Agentic-AI Assisted Research Workflow

AI for Scientific Discovery Participatory Design Workshop

Facilitated by

University of Washington

Scientific Software Engineering Center

SSEC

eScience Institute

Schmidt Sciences

INTER DISCIP LINARY SCIENCE SUMMIT PASADENA 2025

Who we are

Niki Burggraf
Senior RSE

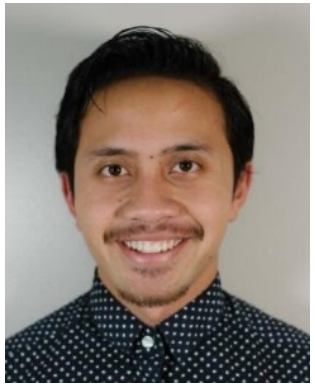
Niki spent over 6 years at Amazon on its serverless compute offering, AWS Lambda, supporting several customer-facing feature launches by building and maintaining microservices on AWS.

Sarah Stone
Executive Director

Sarah Stone is the Executive Director of the eScience Institute. Stone handles eScience operations and planning, develops research and training programs, participates in strategic planning, and serves as the primary contact for university and industry partners, funding agencies and the public.

Anant Mittal
Senior RSE

Anant received his Ph.D. in Computer Science from UW focusing on Human-Computer Interaction. His dissertation work focused on designing and building systems for communication, collaboration, and coordination in complex settings like Accessibility and Health.



