

From Human-in-the-Loop to Agent-in-the-Loop

A Practical Transition Guide



Talk Roadmap

Motivation

Why HITL→AITL matters now

- ML systems scaling
- Human workflows slow
- Autonomous agents rising

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HITL

What it is & why it breaks

- Core definition
- Strengths
- Limitations

Talk Roadmap

Motivation

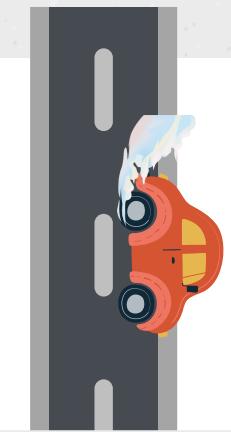
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AITL

What changes with agents

- Core idea
- Architecture

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Talk Roadmap



HTL vs AITL

Where each paradigm wins

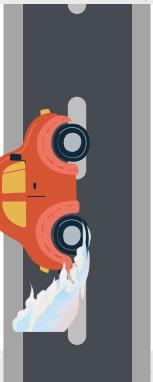
- Real-world examples
- Comparison table
- Transition path

Talk Roadmap

Examples

A practical Agent-in-the-Loop example

- Gitlab
- modAL



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Frameworks

Agentic Framework Landscape (2025)

- LangChain
- LangGraph
- AutoGen

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Future Outlook

& Q&A

- Summary
- Future Outlook
- Closing

Motivation

Why now?

