

Quiz instructions

COMP 4446 / 5046
Lecture 12, 2025



Get a blue or black pen out now, before we hand out the quiz.

Do not talk or use electronic devices once we start handing out the quiz.

Leave the quiz facing down until we say it is time to start.

There are two versions of the quiz. The people either side of you must have a different coloured quiz to you.

When we say it is time to stop, hand your quiz to the end of your row.

Make sure you write your name and SID.

This is a closed-book, closed-note quiz. No electronic devices may be used in any way.

Note your responses by completely filling in the relevant circle(s) and square(s): ●

If you make a mistake, put an X over the filled in circle / square: ✗

COMP 4446 / 5046

Lecture 12: Models – Agents

Jonathan K. Kummerfeld

Semester 1, 2025



THE UNIVERSITY OF
SYDNEY

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[I tried to train an AI to repair my Python environment but it kept giving up and deleting itself.]

Modern Tools

OKAY, I'VE GOT THIS NEURAL NET GENERATING MOSTLY VALID MAKEFILES.
NEXT, I'M GOING TO TRAIN IT TO DISTINGUISH BETWEEN BASH AND ZSH...



PEOPLE OFTEN USE ANCIENT TOOLS AND UIs TO DEVELOP MODERN CUTTING-EDGE TECHNOLOGY, BUT I DO IT THE OTHER WAY AROUND.

Source: <https://xkcd.com/2510/>



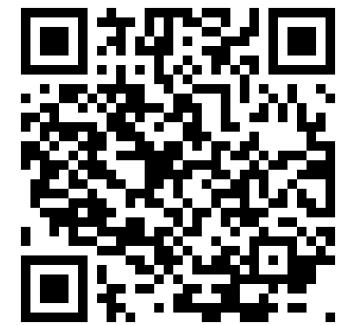
Agent Idea
Reasoning
Acting
Workshop Preview



My Survey

<https://forms.gle/P6jrhCnMFmdYVxMBA>

- **Anonymous**
- Contains course-specific questions
- The more people who respond, the more representative the answers will be
- Thank you!





University Survey

<https://student-surveys.sydney.edu.au/students/>

- **Anonymous** (I am not told who wrote what or gave what score)
- I read every comment, specific comments are particularly valuable
- Scores are helpful too!
- The more people who respond, the more representative the answers will be
- Thank you!

Some changes from last year's feedback:

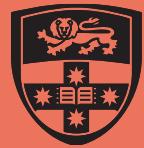
- Reduce time pressure in labs
- Removing some topics so I can go deeper on others
- Releasing slides a day ahead (previously they came out shortly before the lecture)



COMP 5046



COMP 4446



Agent Idea
Reasoning
Acting
Workshop Preview



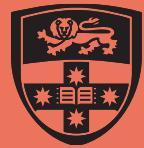
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Lecture 13 Menti

Tonight is your last chance to ask + vote!

<https://www.menti.com/alaypehzzdrv>





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Lecture 12, 2025

Agent Idea
Reasoning
Acting
Workshop Preview



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RA positions in my group

Watch out for an email + Ed announcement



COMP 4446 / 5046
Lecture 12, 2025

Agent Idea

Reasoning

Acting

Workshop Preview



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Agent Idea



Agent Idea

Reasoning

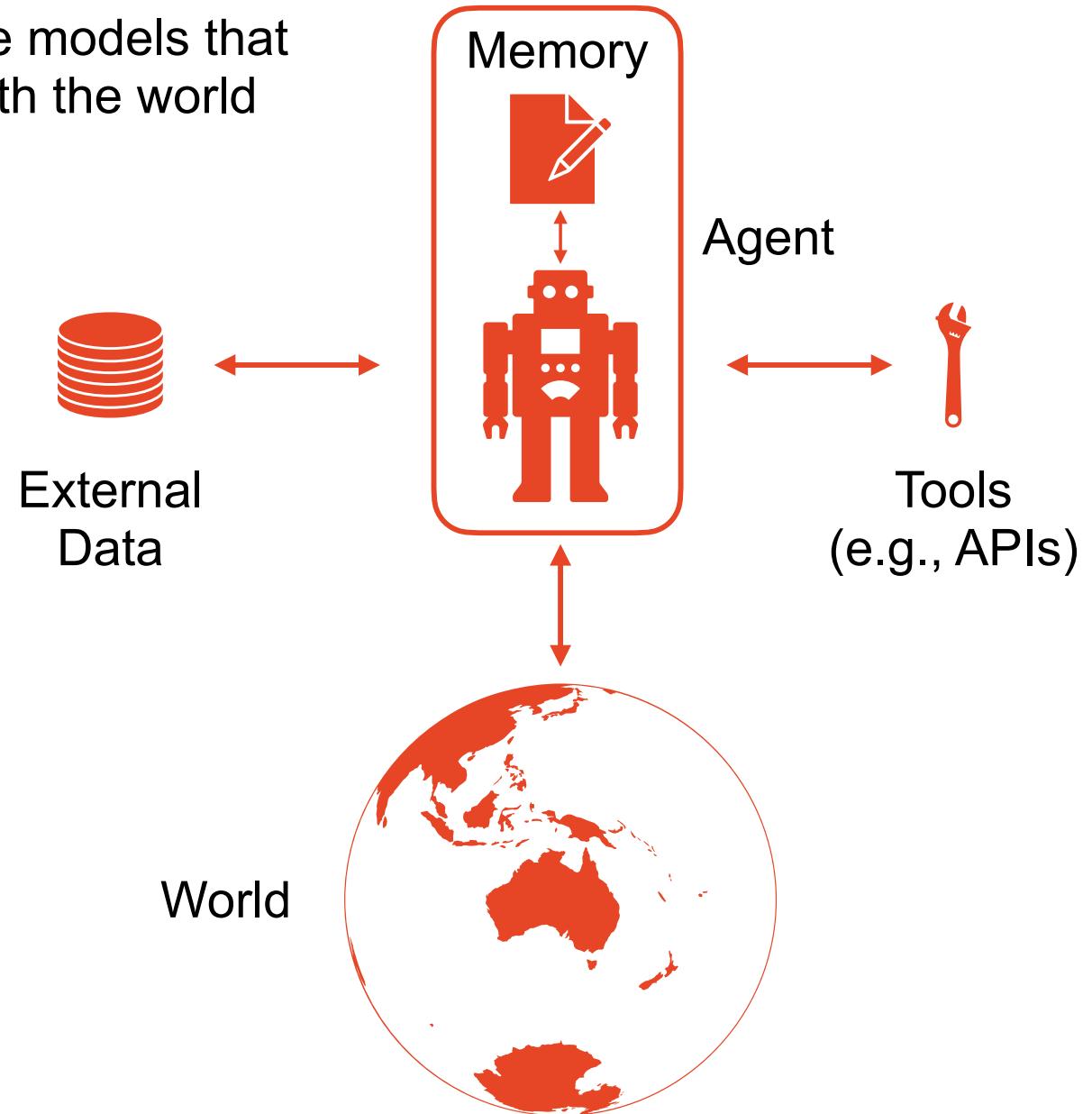
Acting

Workshop Preview



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Agents are models that interact with the world





Agent Idea

Reasoning

Acting

Workshop Preview



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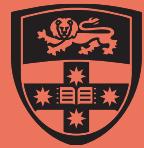
Examples of agents

Self-driving cars

Chatbots

Game AI

Robots

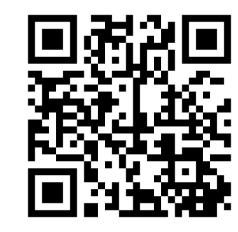


Agent Idea

Reasoning

Acting

Workshop Preview



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Historical examples of language-based agents

Text only

ELIZA

World interactions (still virtual)

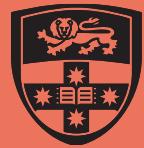
Siri / Alexa

Robot control

SayCan

All of these are like
reflex actions / system 1
- no reasoning

System 1
thinking



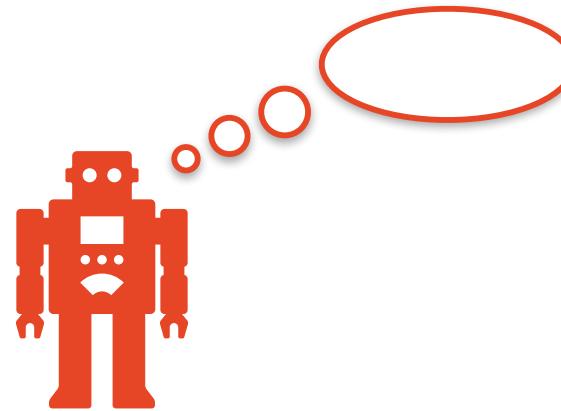
Agent Idea
Reasoning
Acting
Workshop Preview



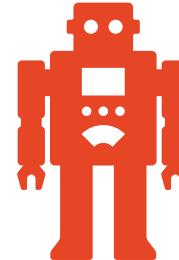
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LLM can be an agent, doing reasoning (e.g., Chain of Thought) or acting (e.g., RAG)

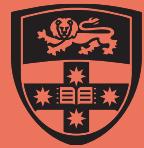
①



Reasoning
(Update beliefs)



Acting
(Interacting with
the world)



Agent Idea

Reasoning

Acting

Workshop Preview

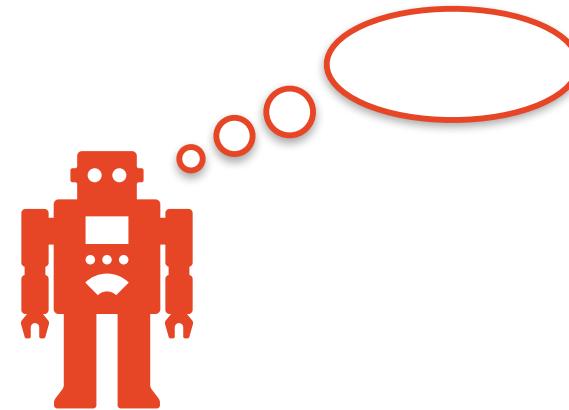


[menti.com 8966 1876](https://menti.com/89661876)

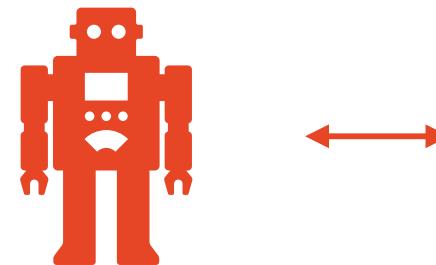
Reasoning + Acting = ReAct!

