“Agentic AI”
Industry Definitions

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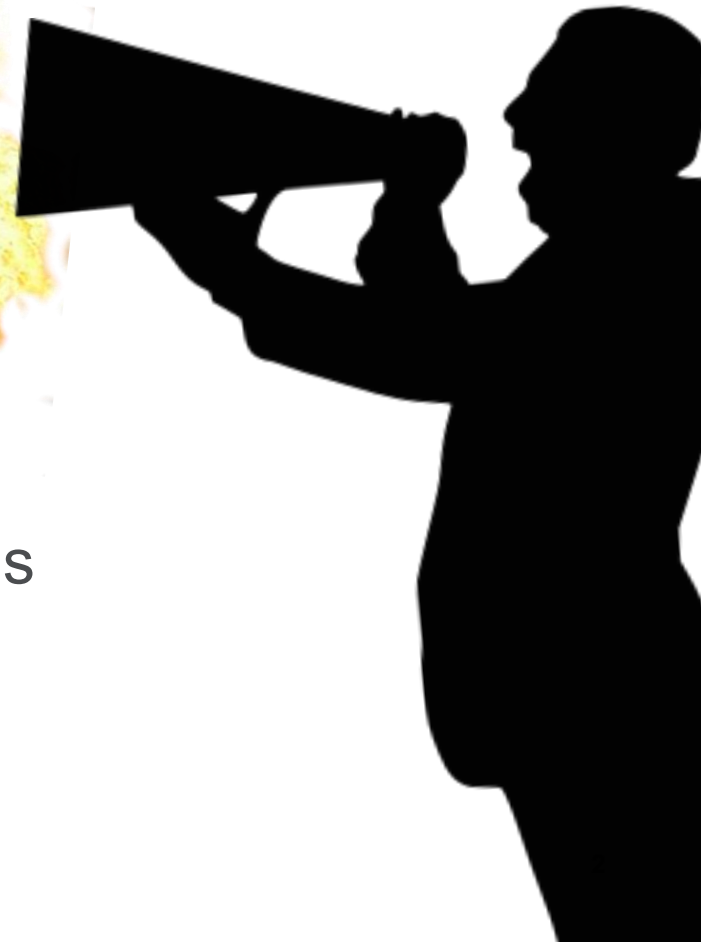
Background

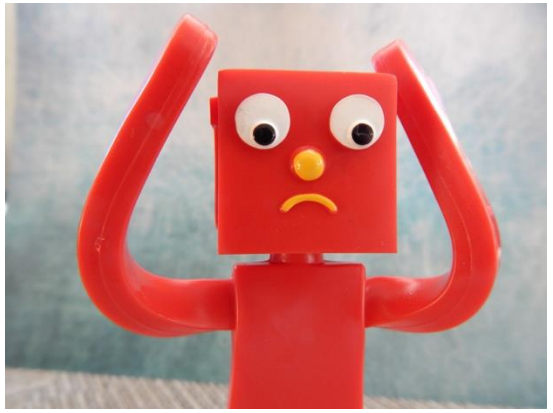


Working in large healthcare tech enterprise

All business leaders want to stay on top of technology trends

- Trend of 2025: “Agentic AI!!!”

Background: Motivation



But *what is* "Agentic AI"???

- Everyone gives a different answer
- Leaders are tasked with equipping their teams with new tech
- Leaders not equipped to know what they need
- Software vendors get to pitch silver bullets

Conflicting Definitions of “Agent”