ML systems are scaling
faster than supervision

Human workflows are too
slow



Agents are becoming
autonomous actors

Transition is happening
whether we prepare or not

Human in the loop

What It Really Means





Human in the loop

Limitations

CONTEXT SENSITIVITY

PERFORMANCE DEGRADES OUTSIDE TRAINED SCENARIOS



Human in the loop

Limitations

EVALUATION DIFFICULTY

RESPONSIBILITY IS UNCLEAR IN HYBRID SYSTEMS

CONTEXT SENSITIVITY

PERFORMANCE DEGRADES OUTSIDE TRAINED SCENARIOS

Human in the loop

Limitations

SCALING ISSUES

HUMAN FEEDBACK BECOMES A BOTTLENECK AT SCALE

EVALUATION DIFFICULTY

RESPONSIBILITY IS UNCLEAR IN HYBRID SYSTEMS

CONTEXT SENSITIVITY

PERFORMANCE DEGRADES OUTSIDE TRAINED SCENARIOS



Human in the loop

Where HITL Shines

HİGH-RİSK DOMAİNİS
SAFETY CRİTICAL

HİGHER ACCURACY
HUMAN CORRECTION



Human in the loop

Where HITL Shines

FASTER IMPROVEMENT
RAPID REFINEMENT

HIGH-RISK DOMAINS
SAFETY CRITICAL

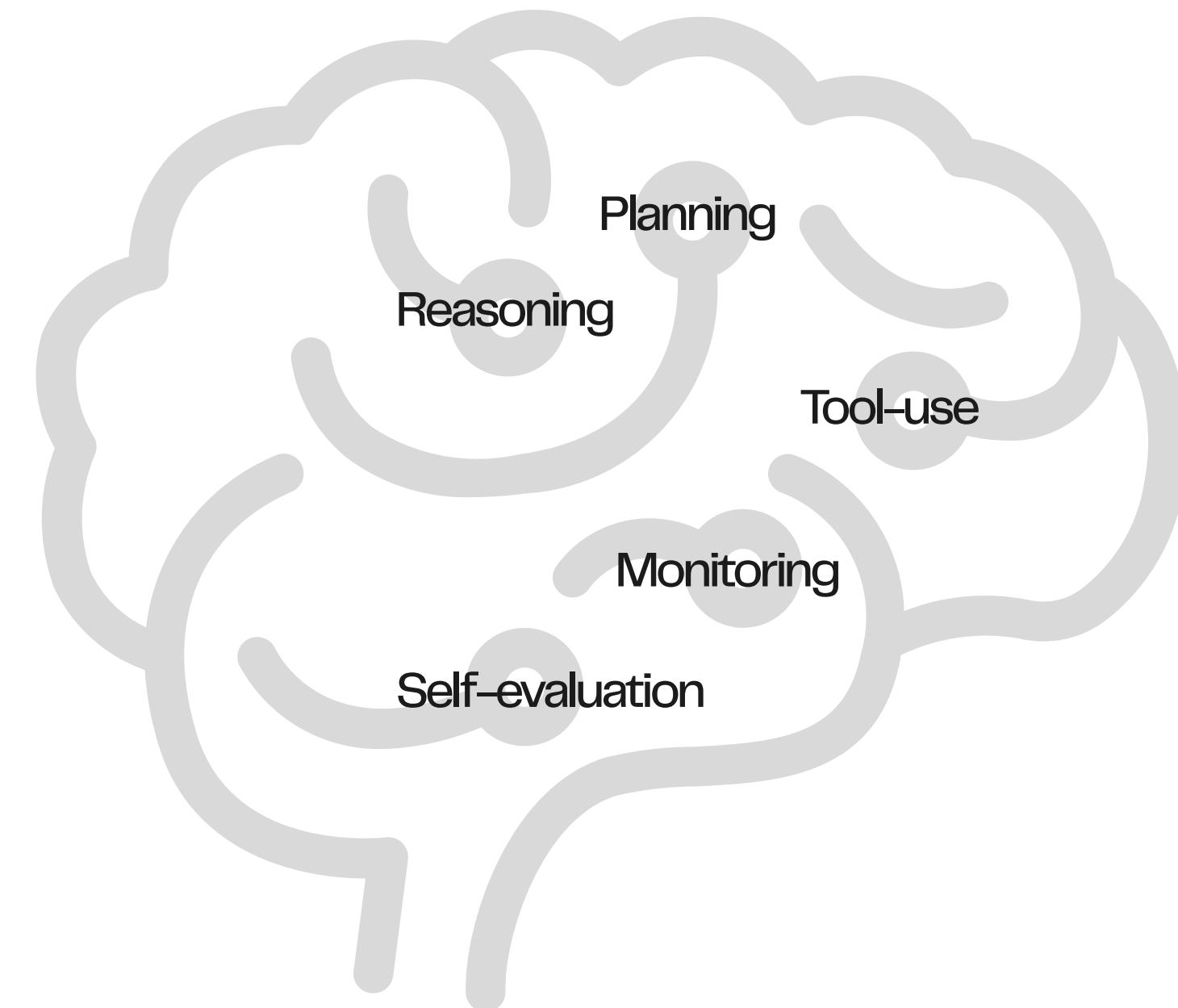
EDGE CASES
BETTER DECISIONS

HIGHER ACCURACY
HUMAN CORRECTION



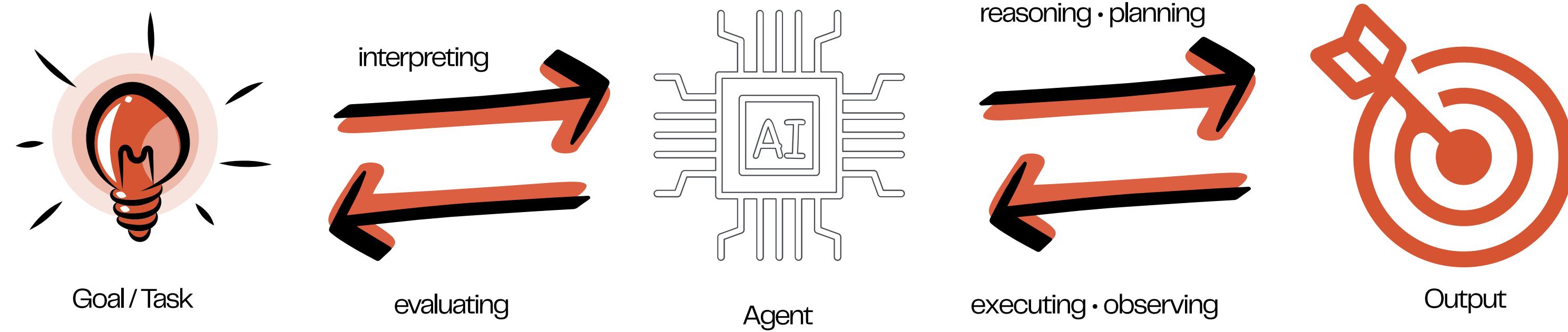
Agent in the loop

Core Idea — “Agents are actors, not just responders.”