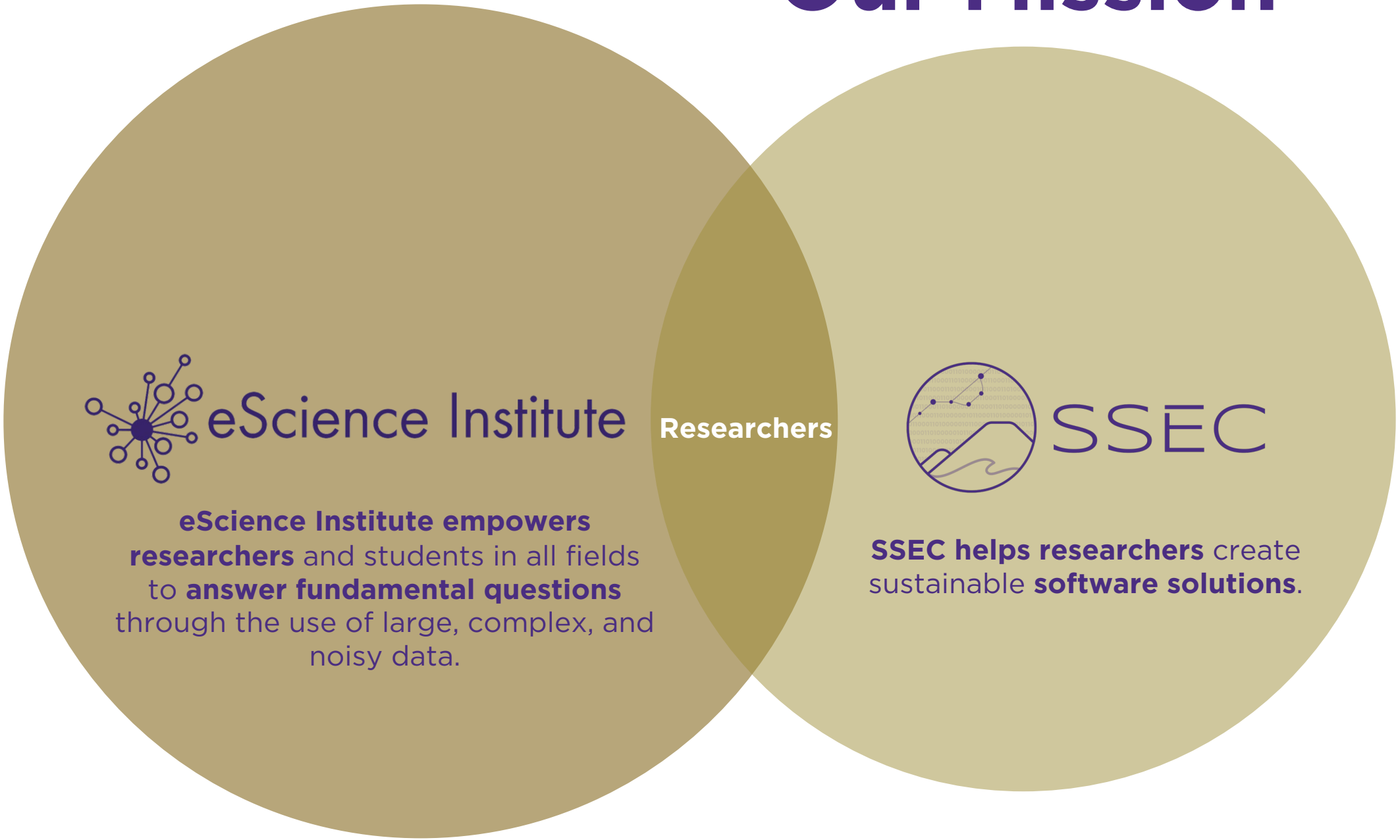
Don Setiawan
Principal RSE

Don has been a research software engineer at UW for 8+ years contributing to open-source research software. Don has a background in Oceanography and Marine Technology. He is currently pursuing an MS in UW SET Tacoma.