- “An artificial intelligence (AI) agent is a software program that can interact with its environment, collect data, and use the data to perform self-determined tasks to meet predetermined goals. … AI agents are rational agents. They make rational decisions based on their perceptions and data to produce optimal performance and results. An AI agent senses its environment with physical or software interfaces.” – AWS (Agents Landing Page)
- “Agents are software robots that use new AI skills to accomplish more complex tasks by including abilities for task planning and autonomous decision making.” – 2025 UiPath Agentic AI Report
- “Agents are applications that use generative AI models to think and act towards goals.”
  – Kurtis Van Gent (Software Engineer, Google GenAI Toolbox), *Neo4j Live Interview*
- “So you take an LLM, you give it some tool-calling capabilities, you give it the ability to execute the results of those tool calls, and then you have an agent, and I feel like I'm happy with that base definition.”
  – Dr. Victor Dibia, Principal RDSE at Microsoft Research (Generative AI, Agents), *TWIML AI Podcast Interview*
- “Agents don’t just respond to user input. Instead, they can process a complex problem such as an insurance claim from start to finish. … The agents do this autonomously — without humans having to check whether the AI is processing everything correctly. … In contrast to existing AI systems and all the copilots out there that help employees to do their job, AI agents are, in fact, fully-fledged employees themselves.”
  – Medium: *What Are AI Agents A Short Intro And A Step-by-Step Guide to Build Your Own*

Who is Right??

"The confusion in the marketplace over what 'agents' are is even worse than the previous confusion over what 'AI' is. … At least with 'AI' there were some definitions we generally agreed on. Now everyone is just calling every piece of software agentic and there is no common understanding to fall back on."[1]

– Ethan Mollick, Associate Professor at The Wharton School and author of *Co-Intelligence*

[1]See https://www.forbes.com/sites/jodiecook/2025/03/14/what-is-an-ai-agent-5-practical-ways-to-use-them-in-your-business/

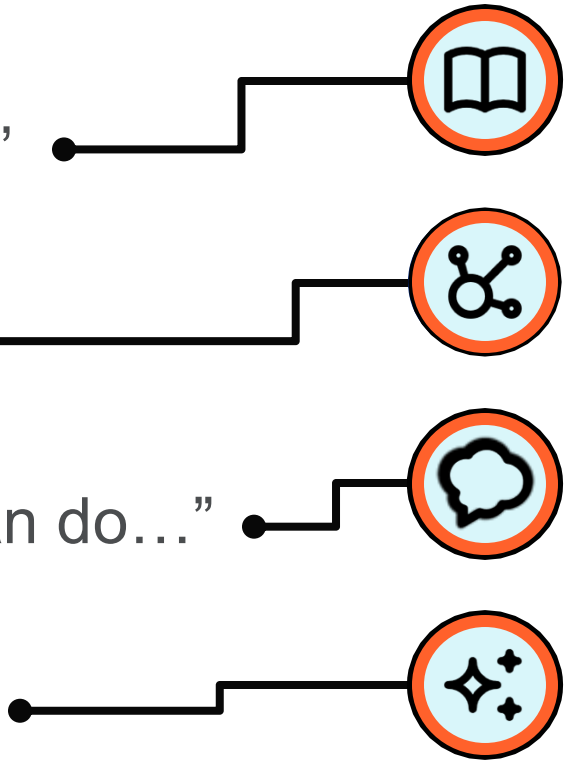
Outline

- **Part 1: The leading uses of “agent” in industry**
  1. Textbook Agent
  2. ~~Multi-Agent Agent~~
  3. ~~Human-like Decision Agent~~
  4. LLM Agent

- **Part 2: Can we bring them together?**
  - Proposal and Discussion

Leading Senses of “Agent”

1. **Textbook Agent**
   - “Just read Russel & Norvig’s *AI A Modern Approach*.”
2. **Multi-Agent Agent**
   - “Agents are the parts of multi-agent systems!”
3. **Human-like Decision Agent**
   - “Can’t put my finger on it, but it’s like how humans can do…”
4. **LLM Agent**
   - “Agents are LLMs that can take actions using tools.”



The “Textbook Agent” Sense

1. **Textbook Agent**
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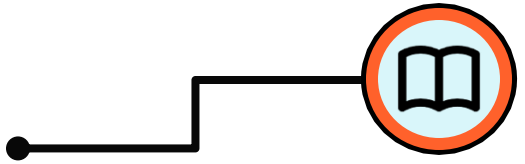

2. **Multi-Agent Agent**
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“They make rational decisions based on their perceptions and data to produce optimal performance and results.”