Agent in the loop

Loop Diagram



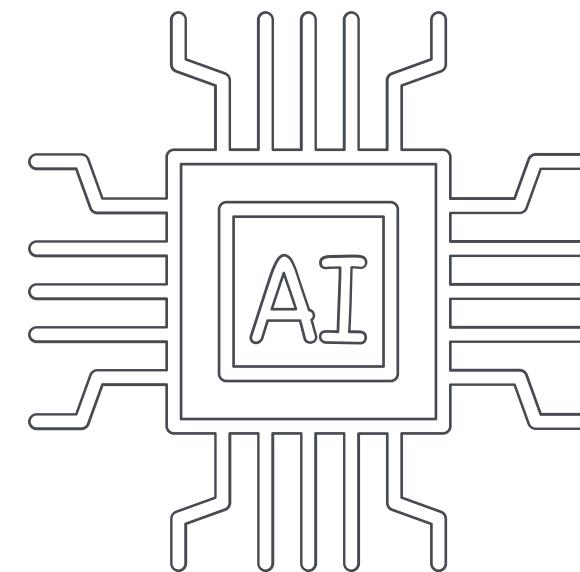
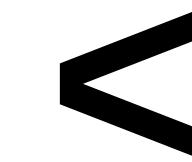
HITL → AITL

What Actually Changes

Speed



Human



Agent

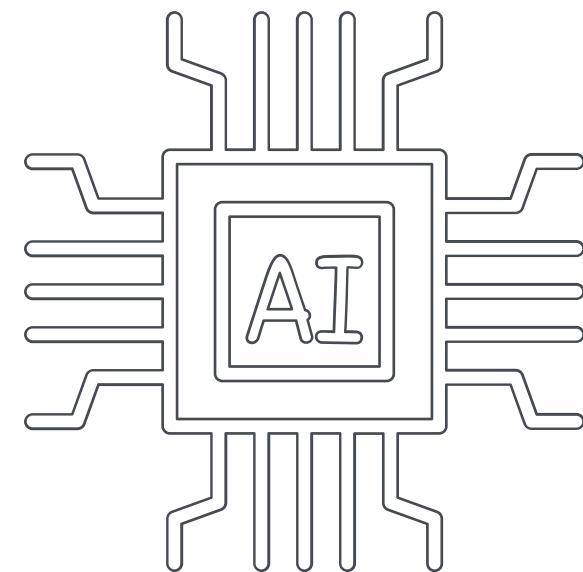
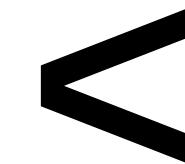
HITL → AITL

What Actually Changes

SCALABILITY



Human



Agent

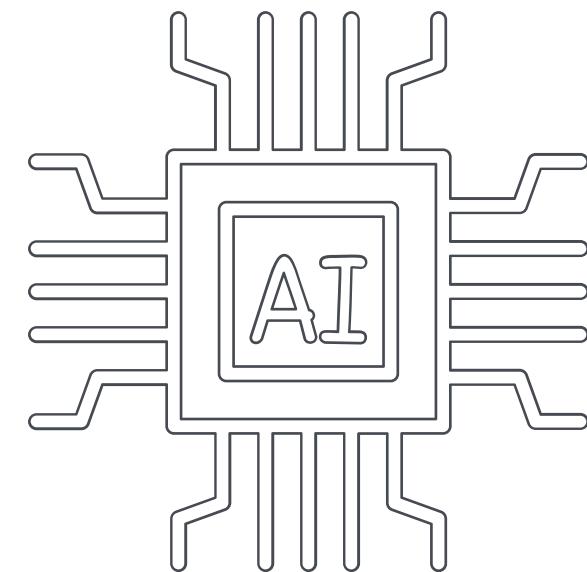
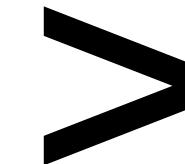
HITL → AITL

