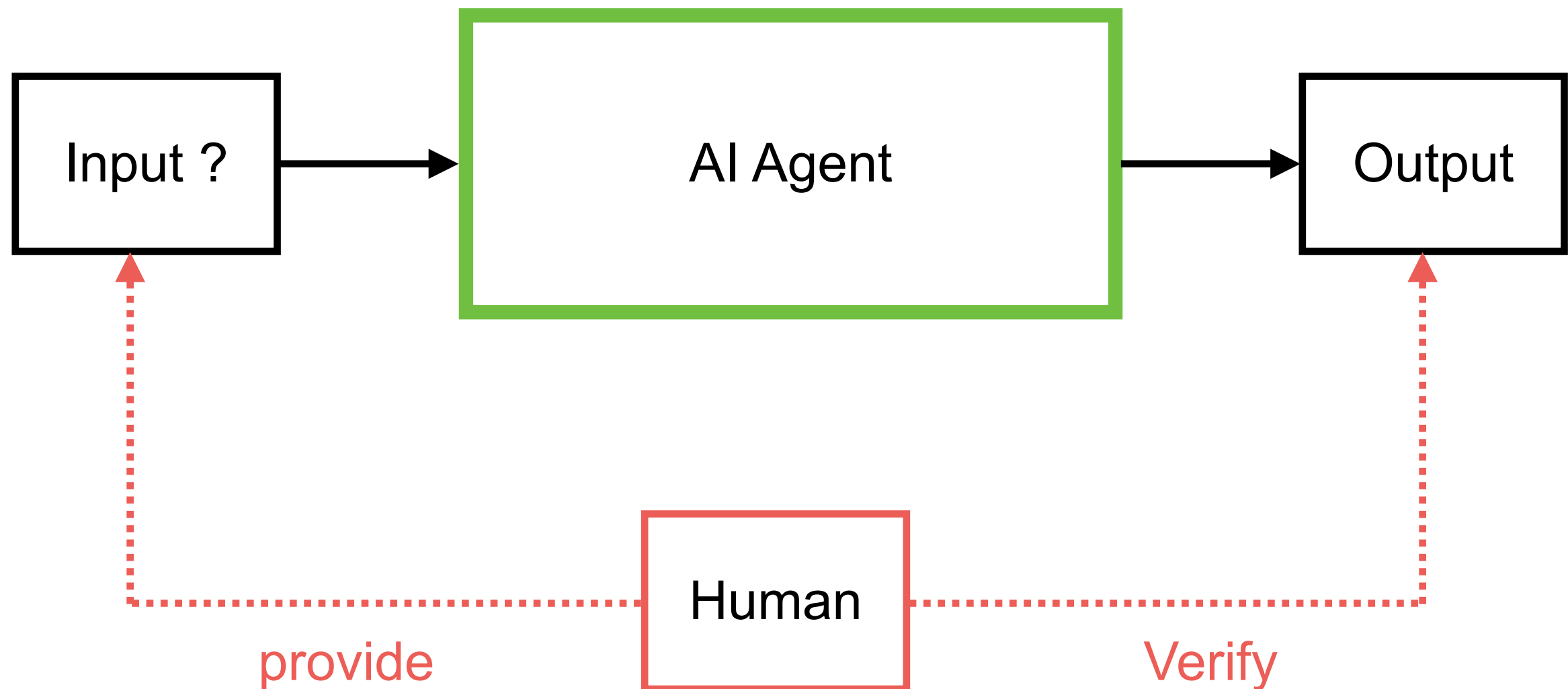
Generation of Programming languages



<https://medium.com/@ajuatahcodingarena/generations-of-programming-languages-bed30d19ea8e>



Coding with AI Agent



AI Agent for Coding



LLM

Code writing
tools

Memory and
Context

Other tools



Vibe -Driven

DESIGN

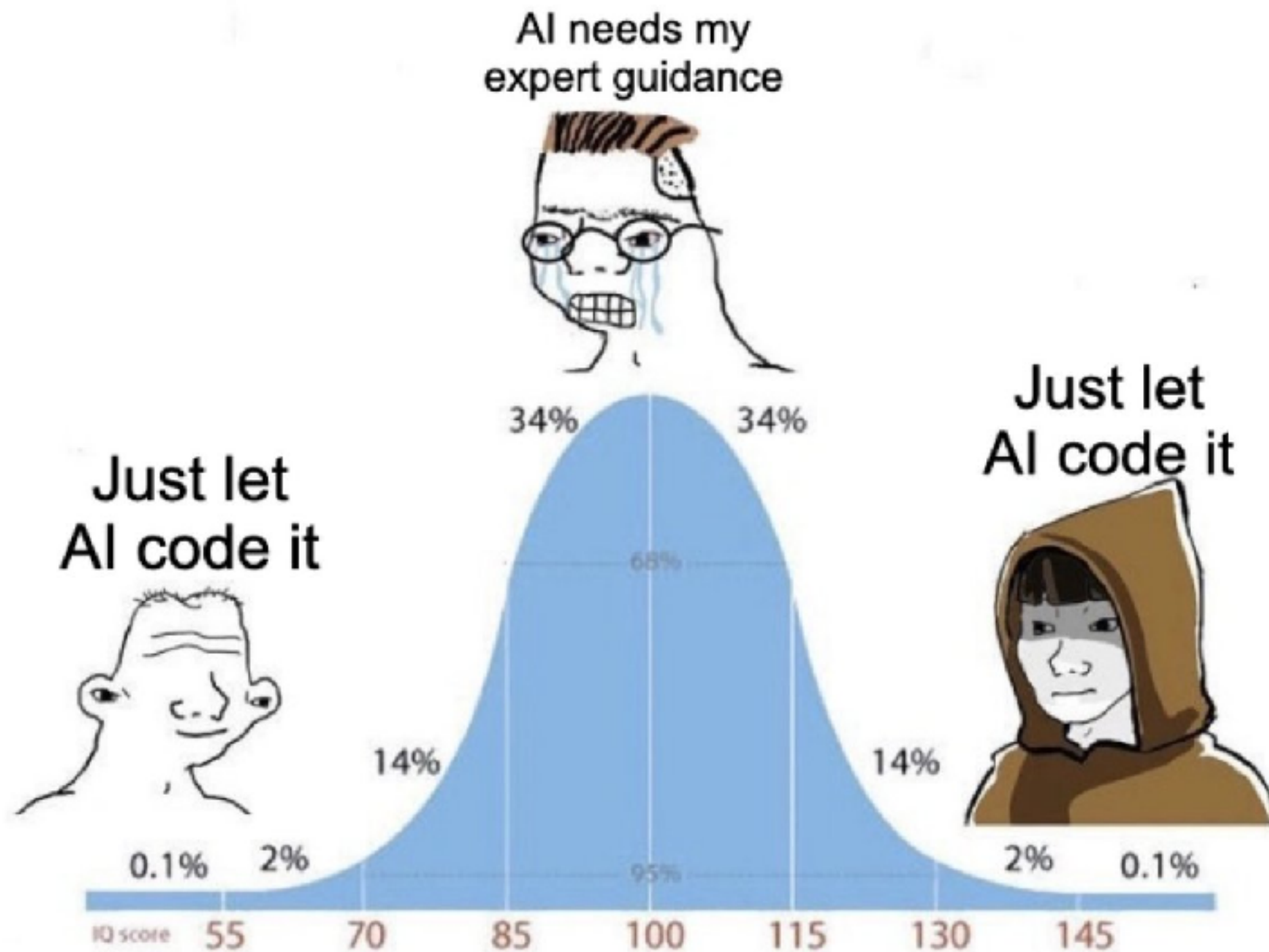
Vibe-awareness in the Heart of Software



Eric Evans

Foreword by Martin Fowler







Andrej Karpathy ✓

@karpathy



There's a new kind of coding I call "vibe coding", where you fully give in to the vibes, embrace exponentials, and forget that the code even exists. It's possible because the LLMs (e.g. Cursor Composer w Sonnet) are getting too good. Also I just talk to Composer with SuperWhisper so I barely even touch the keyboard. I ask for the dumbest things like "decrease the padding on the sidebar by half" because I'm too lazy to find it. I "Accept All" always, I don't read the diffs anymore. When I get error messages I just copy paste them in with no comment, usually that fixes it. The code grows beyond my usual comprehension, I'd have to really read through it for a while. Sometimes the LLMs can't fix a bug so I just work around it or ask for random changes until it goes away. It's not too bad for throwaway weekend projects, but still quite amusing. I'm building a project or webapp, but it's not really coding - I just see stuff, say stuff, run stuff, and copy paste stuff, and it mostly works.

6:17 AM · Feb 3, 2025 · 5.3M Views

<https://x.com/karpathy/status/1886192184808149383>



Vibe Coding

Software development practice that uses artificial intelligence (AI) to generate functional code from **natural language prompts**, accelerating development, and making app building more accessible, especially for those with limited programming experience

<https://cloud.google.com/discover/what-is-vibe-coding>



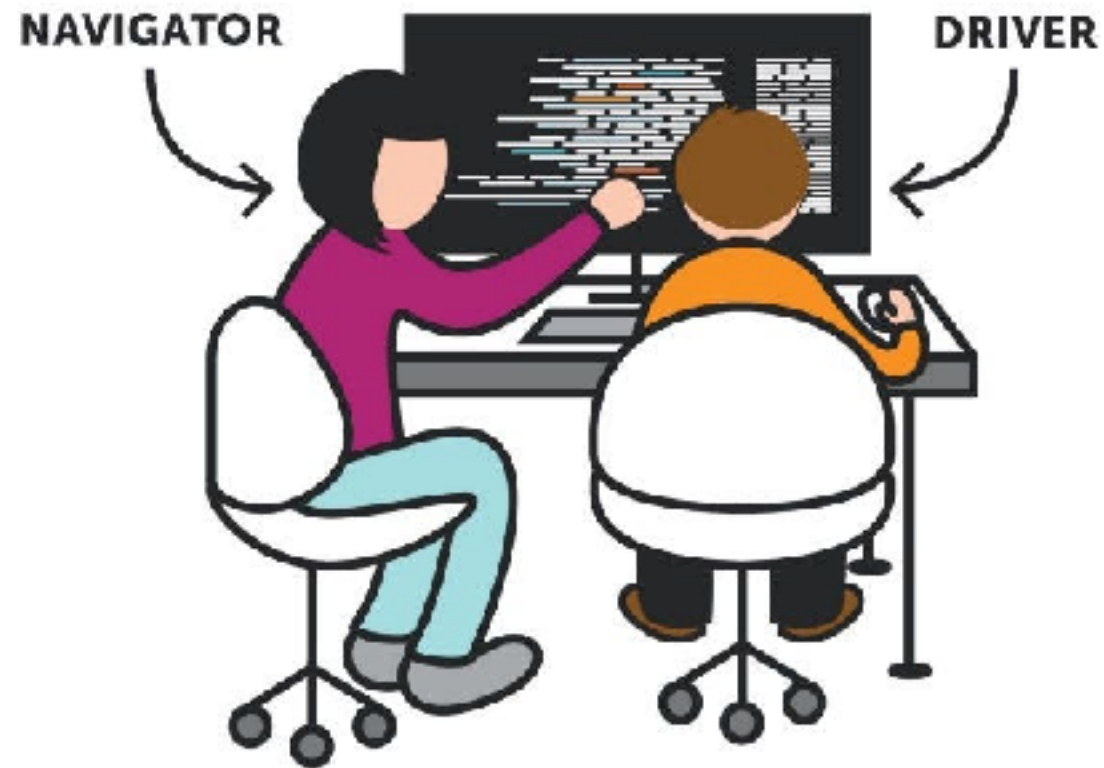
Types of Vibe coding ?

Pure vibe coding

Responsible AI-assist development



PAIR PROGRAMMING



Reviews, Tests and Understands
with experience



Workflows ?