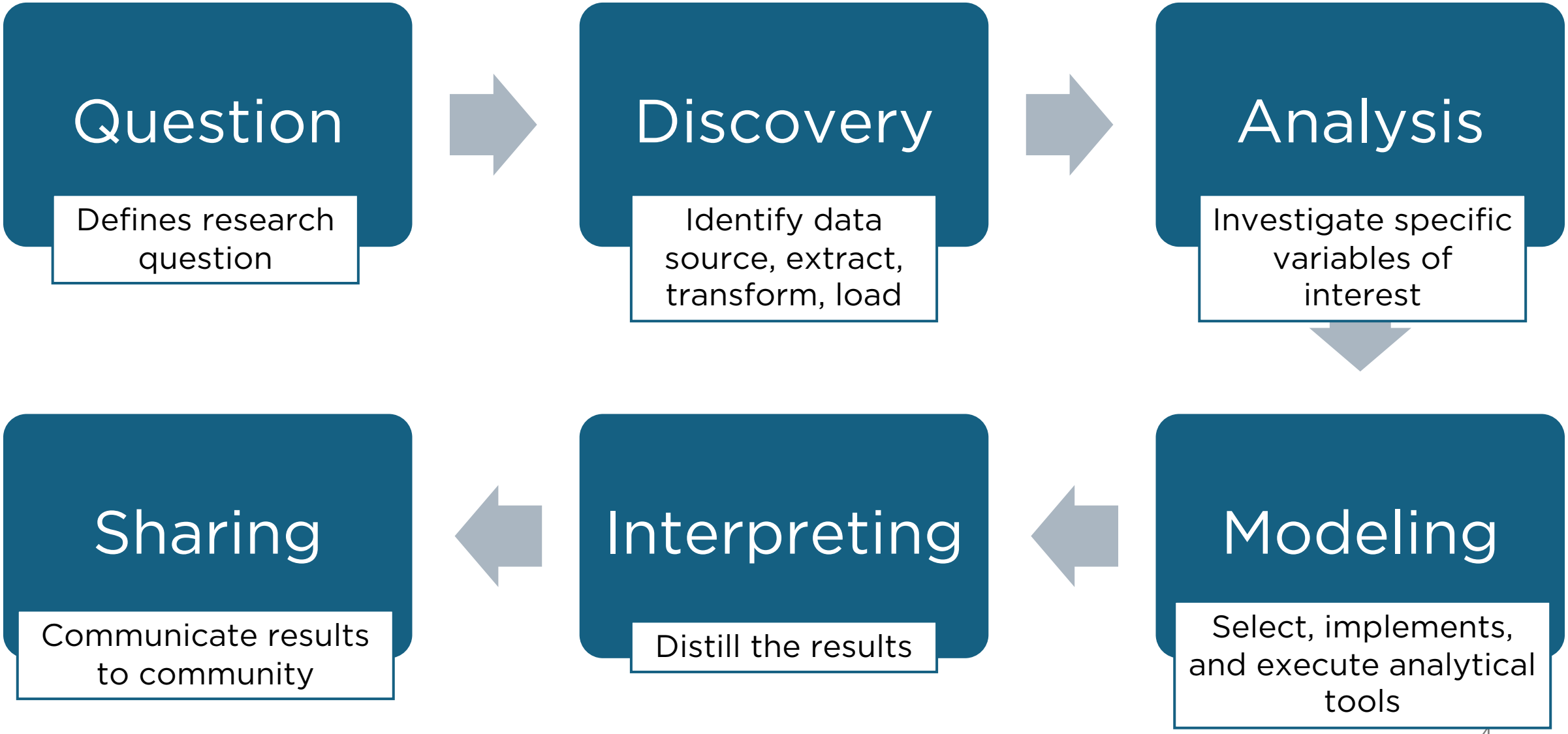
Anshul Tambay
Technical PM

Anshul brings experience in building infrastructure for research from his time as a Data Analyst at Northwestern University, where he studied community violence intervention programs.

Our Mission


eScience Institute
Researchers
SSEC
eScience Institute empowers researchers and students in all fields to answer fundamental questions through the use of large, complex, and noisy data.
SSEC helps researchers create sustainable software solutions.

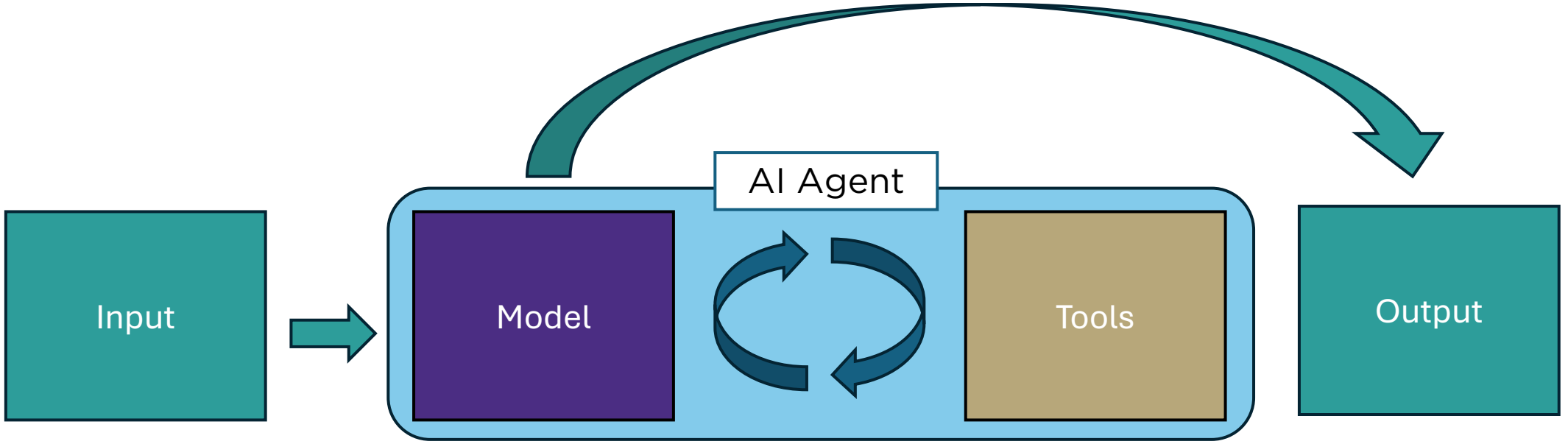
Stages of Data Science Lifecycle



Source: https://ethos.academicdatascience.org/stages/

What is an AI Agent?