Textbook Agent[1]

Agent: “An agent is just something that acts (agent comes from the Latin *agere*, to do).… An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators”

Rational Agent: An agent “that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.”

Artificial Intelligence (as a field): The study and creation of *rational agents*.

[1]Quotations from *Artificial Intelligence: A Modern Approach*, Global Edition – 4th edition (Russel & Norvig, 2021)

Textbook Agent[1]: Implications

So what counts as an “agent”?

- “One could view a hand-held calculator as an agent that chooses the action of displaying ‘4’ when given the percept sequence ‘2 + 2 =’ …“
- “In a sense, all areas of engineering can be seen as designing artifacts that interact with the world; AI operates at (what the authors consider to be) the most interesting end of the spectrum, where the artifacts have significant computational resources and the task environment requires nontrivial decision making.”

[1]Quotations from *Artificial Intelligence: A Modern Approach*, Global Edition – 4th edition (Russel & Norvig, 2021)

The “Multi-Agent Agent” Sense

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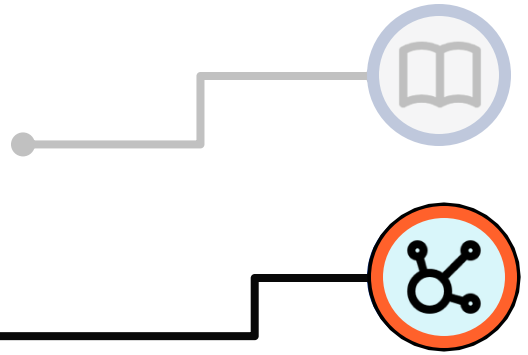

“This is how agents work. . . .”

The “Human-like Decision Agent” Sense

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   - “Agents are LLMs that can take actions using tools.”

“agents [work] autonomously — without humans having to check whether the AI is processing everything correctly. … AI agents are, in fact, fully-fledged employees themselves.”

The “LLM Agent” Sense

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“So you take an LLM, you give it some tool-calling capabilities, you give it the ability to execute the results of those tool calls, and then you have an agent, and I feel like I'm happy with that base definition.”

LLM Agent

Defines “agent” in terms of internal design rather than external function.

Is specific and constrained:

- Reduces “agent” to software that uses LLM(s) as decision making algorithms

LLM Agents typically programmed through prompt templates

- “You are an expert writer. Write an essay about {topic}.”

Often implicitly combined or equivocated with other senses of “agent”

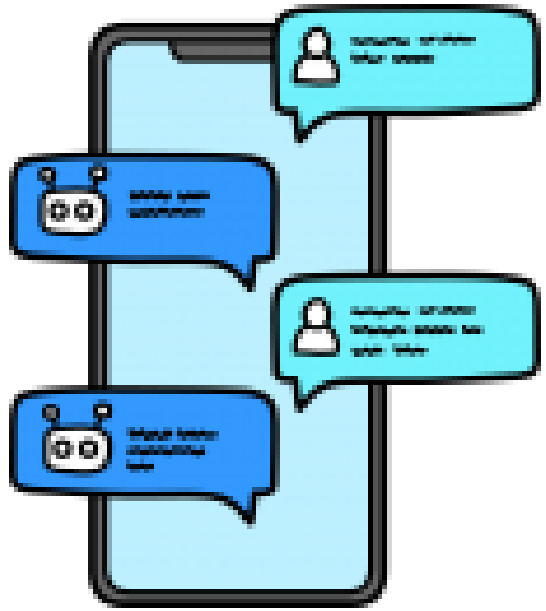
- Described with Russell & Norvig’s classification of 5 types of agents
- Described as *equivalent to* multi-agent system
- Described as *equivalent to* tech that replaces skilled human workers

LLM Agent: Differentiate Agents By Prompts?

It can be tricky to define how to distinguish one agent from another.

