

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

Requirement

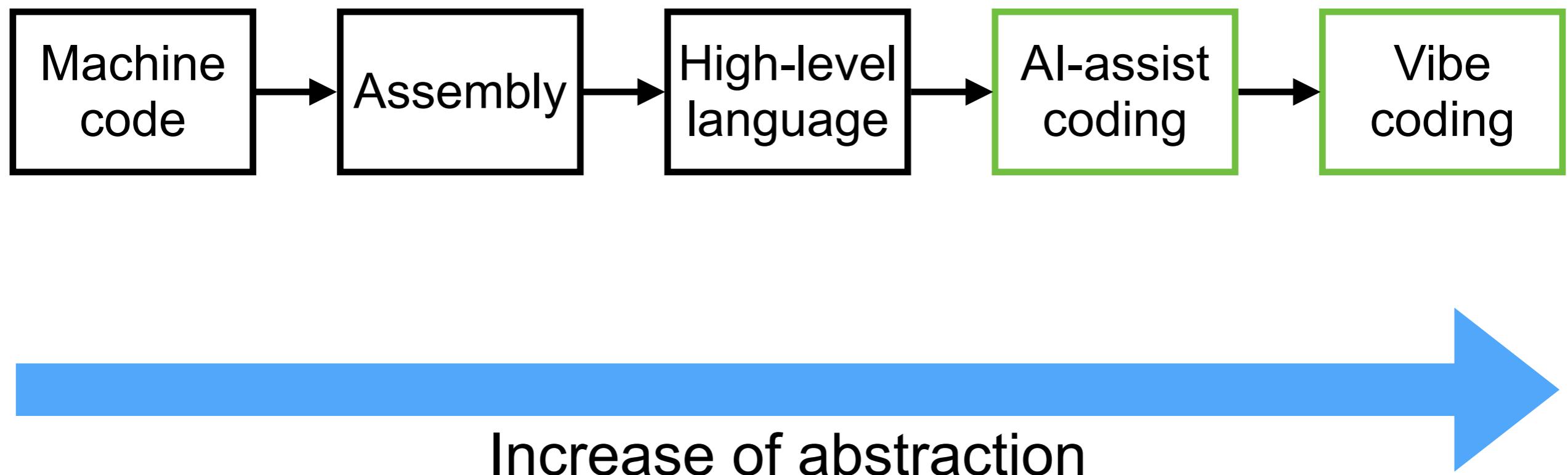
Planning

Coding

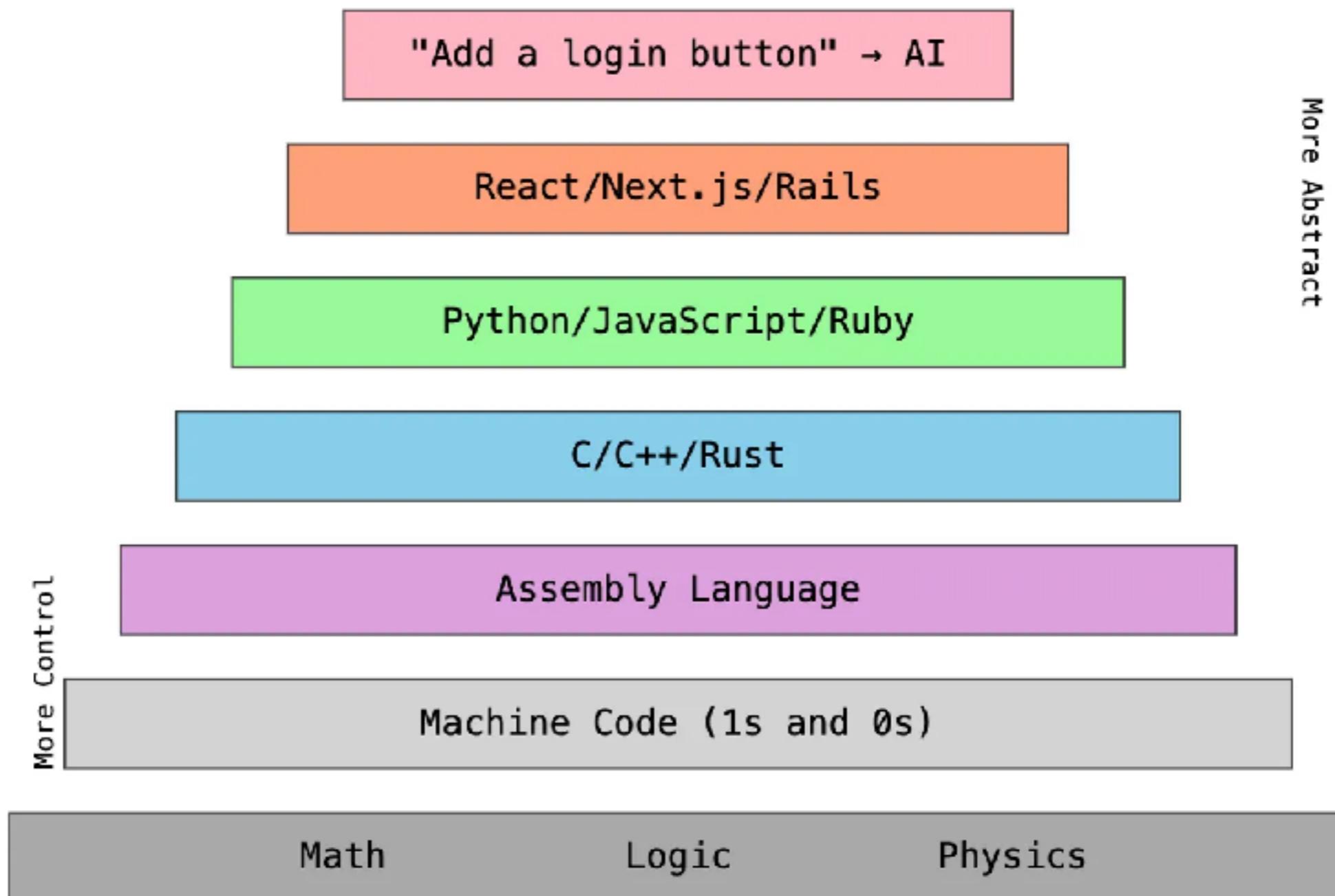
Validate and Testing



History of Programming



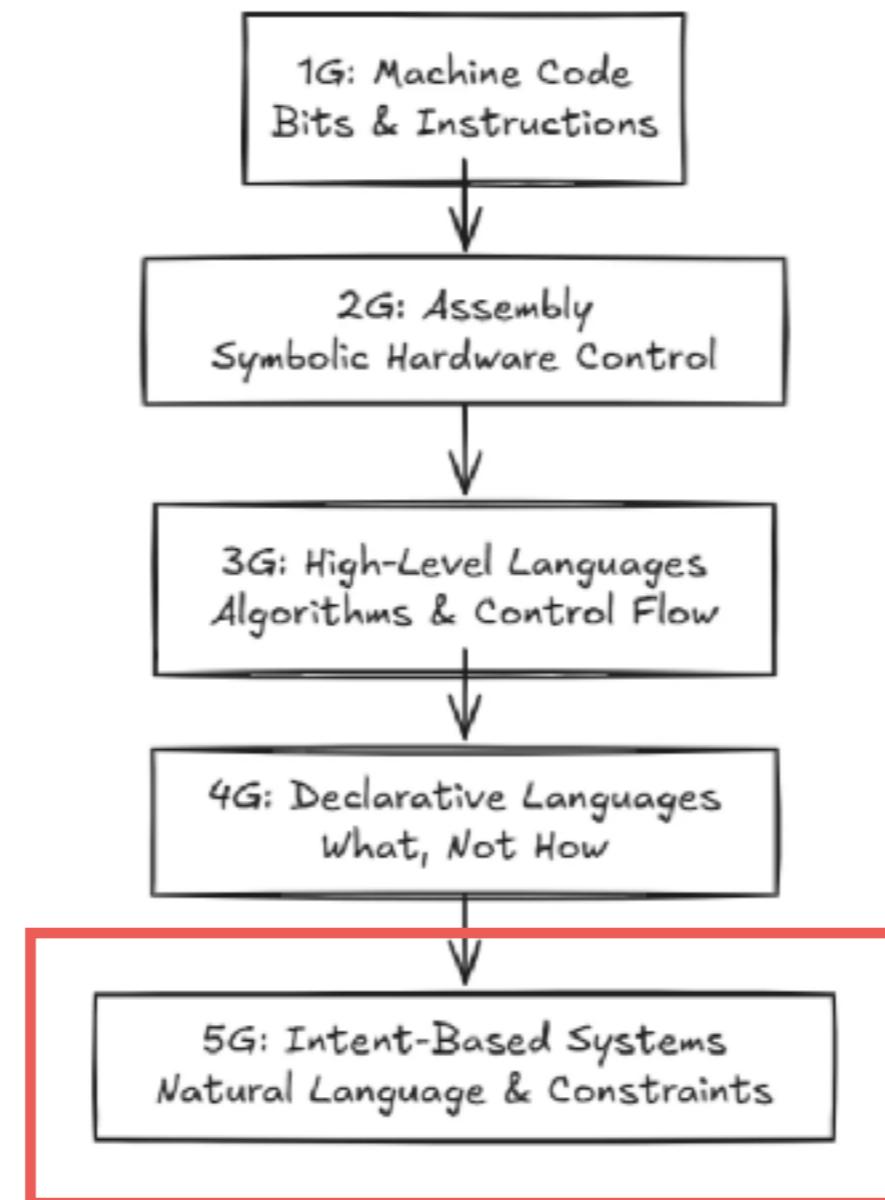
The Modern Tower of Abstraction



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



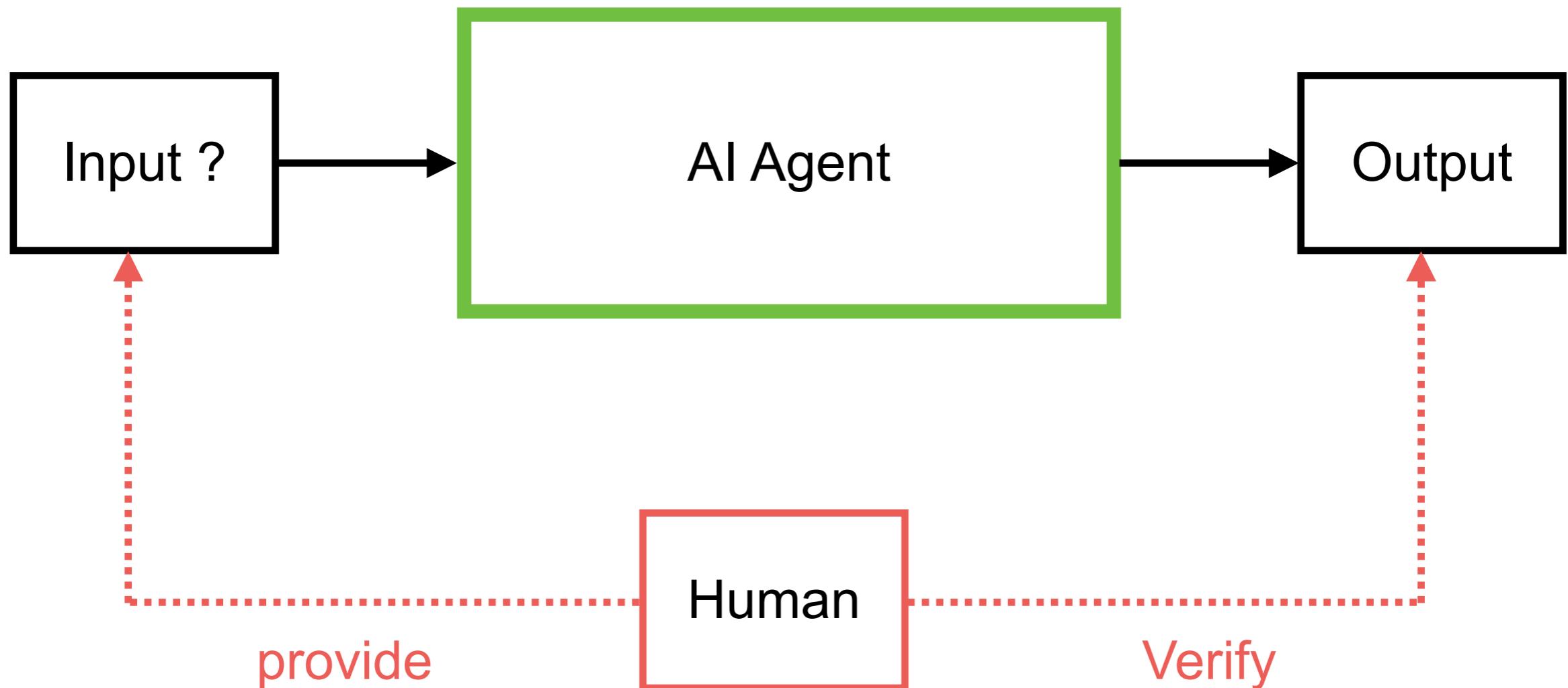
Generation of Programming languages



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



Coding with AI Agent



AI Agent for Coding