What Actually Changes

COST



Human



Agent

HITL → AITL

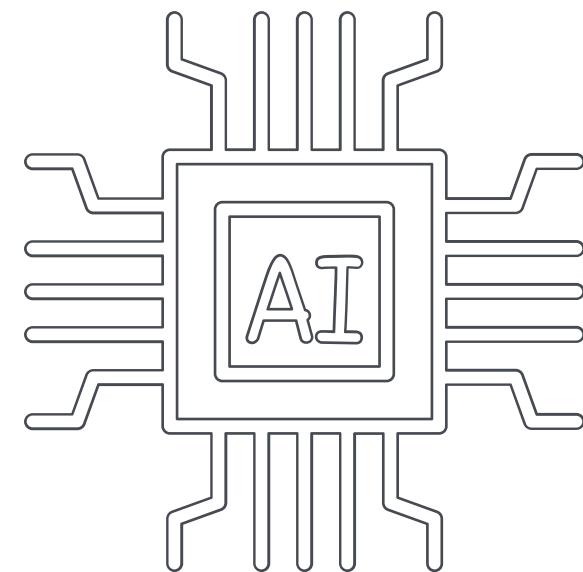
What Actually Changes

RELIABILITY



Human

even



Agent

HITL → AITL

What Actually Changes

Full table

| Feature | HITL | AITL |
|--------------|-----------------------|-------------------------------|
| Accuracy | Medium (human input) | High (agent optimization) |
| Speed | Low (manual feedback) | High (automated decisions) |
| Scalability | Limited | High |
| Cost | High (human labor) | Low (less supervision) |
| Transparency | High | Medium / Low |
| Trust | High | Medium (needs explainability) |
| Adaptivity | Low | High |

HITL → AITL

Real-World Examples (HITL)

1. Medical Diagnosis – Ensuring patient safety

Regulation & Safety

2. Autonomous Vehicles – Managing edge cases

Rare edge cases

3. Manufacturing – Supervisory decision-making

Exception Handling

HITL → AITL

Real-World Examples (AITL)