Application level

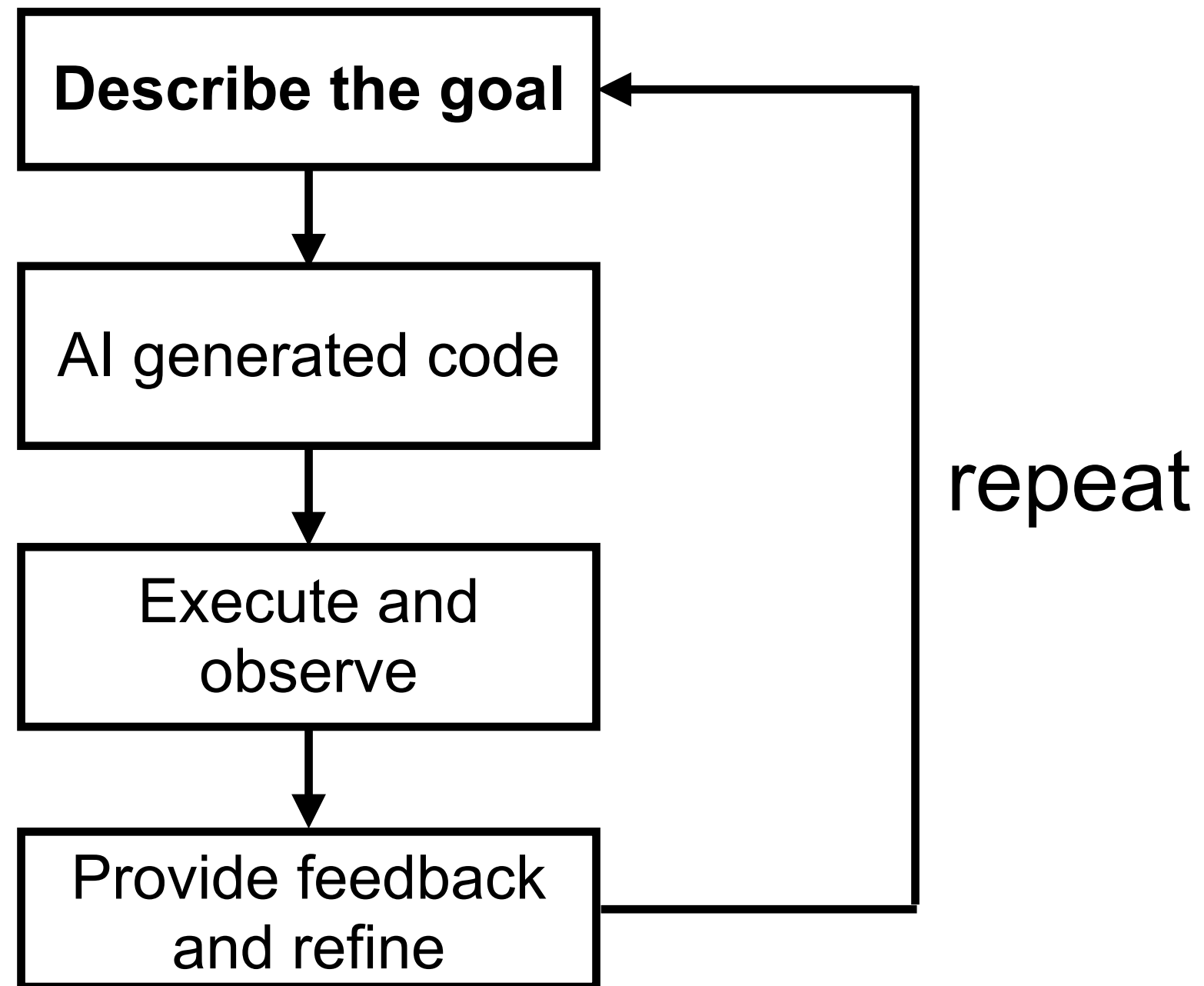
Code level

<https://cloud.google.com/discover/what-is-vibe-coding>



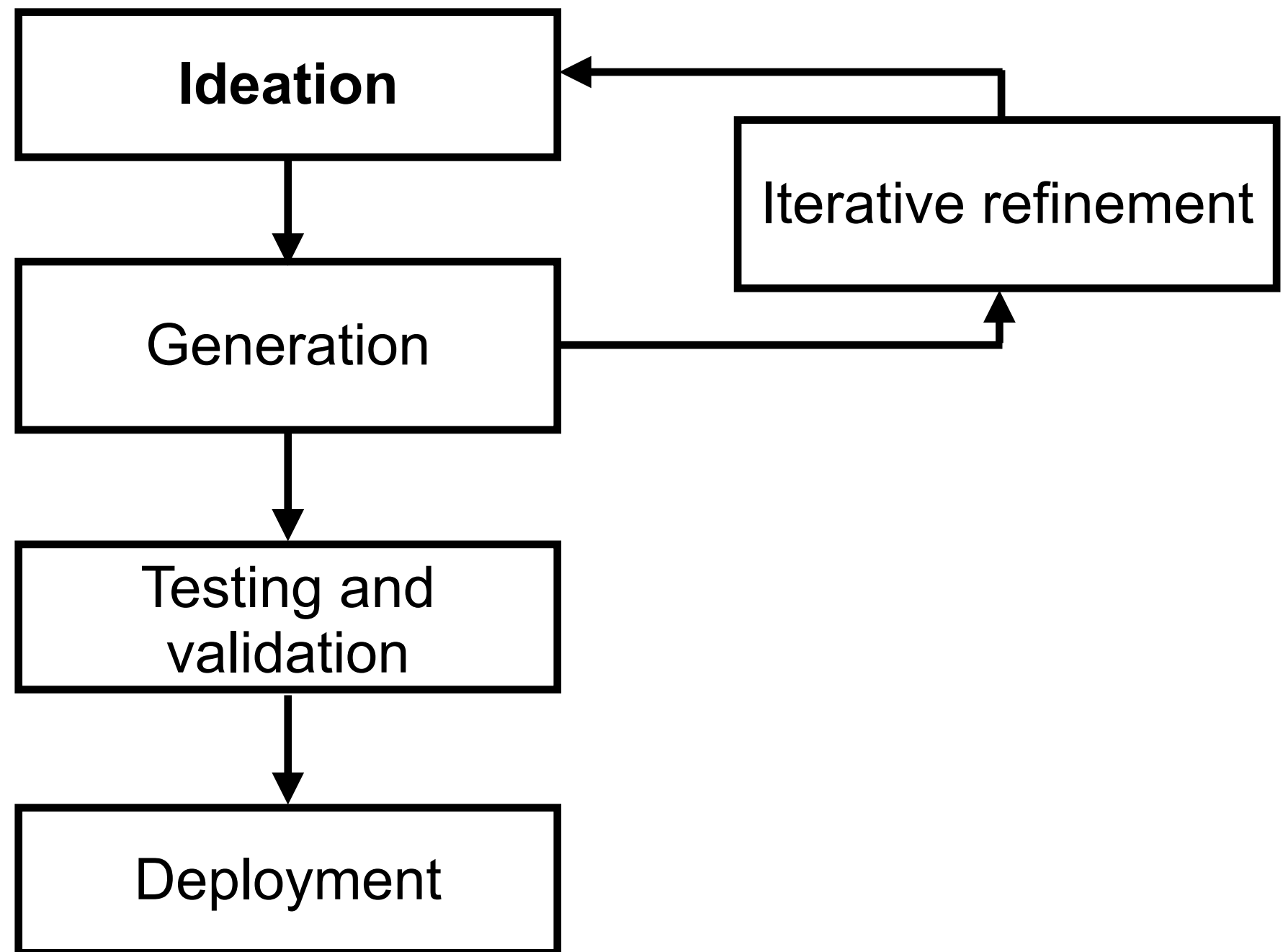
Code level workflow

Conversational loop to create a specific code



Application level workflow

Talking about high-level idea from concept to deployment

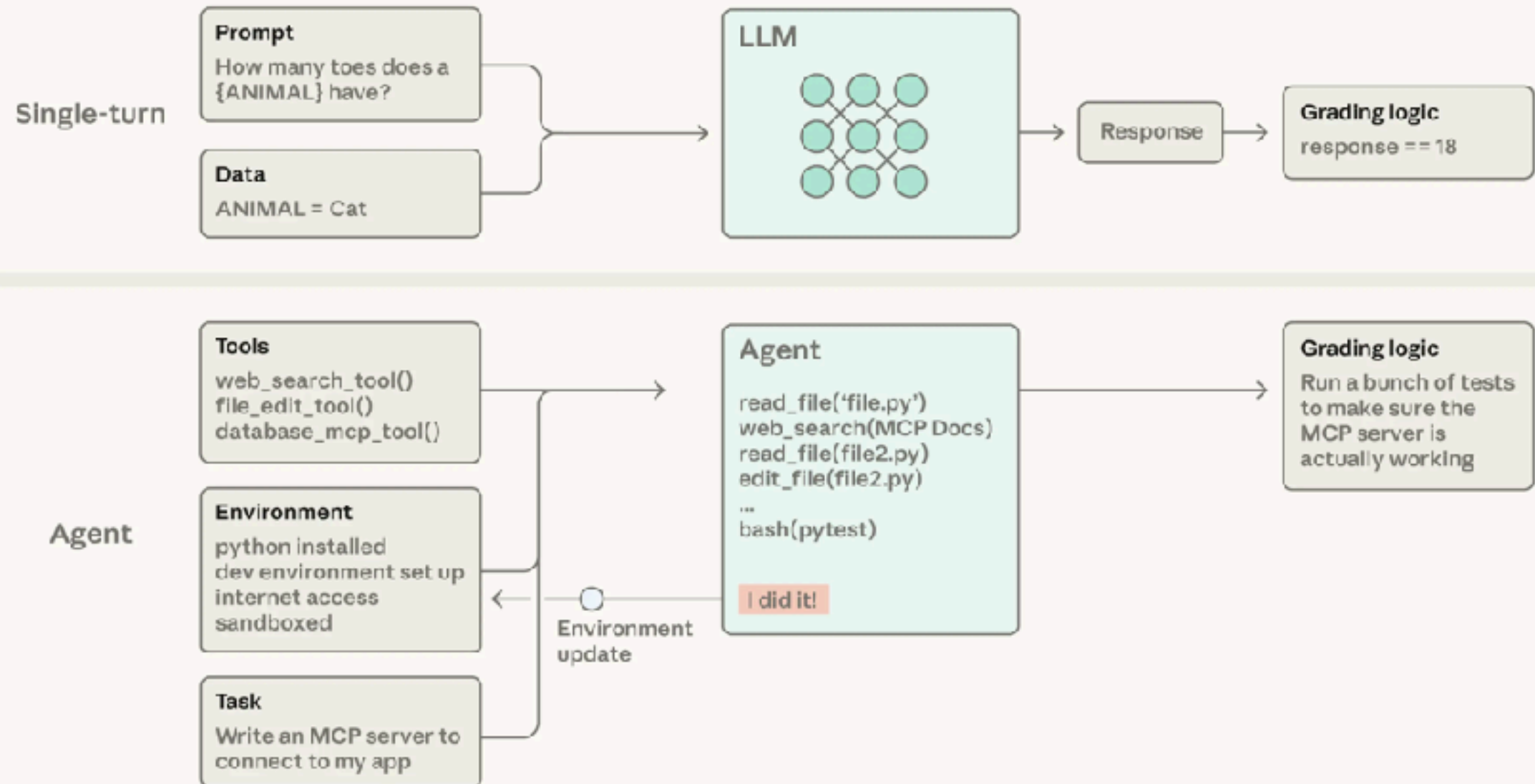


AI Agent for Coding



AI Agent for Coding

Comparison: Single-Turn vs Agent Evaluations



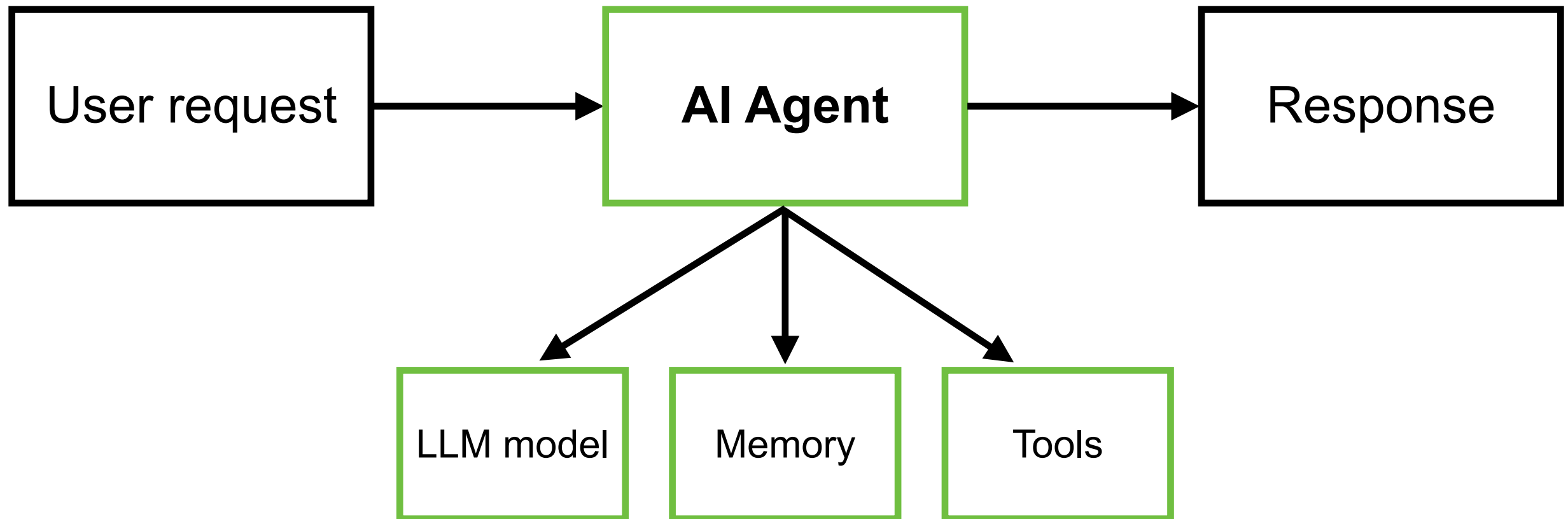
<https://www.anthropic.com/engineering/demystifying-evals-for-ai-agents>



AI Agent for Coding



Simple AI Agent



How to manage context or knowledge
for Agent ?