AI Agent

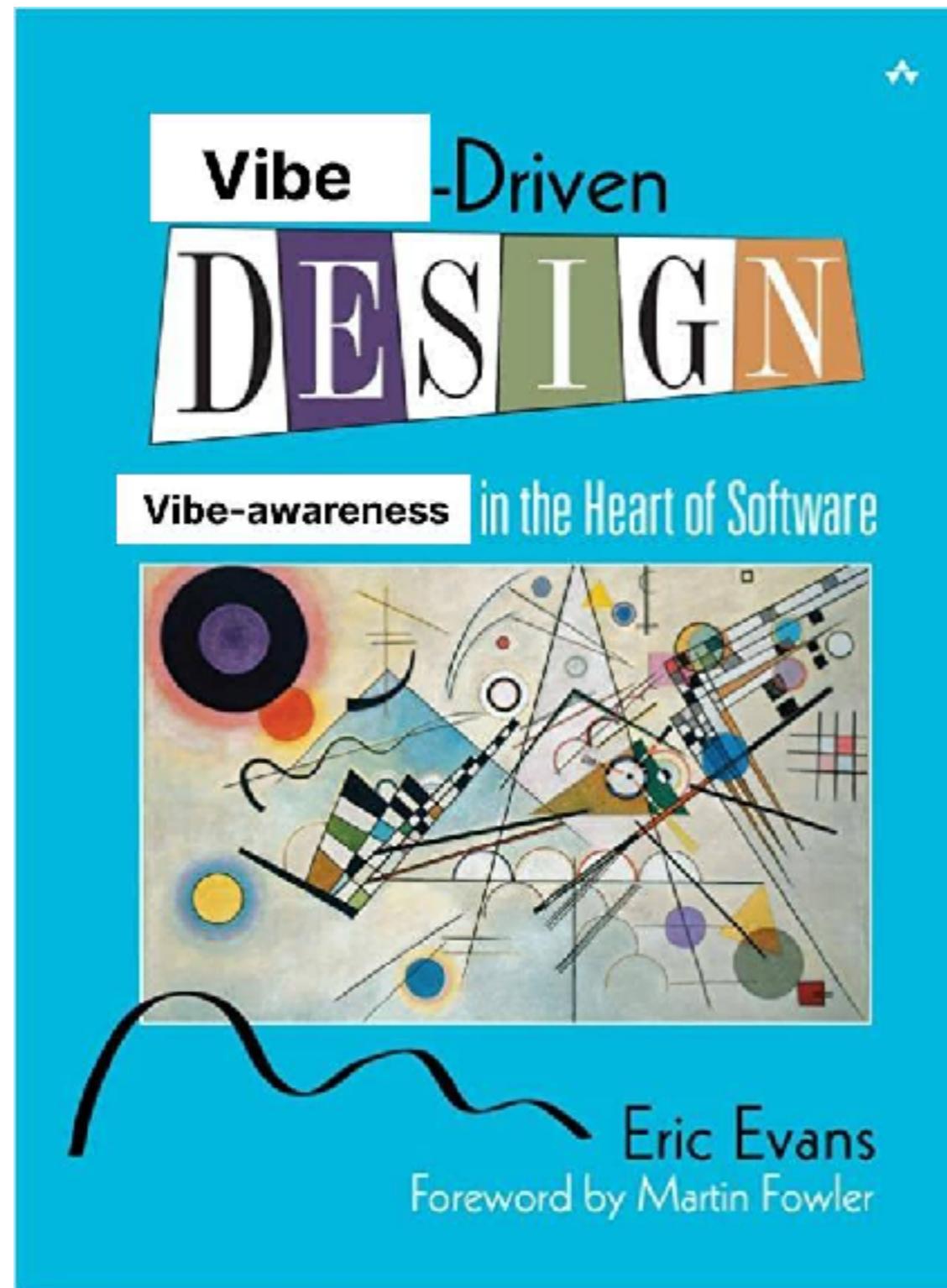
LLM

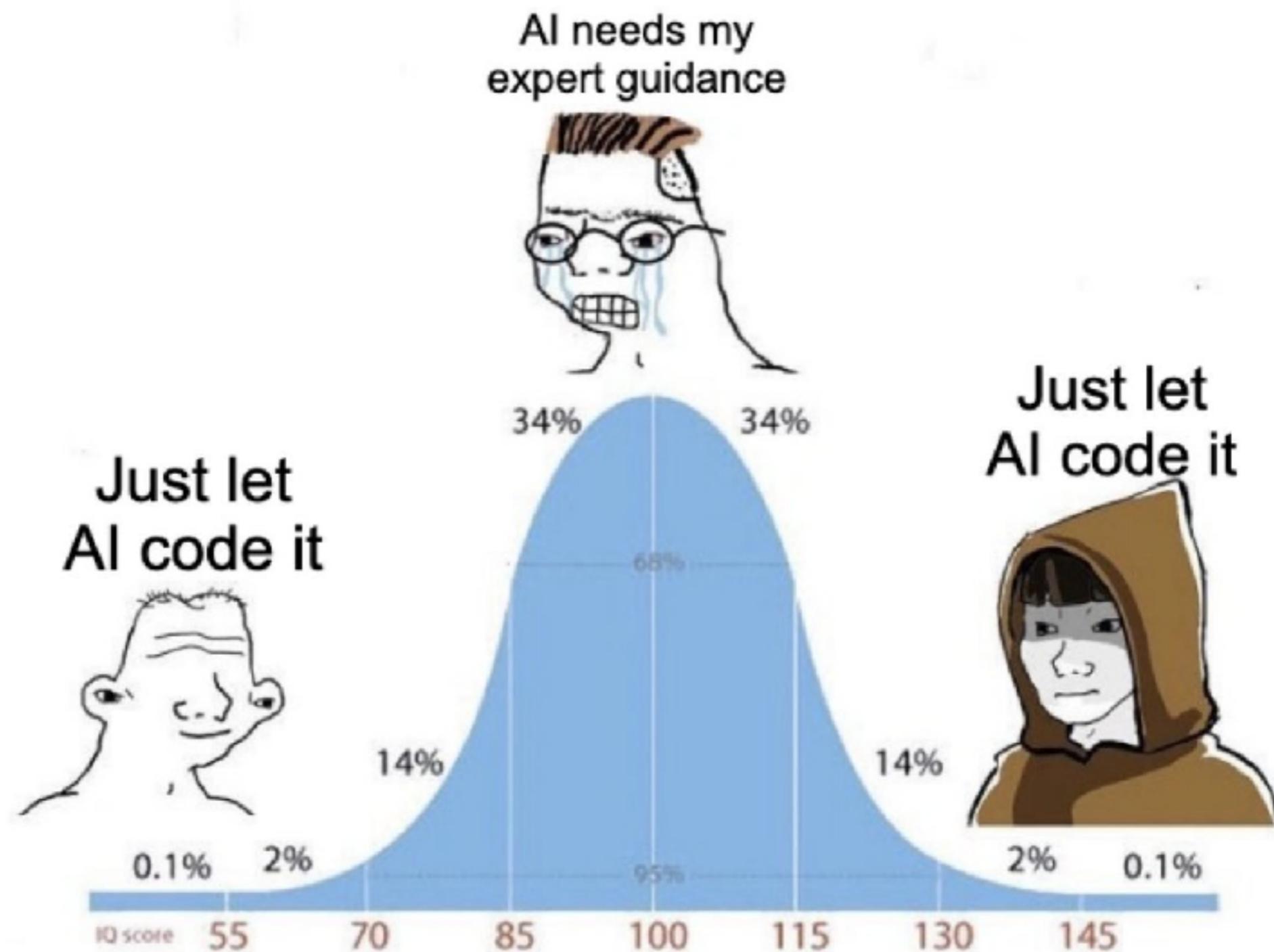
Code writing
tools

Memory and
Context

Other tools









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>



Development

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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>



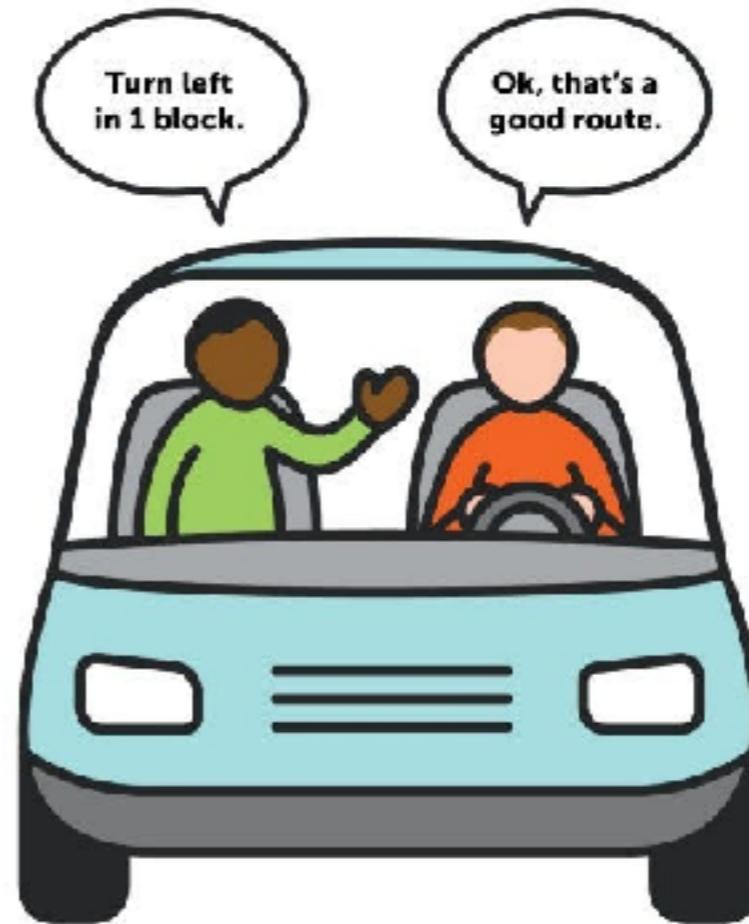
Types of Vibe coding ?

Pure vibe coding

Responsible AI-assist development



PAIR PROGRAMMING



Reviews, Tests and Understands
with experience



Workflows ?