1. Fraud Detection – Real-time transaction analysis

Self-updating policies

2. Recommender Systems – Large-scale personalization

Autonomous preference modeling

3. Smart Logistics & IoT – Dynamic optimization

Real-time coordination

HITL → AITL

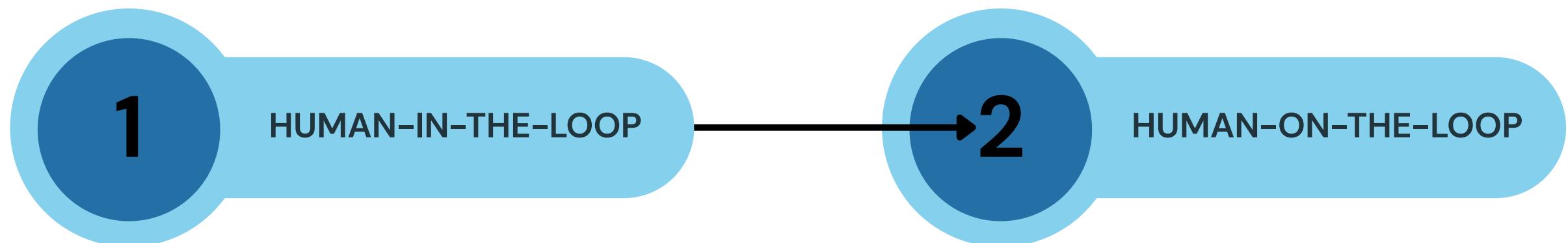
Transition Path

1

HUMAN-IN-THE-LOOP

HITL → AITL

Transition Path



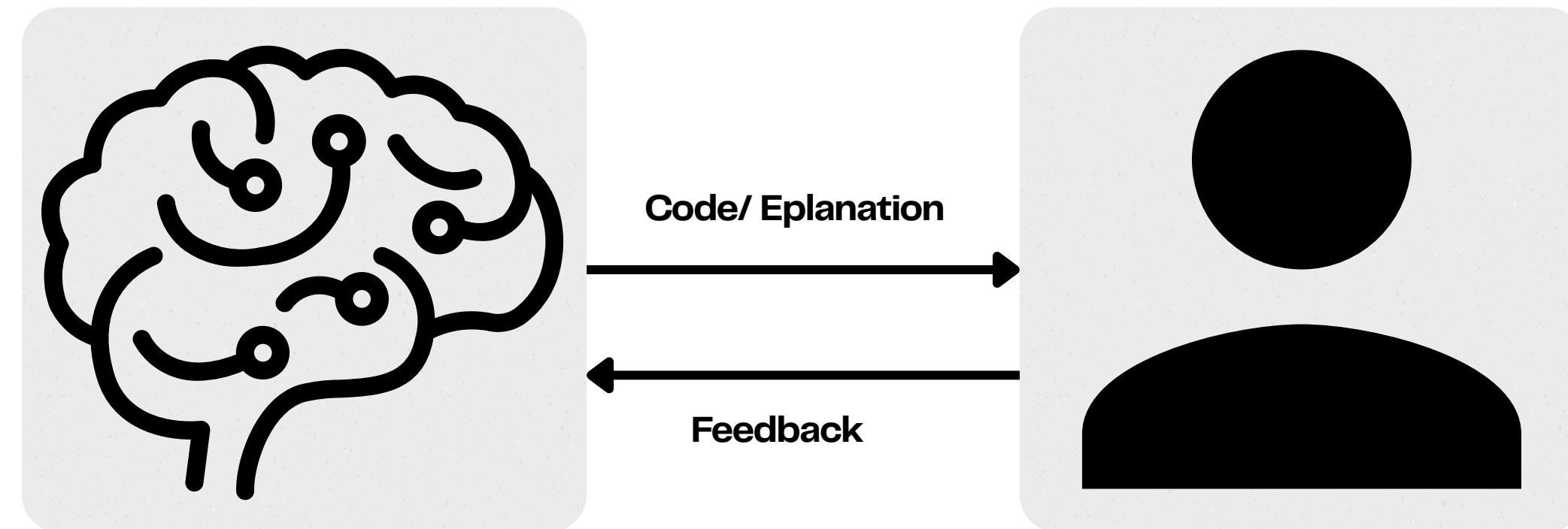
HITL → AITL

Transition Path



AITL Example

Github Copilot



THE AGENT PROPOSES, THE HUMAN SUPERVISES.

AITL Example

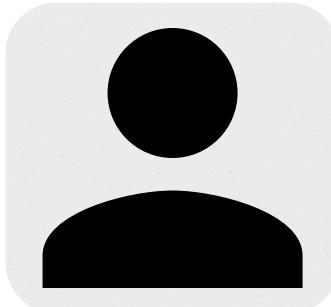
ModAL



Agent (ModAL query strategy)

Agent identifies key samples

(uncertain / informative instances)



Human (labeler)

Human provides correct labels

(supervision step)



Loop (retrain)

Loop updates the model

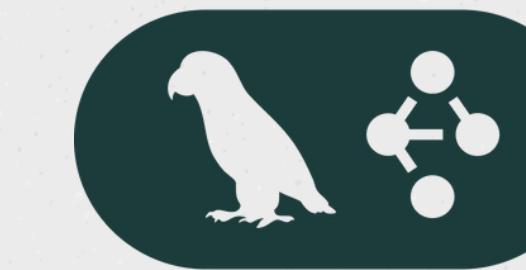
(agent improves after each iteration)

Agentic Framework Landscape (2025)

Building blocks for AITL systems



LANGCHAIN
Tools & workflows



LANGGRAPH
Stateful reasoning

AutogenAI

AUTOGEN
Multi-agent orchestration



CREWAI

Role-based agents



OpenAI

AGENT RUNTIME

Production tool-use

Grand Summary

What We Actually Learned

HTIL is strong but doesn't scale

(risk, precision, human judgment → yes, but slow)

The transition requires 4 critical shifts

(Speed, Scalability, Cost, Reliability/Transparency)

The future is hybrid: agents + human supervision

(not full autonomy, but safe, human-guided models)

AITL puts the agent at the center

(planning, reasoning, tool-use → agent-driven loop)

AITL is already working in the real world

(Copilot, ModAL, labeling systems, logistics...)