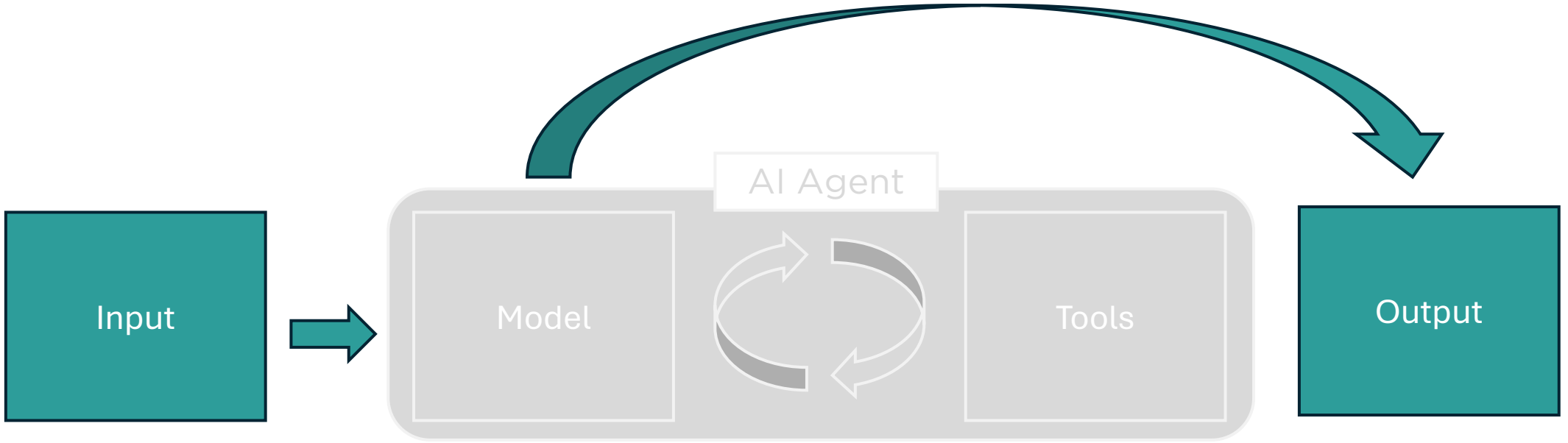
agent ≈ model + tools, within a loop + environment



Source: https://www.linkedin.com/posts/eugeneyan_agent-model-tools-within-a-for-loop-ugcPost-7300335307558658048-ST_a

Input and Output

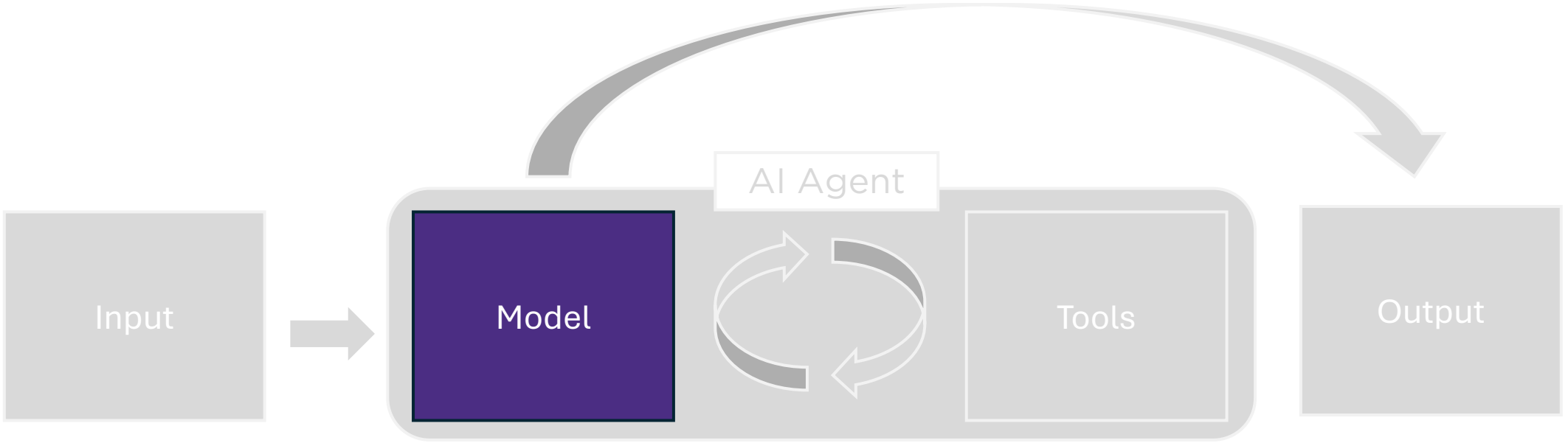
agent ≈ model + tools, within a loop + environment