One option: “They’re different agents if they use different prompt templates”

- Write about “flavonoids” – Agent A
- Write about “free radicals from non-ionizing radiation” – Agent A
- Review this article for grammar – Agent B



But what if you run one prompt with two tasks in parallel?

- Is it still a single agent doing two things at once?
- “That doesn’t sound right….”

LLM Agent: Differentiate Agents By Processing?

Another option: “They’re different agents if they run different tasks”

- Write about “flavonoids” – Agent A
- Write about “free radicals from non-ionizing radiation” – Agent B
- Review this article for grammar – Agent C

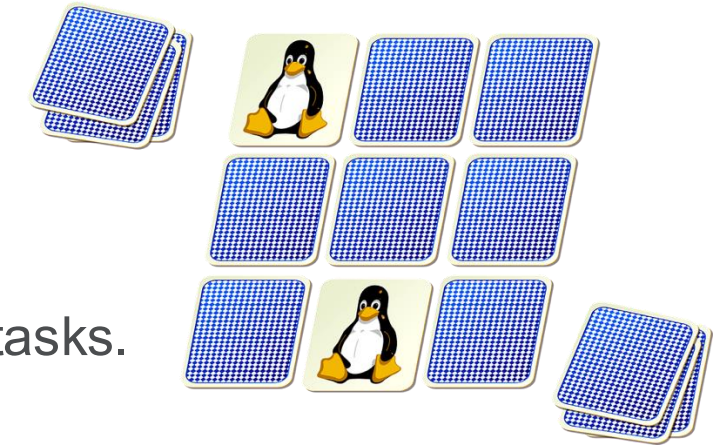
But then every use of one template is a new agent.

- “That doesn’t sound right either.”

LLM Agent: Differentiate Agents By Memory?

Another option: “It’s the same agent if it maintains the same memory state”

- Parallel uses are different agents
- Sequential uses could be the same agent
  - Example: Chat-bot that maintains conversation history



But many “LLM Agents” don’t have individual state memory across tasks.

- Many systems might incorporate *shared* memory
  - For LLMs to chain I/O or to access user context
- Chat-bots might have conversation history, but most “agentic” examples aren’t chats

Thus, this reduces to the “Processing” option in practice, but arguably is more satisfying

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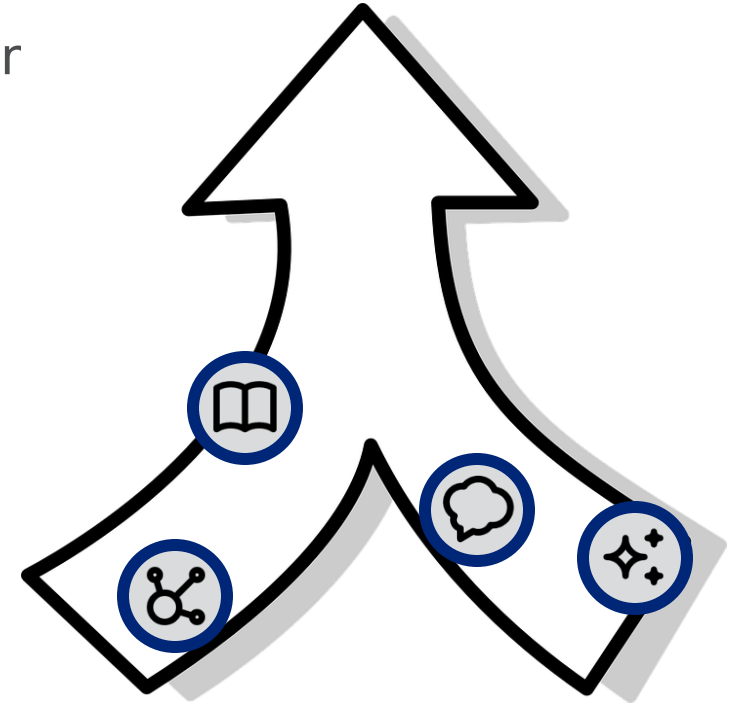
Two Different Aims

- Textbook Agent definition:
  1. Consistent and robust: Useful for technical conversatior
  2. Not satisfying – too broad
- Non-Textbook Agent definitions:
  1. Not very robust when pushed to their limits
  2. More satisfying

Given we have the chaos of competing definitions:

- Find common ground across the different camps?
- Make a definition that satisfies both aims?