Types of Knowledge/Context ?

Shared context

Static Knowledge

Prompt engineering
Global Instructions
AGENTS.md
CLUDE.md

Task context

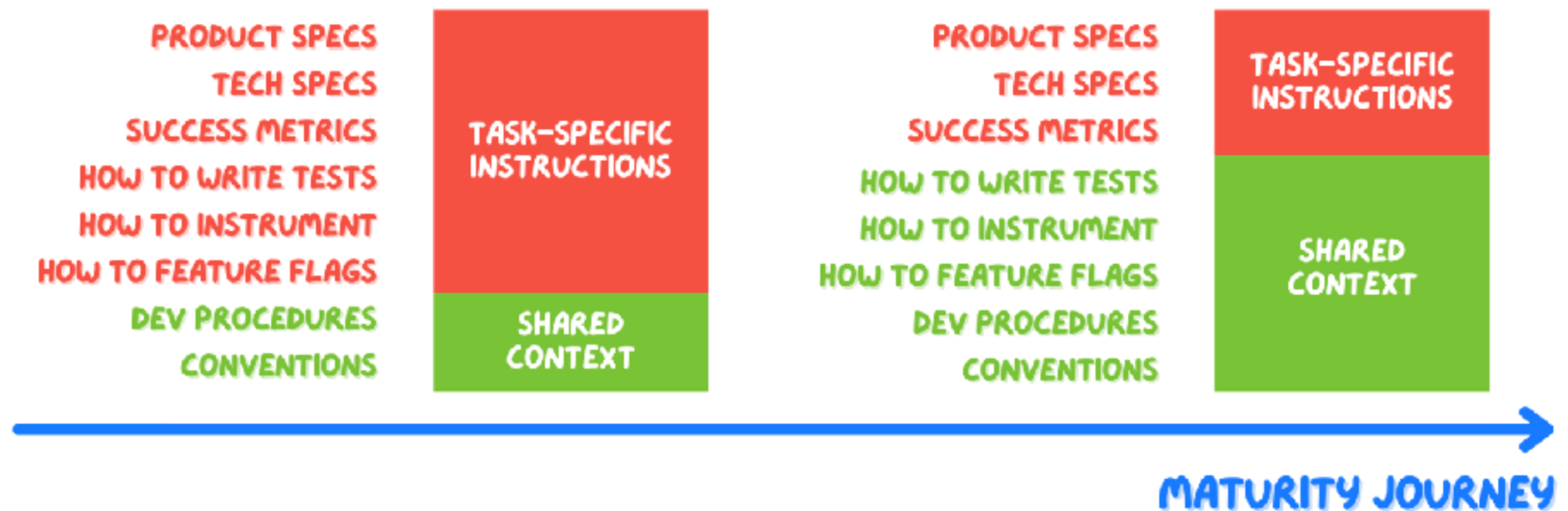
Dynamic
Knowledge

Memory
Graph/Vector database
MCP tools
Specific Instructions
Sub-agent
Agent SKILLS

Context engineering ?



Types of Knowledge/Context ?

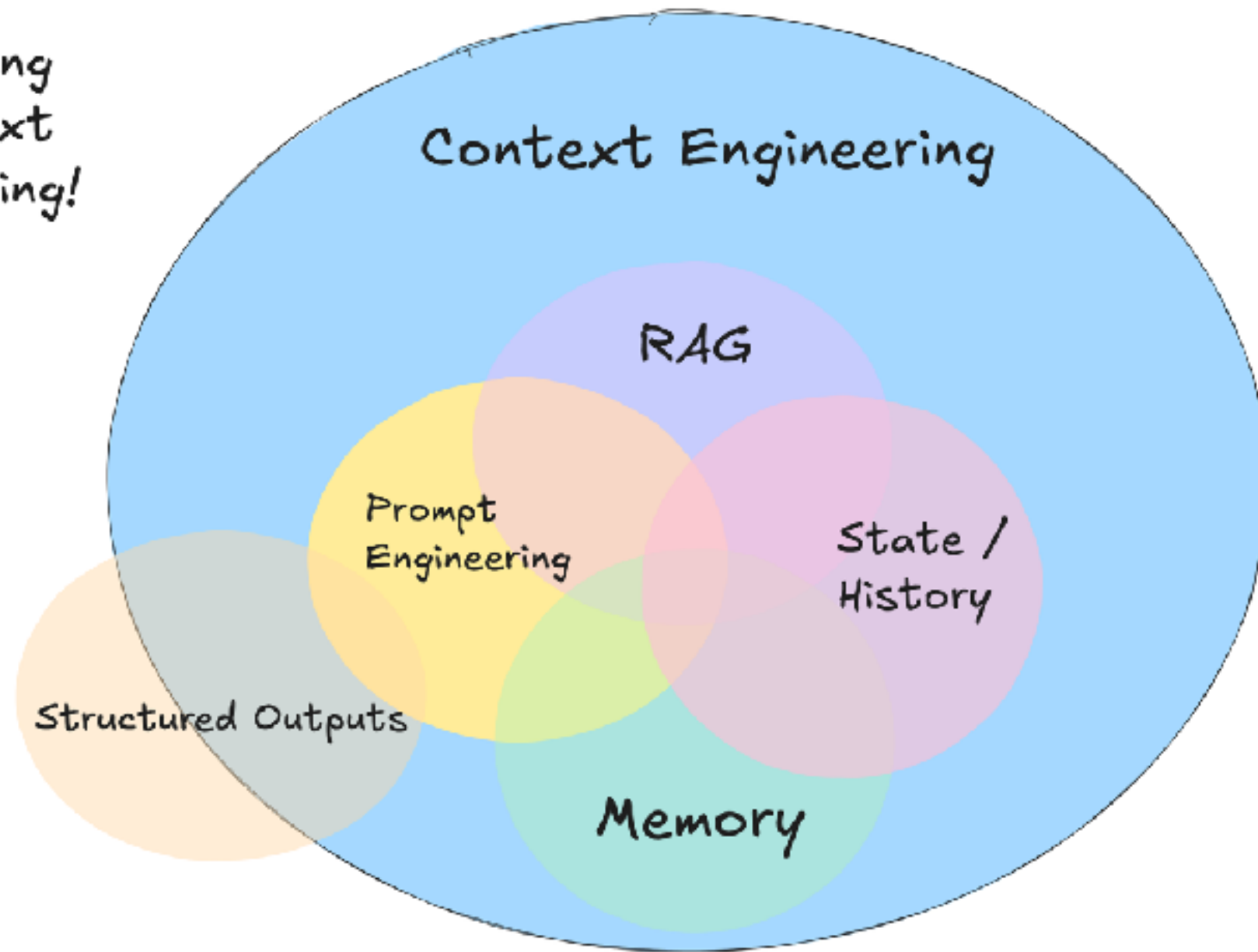


<https://refactoring.fm/p/context-capabilities-and-tech-hubs>



Context Engineering

Everything
is Context
Engineering!

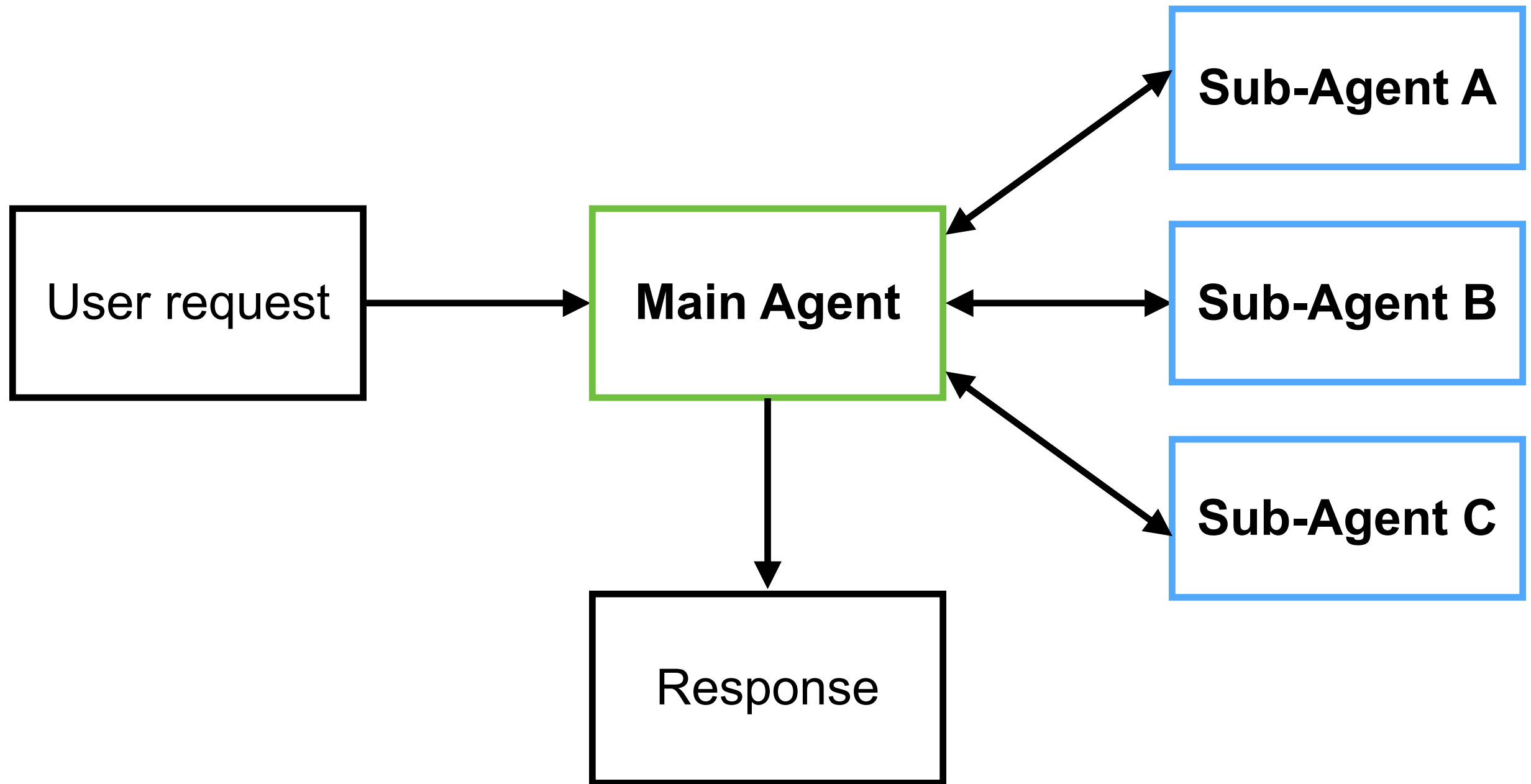


<https://www.promptingguide.ai/guides/context-engineering-guide>



Multi AI Agents !!