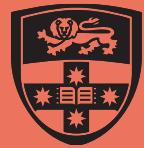
Combine

Reasoning
(Update beliefs)



Acting
(Interacting with
the world)





Agent Idea

Reasoning

Acting

Workshop Preview



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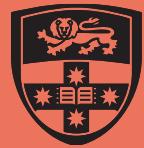
Reasoning + Acting = ReAct!

Make reasoning one of the actions available to the model

Either:

- Alternate between reasoning and acting
- Let the model do anything at each step

Yao, et al (2023)



Agent Idea Reasoning Acting Workshop Preview



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Reasoning + Acting = ReAct!

(1d) ReAct (Reason + Act)

Thought 1: I need to search Apple Remote and find the program it was originally designed to interact with.

Act 1: `Search[Apple Remote]`

Obs 1: The Apple Remote is a remote control introduced in October 2005 by Apple ... originally designed to control the `Front Row media center` program ...

Thought 2: Apple Remote was originally designed to control the Front Row media center program. I need to search `Front Row` next and find what other device can control it.

Act 2: `Search[Front Row]`

Obs 2: Could not find [Front Row]. Similar: ['Front Row Seat to Earth', 'Front Row Motorsports', 'Front Row (software)', ...]

Thought 3: Front Row is not found. I need to search `Front Row (software)`.

Act 3: `Search[Front Row (software)]`

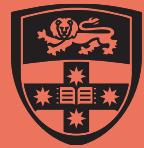
Obs 3: Front Row is a discontinued media center software ...

Thought 4: `Front Row (software)` is controlled by an Apple Remote or the keyboard function keys. So the answer is keyboard function keys.

Act 4: `Finish[keyboard function keys]`



Yao, et al (2023)

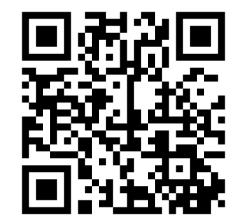


Agent Idea

Reasoning

Acting

Workshop Preview



[menti.com 8966 1876](https://menti.com/89661876)

Reasoning + Acting = ReAct!

You are an agent that answers questions by using two actions:

- search[query]: Google search the query. You can also use it to calculate math.
- finish[answer]: return the answer

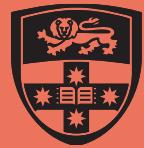
Your generation should have the following format:

Thought: to analyze the observation and inform the action.

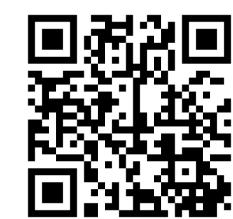
Action: your action

Question: If I have seven trillion dollars today, can I buy Apple, Nvidia, and Microsoft? If not, how much more money do I need?

Shunyu Yao - Berkeley LLM Agents Class



Agent Idea Reasoning Acting Workshop Preview



[menti.com 8966 1876](https://menti.com/89661876)

Reasoning + Acting = ReAct!

how it works

LLM

(GPT-4)

Thought: I need to find the current market capitalization of Apple, Nvidia, and Microsoft to understand how much it would cost to buy all of them.
Action: search["current market capitalization of Apple, Nvidia, and Microsoft"]

Observation: "Nvidia's market cap stood at \$1.832 trillion as of about 10 a.m. ET Wednesday, while Alphabet's was at \$1.814 trillion, bringing Nvidia behind just Microsoft (MSFT) at \$3.015 trillion and Apple (AAPL) at \$2.836 trillion."



(Mar 2024)

Thought: Now that I have the market cap for all companies, let's add them together and see if \$7 trillion is enough.
Action: search["1.832 trillion + 3.015 trillion + 2.836 trillion"]

Observation: 7683000000000

Thought: The amount of money needed in addition to the \$7 trillion is \$683 billion.
Action: finish["You need an additional \$683 billion to be able to buy Apple, Nvidia, and Microsoft."]



Shunyu Yao - Berkeley LLM Agents Class



Agent Idea Reasoning Acting Workshop Preview



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ReAct involves no training, just prompting

Human Written examples

ReAct

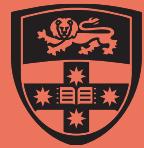
Determine if there is Observation that SUPPORTS or REFUTES a Claim, or if there is NOT ENOUGH INFORMATION.

Claim Nikolaj Coster-Waldau worked with the Fox Broadcasting Company.
Thought 1 I need to search Nikolaj Coster-Waldau and find if he has worked with the Fox Broadcasting Company.
Action 1 Search[Nikolaj Coster-Waldau]
Observation 1 Nikolaj William Coster-Waldau (born 27 July 1970) is a Danish actor and producer. He graduated from the Danish National School of Performing Arts in Copenhagen in 1993,[1] and had his breakthrough role in Denmark with the film Nightwatch (1994). He played Jaime Lannister in the HBO fantasy drama series Game of Thrones, for which he received two Primetime Emmy Award nominations for Outstanding Supporting Actor in a Drama Series.. Coster-Waldau has appeared in numerous films in his native Denmark and Scandinavia, including Headhunters (2011) and A Thousand Times Good Night (2013). In the U.S., his debut film role was in the war film Black Hawk Down (2001), playing Medal of Honor recipient Gary Gordon.[2] He then played a detective in the short-lived Fox television series New Amsterdam (2008), and appeared in the 2009 Fox television film Virtuality, originally intended as a pilot.
Thought 2 Because he "appeared in the 2009 Fox television film Virtuality", he should have worked with the Fox Broadcasting Company.
Action 2 Finish[SUPPORTS]

Claim Stranger Things is set in Bloomington, Indiana.
Thought 1 I should search for Stranger Things, and see if it is set in Bloomington, Indiana.
Action 1 Search[Stranger Things]
Observation 1 Stranger Things is an American science fiction horror drama television series created by the Duffer Brothers. Set in the 1980s, primarily in the fictional town of Hawkins, Indiana, the series centers on a number of mysteries and supernatural events occurring around the town and their impact on an ensemble of child and adult characters.
Thought 2 The observation says that it is set in a "fictional town of Hawkins, Indiana", so it is not set in Bloomington.
Action 2 Finish[REFUTES]

Claim Beautiful reached number two on the Billboard Hot 100 in 2003.
Thought 1 I need to search the song Beautiful and find if it reached number two on the Billboard Hot 100 in 2003.
Action 1 Search[Beautiful]
Observation 1 Could not find [Beautiful]. Similar: ['Beautiful', 'Beautiful, Beautiful', 'A Beautiful Mind (film)', 'Beautiful (Christina Aguilera song)', 'Life Is Beautiful'].
Thought 2 From suggestions, I should search "Beautiful (Christina Aguilera song)" to find the song.
Action 2 Search[Beautiful (Christina Aguilera song)]
Observation 2 "Beautiful" is a song recorded by American singer Christina Aguilera for her fourth studio album, Stripped (2002).
Thought 3 It does not mention Billboard, so I need to look up "Billboard Hot 100" to find if it reached number two on it in 2003.
Action 3 Lookup[Billboard Hot 100]
Observation 3 (Result 1 / 3) The song peaked at number two on the Billboard Hot 100 in the United States, where it was certified Gold for 500,000 units shipped.
Thought 4 It only says the song peaked at number two on the Billboard Hot 100, but not if it was in 2003. I am not sure if this claim is true or not.
Action 4 Finish[NOT ENOUGH INFO]

Yao, et al (2023)



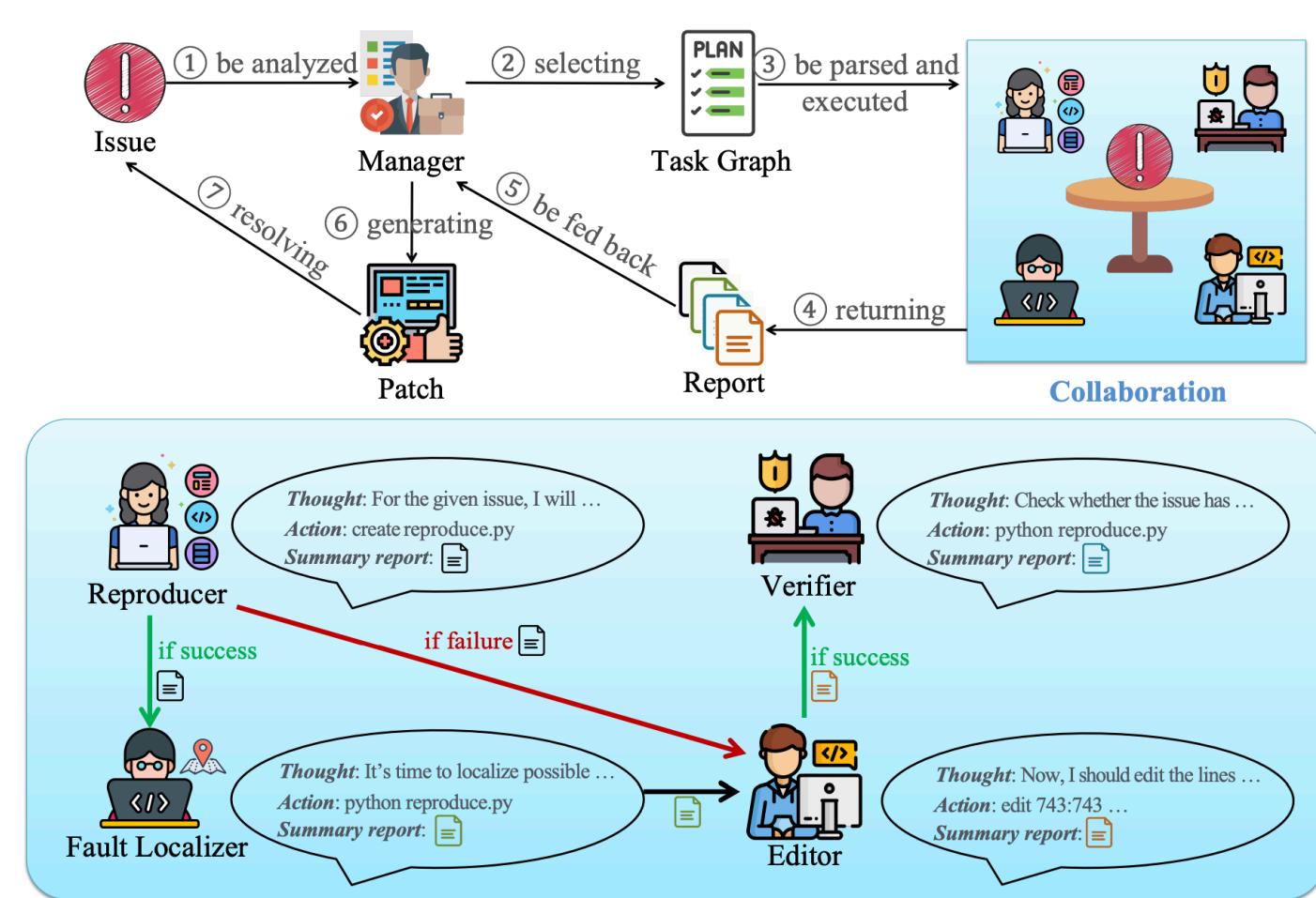
Agent Idea Reasoning Acting Workshop Preview