Application level

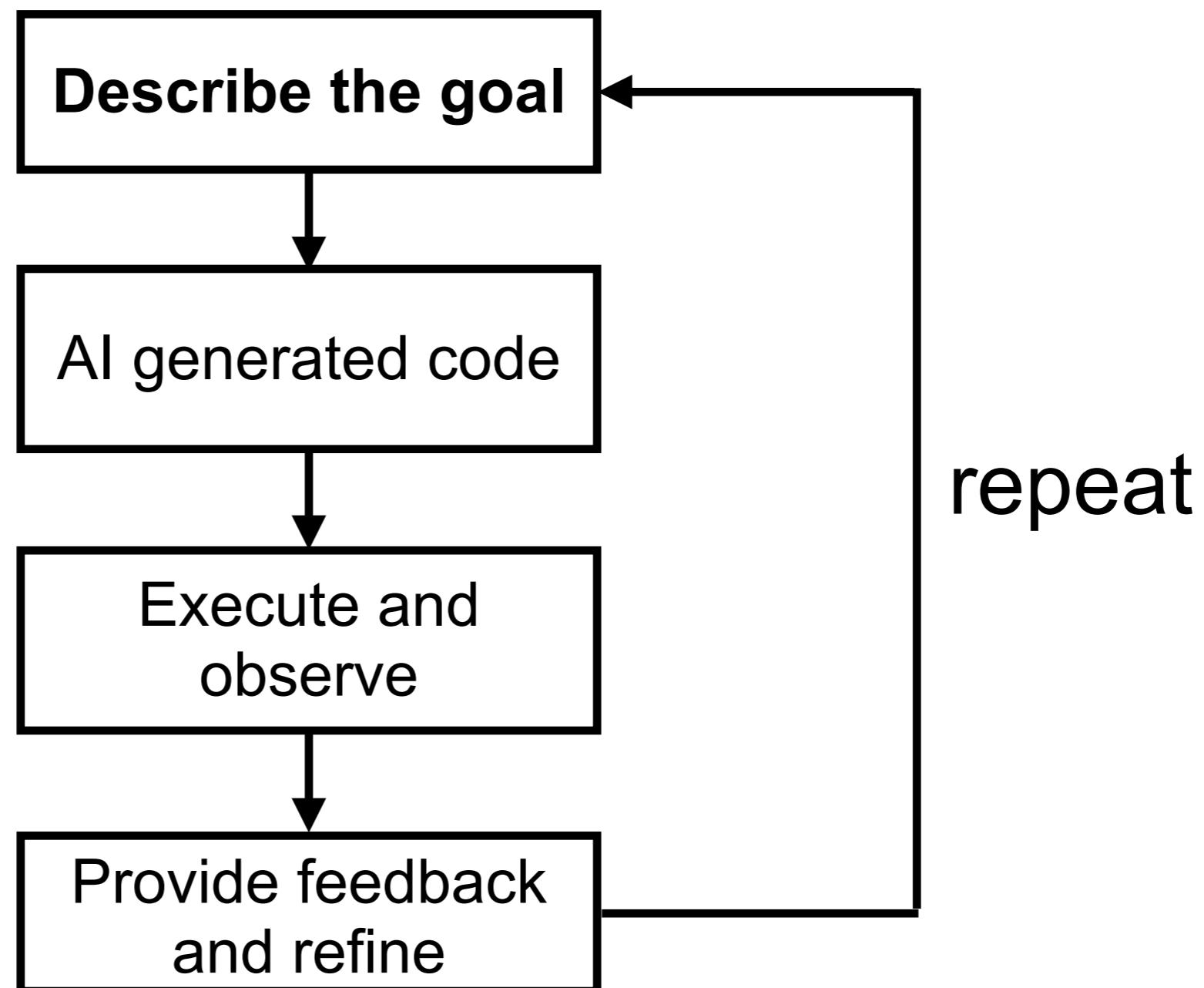
Code level

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



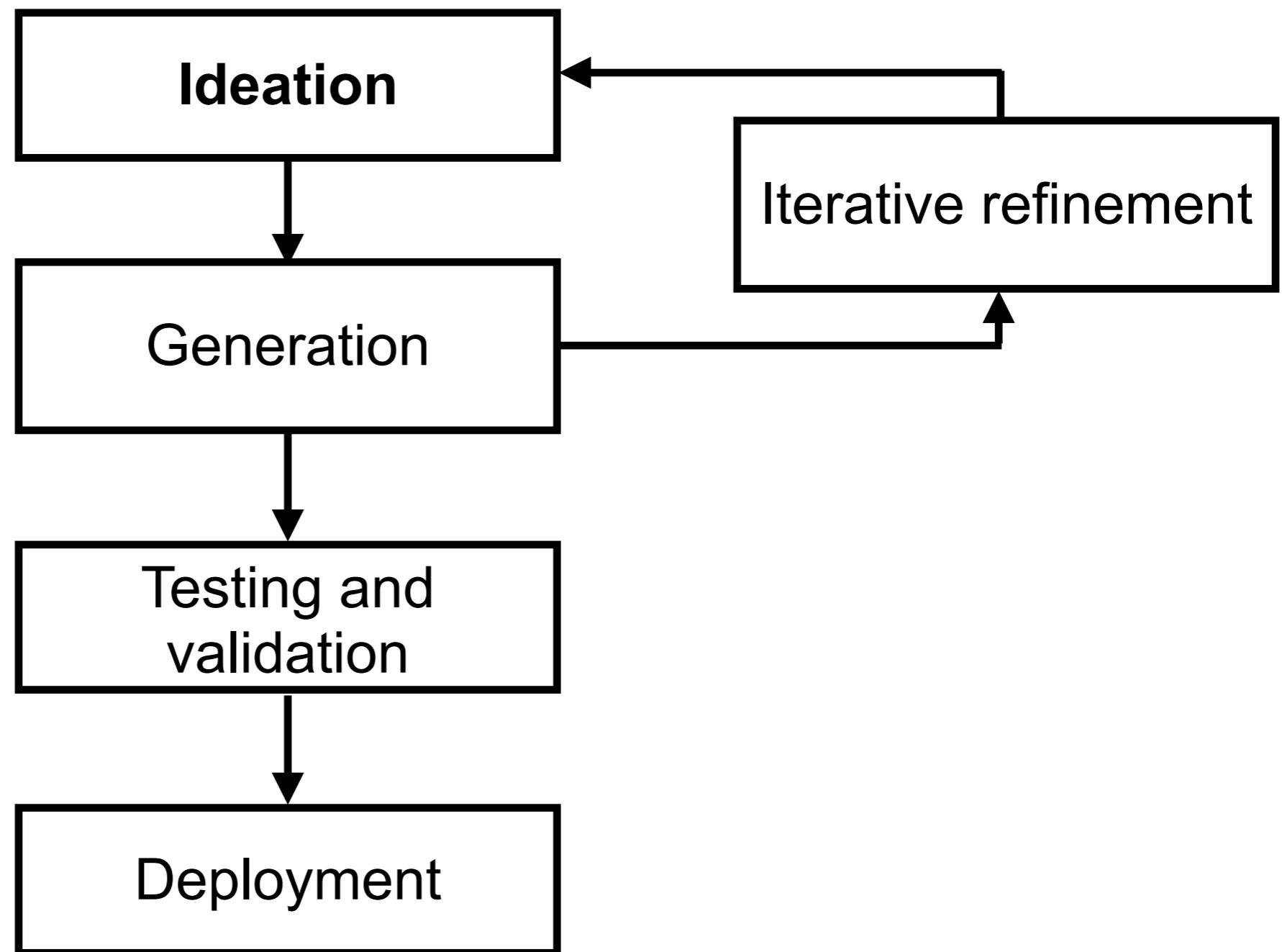
Code level workflow

Conversational loop to create a specific code



Application level workflow

Talking about high-level idea from concept to deployment

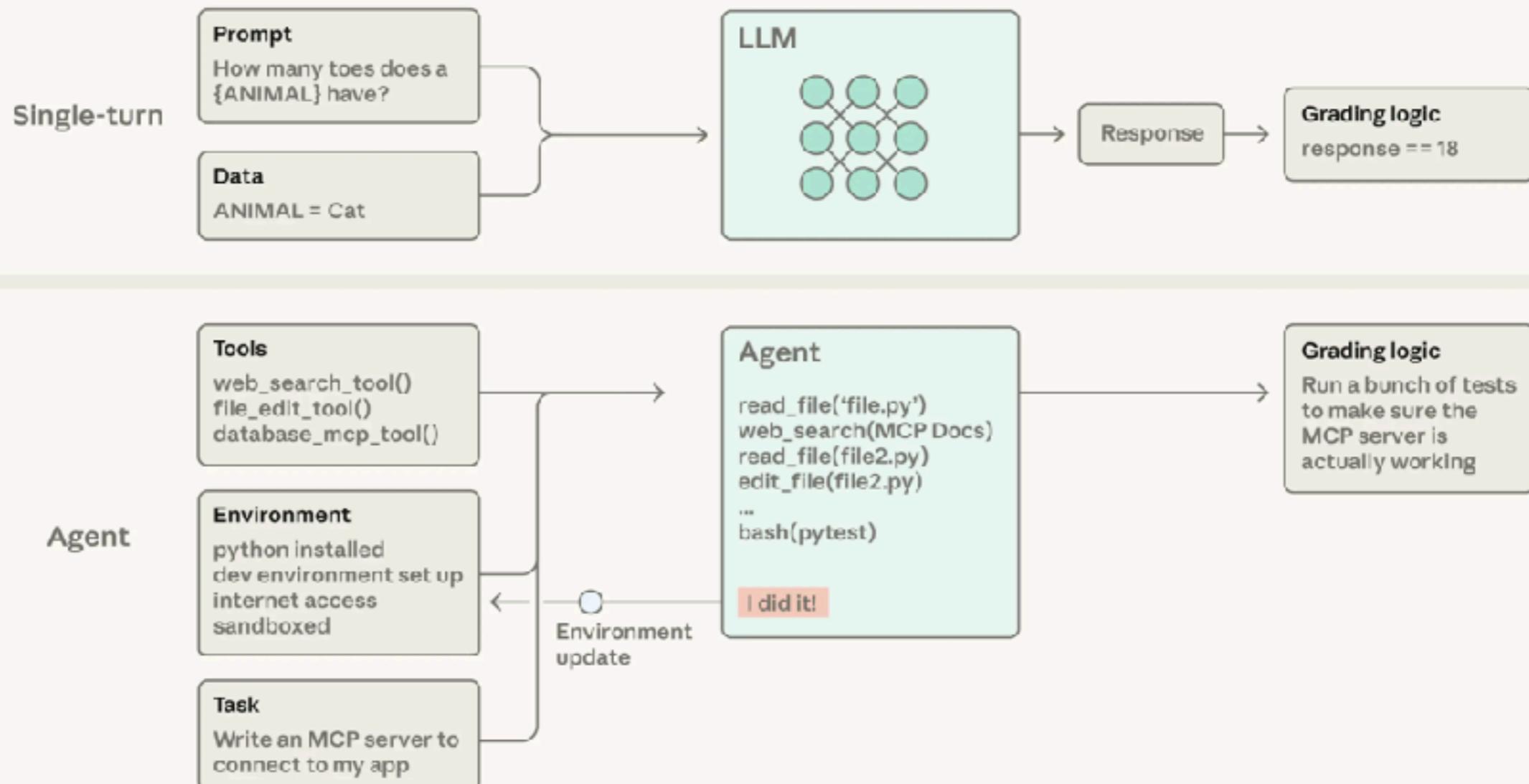


AI Agent for Coding



AI Agent for Coding

Comparison: Single-Turn vs Agent Evaluations



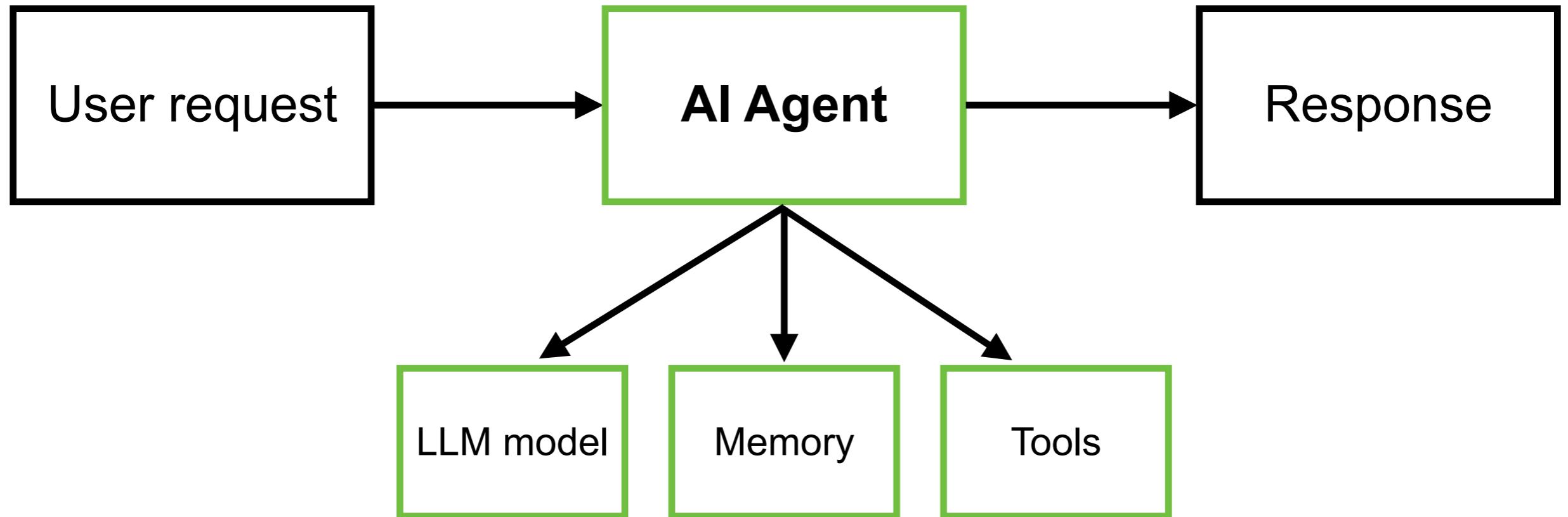
<https://www.anthropic.com/engineering/demystifying-evals-for-ai-agents>



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

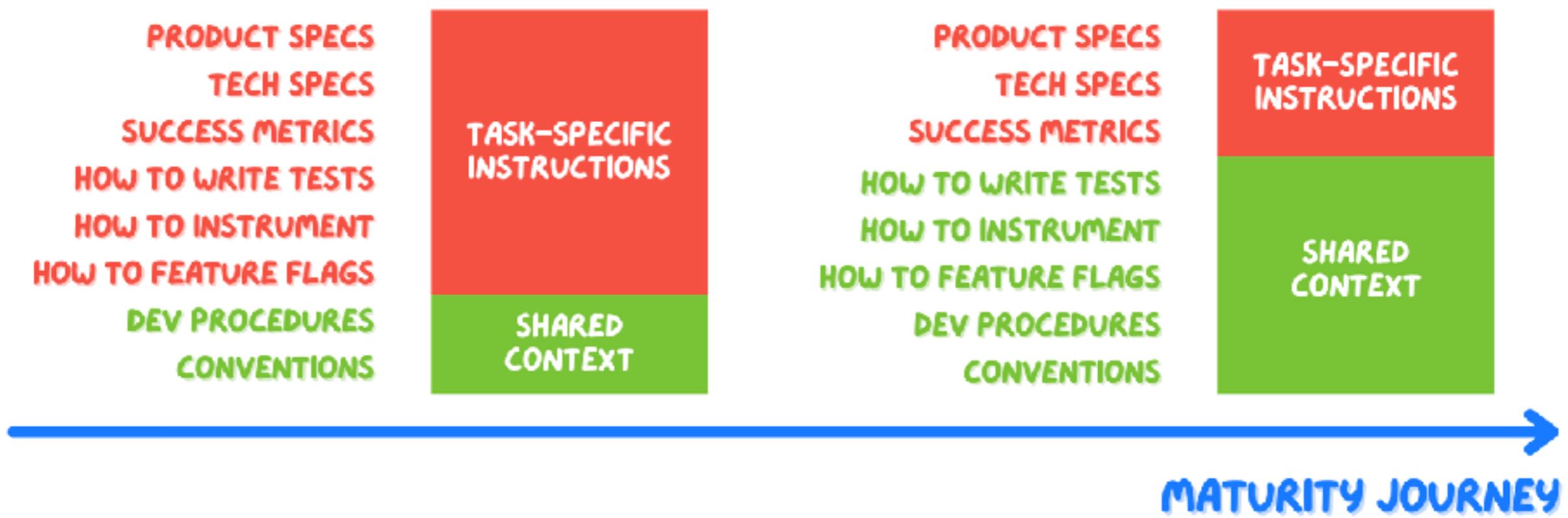
Sub-agent

Agent SKILLs

Context engineering ?



Types of Knowledge/Context ?