Sub-agent with **centralized** orchestration

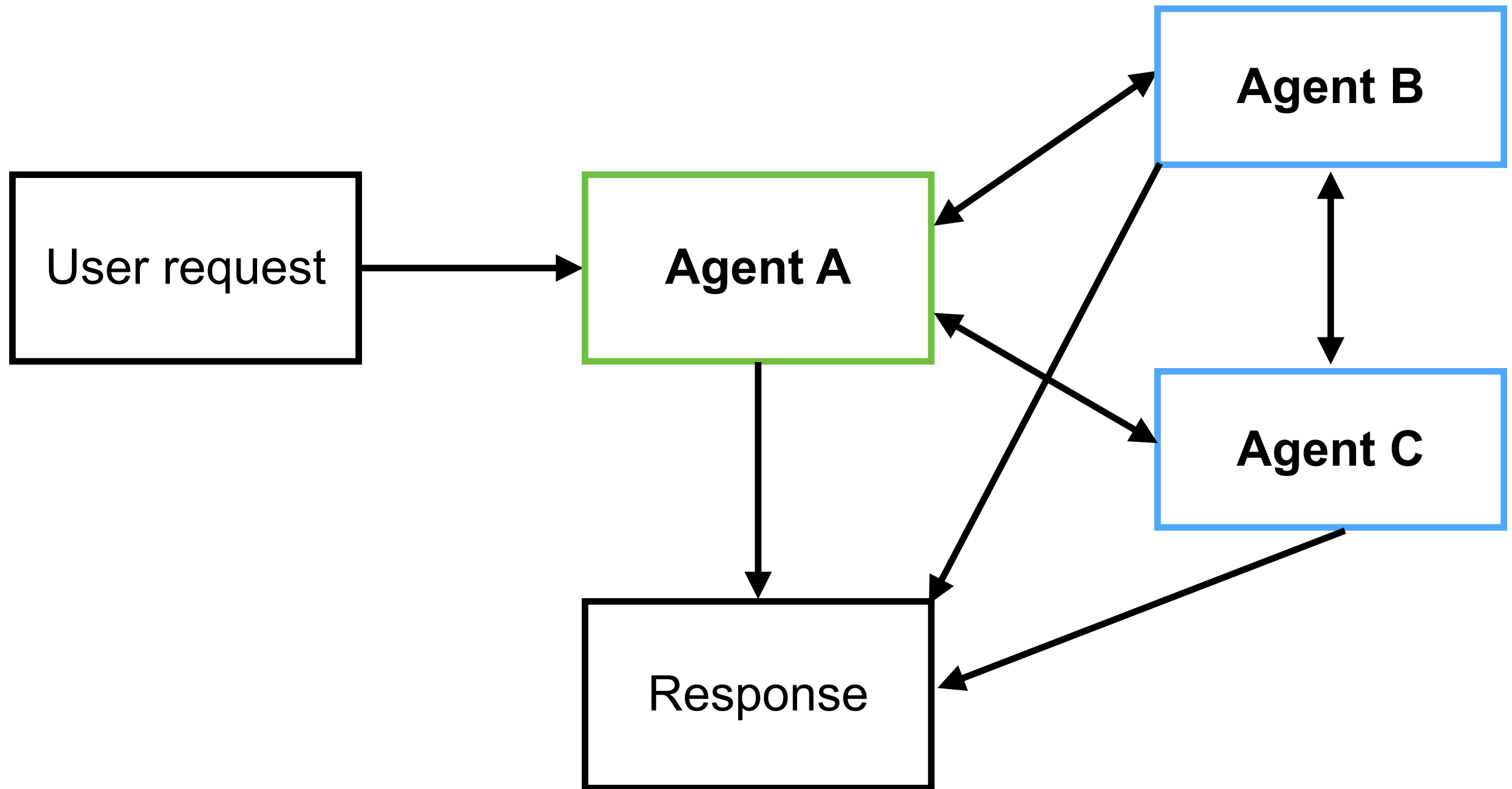


<https://www.blog.langchain.com/choosing-the-right-multi-agent-architecture/>



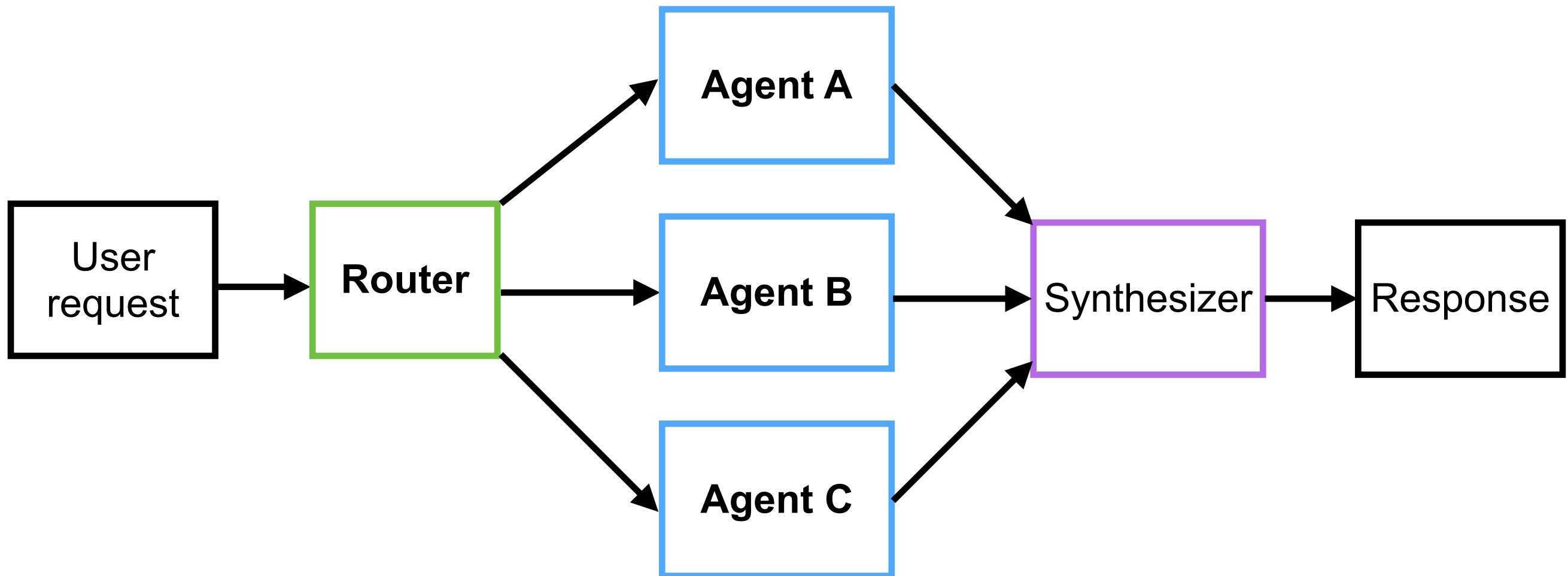
Multi AI Agents !!

State-driven transitions based-on conversation context



Multi AI Agents !!

Router and parallel run



Prompt vs Agent Skills ?



Command

<https://agentskills.io/>



Agent Skills

Moving from a paradigm of
“prompt” to “programming by instruction”

Agent loads specialized prompts and knowledge on-demand

Specialized
task

Reduce
repetition

Compose
capabilities

Efficient
loading

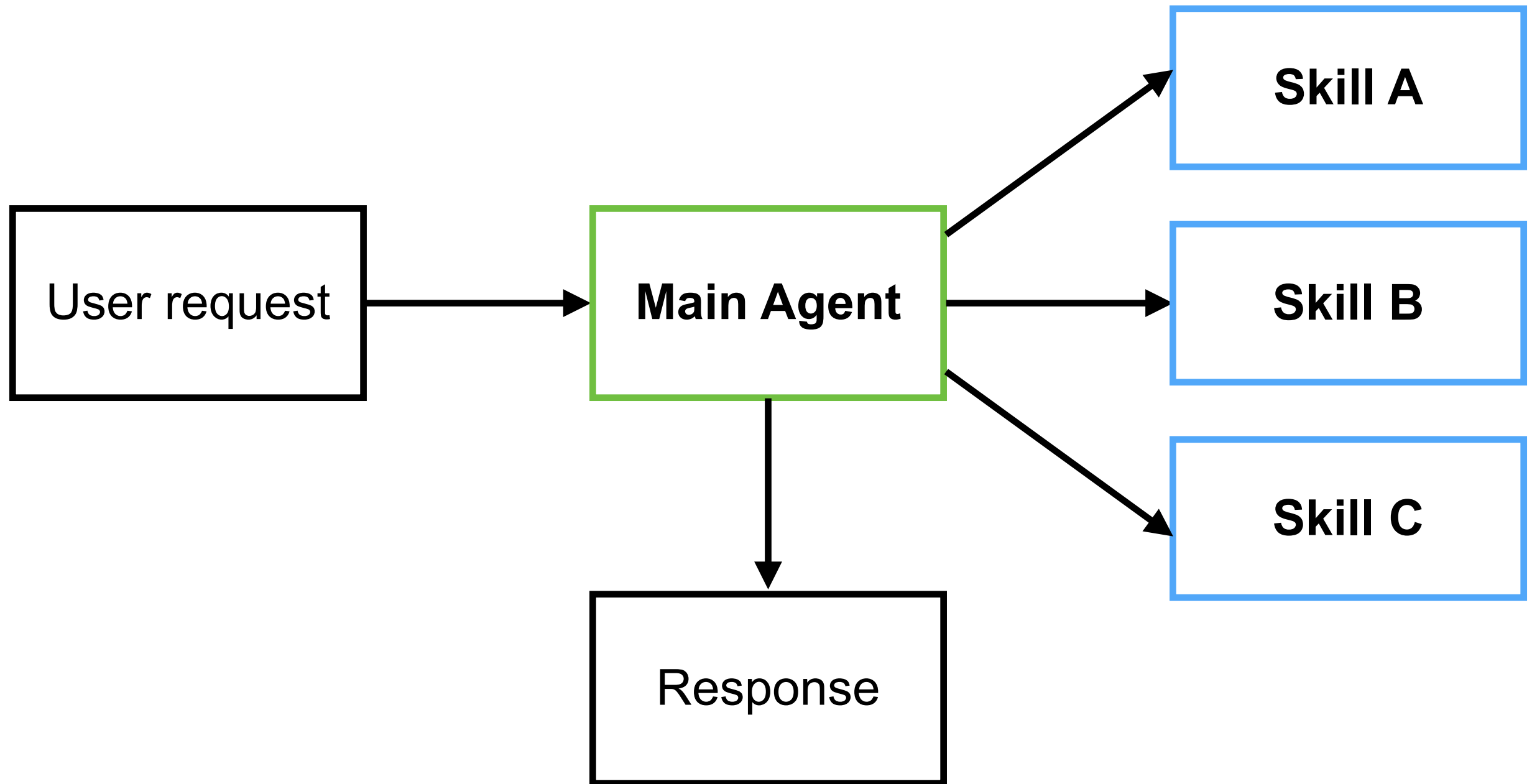
Interoperability

<https://agentskills.io/>



Agent with Skills

Load skills on-demand from context



<https://www.blog.langchain.com/choosing-the-right-multi-agent-architecture/>



Structure of Agent Skills

Level 1
Metadata

Level 2
Instructions

Level 3
Resources and code

<https://agentskills.io/>



Prompt vs Skill

Features	Prompt	Agent Skills
Persistence	Ephemeral (chat-specific)	Persistent (Useable cross conversation)
Activation	Manual by user	Automatic (Triggered by context)
Structure	Unstructured text/ instruction	Structured markdown File system-based
Context load	Full instruction	Load only when needed
Token cost	Higher (Repeated usage)	Lower (Load on-demand)
Use case	One-time, creative quick query	Repeatable workflows Specialized tasks

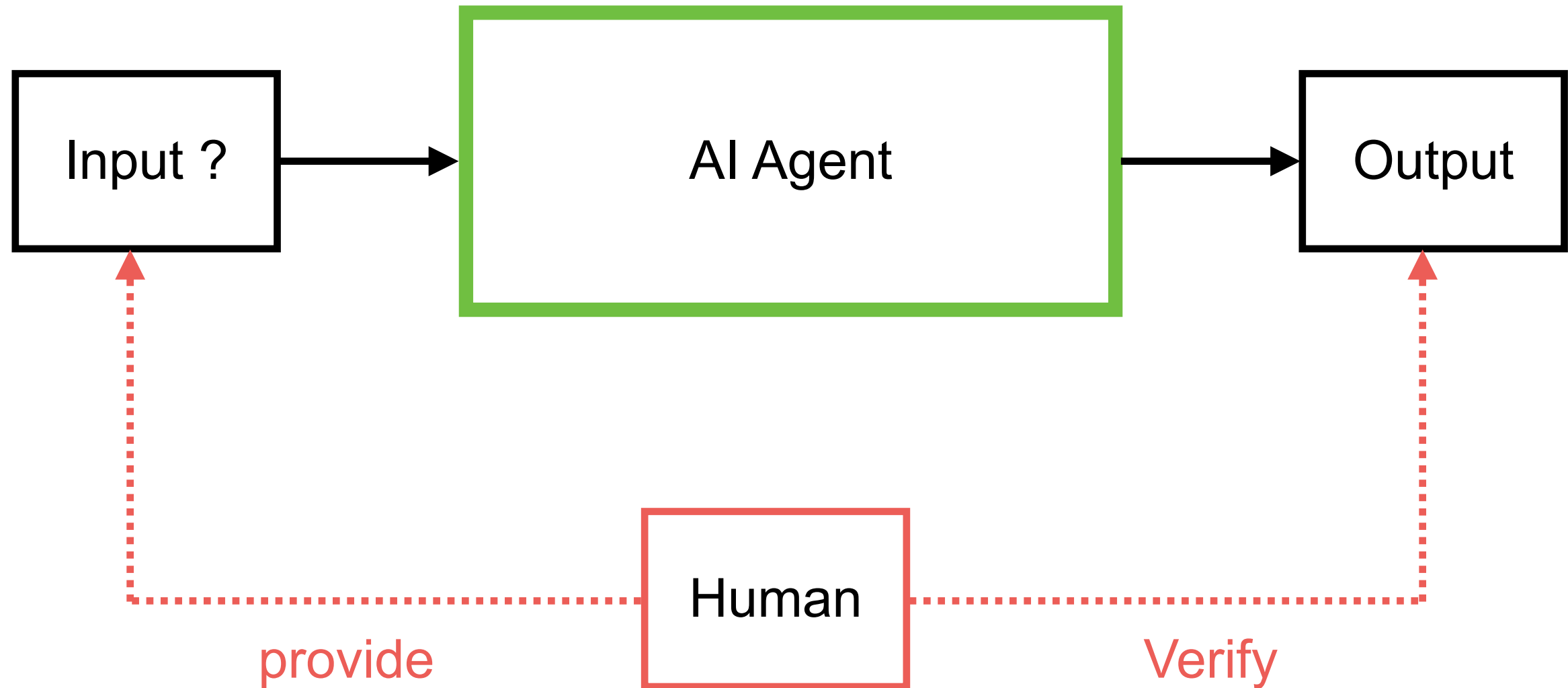
<https://agentskills.io/>



How to provide inputs ?