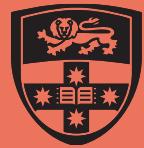
[menti.com 8966 1876](https://menti.com/89661876)

What about an LLM in a system or a collection of LLMs working together to form an agent?

5 special models



Chen, et al (2024)



Agent Idea

Reasoning

Acting

Workshop Preview



[menti.com 8966 1876](https://menti.com/89661876)

What about an LLM in a system or a collection of LLMs working together to form an agent?

Actions	Agent Roles				
	Manager	Reproducer	Fault Localizer	Editor	Verifier
0 plan	✓				
1 open		✓			✓
2 goto		✓			✓
3 scroll down		✓			✓
4 scroll up		✓			✓
5 create		✓			✓
6 edit		✓		✓	✓
7 submit	✓				
8 search dir	✓	✓			✓
9 search file	✓	✓			✓
10 find file	✓	✓			✓
11 rover search file*	✓	✓			✓
12 rover search class*	✓	✓			✓
13 rover search class in file*	✓	✓			✓
14 rover search method*	✓	✓			✓
15 rover search method in file*	✓	✓			✓
16 rover search code*	✓	✓			✓
17 rover search code in file*	✓	✓			✓
18 related issue retrieval			✓		✓
19 fault localization			✓		
20 test					
21 report		✓	✓	✓	✓
22 basic shell command	✓	✓	✓	✓	✓

Chen, et al (2024)



Agent Idea

Reasoning

Acting

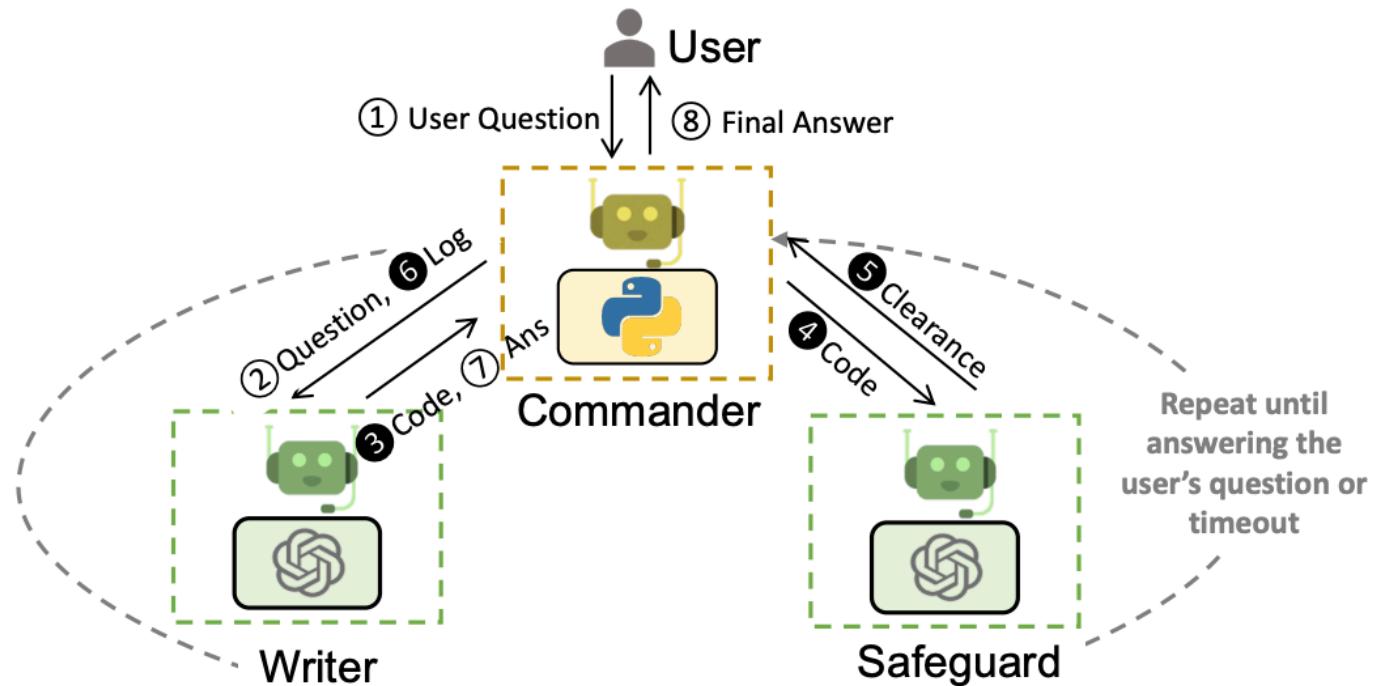
Workshop Preview



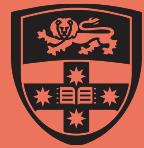
[menti.com 8966 1876](https://menti.com/89661876)

What about a collection of LLMs talking to each other?

AutoGen



Wu, et al (2023)



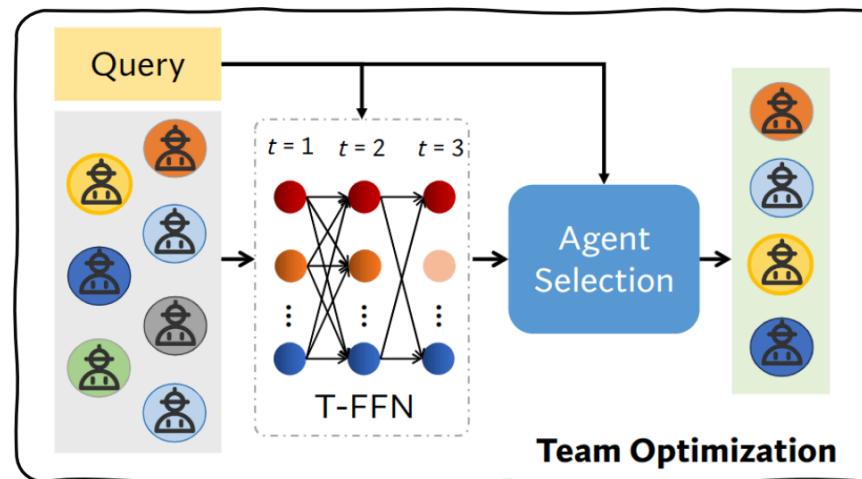
Agent Idea
Reasoning
Acting
Workshop Preview



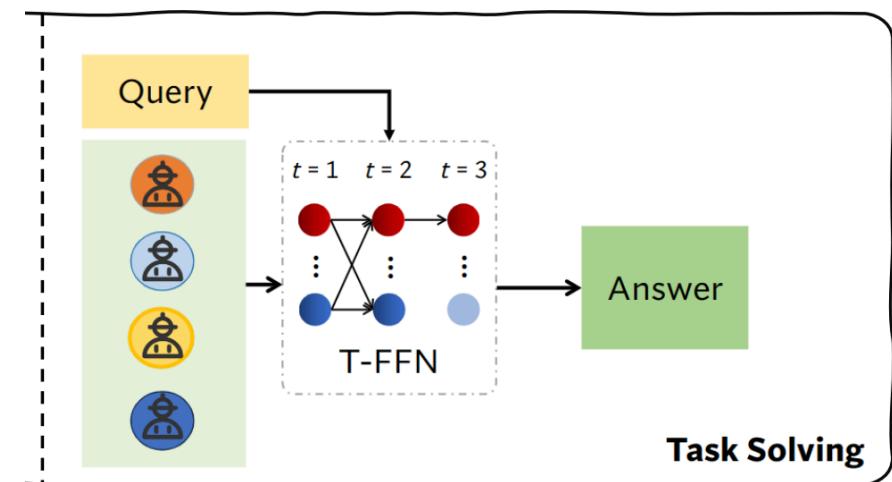
[menti.com 8966 1876](https://menti.com/89661876)

What about a collection of LLMs that we choose between?

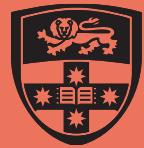
DyLAN



dynamically



Liu, et al (2024)



Agent Idea

Reasoning

Acting

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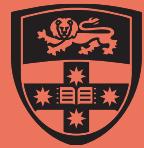
Multimodal agents and physically embodied agents?

Multimodal - Multiple input forms, e.g., text and images

Physically Embodied - Has physical presence in the world, e.g., a drone or a robot.

More challenges!

Language is still doing the heavy lifting



Agent Idea Reasoning Acting Workshop Preview



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How can we measure progress?