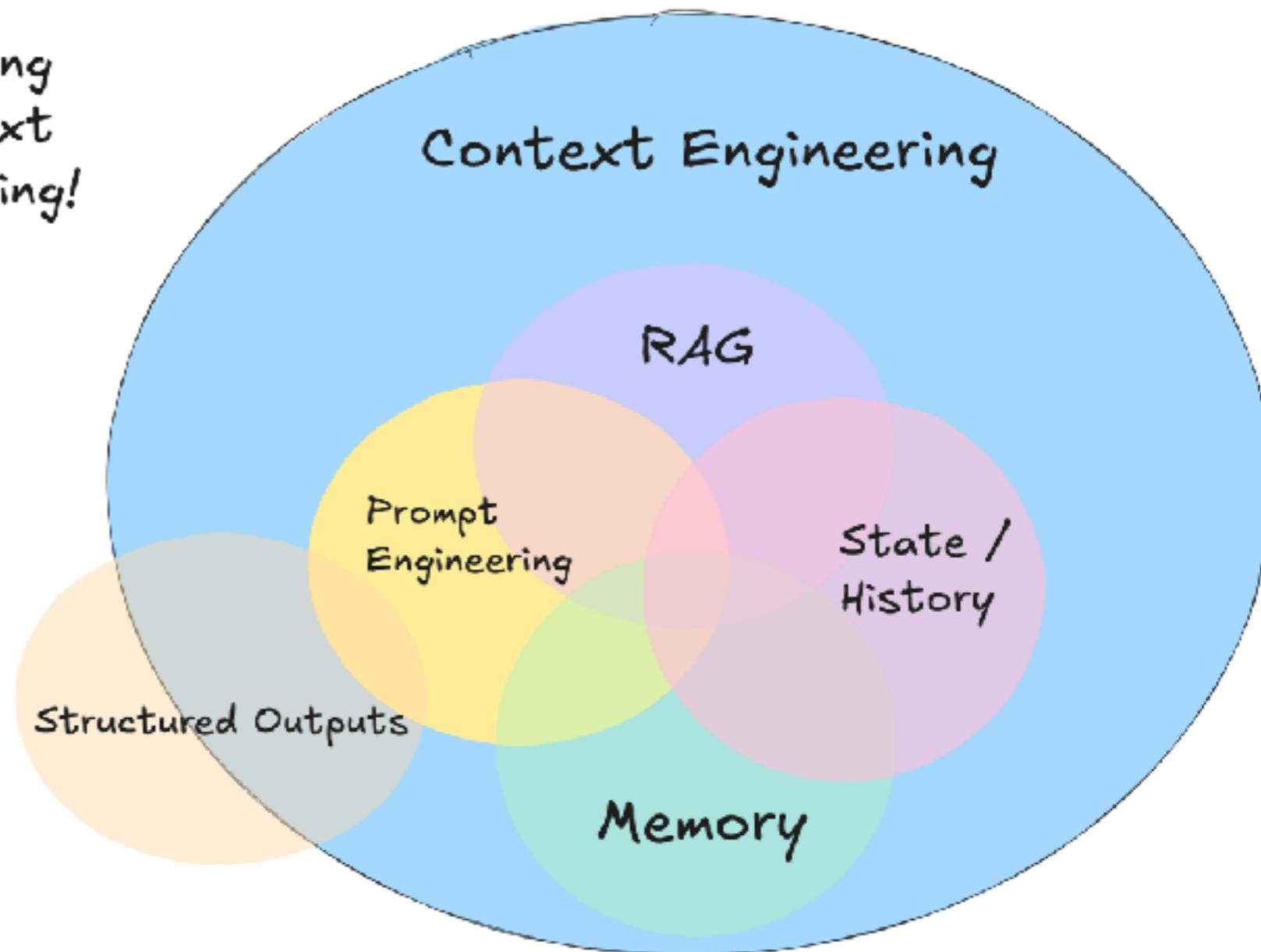


<https://refactoring.fm/p/context-capabilities-and-tech-hubs>



Context Engineering

Everything
is Context
Engineering!

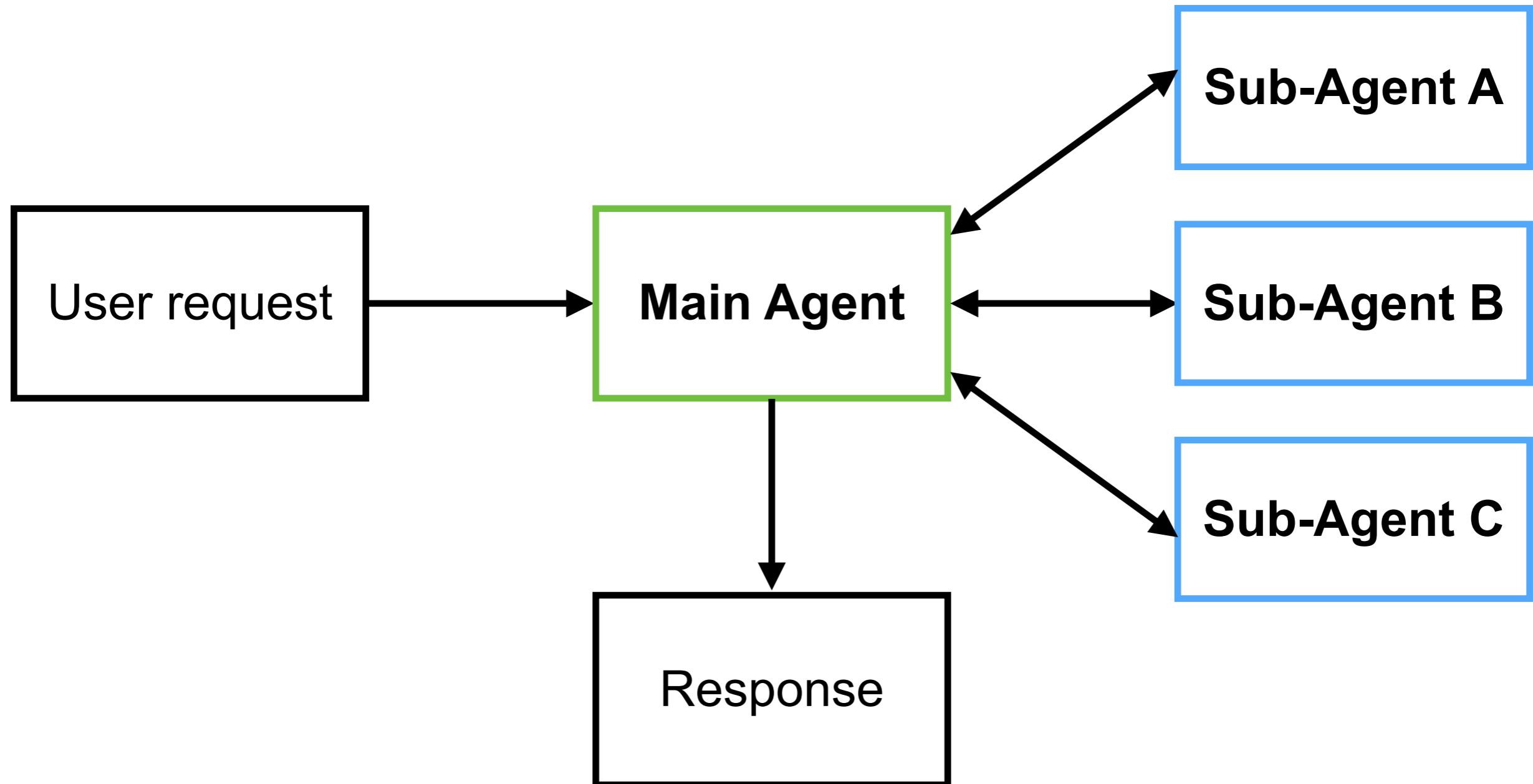


<https://www.promptingguide.ai/guides/context-engineering-guide>



Multi AI Agents !!

Sub-agent with **centralized** orchestration

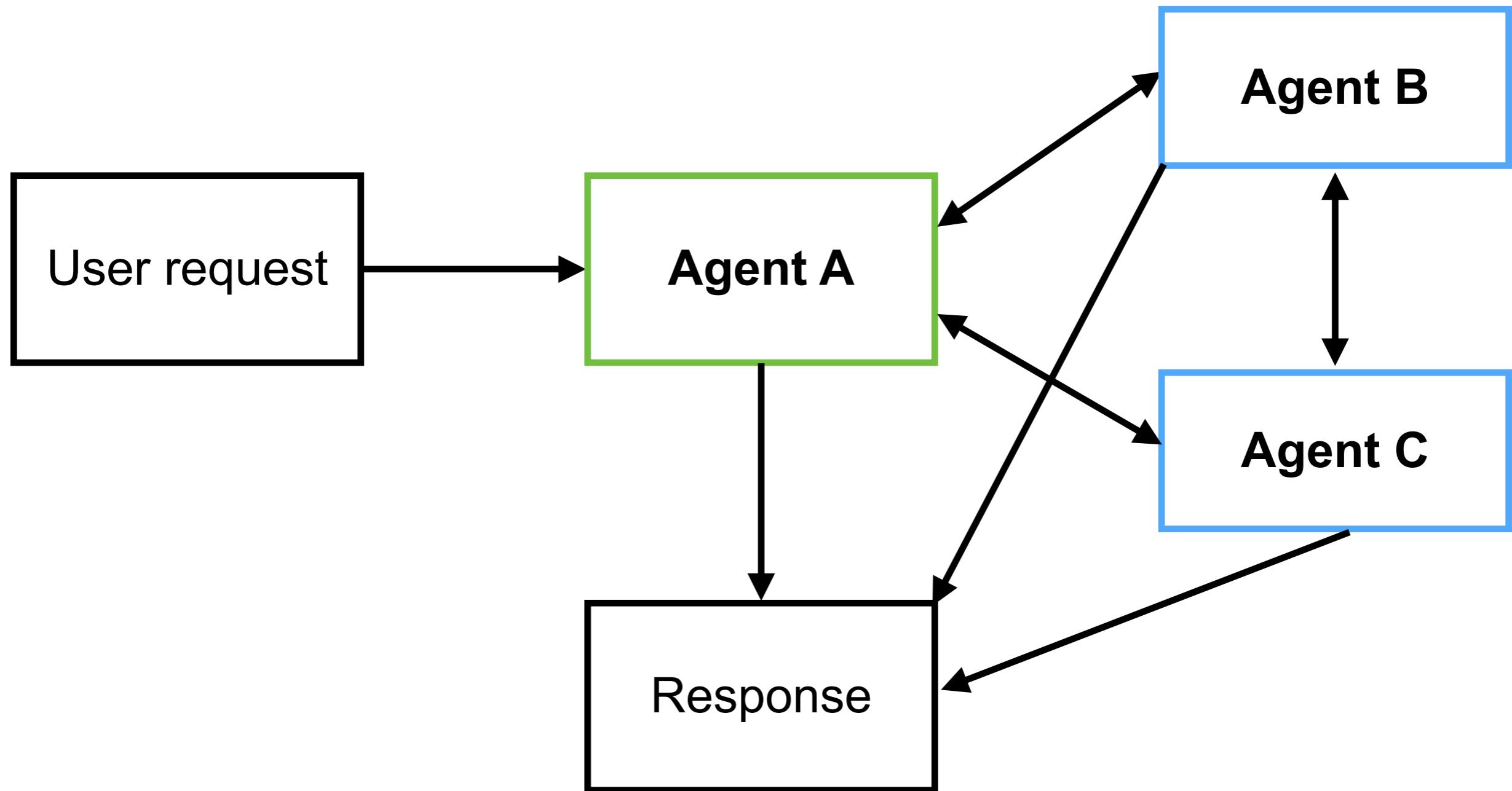


<https://www.blog.langchain.com/choosing-the-right-multi-agent-architecture/>



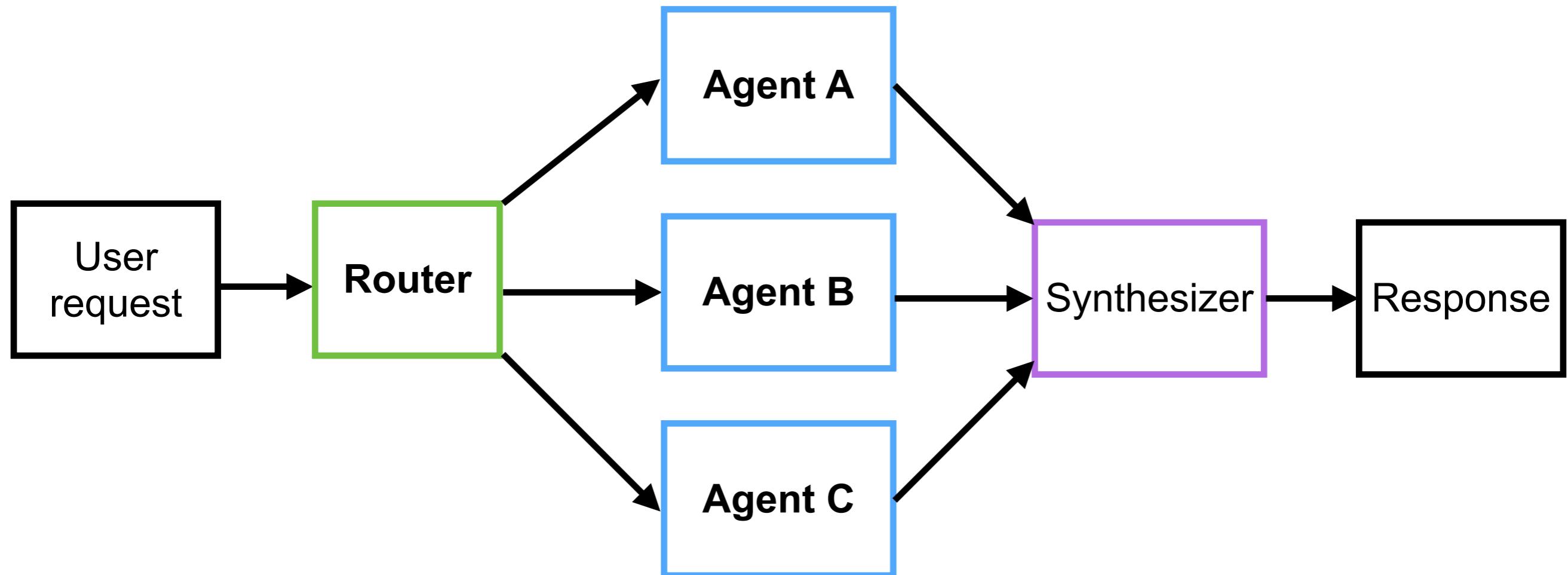
Multi AI Agents !!