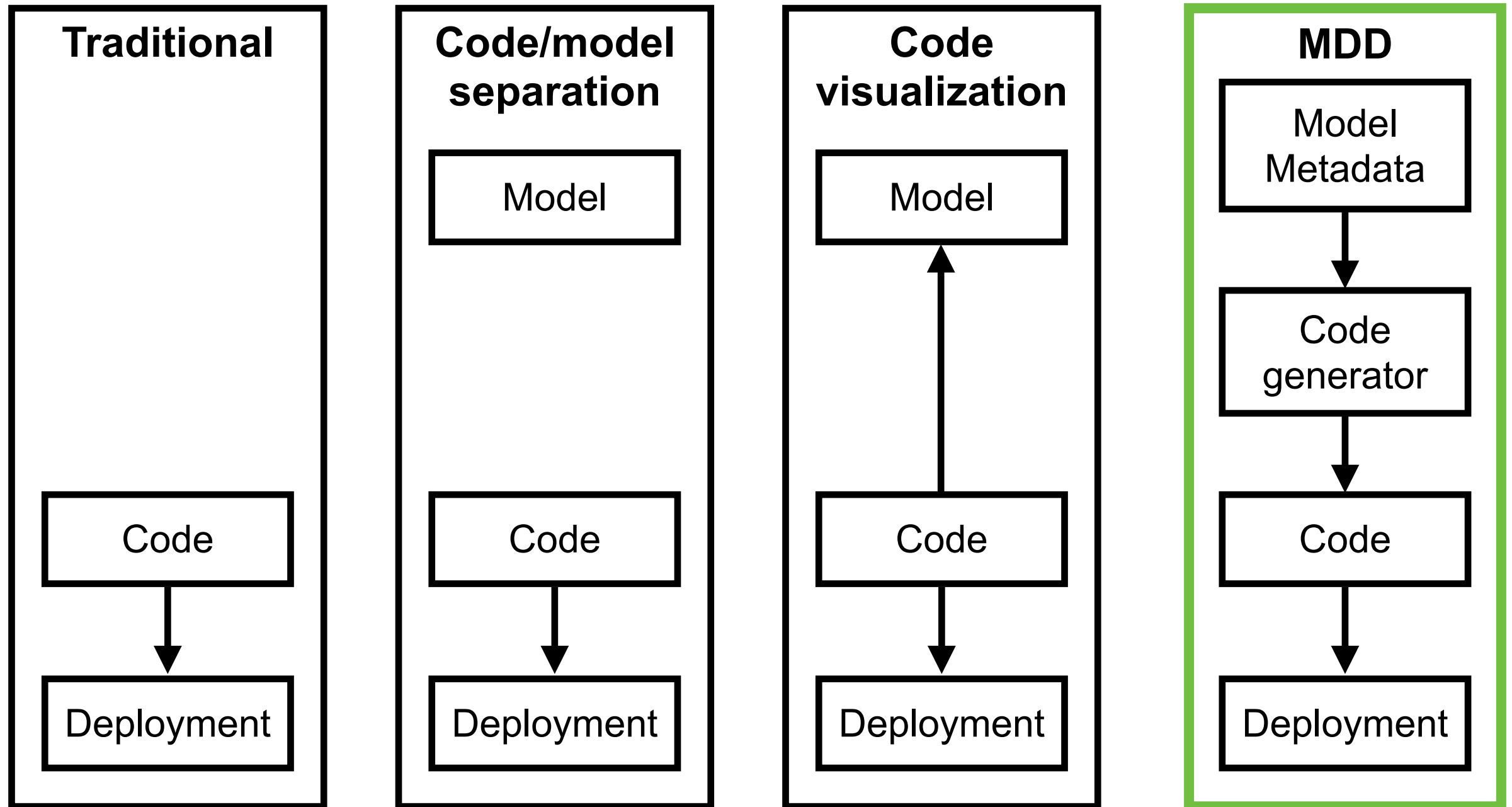
How to provide inputs ?



Model-Driven Development (MDD)



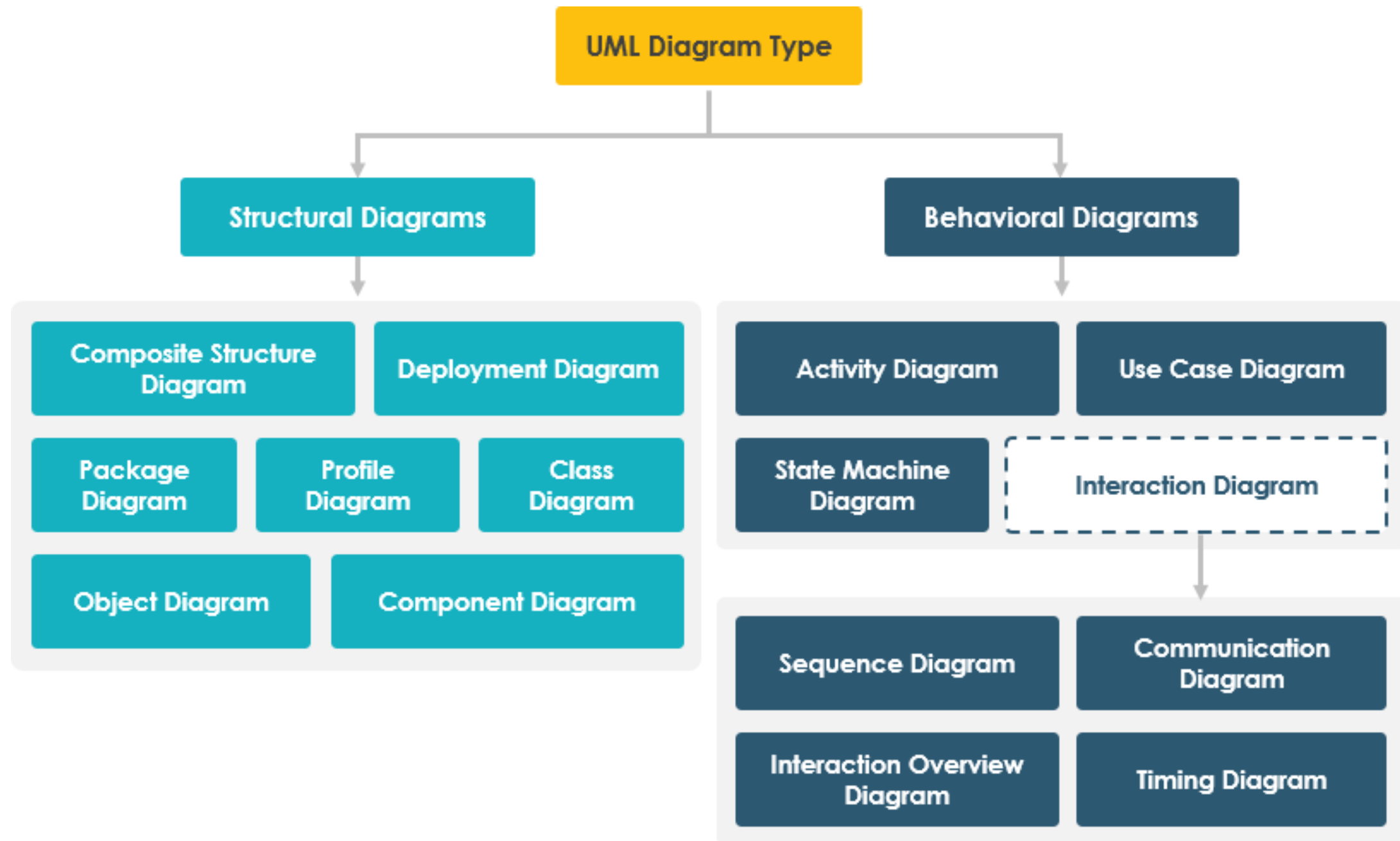
Traditional coding to MDD



<https://arxiv.org/abs/2410.18489>



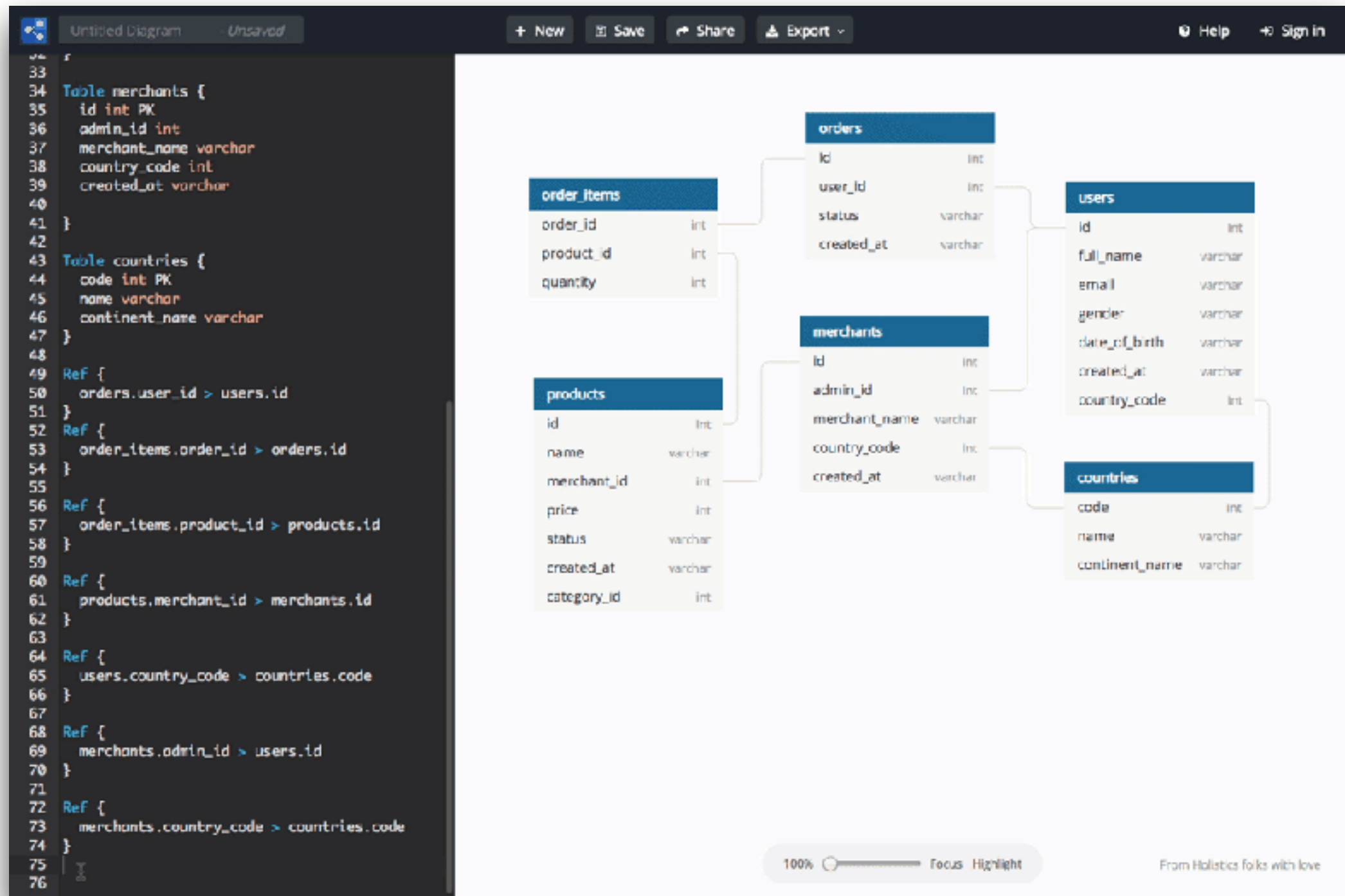
UML Diagrams !!



<https://www.visual-paradigm.com/guide/uml-unified-modeling-language/behavior-vs-structural-diagram/>



ER Diagrams for Database !!