Future Outlook

Where Agent-in-the-Loop Is Going Next

Autonomous labeling at scale

(humans only verify rare edge cases)

Self-tuning / self-eval models

(eval loops built directly into agents)

Human-over-the-loop safety

(humans supervise systems, not single tasks)

Multi-agent collaborative systems

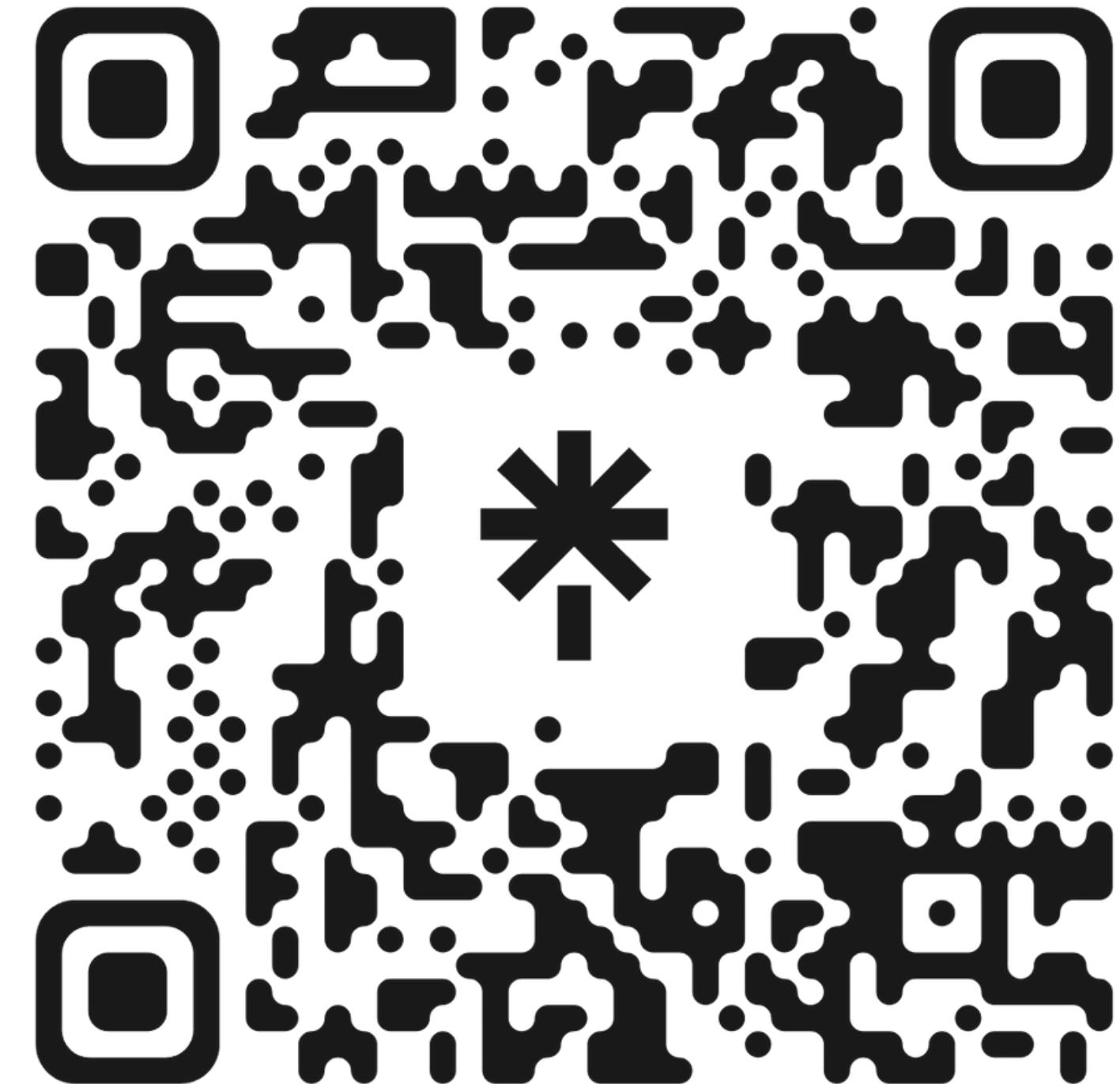
(coordinated teams of agents solving tasks)



Thanks for joining

Stay curious.

Build responsibly.



See & learn more