Input: The **data input** in the form of **text, image, and/or videos**, along with a **set of instructions** in natural language.
Output: The **immutable results** or outputs of the agent's work (e.g., **a generated summary**, **a file**, **an image**, or **structured data**)

Model (LLM)

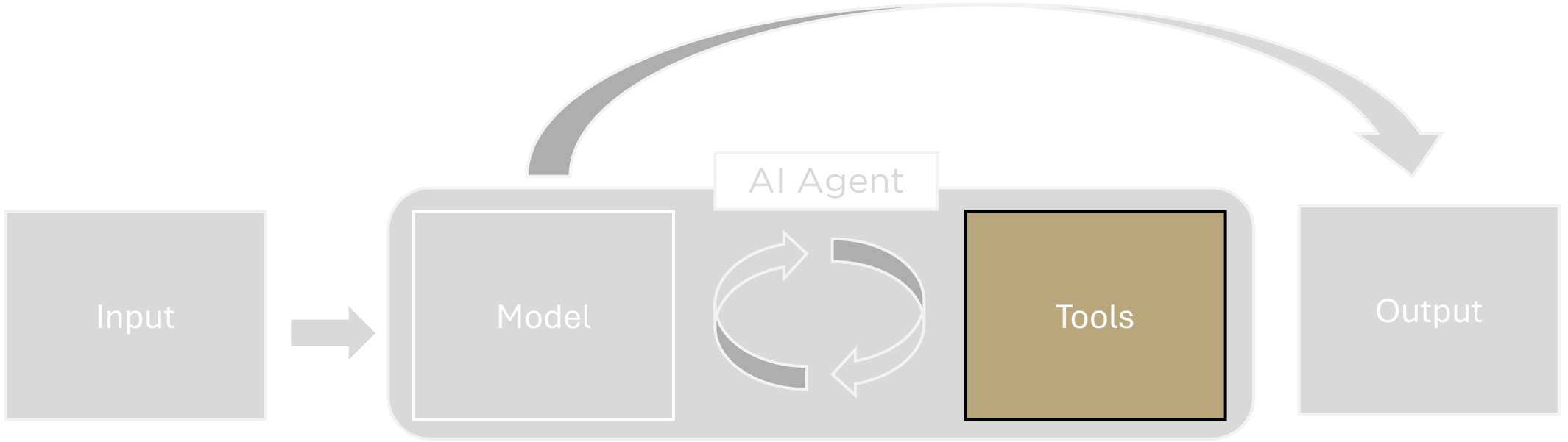
agent ≈ model + tools, within a loop + environment



Large Language Model is the brain of the whole system.
Examples: **GPT-4.1, Claude Sonnet 4, Gemini 2.5 Pro, LLaMA 4, OLMo 2**.

Tools

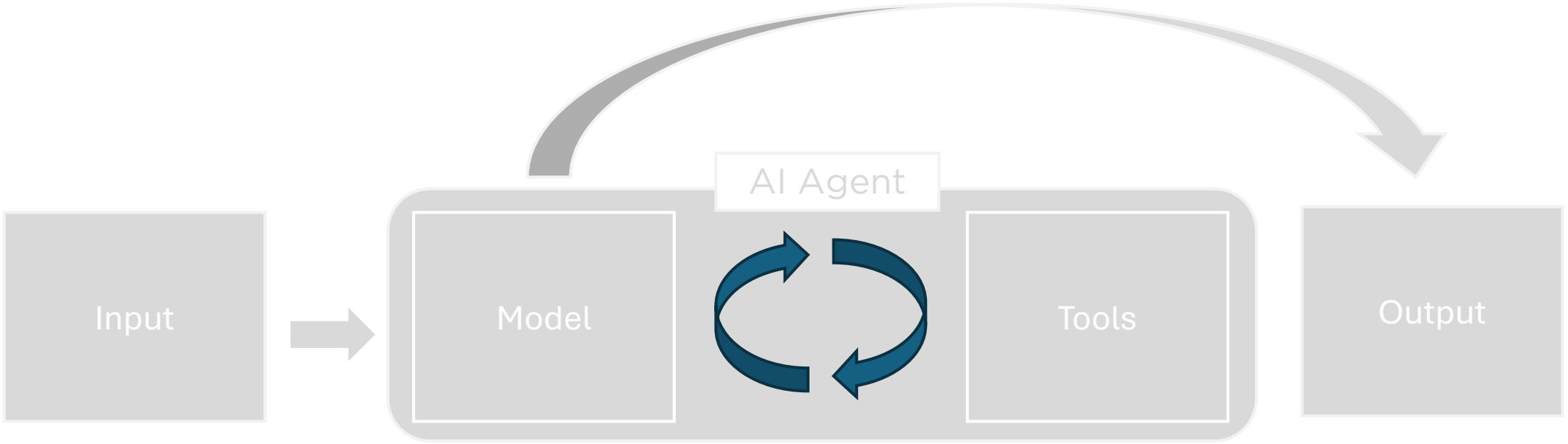
agent ≈ model + tools, within a loop + environment