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

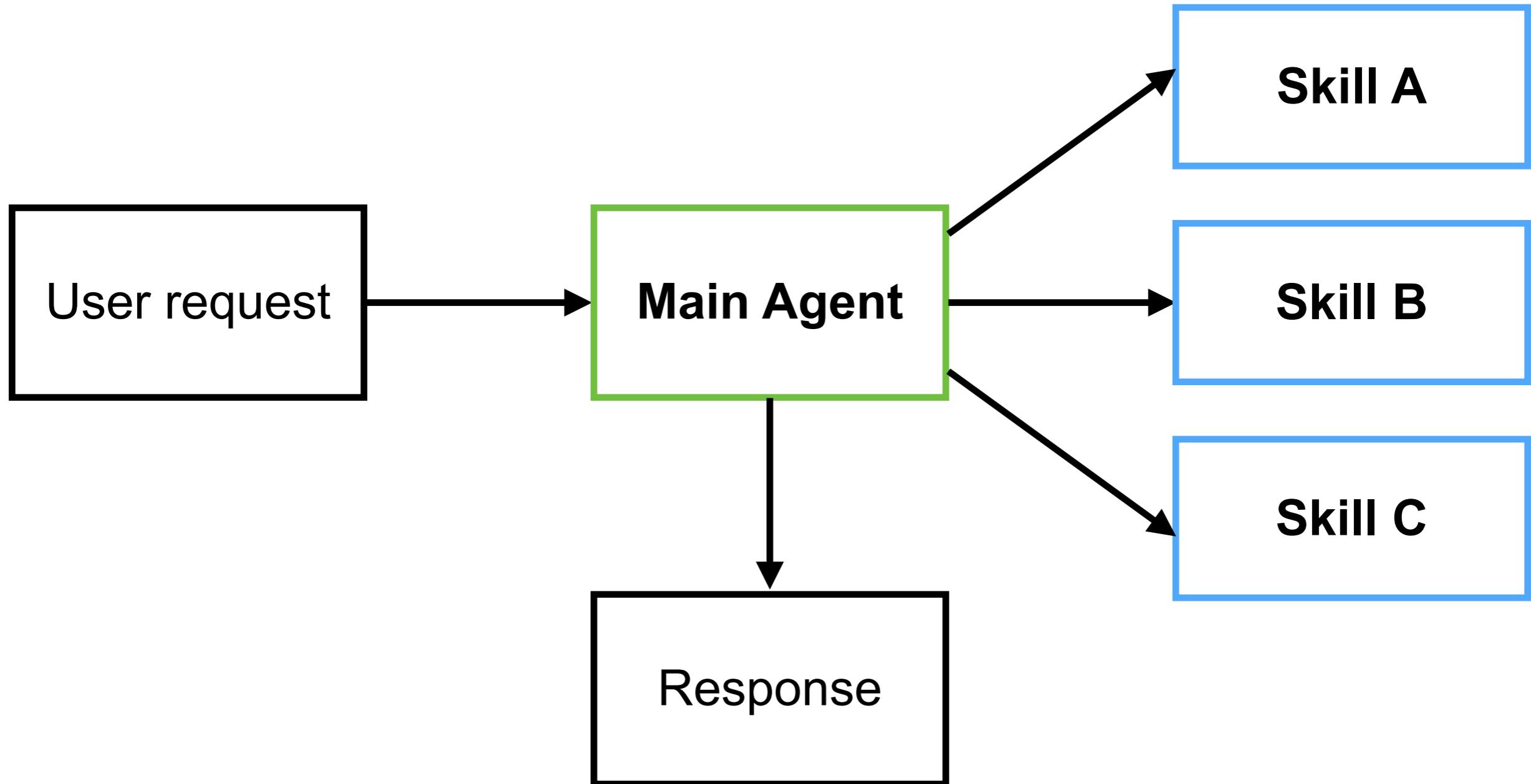
Interoperability

<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

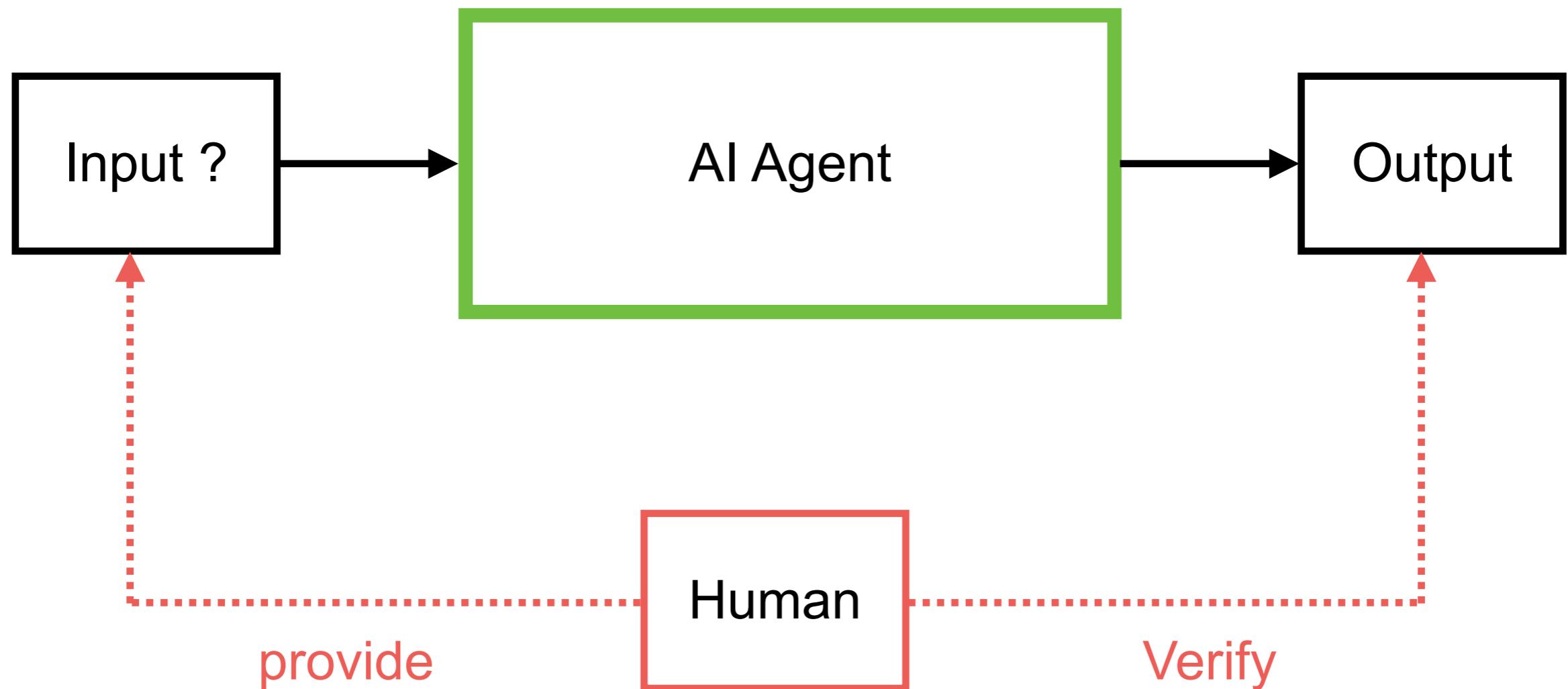
<https://agentskills.io/>



How to provide inputs ?



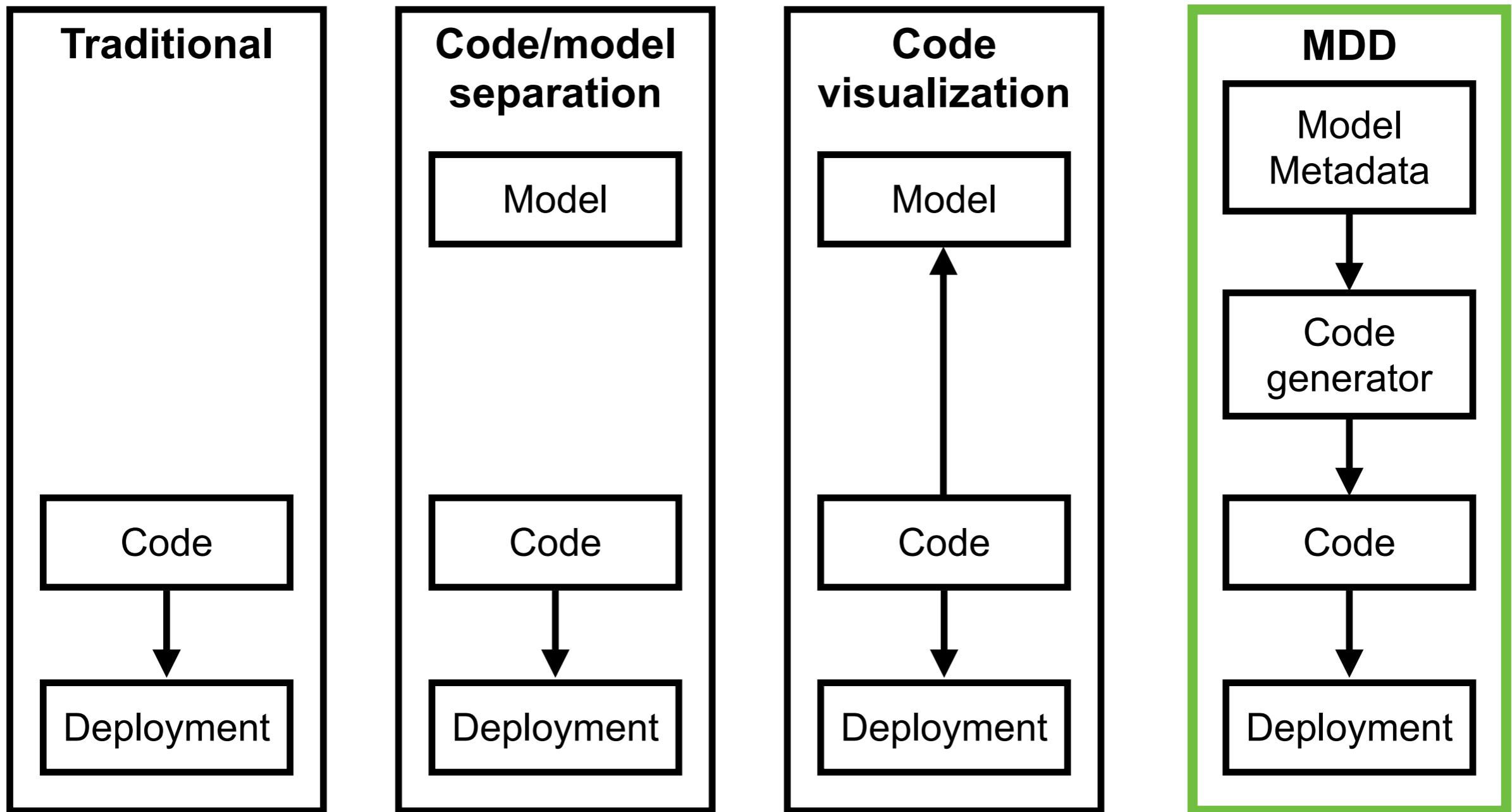
How to provide inputs ?



Model-Driven Development (MDD)