Proposed Definition

- **Agentic**: When something acts to change the I/O relationship that it has with its outside environment.

Comparison with Textbook Agent definition:

- Similar: Based on presence of I/O with environment
- Dissimilar: Requires particular kind of output to be present

Comparison of Definitions

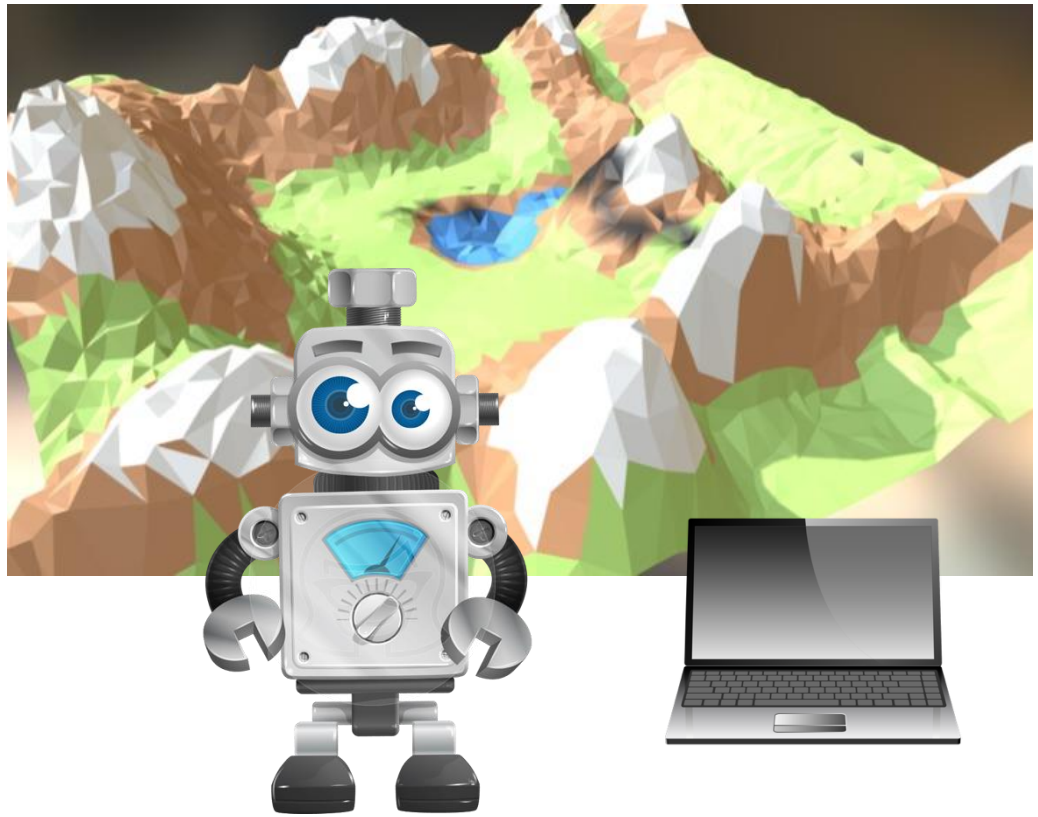
"When something acts to change the I/O relationship that it has with its outside environment."