All the software programs that an LLM can access and use.
Examples: Your data pipelines, “classic” ML models, database access, and other web services.

Loop (MCP)

agent ≈ model + tools, within a loop + environment

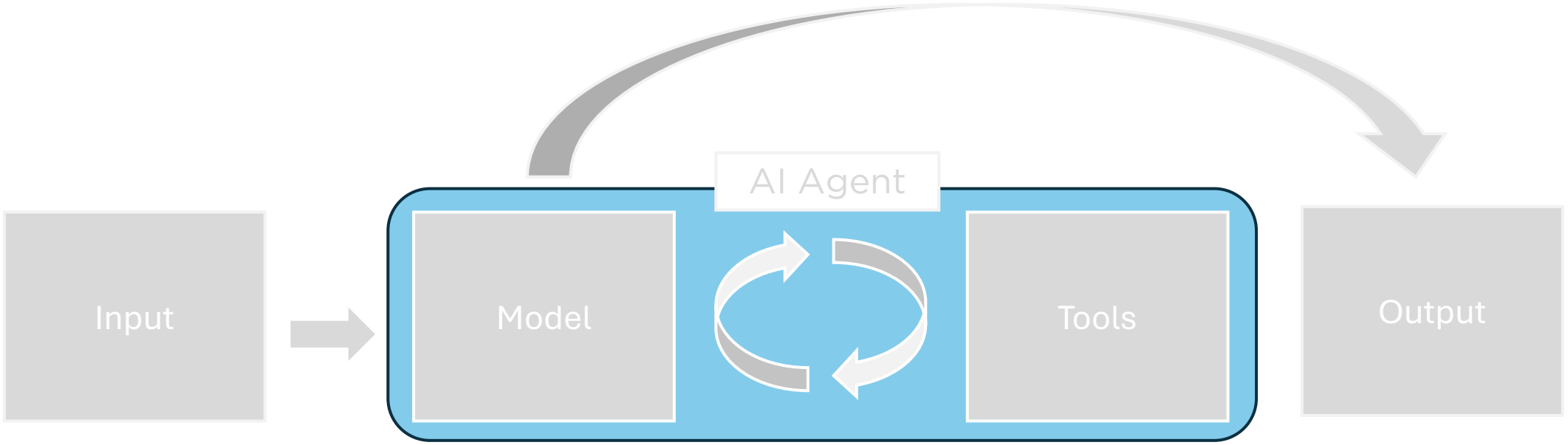


This is the action-and-feedback exchange between LLM and Tool usage. The LLM dynamically follow their own process and tool usage.

Example: The most common protocol for this communication is Model Context Protocol (MCP). https://modelcontextprotocol.io/.