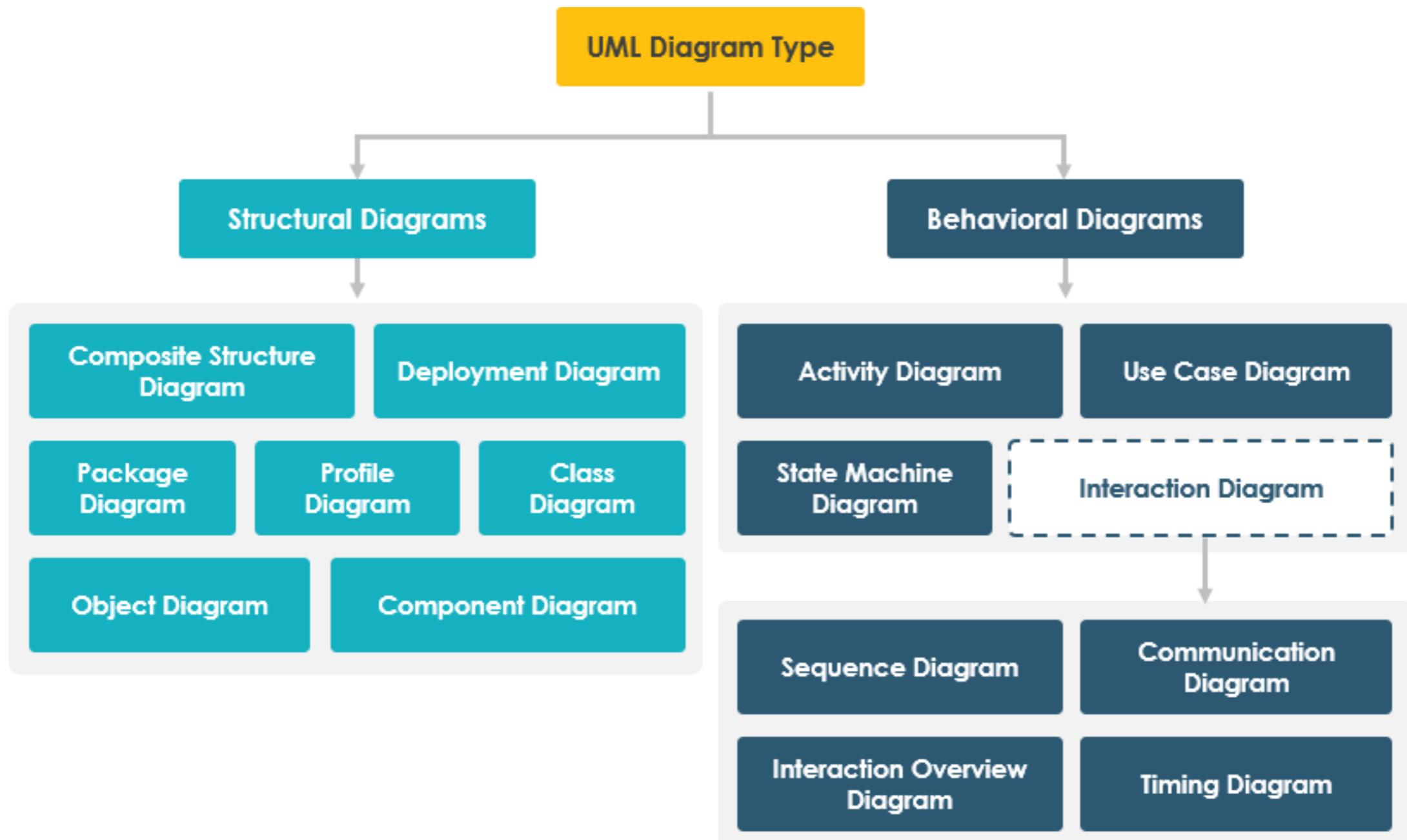
Traditional coding to MDD



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



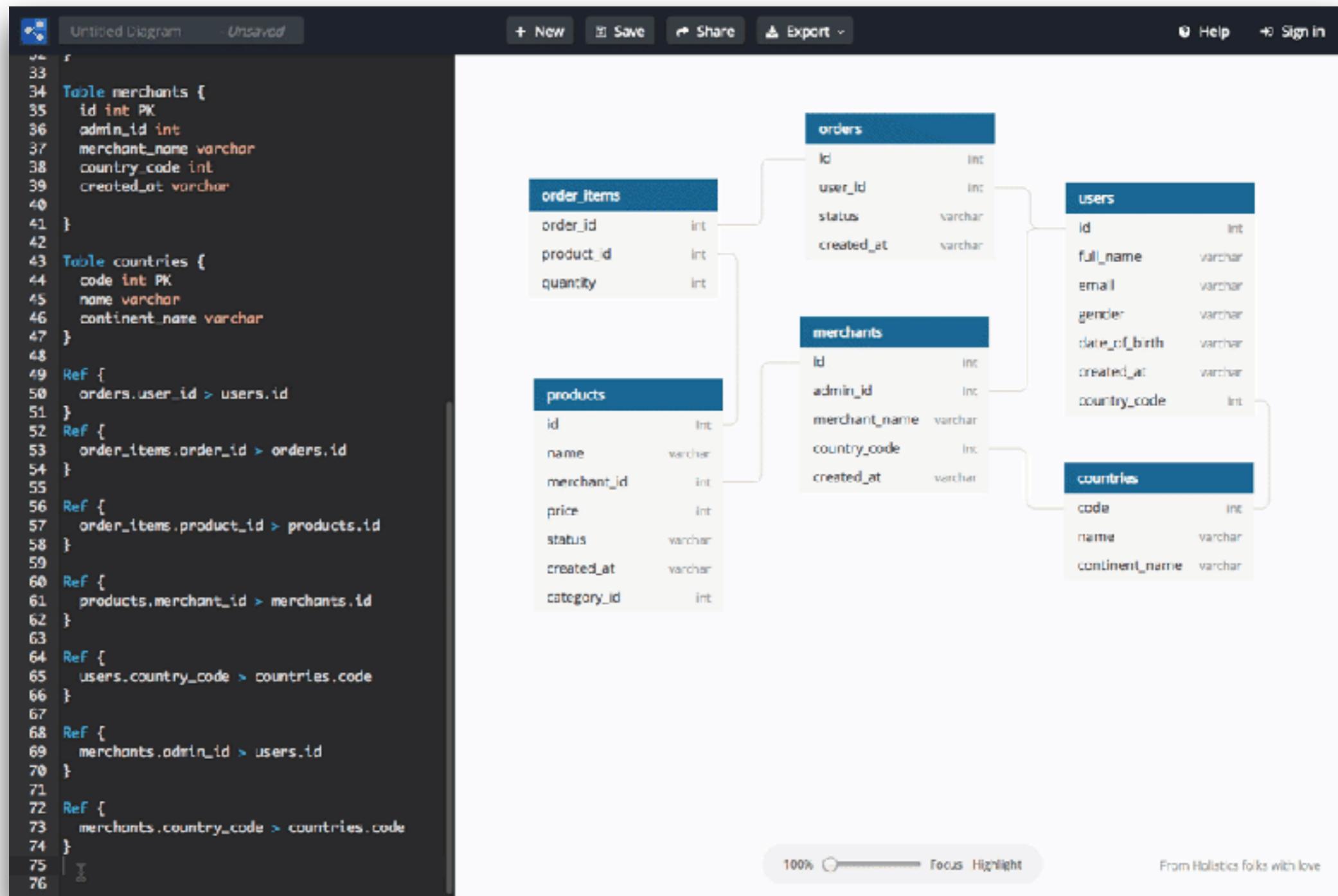
UML Diagrams !!



<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

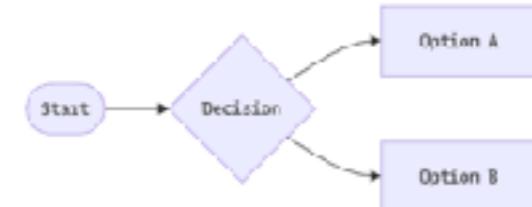
Diagram as a Code (AI-friendly)