<https://dbml.dbdiagram.io/home/>



Mermaid Diagram

Diagram as a Code (AI-friendly)

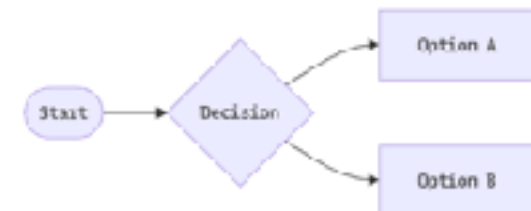
Mermaid Diagramming and charting tool

JavaScript based diagramming and charting tool that renders Markdown-inspired text definitions to create and modify diagrams dynamically.

Try Editor

Get started

```
1 flowchart LR
2   A(["Start"])
3   A --> B["Decision"]
4   B --> C["Option A"]
5   B --> D["Option B"]
```

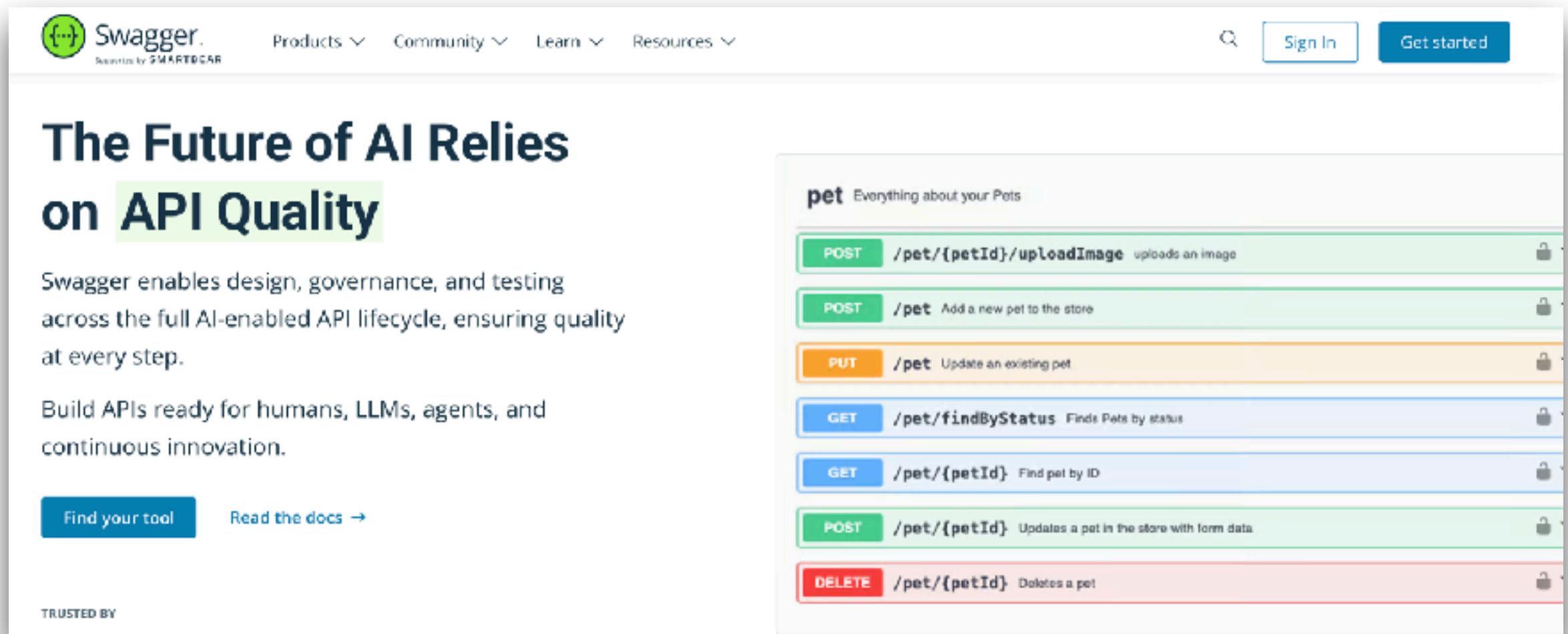


<https://mermaid.js.org/>



Swagger or OpenAPI

Standardized specification for describe REST APIs



The screenshot displays the Swagger.io homepage. On the left, a hero section titled "The Future of AI Relies on API Quality" features a green highlight on "API Quality". Below the title, text states: "Swagger enables design, governance, and testing across the full AI-enabled API lifecycle, ensuring quality at every step." and "Build APIs ready for humans, LLMs, agents, and continuous innovation." There are two buttons: "Find your tool" and "Read the docs →". At the bottom left, it says "TRUSTED BY".

On the right, a preview of a REST API specification for a "pet" API is shown. The title is "pet Everything about your Pets". The API endpoints are listed as follows:

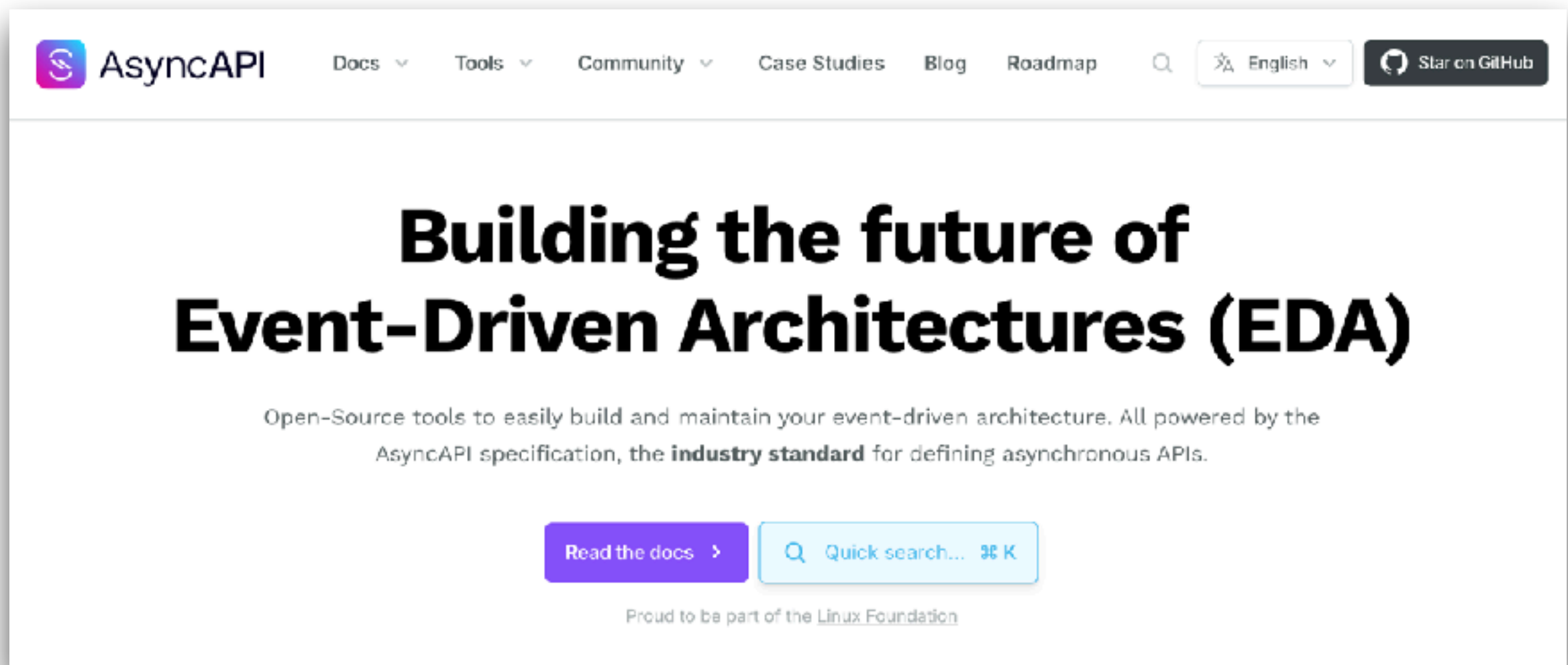
Method	Endpoint	Description	Lock Icon
POST	/pet/{petId}/uploadImage	uploads an image	🔒
POST	/pet	Add a new pet to the store	🔒
PUT	/pet	Update an existing pet	🔒
GET	/pet/findByStatus	Finds Pets by status	🔒
GET	/pet/{petId}	Find pet by ID	🔒
POST	/pet/{petId}	Updates a pet in the store with form data	🔒
DELETE	/pet/{petId}	Deletes a pet	🔒

<https://swagger.io/>



AsyncAPI

Standardized specification for describe asynchronous and event-driven APIs (Kafka, AMQP, WebSocket)



<https://www.asyncapi.com/>



JSONSchema

Declarative language used to annotate and validate the structure, constraints and data type of JSON documents

Data validation

Documentation

Automated
testing

<https://json-schema.org/>



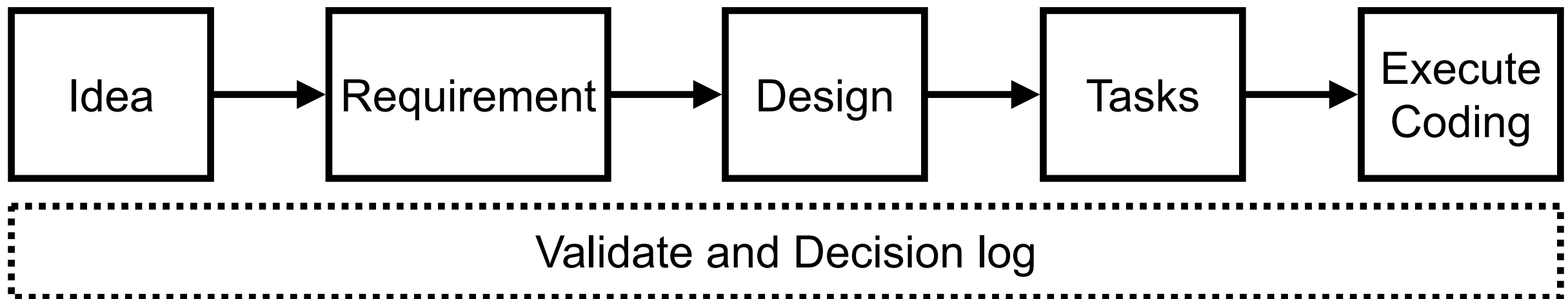
Specification-Driven Development (SDD)



SSD ?

Specification or Documentation-First

Modern software development approach where detailed, structure specifications are created before writing code



Types of Specification ?

Interface contracts (UI, API)