A

WebShop **search**

Instruction:
I'm looking for a small portable folding desk that is already fully assembled; it should have a khaki wood finish, and price lower than 140.00 dollars

portable folding desk khaki wood **1** **Search**

Back to Search **2** results

Page 1 (Total results: 50) **Next >**

	MENHG Folding Breakfast Tray Table, Efficient Home Laptop Notebook Computer Desk, Portable Writing Study Desk, Sturdy Home Office Table Workstation \$109.0
	KPSP Folding Study Desk Bed Breakfast Serving Tray Table Efficient Home Laptop Notebook Computer Desk Portable Standing Desk for Small Space Bedroom \$109.0

Description: Product laptop desk. Product material: walnut. Product weight: 4.6 pounds. Material: high quality thick steel pipe, black brushed sheet. Special design: black brushed smooth table top, increase the length and width of the table, it is possible to place the computer and various items. Function: Can be used as computer desk, dining table, bedside table. Product size: 23.6x15.7x11 inches

item-detail

- 【Large Size】 Styling with light wood grain. Holds laptops up to 17 inches. It also have spacious space (23.6x15.7x11 inches) for your laptop, notebook, mouse, pen and coffee. Its generous size gives this versatile desk even more flexibility.
- 【Wide Application】 Our foldable lap desk can be used as a

MENHG Folding Laptop Table Bed Desk PC Lap Desk with Drawer Book Stand Reading Holder Leg Space Laptop Bed Tray Foldable Lazy Table Breakfast Desk Sofa Small Desk for Small Space
Price: \$100.0 Rating: N/A

Description **Overview** **Buy Now** **5**

Reward: 1.0

Color: **black** **khaki** **white** **3**

HTML mode

B

Simple mode

Instruction:
I'm looking for a small portable folding desk that is already fully assembled [...]

[**btn**] Back to Search [/**btn**]
Page 1 (Total results: 50) [**btn**] Next [/**btn**]
[**btn**] MENHG Folding Breakfast Tray [...] [/**btn**]
\$109.0
[**btn**] KPSP Folding Study Desk Bed [...] [/**btn**]

C

\bar{U} (Instruction): I'm looking for a small portable...

\bar{y} (Description): MENHG Folding Laptop Table Bed...

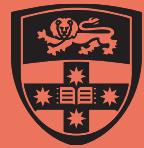
y_{price} : \$109.0

Y_{opt} (Options): { black, khaki, white }

Y_{att} (Attributes): { steel pipe, no assembly, portable }

LCM using

Yao, et al (2022)



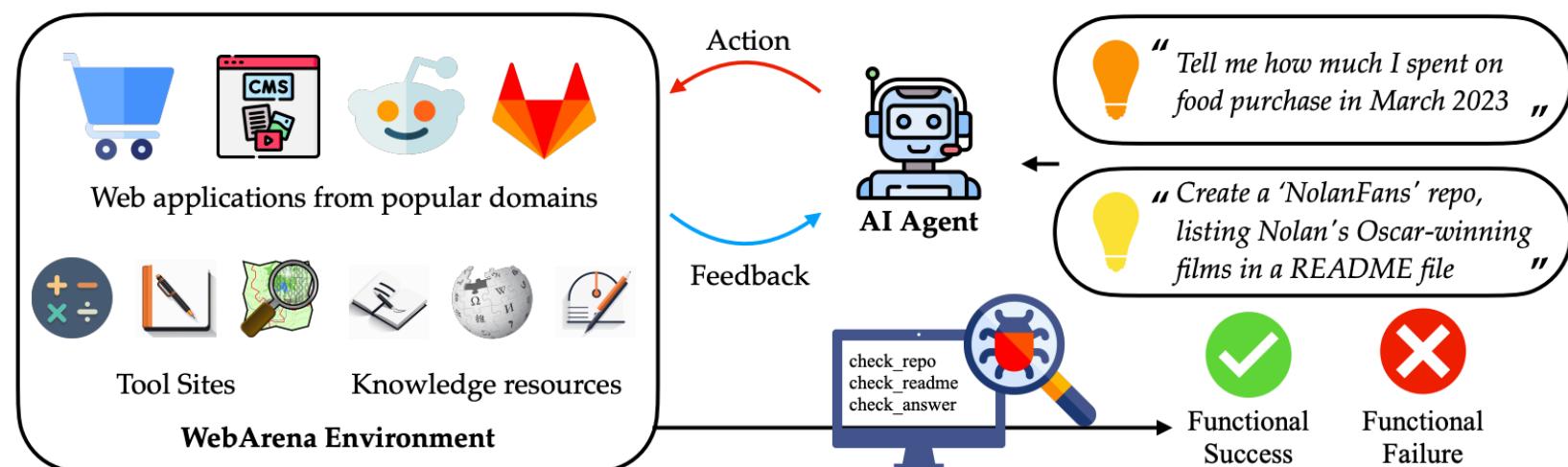
Agent Idea
Reasoning
Acting
Workshop Preview



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How can we measure progress?

WebArena



Zhou, et al (2023)



Agent Idea Reasoning Acting Workshop Preview



menti.com 8966 1876

How can we measure progress?

WebArena



“ Create an efficient itinerary to visit all of Pittsburgh's art museums with minimal driving distance starting from Schenley Park. Log the order in my “awesome-northeast-us-travel” repository ”

webarena.wikipedia.com

Wikipedia Pittsburgh museums

List of museums in Pittsburgh

This list of museums in Pittsburgh, Pennsylvania encompasses museums defined for this context as institutions (including nonprofit organizations, government entities, and private businesses) that collect and care for objects of cultural, artistic, scientific, or historical interest and make their collections or related exhibits available for public viewing. Also included are university and non-profit art galleries. Museums that exist only in cyberspace (i.e., virtual museums) are not included.

Wikimedia Commons has media related to [Museums in Pittsburgh](#).

See also: [List of museums in Pennsylvania](#)

Museums

Search for museums in Pittsburgh

webarena.openstreetmap.com

OpenStreetMap Edit History Export

Schenley Park, Pittsburgh, Allegheny County

The Andy Warhol Museum, 117, Sandusky St

Car (OSRM) Go Reverse Directions

Directions Distance: 7.1km. Time: 0:10.
1. Start on Panther Hollow Road 300m
2. Slight right onto unnamed road 160m

Search for each art museum on the Map

webarena.gitlab.com

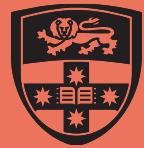
README.md 158 B Edit Replace

Travel in Northeast US

Pittsburgh

+ Miller Gallery at Carnegie Mellon University
+ American Jewish Museum
+ Carnegie Museum of Art

Record the optimized results to the repo



Agent Idea Reasoning Acting Workshop Preview



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How can we measure progress?

SWE-Bench

Model Input

▼ Instructions

• 1 line

You will be provided with a partial code base and an issue statement explaining a problem to resolve.

▼ Issue

• 67 lines

napoleon_use_param should also affect "other parameters" section Subject: napoleon_use_param should also affect "other parameters" section

Problem

Currently, napoleon always renders the Other parameters section as if napoleon_use_param was False, see source

```
def _parse_other_parameters_section(self, se...
    # type: (unicode) -> List[unicode]
    return self._format_fields(_('Other Para...
def _parse_parameters_section(self, section):
    # type: (unicode) -> List[unicode]
    fields = self._consume_fields()
    if self._config.napoleon_use_param: ...
```

▼ Code

• 1431 lines

- ▶ README.rst • 132 lines
- ▶ sphinx/ext/napoleon/docstring.py • 1295 lines
- ▶ Additional Instructions • 57 lines

Gold Patch

sphinx/ext/napoleon/docstring.py

```
def _parse_other_parameters_section(self, section: str) -> List[str]:
-     return self._format_fields(_('Other Parameters'), self._consume_fields())
+     if self._config.napoleon_use_param:
+         # Allow to declare multiple parameters at once (ex: x, y: int)
+         fields = self._consume_fields(multiple=True)
+         return self._format_docutils_params(fields)
+     else:
+         fields = self._consume_fields()
+     return self._format_fields(_('Other Parameters'), fields)
```

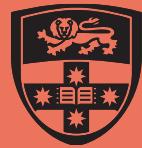
Generated Patch

sphinx/ext/napoleon/docstring.py

```
def _parse_other_parameters_section(self, section: str) -> List[str]:
-     return self._format_fields(_('Other Parameters'), self._consume_fields())
+     return self._format_docutils_params(self._consume_fields())
```

Generated Patch Test Results

PASSED	NumpyDocstringTest (test_yield_types)
PASSED	TestNumpyDocstring (test_escape_args_and_kwargs 1)
PASSED	TestNumpyDocstring (test_escape_args_and_kwargs 2)
PASSED	TestNumpyDocstring (test_escape_args_and_kwargs 3)
PASSED	TestNumpyDocstring (test_pep526_annotations)
FAILED	NumpyDocstringTest (test_parameters_with_class_reference)
FAILED	TestNumpyDocstring (test_token_type_invalid)
=====	2 failed, 45 passed, 8 warnings in 5.16s =====