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"]
```

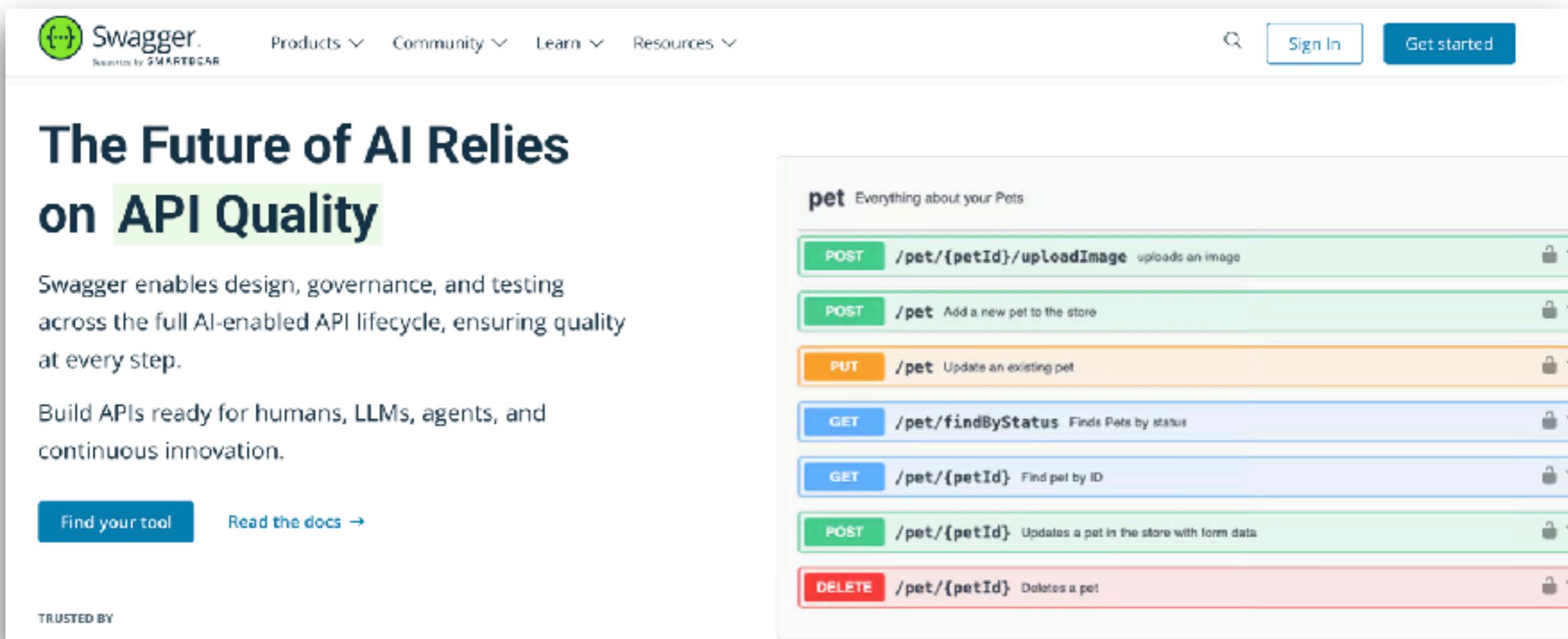


<https://mermaid.js.org/>



Swagger or OpenAPI

Standardized specification for describe REST APIs



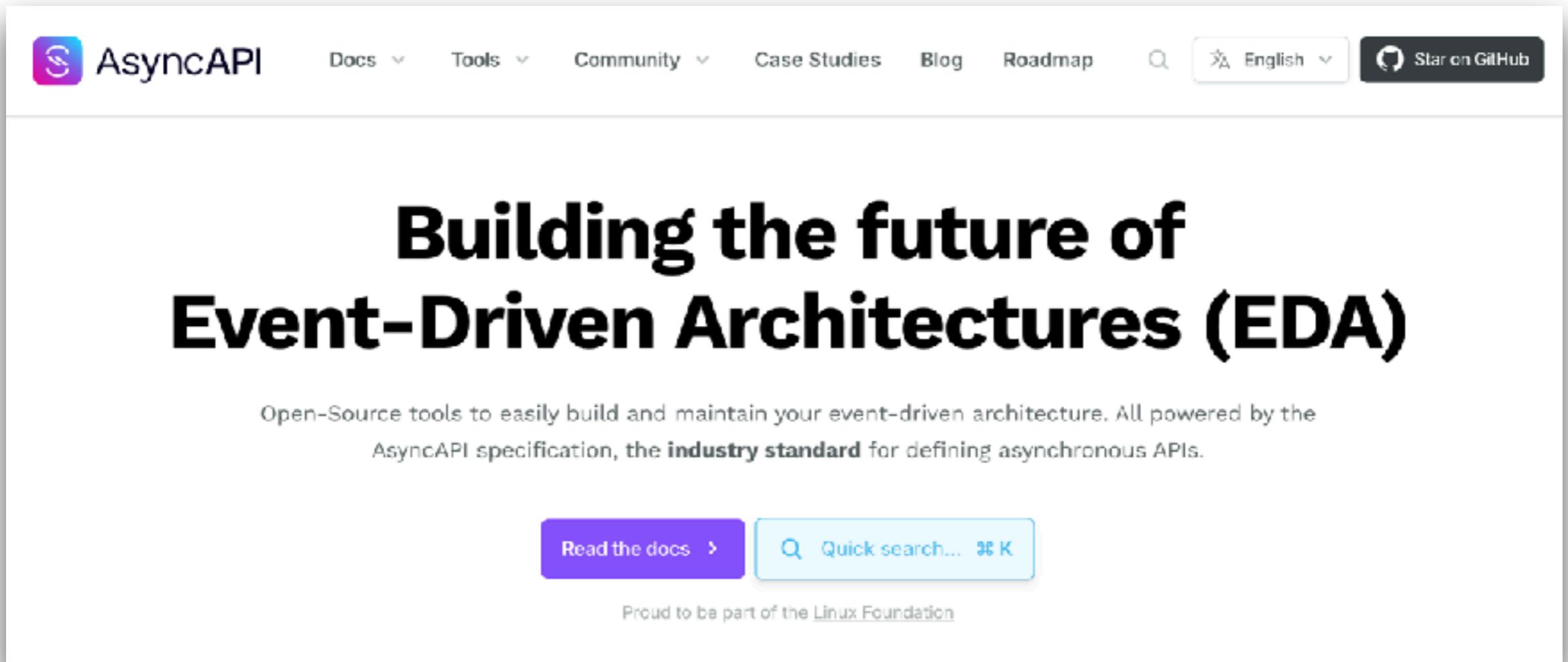
The screenshot shows the Swagger website homepage. The header includes the Swagger logo, a search bar, and navigation links for Products, Community, Learn, and Resources. The main content features a large heading 'The Future of AI Relies on API Quality' with a subtext about Swagger enabling design, governance, and testing across the AI-enabled API lifecycle. Below this is a section for building APIs ready for humans, LLMs, agents, and continuous innovation. A 'Find your tool' button and a 'Read the docs →' link are also present. On the right, a detailed API documentation for the 'pet' resource is shown, listing seven operations: 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), and DELETE /pet/{petId} (Deletes a pet). Each operation is accompanied by a lock icon.

<https://swagger.io/>



AsyncAPI

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



The screenshot shows the AsyncAPI website homepage. The header includes a logo, navigation links for Docs, Tools, Community, Case Studies, Blog, and Roadmap, a search bar, a language selector for English, and a 'Star on GitHub' button. The main title 'Building the future of Event-Driven Architectures (EDA)' is prominently displayed in large, bold, black text. Below the title, a subtitle reads: 'Open-Source tools to easily build and maintain your event-driven architecture. All powered by the AsyncAPI specification, the **industry standard** for defining asynchronous APIs.' At the bottom of the main content area are two buttons: 'Read the docs' and 'Quick search... 36 K'. A small note at the bottom states: 'Proud to be part of the [Linux Foundation](#)'.

<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/>



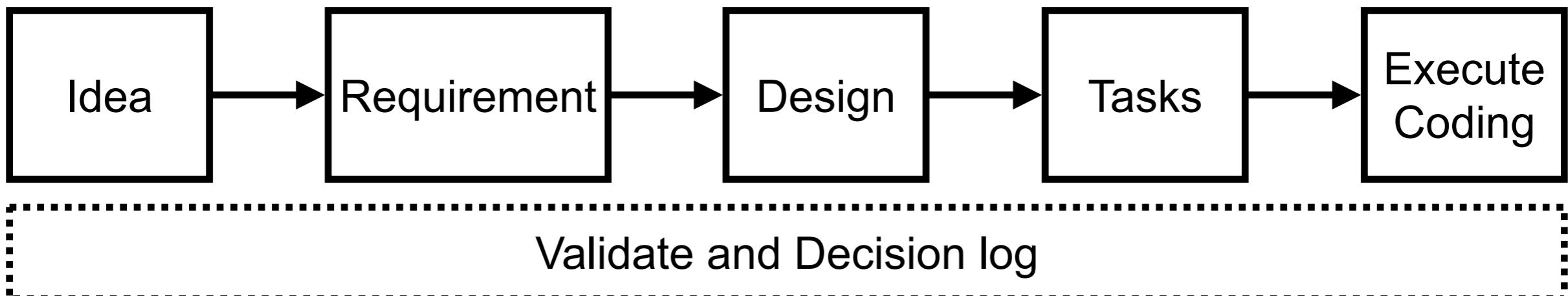
Specification-Driven Development (SDD)



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

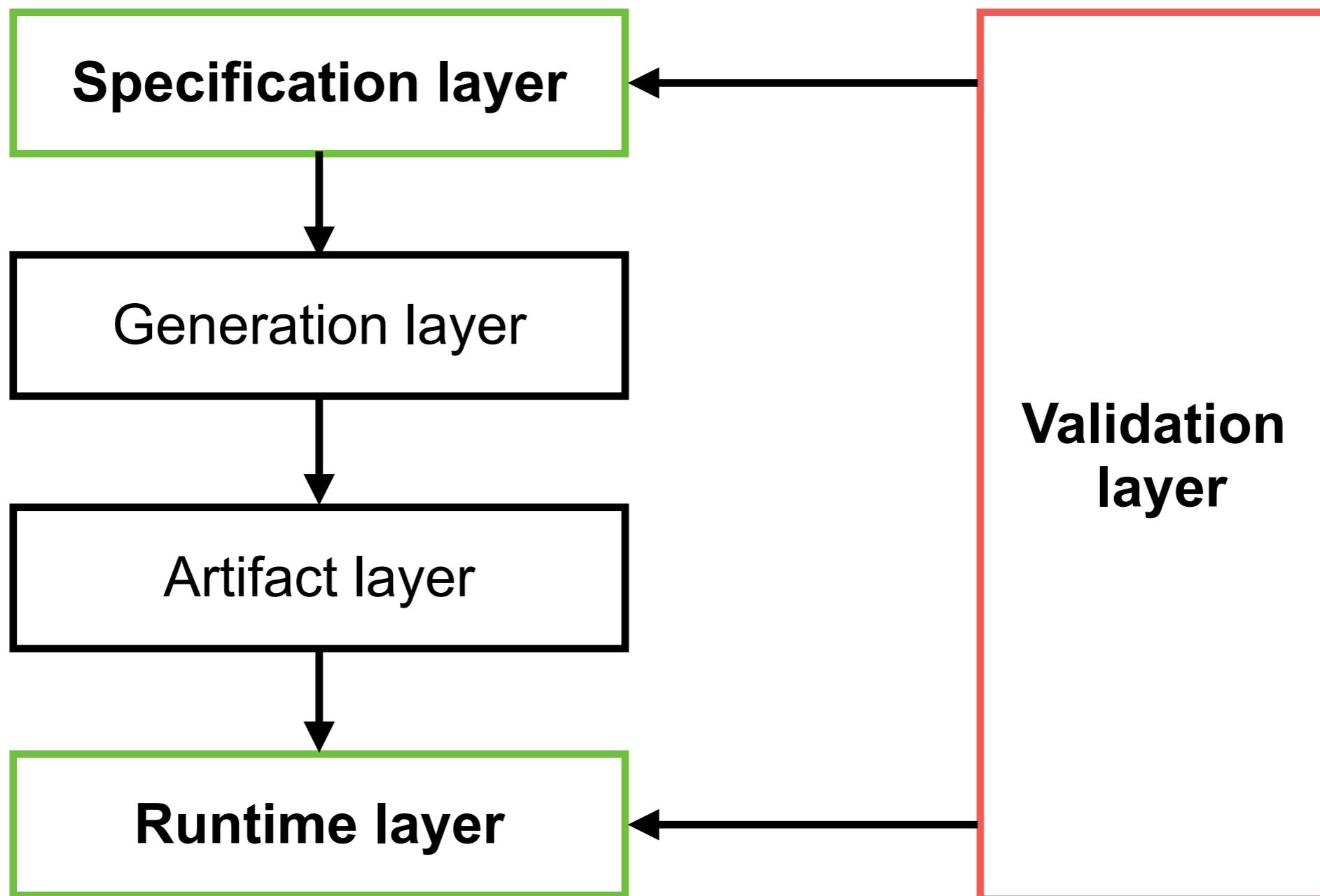
Security policy and constraints

Versioning semantics