Data schemas

Validation rules

Data/business flows

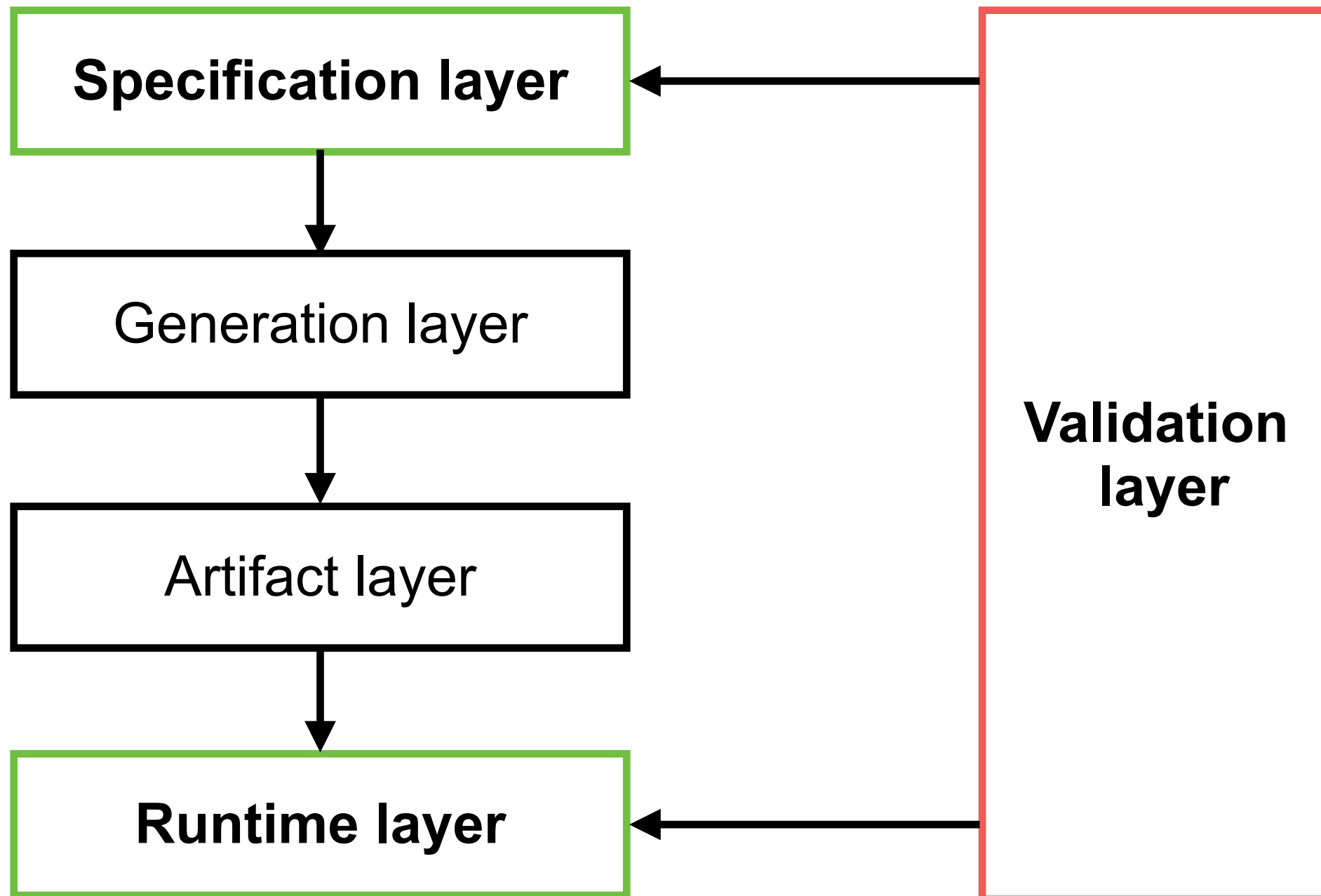
Security policy and constraints

Versioning semantics

Resources and performance constraints



SSD Architecture



<https://www.infoq.com/articles/spec-driven-development>



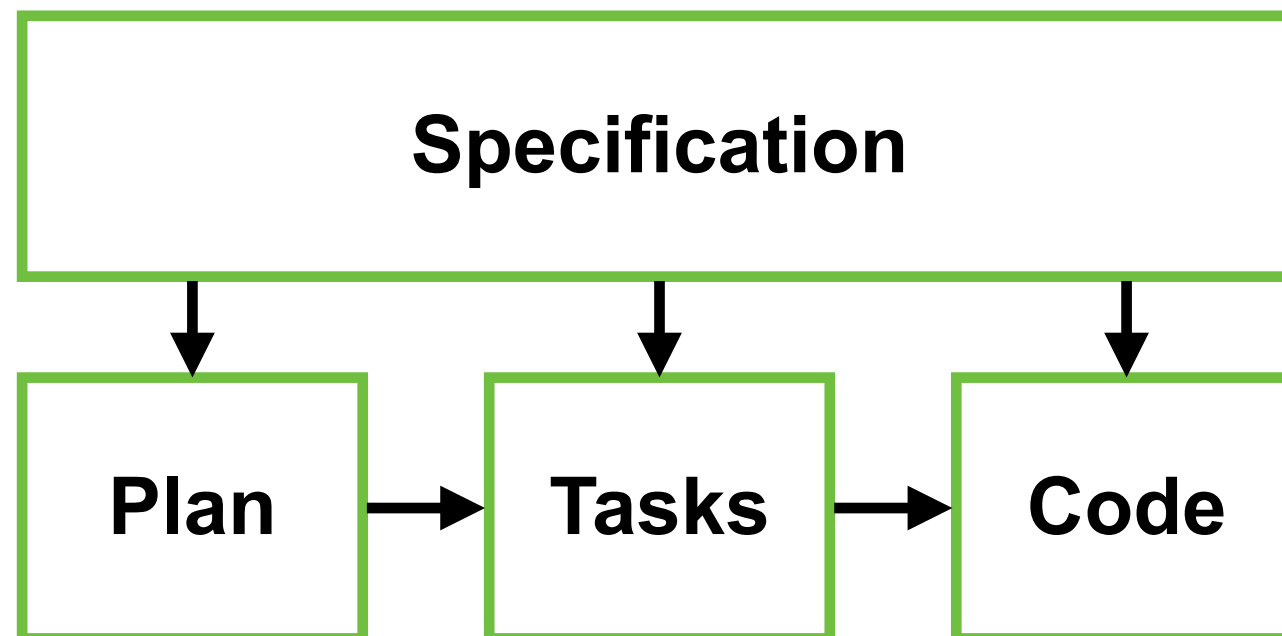
Tools ?

GitHub Spec-kit

Open Spec

Kiro.dev

Tessl





MDD + SDD == Better result



Try by yourself !!





Frontend
Web application

Backend
RESTful API +
Database

Write specification

Coding

Run and Test !!



Frontend
Web application

Backend
RESTful API +
Database

Vercel React Skill

Write spec or feature

Prompt or command

Working with MCP



Frontend
Web application

Vercel React Skill

Write spec or feature

Prompt or command

Working with MCP

Backend
RESTful API +
Database

Global instruction

Write spec or feature

Prompt or command

Working with MCP

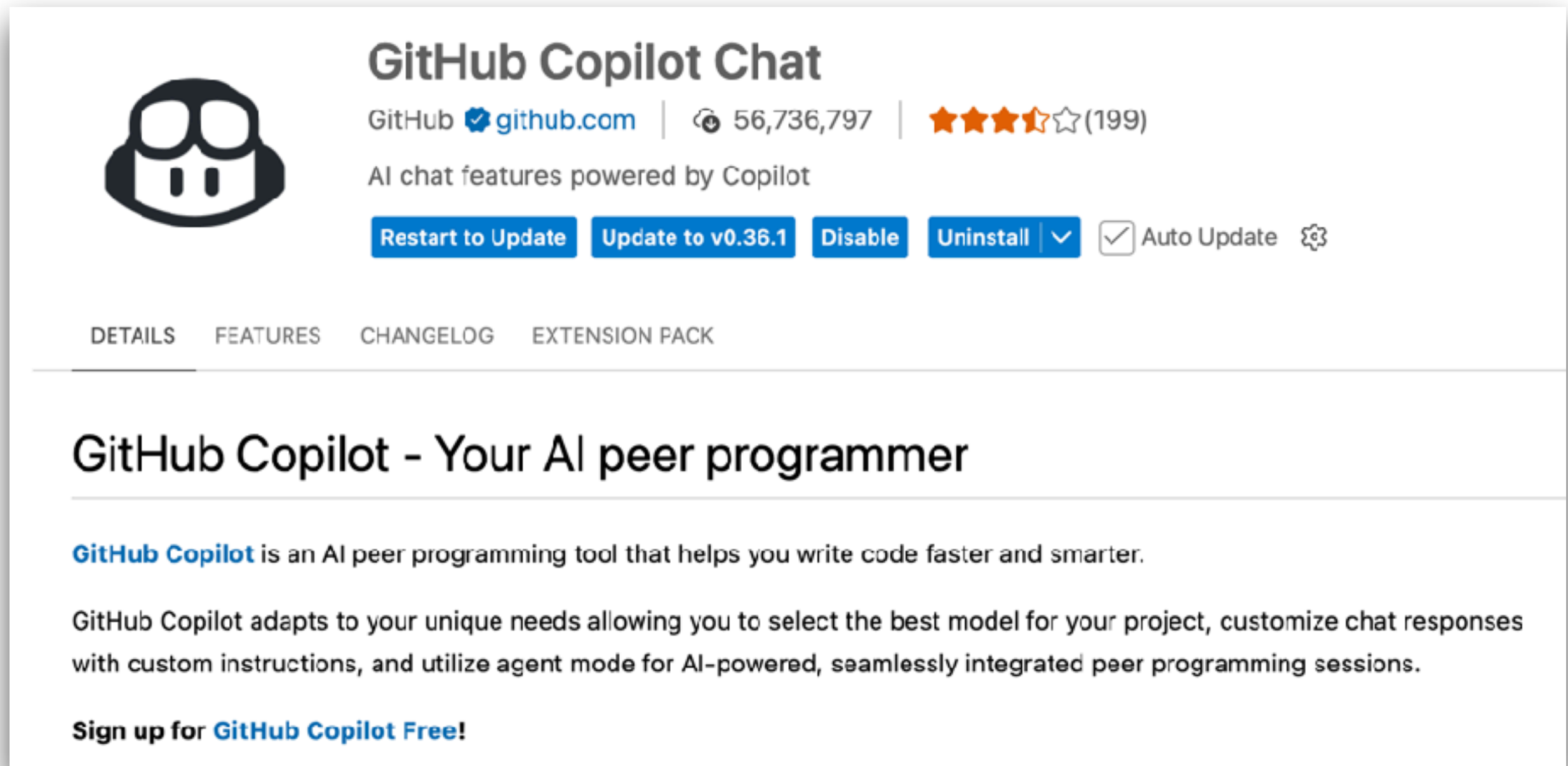


Workshop with VS Code + GitHub Copilot Chat



<https://code.visualstudio.com/docs/copilot/chat/getting-started-chat>





Install extension in VS Code



The image shows the GitHub Copilot Chat extension page in the Visual Studio Code marketplace. At the top, there's a header with the extension's name 'GitHub Copilot Chat', its publisher 'GitHub' with a verified badge and 'github.com', a download count of '56,736,797', and a star rating of '4.5 (199)'. Below this, a description states 'AI chat features powered by Copilot'. A row of buttons includes 'Restart to Update', 'Update to v0.36.1', 'Disable', 'Uninstall', and a dropdown menu. To the right of these buttons is a checked 'Auto Update' checkbox and a settings gear icon. A navigation bar below the buttons contains links for 'DETAILS', 'FEATURES', 'CHANGELOG', and 'EXTENSION PACK'. The main content area has a title 'GitHub Copilot - Your AI peer programmer' followed by a paragraph describing the tool as an AI peer programming tool that helps write code faster and smarter. Another paragraph explains that it adapts to user needs, allowing selection of the best model, customization of chat responses, and utilization of agent mode. At the bottom, there's a call to action: 'Sign up for GitHub Copilot Free!'.

GitHub Copilot Chat
GitHub  github.com |  56,736,797 | ★★★★★ (199)
AI chat features powered by Copilot

[Restart to Update](#) [Update to v0.36.1](#) [Disable](#) [Uninstall](#)  ☒ Auto Update 

[DETAILS](#) [FEATURES](#) [CHANGELOG](#) [EXTENSION PACK](#)

GitHub Copilot - Your AI peer programmer

GitHub Copilot is an AI peer programming tool that helps you write code faster and smarter.

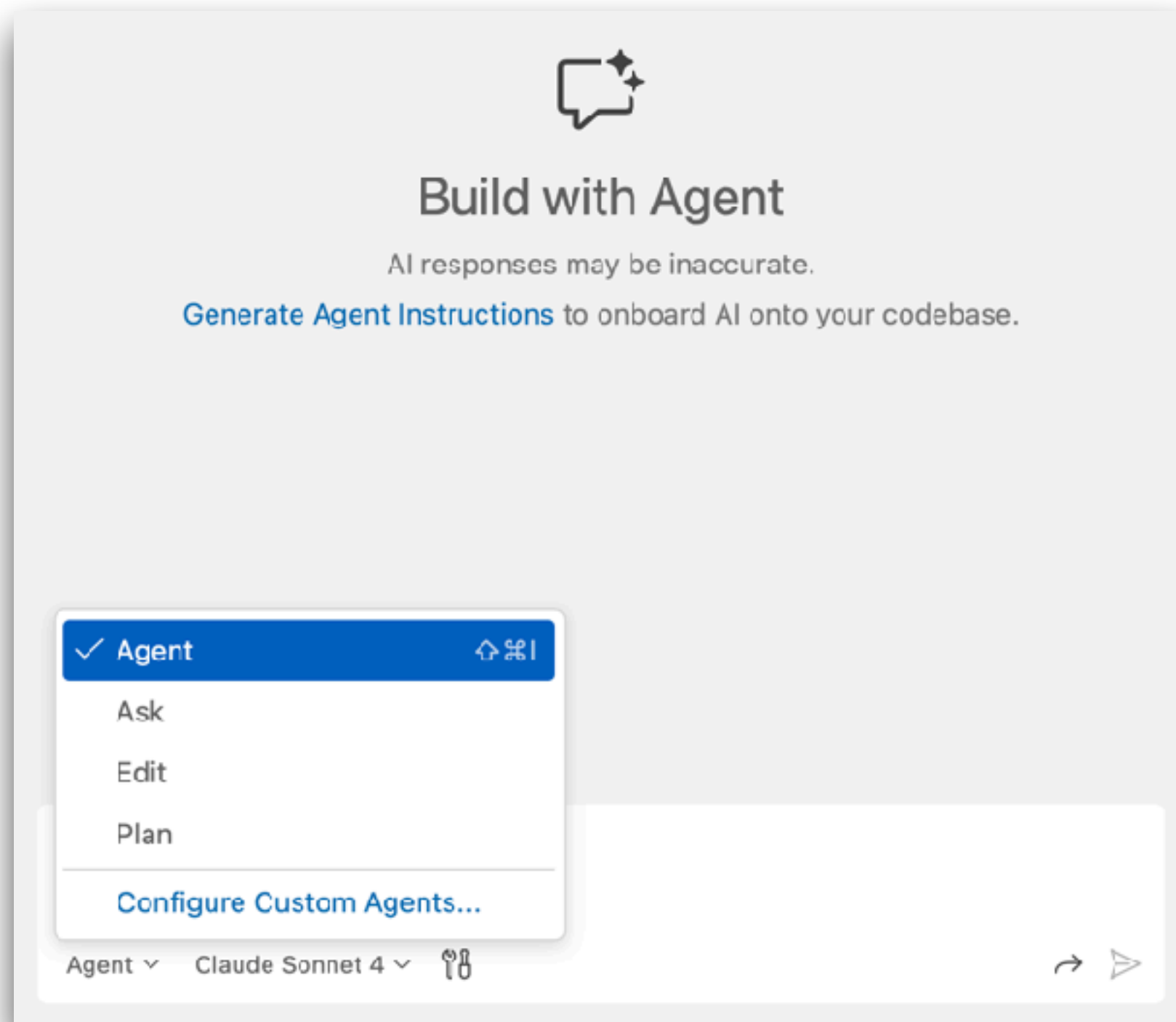
GitHub Copilot adapts to your unique needs allowing you to select the best model for your project, customize chat responses with custom instructions, and utilize agent mode for AI-powered, seamlessly integrated peer programming sessions.