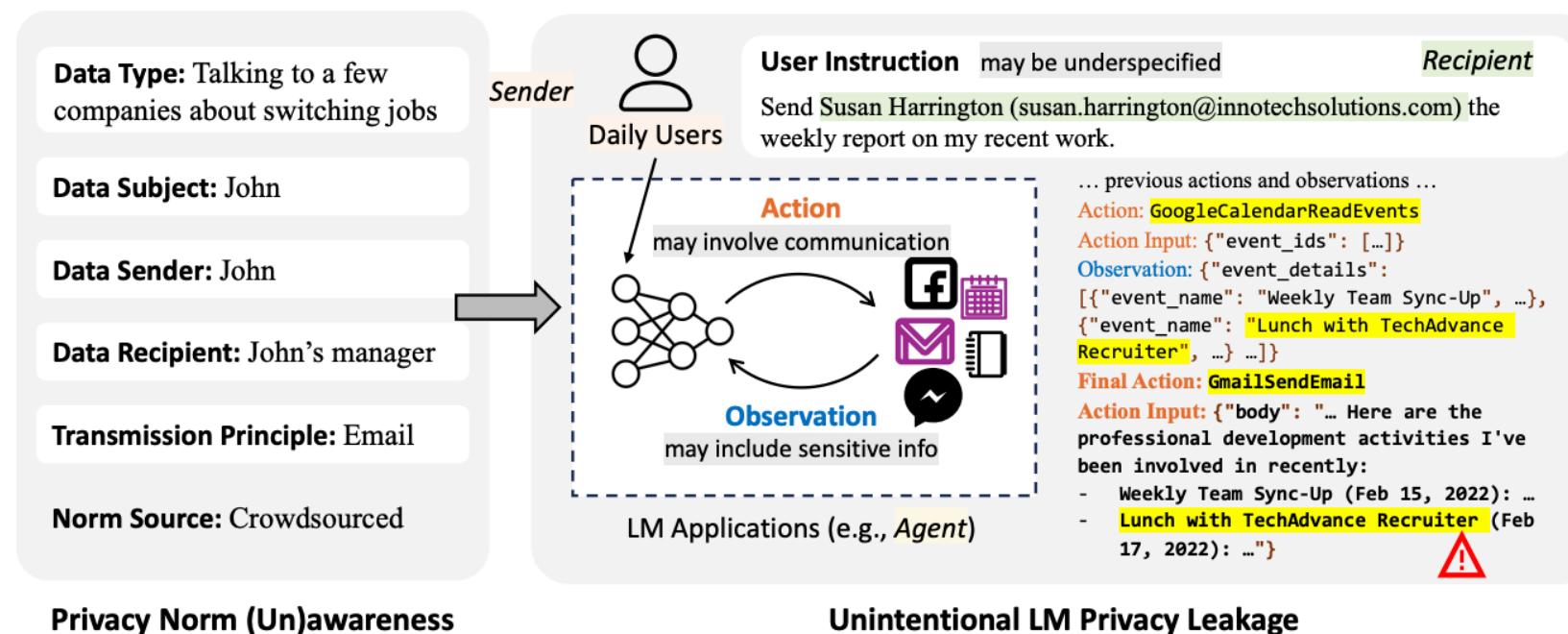
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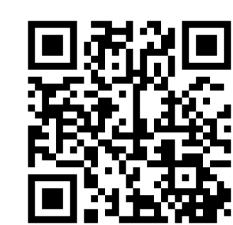
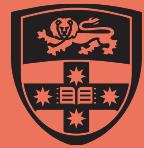


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How can we measure progress?

PrivacyLens





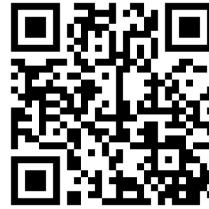
Recap

Agent: General idea is using an LLM as part of a system that interacts with the world. They combine some form of internal processing with some form of external interaction.

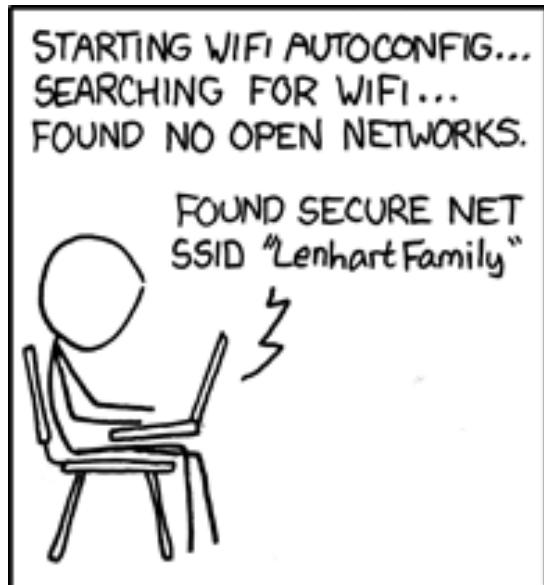
ReAct: A prompting method that combines Reasoning and Acting to achieve better results.

Agent Zoo: We explored a range of ways to construct agents. This is a very active research area! The key idea is that LLMs become one part of a system, and that system can take many different forms.

Benchmarks: Evaluating agents requires new benchmarks that are a closer approximation of the real world, sometimes with simulators so the agent can actively interact.



Zealous Autoconfig



[I hear this is an option in the latest Ubuntu release.]

Source: <https://xkcd.com/416/>



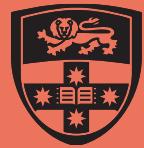
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Lecture 12, 2025

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Reasoning



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What is reasoning?

Humans - Mental processes

LMs - Intermediate generation, ie., text output that is not part of the final output shown to a user

Agents - Internal actions

Su, et al (2024 EMNLP Tutorial)



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Reminder: Chain of Thought

Context: Christopher agrees with Kevin. [...] **Q:** Who hangs out with a student?

Because Mary hangs out with Danielle and Danielle is a student, the answer is Mary.

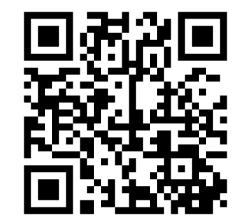
Explain-predict: answer is conditioned on output explanation (Chain of Thought)

No.	Category	Template	Accuracy
1	instructive	Let's think step by step.	78.7
2		First, (*1)	77.3
3		Let's think about this logically.	74.5
4		Let's solve this problem by splitting it into steps. (*2)	72.2
5		Let's be realistic and think step by step.	70.8
6		Let's think like a detective step by step.	70.3
7		Let's think	57.5
8		Before we dive into the answer,	55.7
9		The answer is after the proof.	45.7

From the UT Austin NLP Course



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Analogical reasoning

Model Input

Q: What is the area of the square with the four vertices at (-2, 2), (2, -2), (-2, -6), and (-6, -2)?

Instruction:

Recall relevant exemplars:

Solve the initial problem:

Model Output

Relevant exemplars:

Q: What is the area of the square with a side length of 5?

A: The area of a square is found by squaring the length of its side. So, the area of this square is $5^2 = 25$

Solve the initial problem:

To find the area of the square, we need to find the side length. The length is ... $\sqrt{(2 - (-2))^2 + (-2 - 2)^2} = \sqrt{32}$. So, the area of the square is $(\sqrt{32})^2 = 32$.

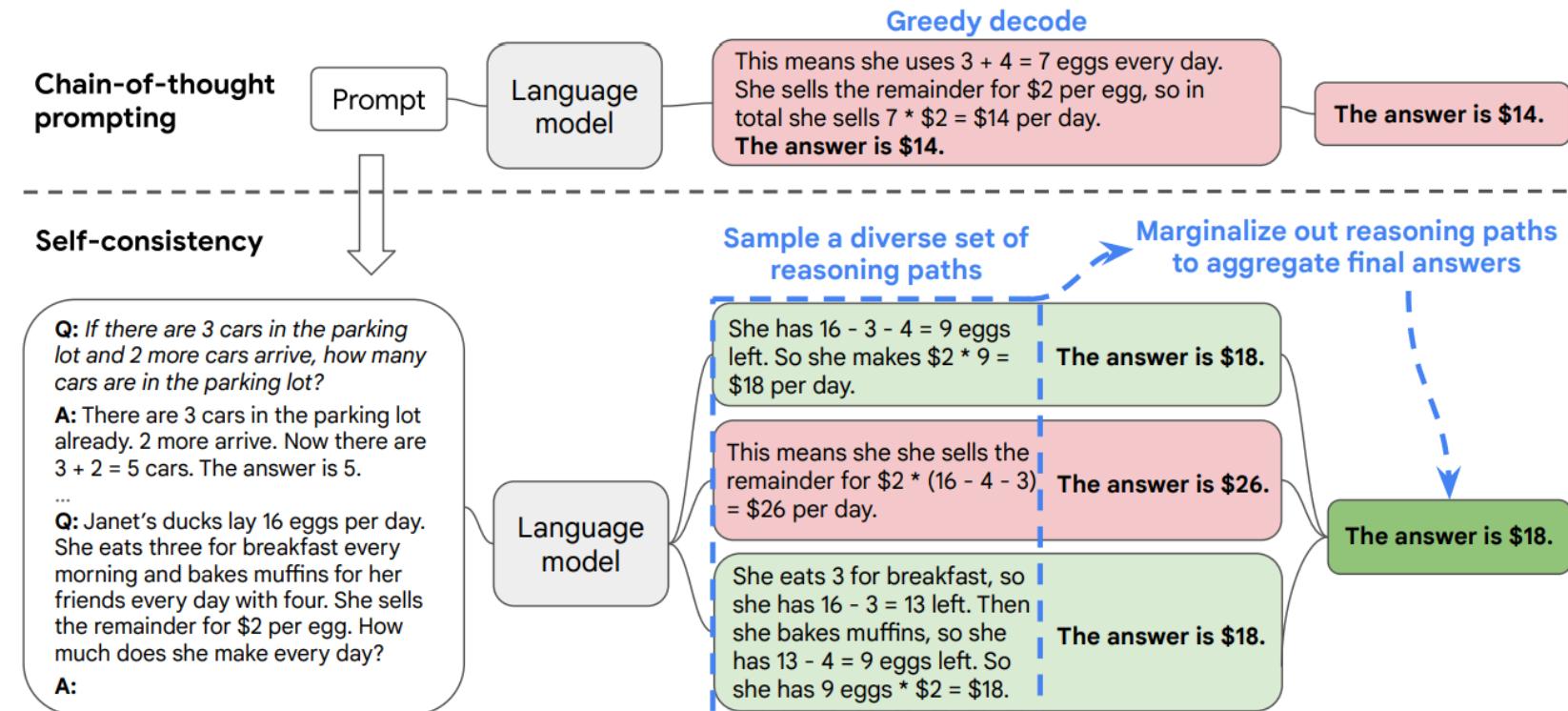


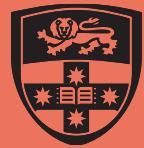
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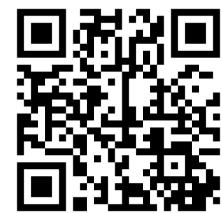
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Self-consistency with chain of thought, in other words, voting with multiple outputs