	Textbook Agent	Multi-Agent	Human-like Agent	LLM Agent	Proposed Agent
Robot that folds laundry	✓	✗	✓	✗	✓
Laptop sitting on table	✓	✗	?	✗	✗
LLM-based tool-using app	✓	?	?	✓	✓
Network Router	✓	✗	✗	✗	✗
Compute server clusters	✓	✓	✗	✗	✗

Example 1: 3D World

Two entities that perform I/O in a 3D world

1. Laptop computer
2. Walking robot

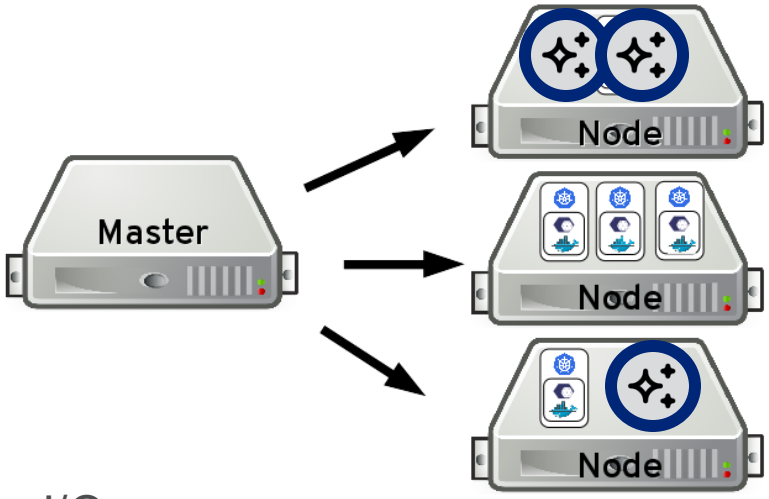


- Laptop input constrained by where/how it is used
  - Camera can only “see” what’s in field of view
  - Output constrained to screen and speakers
- Robot can choose to move
  - Changes the space of inputs it can receive
  - Changes the space of objects it can manipulate

The robot might pick up and move the laptop, but the laptop doesn’t cause the change.

- The laptop lacks “agency”

Example 2: Virtual Network



Two entities that perform I/O in a network environment:

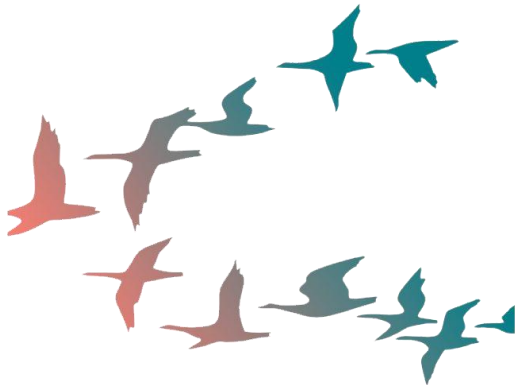
1. Managed compute server cluster
2. Modern “agentic” LLM software

- Cluster I/O constrained to its orchestration environment
  - Master/slave job allocation, memory allocation, etc.
- LLM software can choose to use tools that let it change its I/O
  - Navigate internet to find new articles to read or new web forms to output to

The cluster might get connected to new log streams, but it doesn’t cause the change

- The cluster lacks “agency”.

First Derivative: Change in I/O Space



Distinction:

- Current I/O space
  - What the robot can ever see if it stays put
- Space of I/O spaces that can be reached with known actions
  - What the robot can ever see anywhere it can currently move

The space of change is constrained:

- A robot can only walk the surface of the ground if it has legs or wheels
  - Legs won't let it fly – it cannot explore the sky
  - If the robot got stuck in mud, it could no longer move – it loses agency!
- An LLM agent can only crawl the internet if given a "tool" that enables that
  - An internet-crawl tool will not let it pour my coffee
  - If the LLM only has tools for simple math, it cannot change its I/O space – it lacks agency!