Resources and performance constraints



SSD Architecture

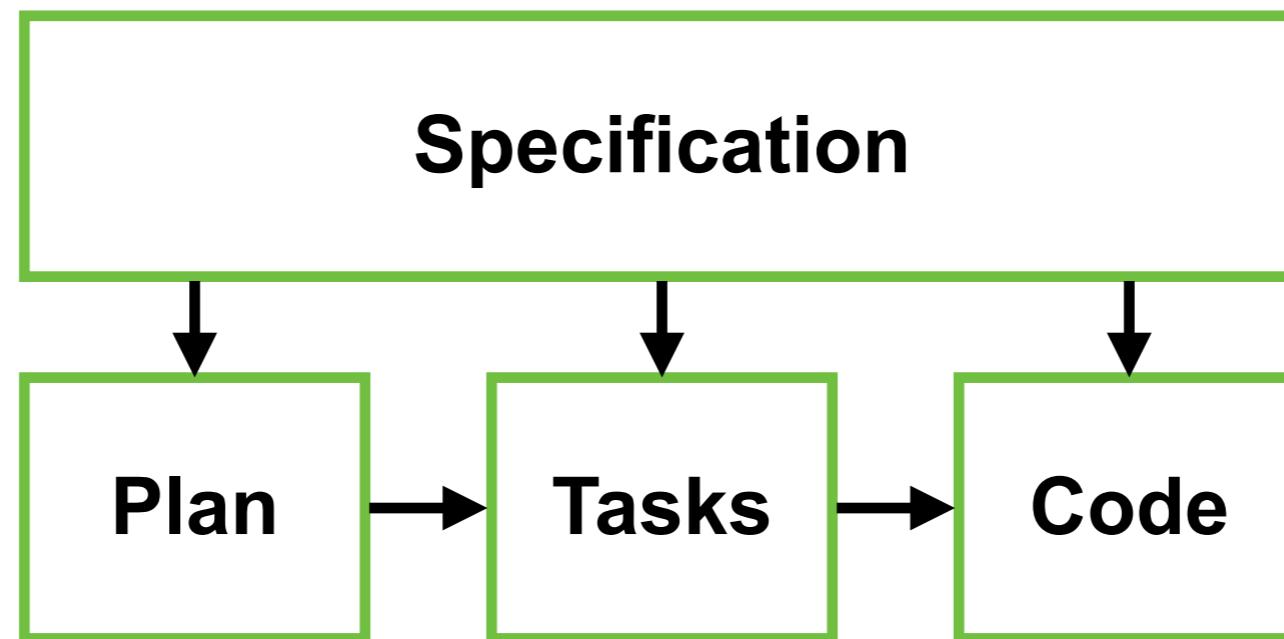


<https://www.infoq.com/articles/spec-driven-development>



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

Backend
RESTful API +
Database

Vercel React Skill

Global instruction

Write spec or feature

Write spec or feature

Prompt or command

Prompt or command

Working with MCP

Working with MCP

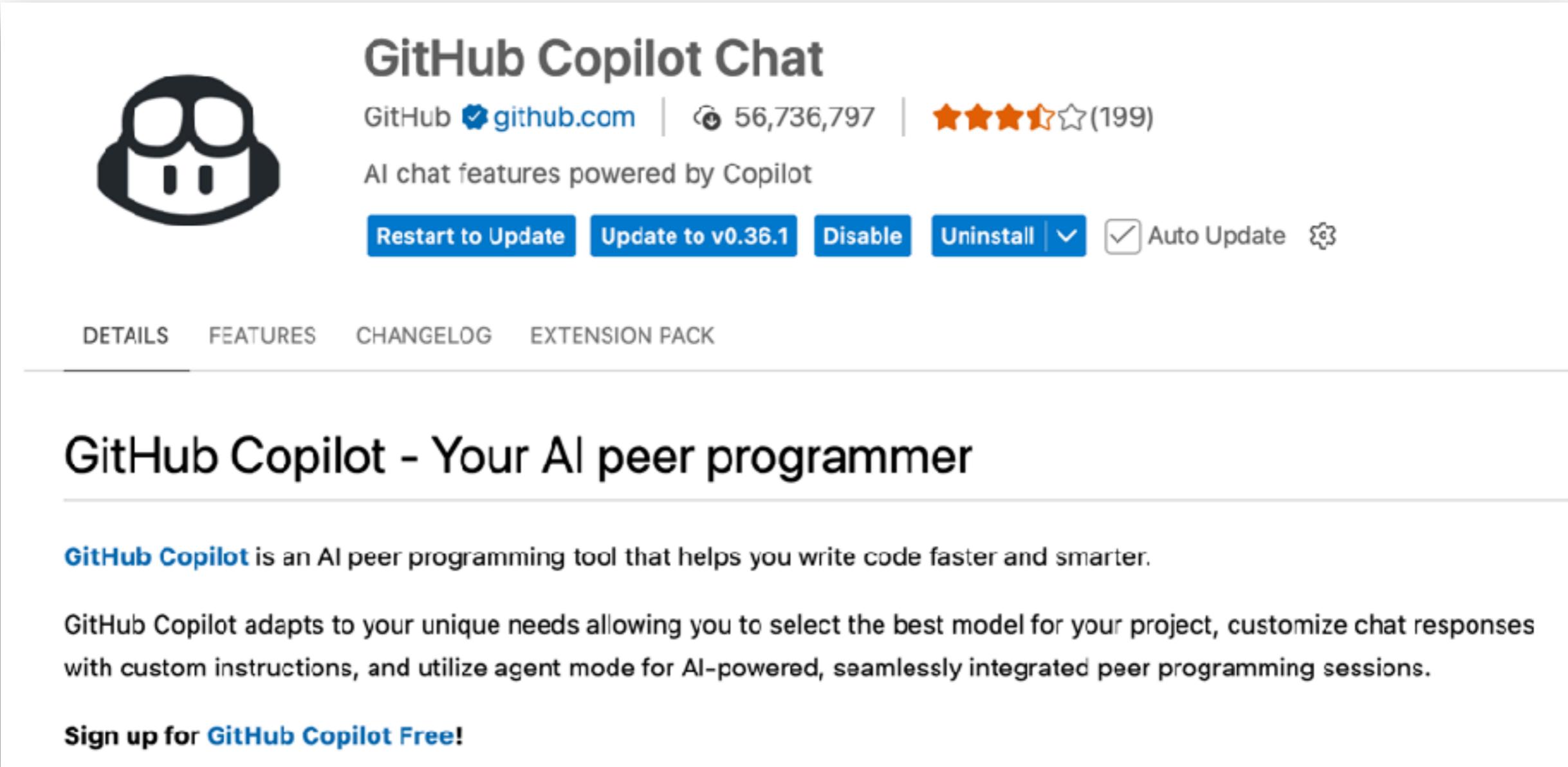


Workshop with vs Code + GitHub Copilot Chat

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



Install extension in VS Code



The screenshot shows the GitHub Copilot Chat extension page in the Visual Studio Code Marketplace. The extension icon is a black owl wearing glasses. The title is "GitHub Copilot Chat". Below the title, it says "GitHub [github.com](#) | 56,736,797 | ★★★★★ (199)". The description is "AI chat features powered by Copilot". Action buttons include "Restart to Update", "Update to v0.36.1", "Disable", "Uninstall", "Auto Update", and a settings icon. Below the main card, there is a section titled "GitHub Copilot - Your AI peer programmer" with a description of the tool and a "Sign up for GitHub Copilot Free!" button.

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.

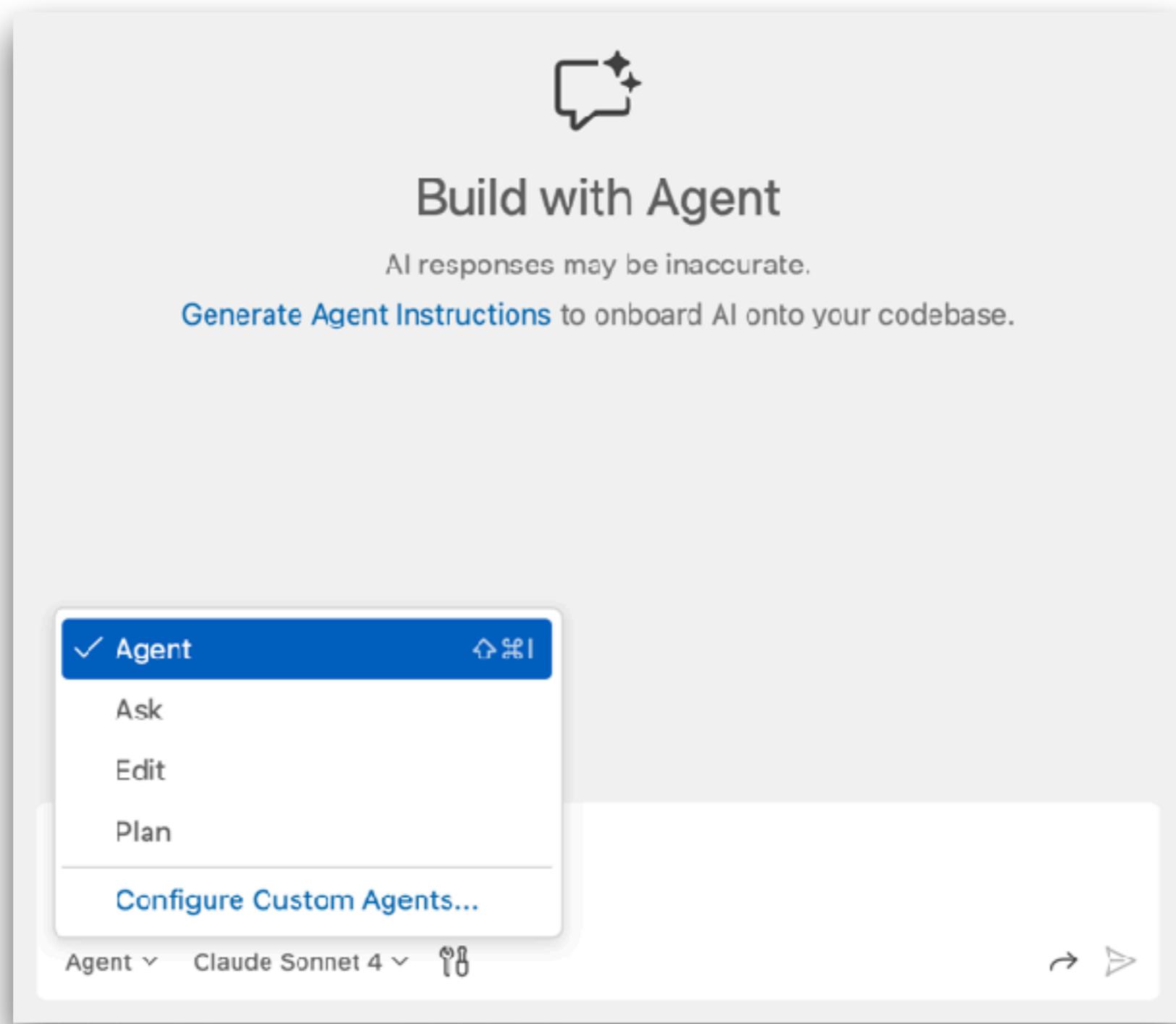
GitHub Copilot adapts to your unique needs allowing you to select the best model for your project, customize chat responses with custom instructions, and utilize agent mode for AI-powered, seamlessly integrated peer programming sessions.

[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

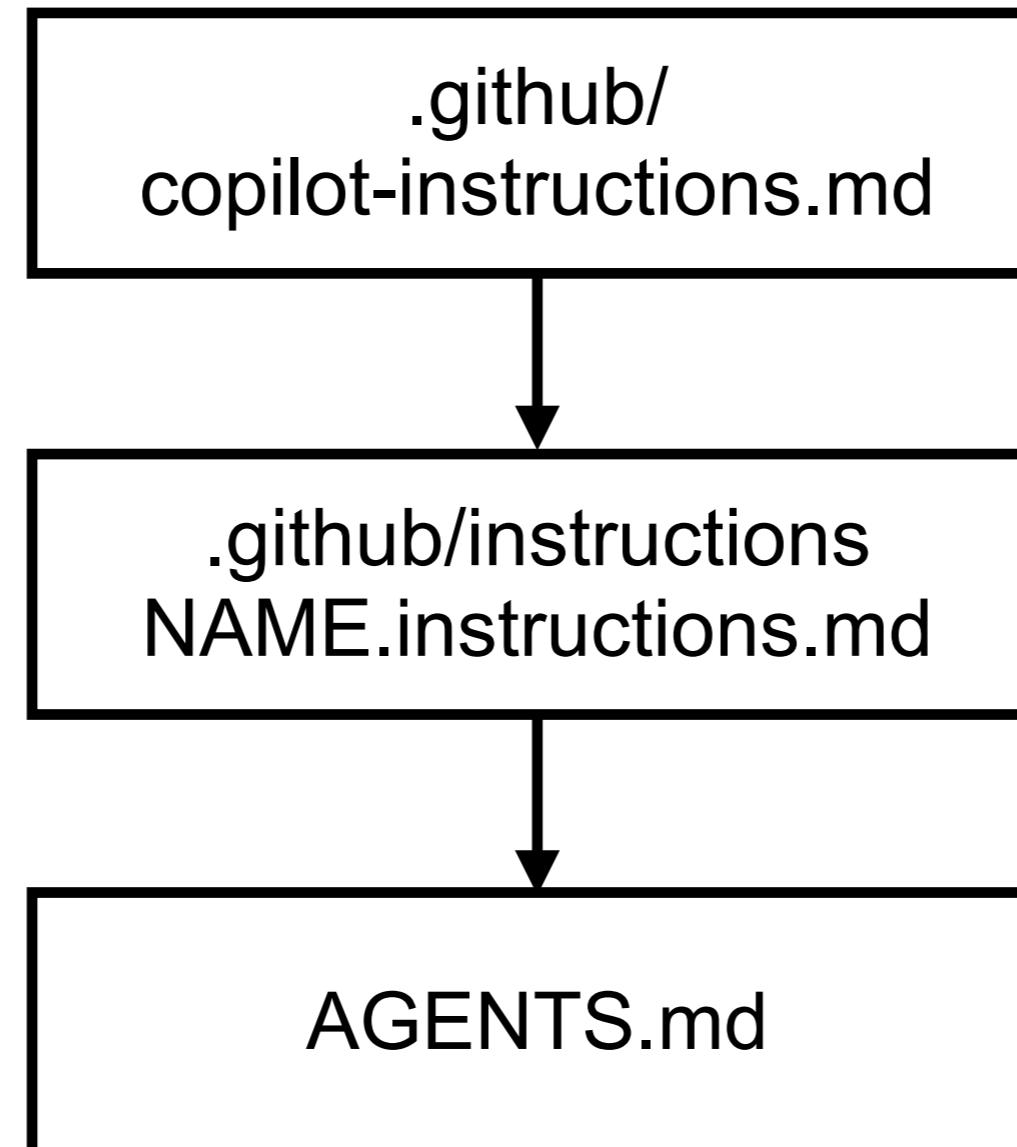
Plan

Custom
Agent

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



Custom instructions !!



Global

Specific by types

Disable by default in VS Code

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



Development

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Customization !!

Agent

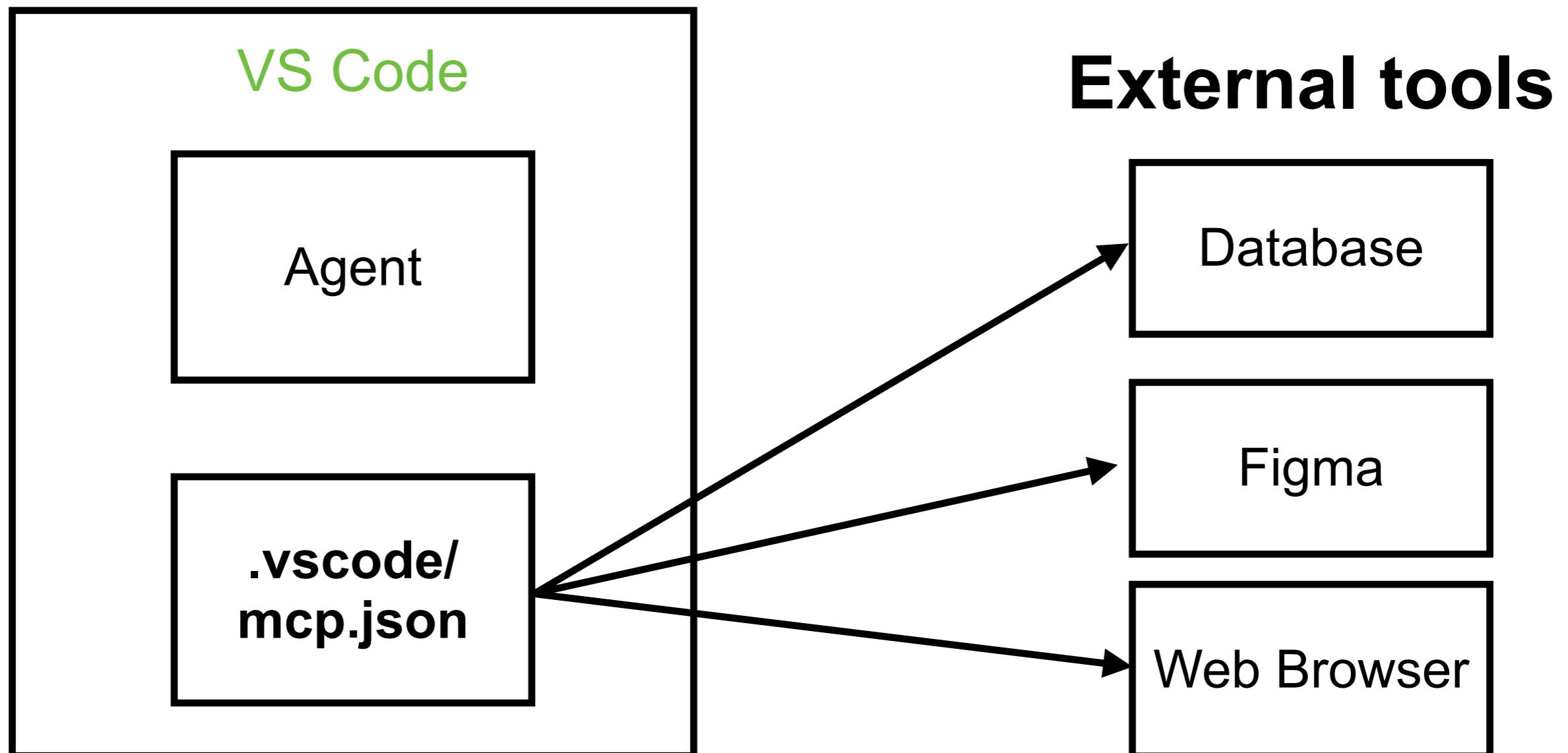
Instruction

Prompts

Skills



Working with MCP



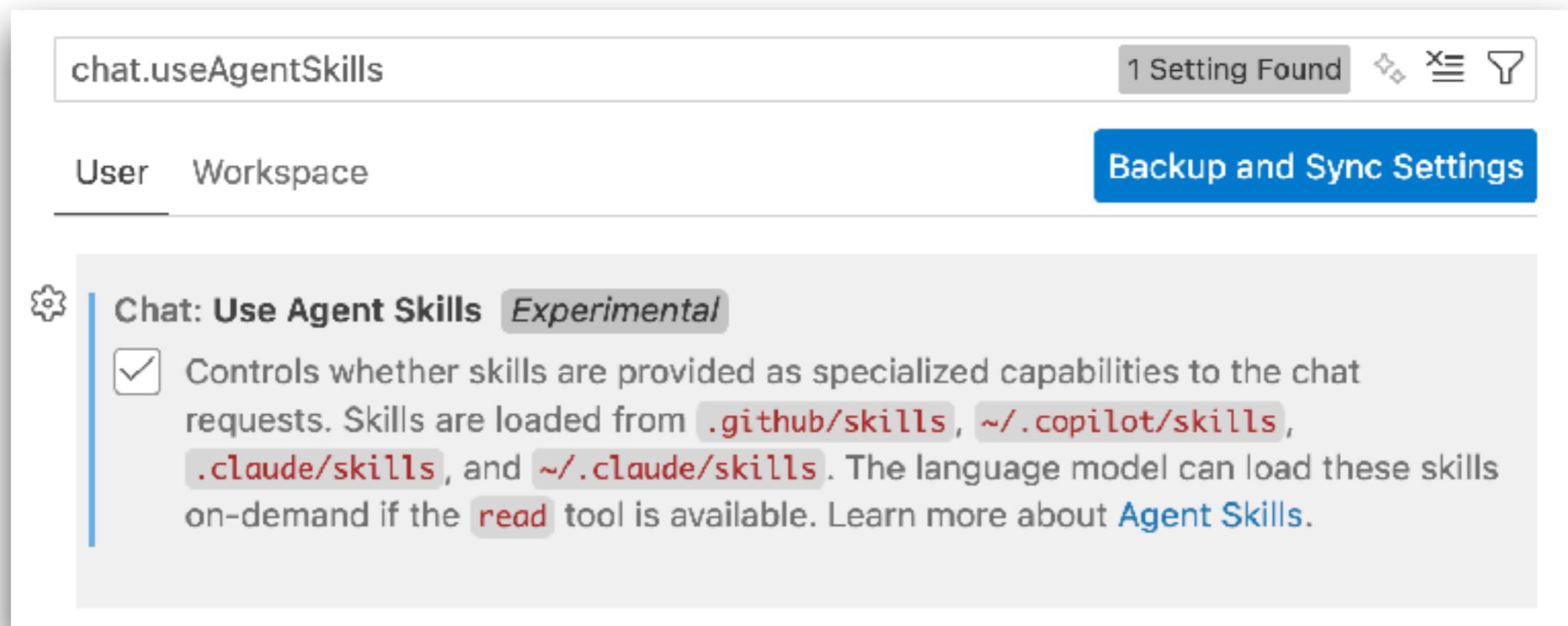
<https://code.visualstudio.com/docs/copilot/customization/custom-agents>



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