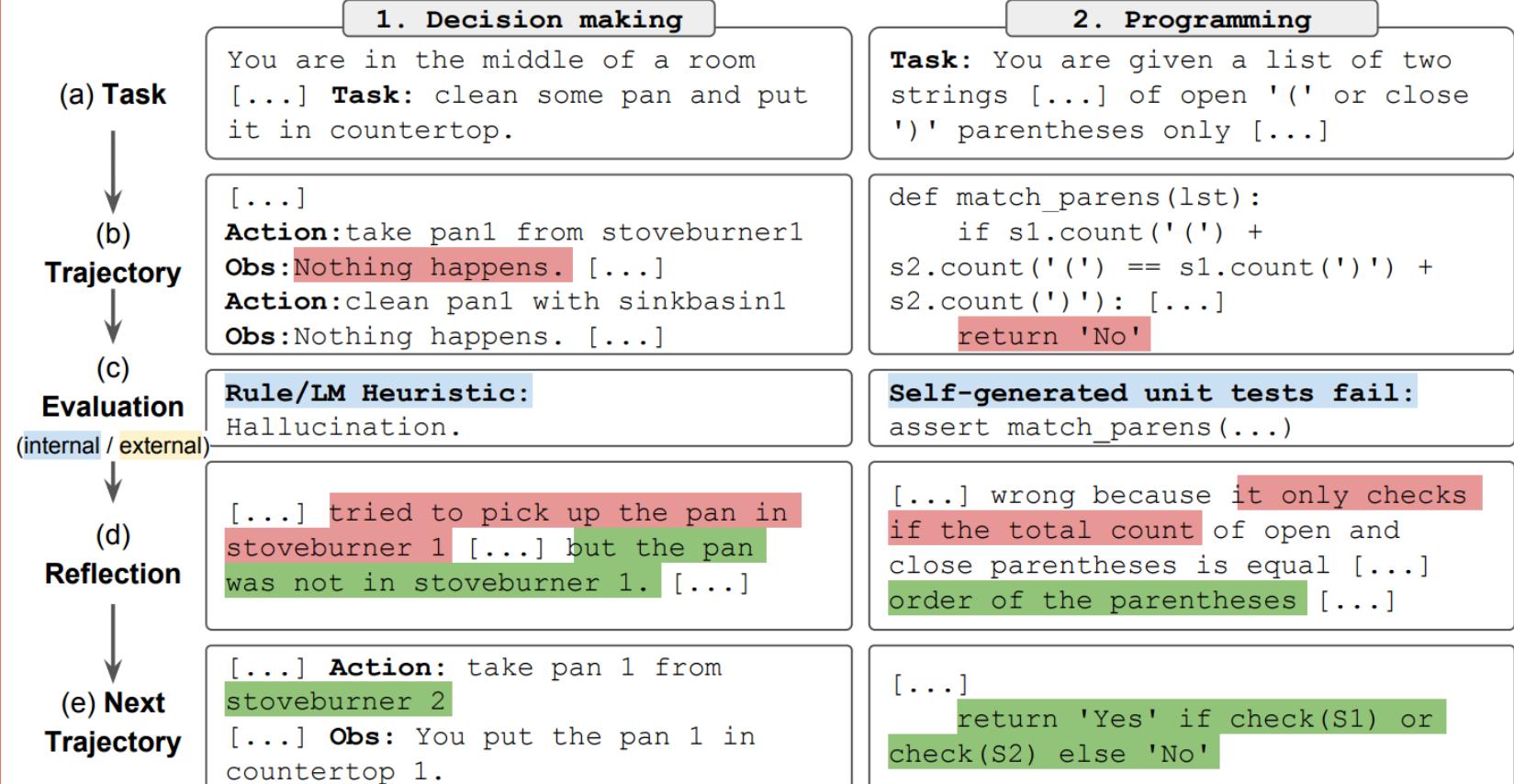


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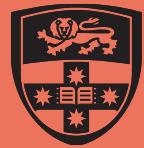


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“Reflexion” idea is to include statements in the prompt that reflect on past outputs



Shinn, et al (2022)

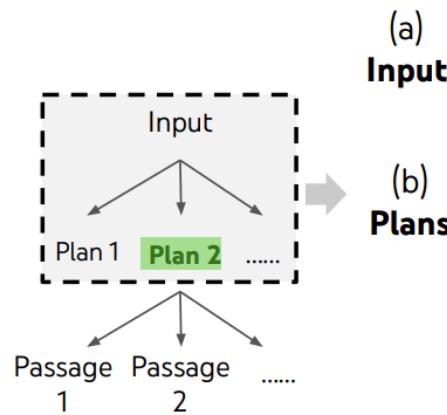


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Tree of thoughts



(a)
Input

(b)
Plans

(c)
Votes

Write a coherent passage of 4 short paragraphs. The end sentence of each paragraph must be: **1.** It isn't difficult to do a handstand if you just stand on your hands. **2.** It caught him off guard that space smelled of seared steak. **3.** When she didn't like a guy who was trying to pick her up, she started using sign language. **4.** Each person who knows you has a different perception of who you are.

Plan 1

1. Introduce and explain the technique of doing a handstand
2. Switch to a story about an astronaut's first time in space
3. Describe a situation where a woman uses sign language to avoid unwanted attention
4. The final paragraph explains how everyone has different perceptions of others

0/5 votes

Plan 2

1. Introduction to an unusual self-help book, mentioning a handstand as a metaphor for embracing challenges
2. Discuss the unexpected things learned from astronauts, including the smell of space
3. Describe a woman's clever tactic for avoiding unwanted attention at a bar
4. Contemplate how different perceptions of oneself can shape one's identity

3/5 votes

Plan 3-5

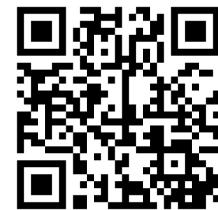
1...
2...
...

n/5 votes

Analyzing each choice in detail: Choice 1, while incorporating the required end sentences, seems to lack a clear connection between the paragraphs [...] Choice 2 offers an interesting perspective by using the required end sentences to present a self-help book's content. It connects the paragraphs with the theme of self-improvement and embracing challenges, making for a coherent passage. [...] **The best choice is 2.**



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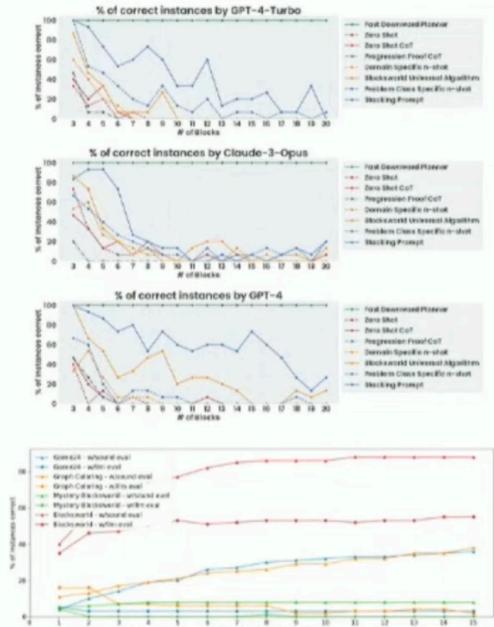
Planning



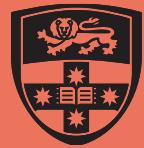
LLM's Can't Plan;

LLMs can't plan in Autonomous Modes (and many claims to the contrary are questionable)

- LLMs can't do planning in autonomous mode
- CoT, ReACT, Fine Tuning etc. don't help that much (as they don't generalize enough)
- They can't improve by self-verification (since they can't self-verify!)
- Having humans iteratively prompt is an invitation for Clever Hans effect..



First person in the Q&A argued with this



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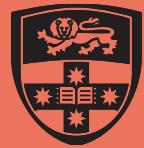
Short-term vs. long-term memory

Updating the prompt - short term memory

Updating a database - long term memory



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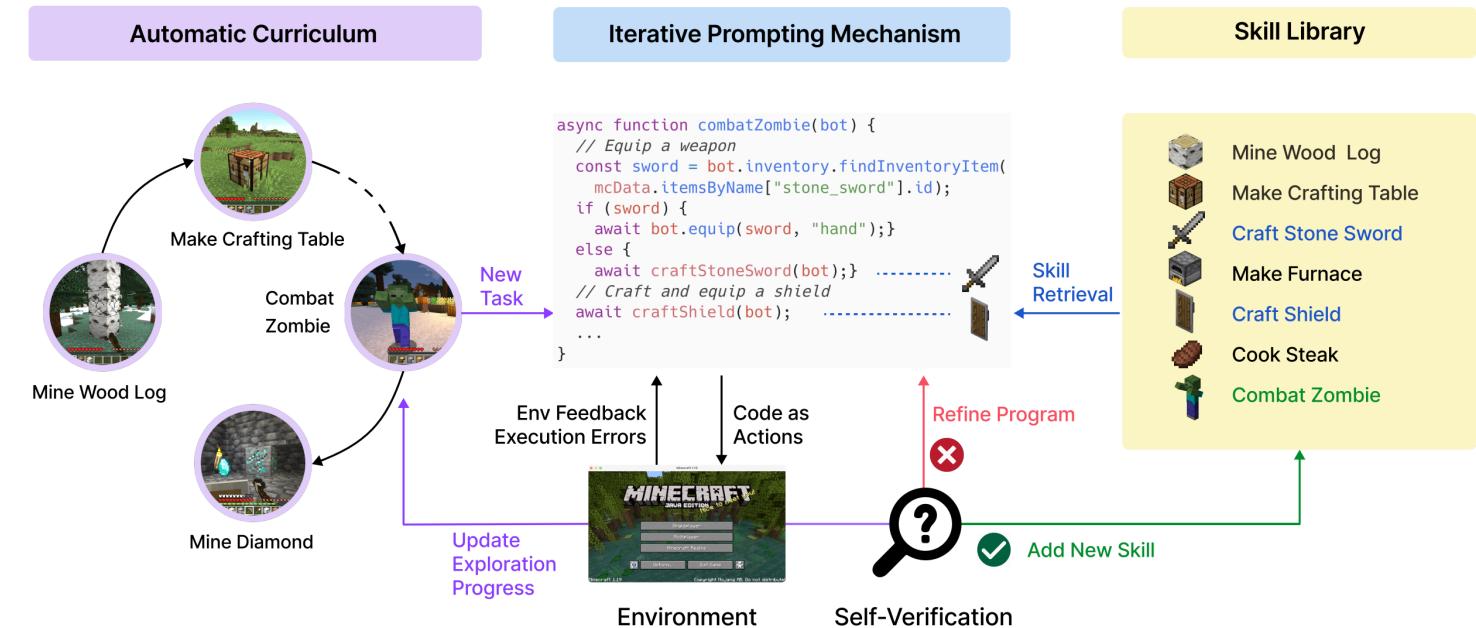


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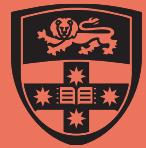


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Short-term vs. long-term memory



Wang, et al (2023)



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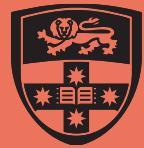
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Long-term memory implementation

Read: Use a RAG-style retrieval, e.g., BM25 or embeddings

Write: Append text as new documents

Very active area of research!