Second Derivative: Change in Possible Changes

Distinction:

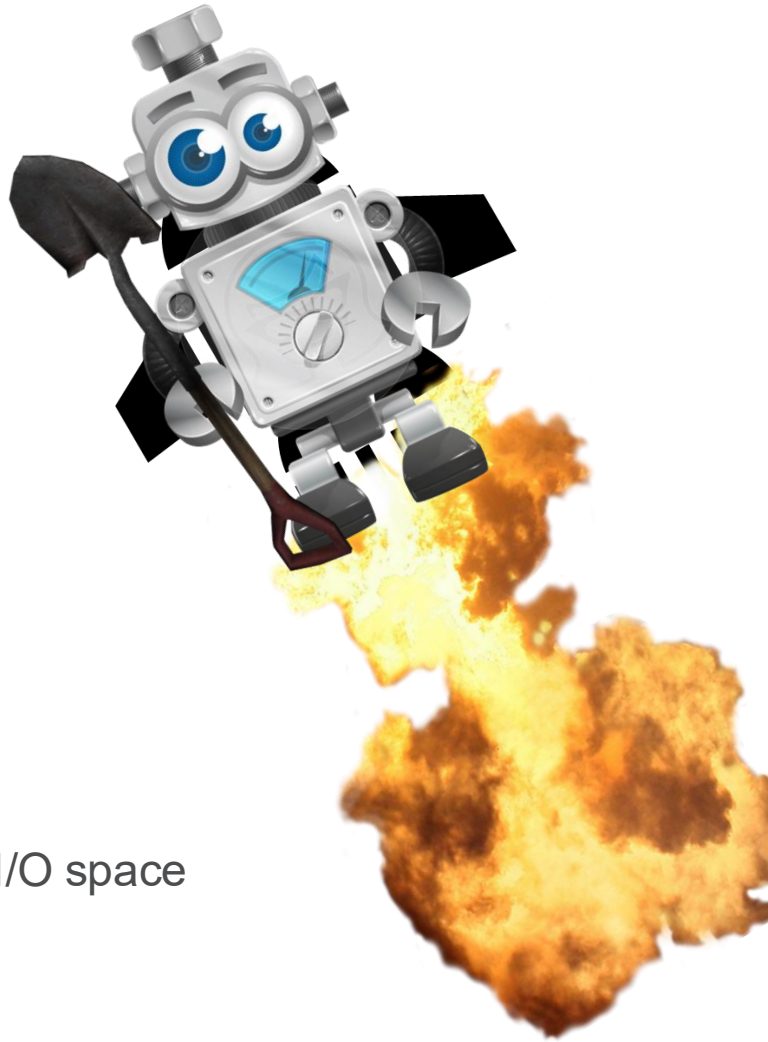
- Space of I/O spaces that can be reached with known actions
  - What the robot can ever see anywhere it can currently move
- Space of I/O spaces that can be reached with actions that can be learned
  - What the robot can ever see anywhere it can learn to move

Say the robot is stuck in mud, but it has a shovel

- Could be used to free its legs, IF it knows how to use it
- If it cannot use the shovel, it still lacks agency
- If it can learn to use the shovel, it can gain agency!
- If it can learn how to build a jetpack, it can also then fly!

Implication: **Learning can enable agency**

- Learning actions within one's starting I/O space can unlock changes to that I/O space
- Not all learning unlocks new changes



Derivative Takeaways

Definition seems to hold together when pushed to its limits

- Offers conceptual connections regarding agency and learning

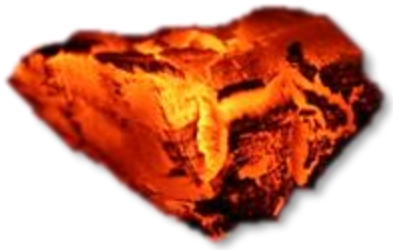
It is up to the AI developer to responsibly give AI:

- Right tools for the spaces it can explore
- Right constraints for what it can learn to use

Conclusion

Nuggets

- Recognizing different “Agentic AI” definitions helps navigate confusing conversations
- Pinning down definitions helps explore how robust they are when pushed to limits
- Proposed definition for potentially unifying different schools of thought



Coal

- “Agentic” term confusion isn’t going away soon!
- Presented definitions are characterizations
  - Usage in practice can vary
- Proposed definition adds to the many
  - But a new unifying definition that satisfies public sensibilities might be the only way to remove the existing conflict
- Proposed definition has not been put to the test
  - Discuss! ☺