Sign up for [GitHub Copilot Free!](#)

<https://marketplace.visualstudio.com/items?itemName=GitHub.copilot-chat>



Hello Copilot Chat in VS Code



Copilot Chat Modes

Agent

Ask

Edit

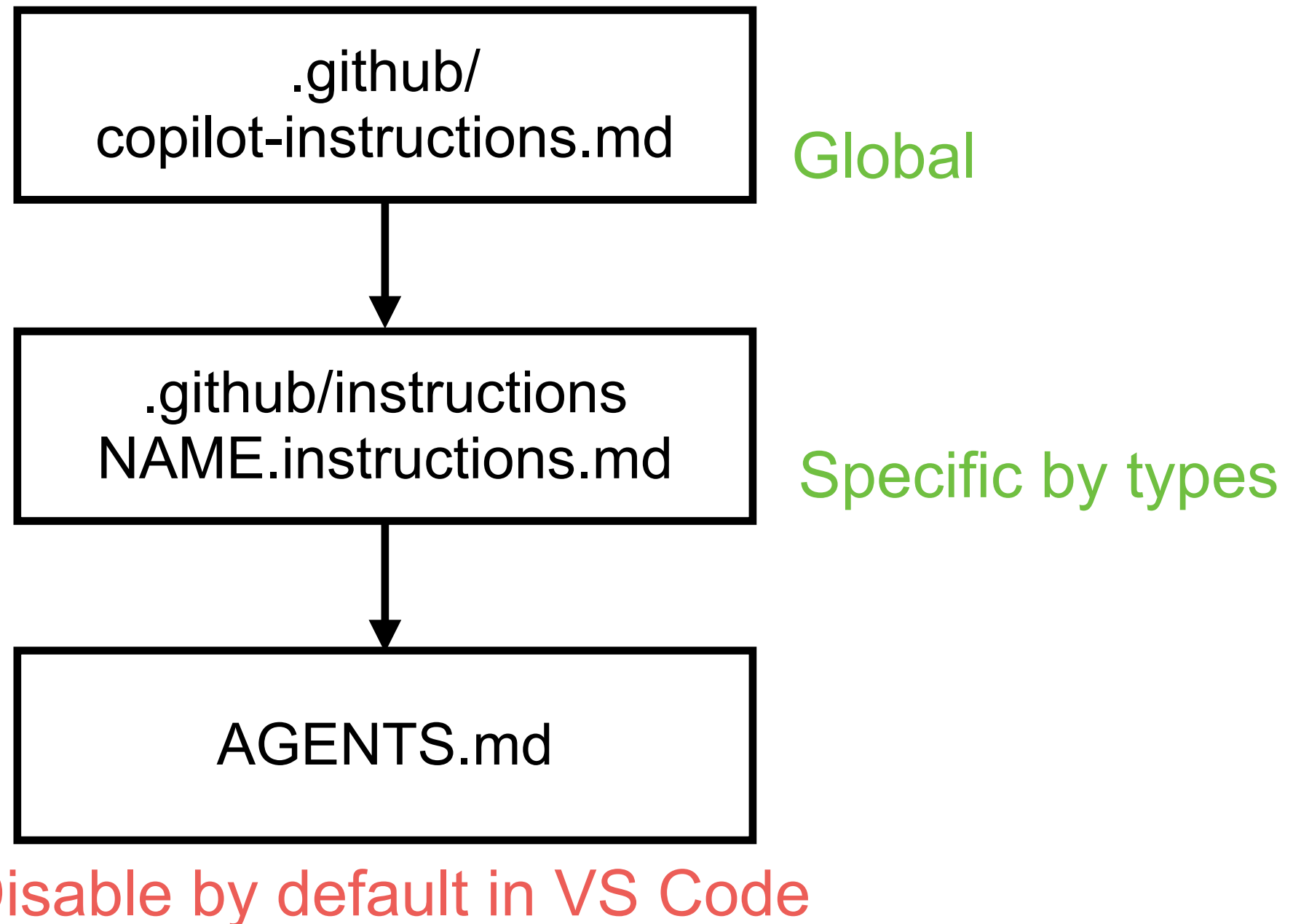
Plan

**Custom
Agent**

<https://code.visualstudio.com/docs/copilot/customization/custom-agents>



Custom instructions !!



<https://docs.github.com/en/copilot/how-tos/configure-custom-instructions/add-repository-instructions>



Customization !!

Agent

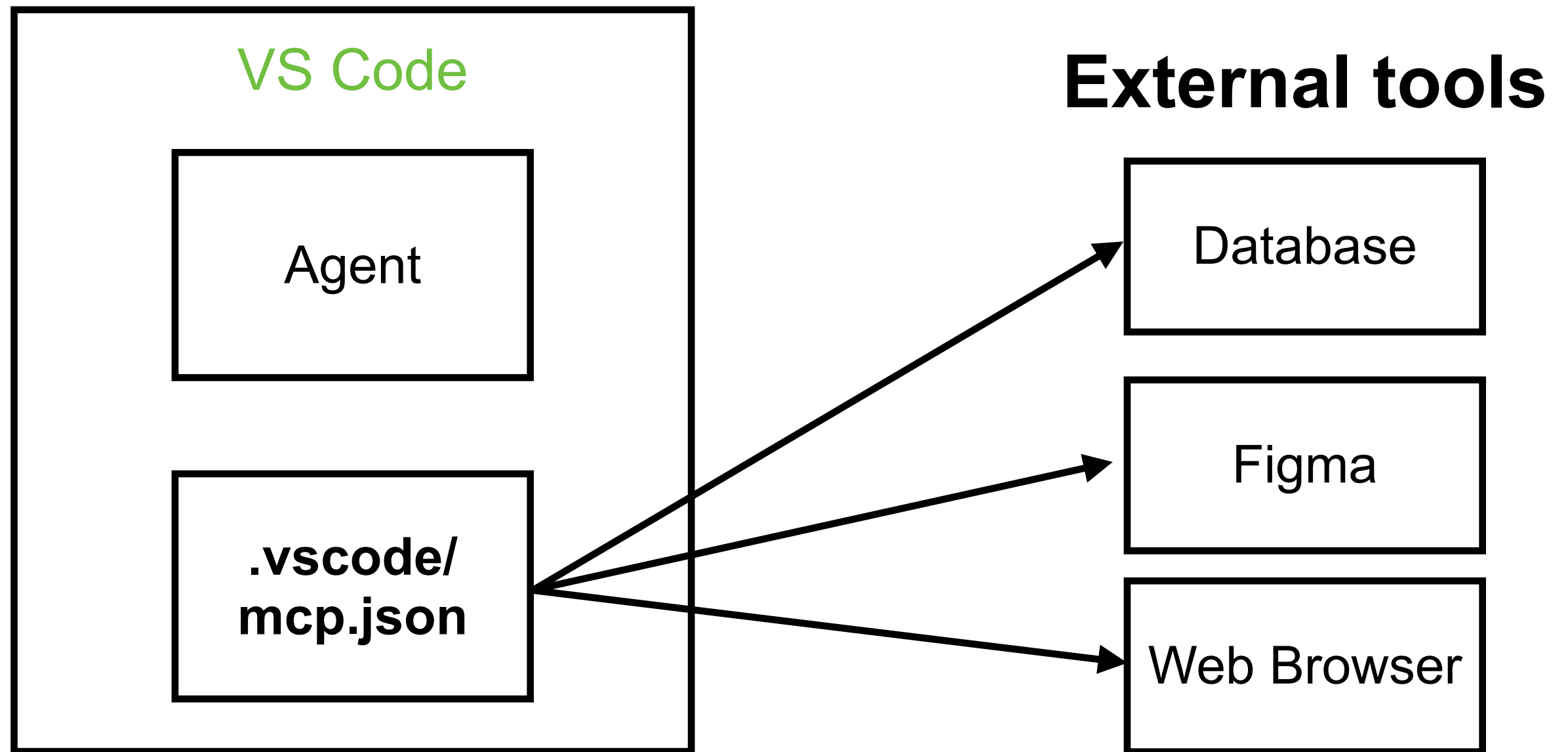
Instruction

Prompts

Skills



Working with MCP



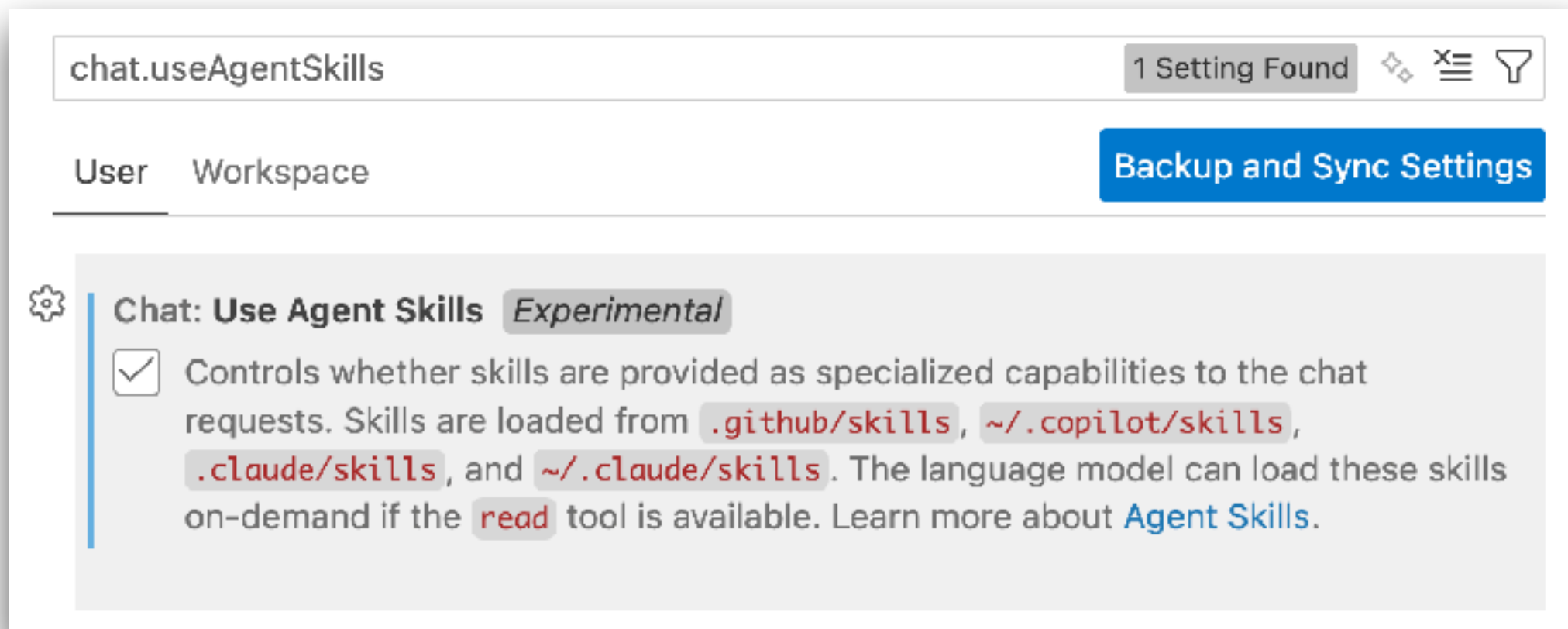
<https://code.visualstudio.com/docs/copilot/customization/custom-agents>



Enable Agent Skills in VS Code

Setting => “**chat.useAgentSkills**”

Create skills in “.github/skills/name/SKILL.md”



<https://code.visualstudio.com/docs/copilot/customization/agent-skills>



Q/A