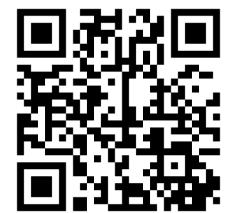


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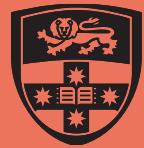
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DSPy: Declarative Self-improving Python

Define computation graphs

Compiler optimises automatically

Used, e.g., to mix prompt optimisation and fine-tuning
(Soylu, et al, 2024)

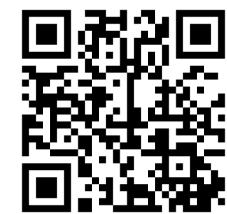


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Recap

What is Reasoning? This is any process by which models ‘think’ before generating the primary output.

Main approaches: Chain of thought prompting was the first and a lot of other approaches are variants / extensions of it. Creating and using memory is an unsolved challenge. Approaches are now mature enough that we are seeing various ways of combining them (e.g., with DSPy).

Planning: We only briefly touched on this massive area, but the core message is that when evaluated carefully, LLMs seem to struggle with planning. Another active area of research.



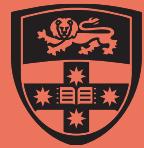
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Acting

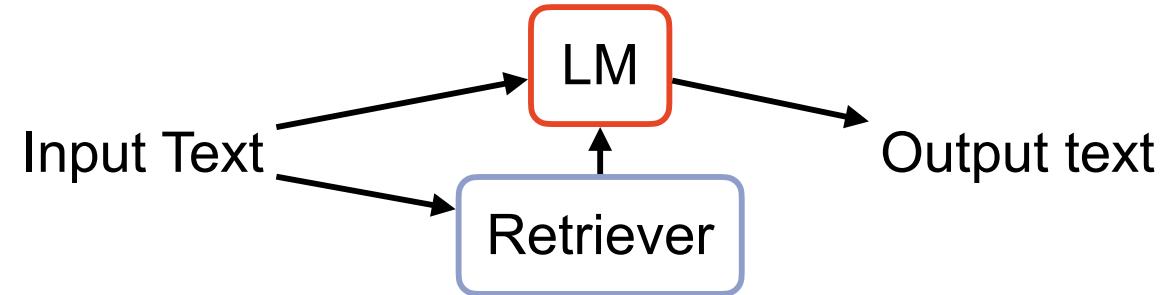


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RAG (Retrieval Augmented Generation) is one form of acting in the world

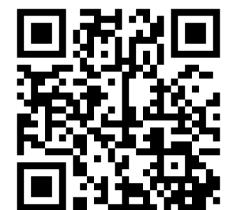


Usefulness depends on:

- The knowledge base you retrieve from
- The quality of your retrieval method



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An LLM can ‘use’ tools by producing special symbols in output

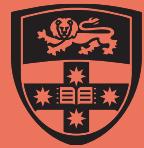
The New England Journal of Medicine is a registered trademark of [QA("Who is the publisher of The New England Journal of Medicine?") → Massachusetts Medical Society] the MMS.

Out of 1400 participants, 400 (or [Calculator(400 / 1400) → 0.29] 29%) passed the test.

The name derives from “la tortuga”, the Spanish word for [MT("tortuga") → turtle] turtle.

The Brown Act is California’s law [WikiSearch("Brown Act") → The Ralph M. Brown Act is an act of the California State Legislature that guarantees the public's right to attend and participate in meetings of local legislative bodies.] that requires legislative bodies, like city councils, to hold their meetings open to the public.

Toolformer - Schick, et al (2023), also see TALM

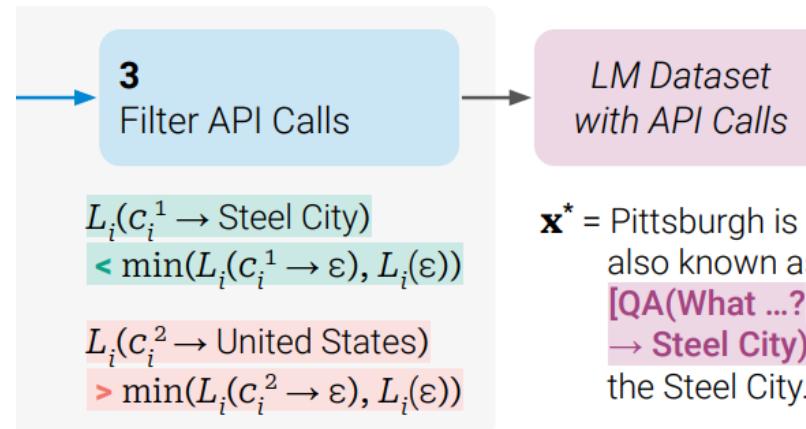
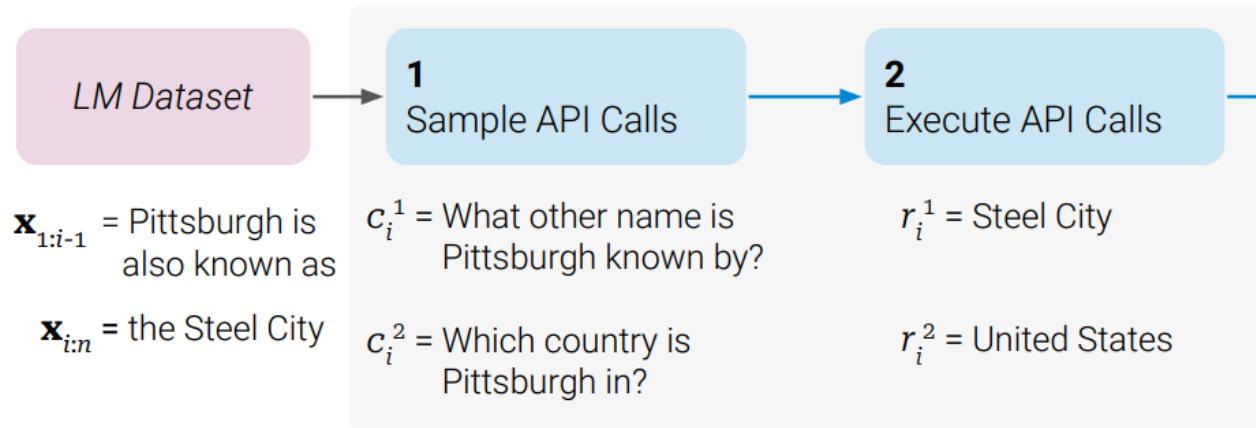


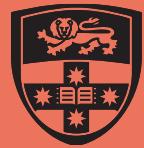
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To get examples of tool use, find ways to use them in existing data





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Web interaction

Train with RL

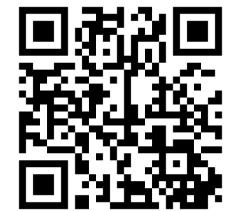
Command

Search <query>
Clicked on link <link ID>
Find in page: <text>
Quote: <text>
Scrolled down <1, 2, 3>
Scrolled up <1, 2, 3>
Top
Back
End: Answer
End: <Nonsense, Controversial>

WebGPT - Nakano, et al (2022)



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Web interaction

How can I train the crows in my neighborhood to bring me gifts?

This question does not make sense This question should not be answered

Search results for: how to train crows to bring you gifts Quotes ↗

← how to train crows to bring Find

[How to Make Friends With Crows - PetHelpful](#)
If you did this a few times, your crows learn your new place, but as I said, I'm not sure if they will follow or visit you there since it's probably not in their territory. The other option is simply to make new crow friends with the crows that live in your new neighborhood.

[Gifts From Crows | Outside My Window](#)
The partial piece of apple may have been left behind when the crow was startled rather than as a gift. If the crows bring bright objects you'll know for sure that it's a gift because it's not something they eat. Brandi Williams says: May 28, 2020 at 7:19 am

♦Question
How can I train the crows in my neighborhood to bring me gifts?

♦Quotes
From Gifts From Crows | Outside My Window (www.birdsoutsidemywindow.org)
> Many animals give gifts to members of their own species but crows and other corvids are the only ones known to give gifts to humans.

♦Past actions
Search how to train crows to bring you gifts
Click Gifts From Crows | Outside My Window www.birdsoutsidemywindow.org
Quote
Back

♦Title
Search results for: how to train crows to bring you gifts

♦Scrollbar: 0 - 11

♦Text
[0] How to Make Friends With Crows - PetHelpful [pethelpful.com]
If you did this a few times, your crows would learn your new place, but as I said, I'm not sure if they will follow or visit you there since it's probably not in their territory. The other option is simply to make new crow friends with the crows that live in your new neighborhood.