Environment

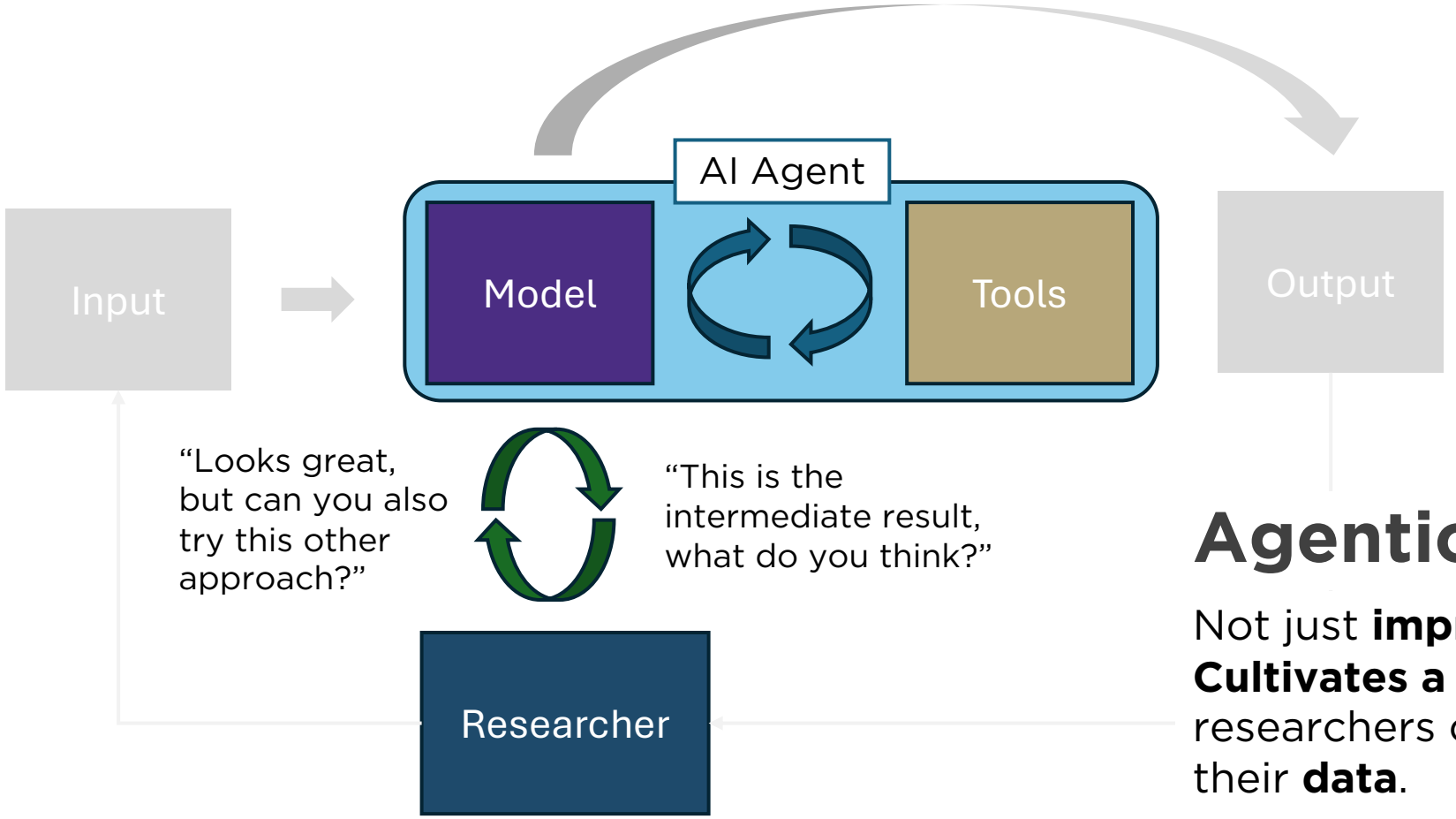
agent ≈ model + tools, within a loop + environment



The runtime environment that supports the agent's operations.

Examples: Deployment Environment (Cloud vs On-premises), Security, Observability, Memory, Data Sources, Physical Environment, etc.

Our Goal: A balance of autonomy and human-in-the-loop



Agentic AI as a Tool

Not just **improving outputs**. **Cultivates a culture** where researchers can **trust** and **act** on their **data**.