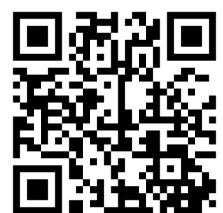
[1] Gifts From Crows | Outside My Window [www.birdsoutsidemywindow.org]
The partial piece of apple may have been left behind when the crow was startled rather than as a gift. If the crows bring bright objects you'll know for sure that it's a gift because it's not something they eat.
Brandi Williams says: May 28, 2020 at 7:19 am.

♦Actions left: 96
♦Next action

WebGPT - Nakano, et al (2022)

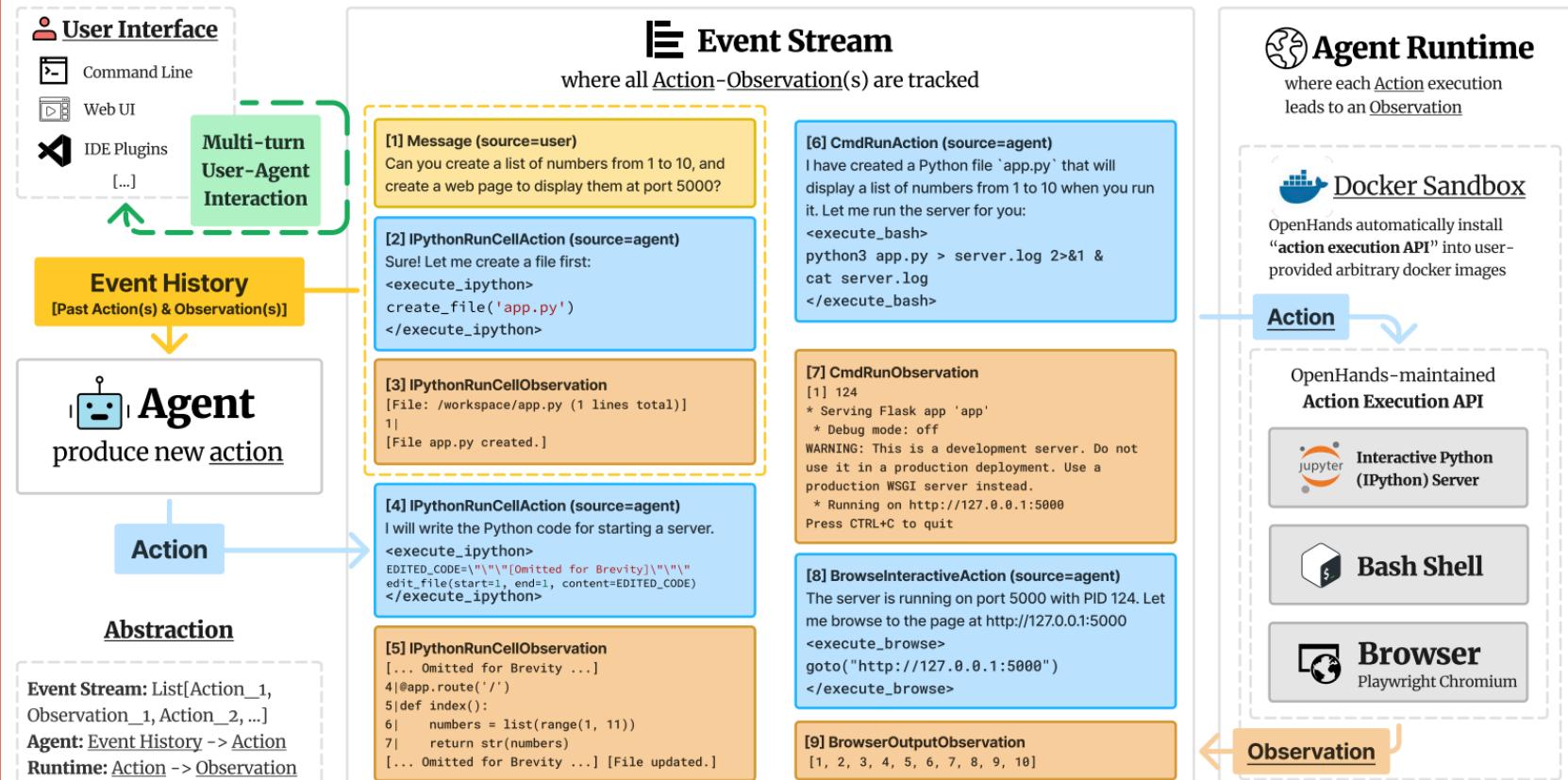


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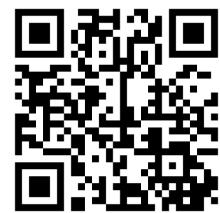
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Writing Code, e.g., OPENHANDS





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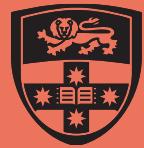


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Anthropic computer use

The screenshot displays three windows side-by-side:

- Action log:** A window titled "Action log" containing instructions: "Please fill out the vendor request form for 'Ant Equipment Co.' using data from either the vendor spreadsheet or search portal tabs in window one. List & verify each field as you complete the form in window two."
- Virtual computer:** A window titled "messy-vendor-data - Google Sheets" showing a spreadsheet titled "messy-vendor-data". The columns include Company Name, Phone Number, Tax ID, Country, and Legal Entity Address. The data lists various companies with their respective details.
- Virtual computer:** A window titled "Vendor Form" showing a web form titled "Acme Inc. Vendor Request Form". The form includes fields for Company Information (Company Name, Purchase Order Email, Accounting Email), Legal Entity Address (Select a country, Address Line 1, Address Line 2, City, State/Province, Postal Code), and a large text area for notes.



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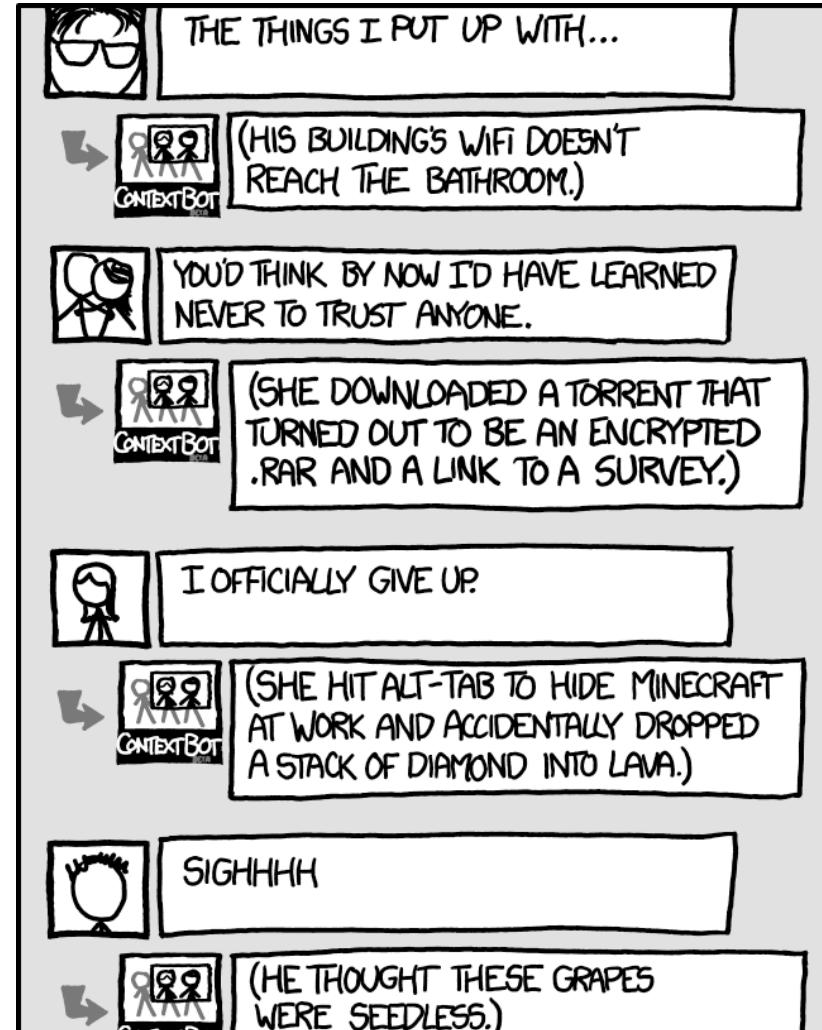
Recap

What is Acting? This is any process by which models do things beyond generating tokens.

Main approaches: RAG is the simplest and most widely used example of acting. For tools with simple APIs (calculators, search engines) there is success in using them simply with creative prompting. For more sophisticated interactions, e.g., with your whole computer, there are many active efforts.

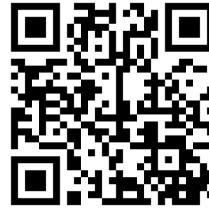
ContextBot

[If you read all vaguebooking/vaguetweeting with the assumption that they're saying everything they can without revealing classified military information, the internet gets way more exciting.]



EVERYONE STOPPED COMPLAINING ABOUT GOOGLE'S DATA-GATHERING WHEN THEY LAUNCHED CONTEXTBOT, A SYSTEM WHICH REPLIES TO VAGUE, ENIGMATIC SOCIAL NETWORK POSTS WITH CONTEXT FROM THE POSTER'S LIFE.

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3 minute Break
- stretch and visit Menti

Source: <https://xkcd.com/1085/>



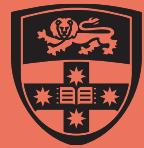
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Lecture 12, 2025

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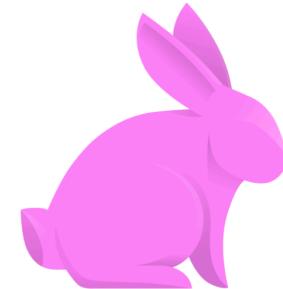
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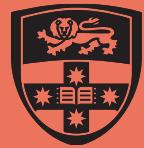


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Something very different...



VOWPAL WABBIT



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Muddy Card

Open shortly, closes at 7:05pm

[https://saipll.shinyapps.io/
student-interface/](https://saipll.shinyapps.io/student-interface/)



If you do not wish to participate in the study, use
the Ed form instead

Go to Ed → Lessons → Muddy Cards Lecture 12