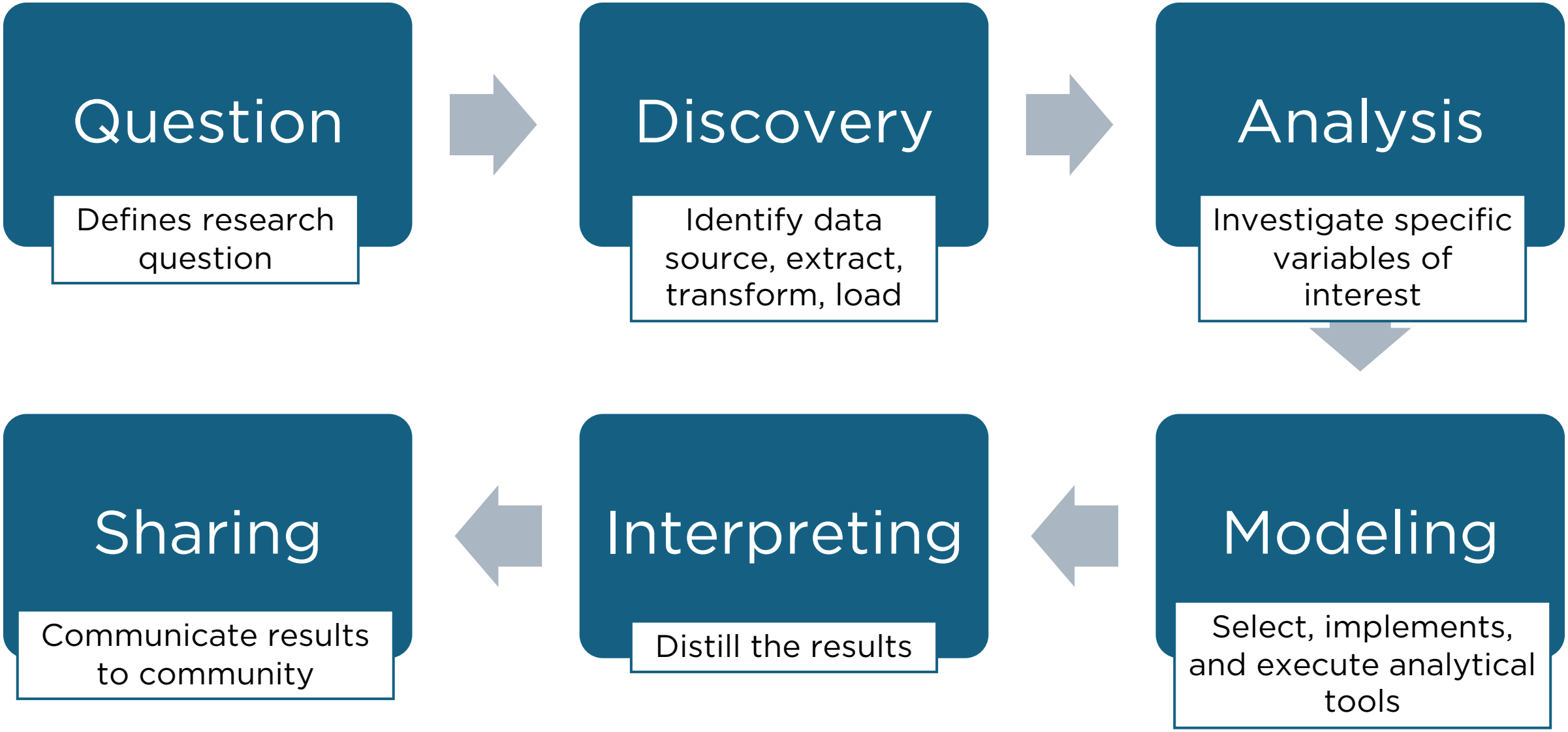
Agentic AI as a Tool
How do we achieve this?

https://cloud.google.com/transform/101-real-world-generative-ai-use-cases-from-industry-leaders

https://blogs.microsoft.com/blog/2025/04/22/https-blogs-microsoft-com-blog-2024-11-12-how-real-world-businesses-are-transforming-with-ai/

Agentic AI as a Tool
How do we achieve this?

Where can we leverage AI Agent(s)?



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Some nuggets of wisdom

"Every **brilliant experiment**, like every great work of art, **starts** with an **act of imagination**."

Jonah Lehrer

"If you **want** to have **good ideas**, you must **have many ideas**."

Linus Pauling

"**Nothing** in **life is to be feared**, it is only to be **understood**. Now is the time to **understand more**, so that we may **fear less**."

Marie Curie