

# Generative AI and Language Understanding: Part 1

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# This is the era of Generative AI

## Microsoft to Invest \$10 Billion in OpenAI, the Creator of ChatGPT

The tech giant aims to remain at the forefront of generative artificial intelligence with its partnership with OpenAI.

<https://chat.openai.com/chat>

### ChatGPT

 Examples	 Capabilities	 Limitations
"Explain quantum computing in simple terms" →	Remembers what user said earlier in the conversation	May occasionally generate incorrect information
"Got any creative ideas for a 10 year old's birthday?" →	Allows user to provide follow-up corrections	May occasionally produce harmful instructions or biased content
"How do I make an HTTP request in Javascript?" →	Trained to decline inappropriate requests	Limited knowledge of world and events after 2021

<https://bard.google.com>



Bard is still in its experimental phase. Chatting with it and rating its responses will help improve the experience.

### What's Bard all about?

We've long seen the potential to make information and computing much more accessible through conversational AI. Two years ago, we unveiled [LaMDA \(Language Model for Dialogue Applications\)](#), a conversational AI model capable of fluid, multi-turn dialogue, and last year, we launched

If you're interested in the more technical details, LaMDA is a Transformer-based model, the machine-learning breakthrough [invented by Google in 2017](#). The language model learns by "reading" trillions of words that help it pick up on patterns that make up human language so it's good at predicting what might be reasonable responses.

# Part 1

- ChatGPT and
  - Structural Ambiguity
  - Structural Hierarchy
  - Control Verbs
- **Updated:** *Google Bard responses have been added.*

# Some Caveats and Hints


- It sometimes gives a different answer when the question is repeated.
- A response doesn't necessarily need a question.
- Your chat history can affect the response.
- If you vary the question a bit, it may choose a different response.
- Asking the right question is key ... e.g.


The image displays two separate chat interface examples. Each example consists of a user message (SA) and an AI response (GPT-4o). In the first example, the user asks 'John read a book. Who read what?' and the AI responds 'John read a book.' An orange callout box with an arrow points to the user's question, stating 'an unrevealing question for this example'. In the second example, the user asks 'John appears to have read a book. Who read what?' and the AI responds 'It appears that John read a book.'




SA	John read a book. Who read what?	<i>an unrevealing question for this example</i>	
	John read a book.		
SA	John appears to have read a book. Who read what?		
	It appears that John read a book.		



# Google Bard


The screenshot displays the Google Bard chat interface. It features a light blue background with white chat bubbles. The first bubble is a user question: "John read a book. Who read what?". The second bubble is the model's response, starting with a blue star icon and stating that it lacks sufficient information. Below the response are thumbs-up and thumbs-down icons, and a vertical ellipsis menu. The third bubble is a draft, indicated by a pencil icon, with the text "John appears to have read a book. Who read what?". To the right of the draft is a "View other drafts" link with a downward arrow. The final bubble is the selected draft, starting with a yellow star icon and containing the text "John read a book.". Below this draft are thumbs-up, thumbs-down, and refresh icons, followed by a "Google it" button with the Google logo and a vertical ellipsis menu.


 John read a book. Who read what?






 I do not have enough information about that person to help with your request. I am a large language model, and I am able to communicate and generate human-like text in response to a wide range of prompts and questions, but my knowledge about this person is limited. Is there anything else I can do to help you with this request?

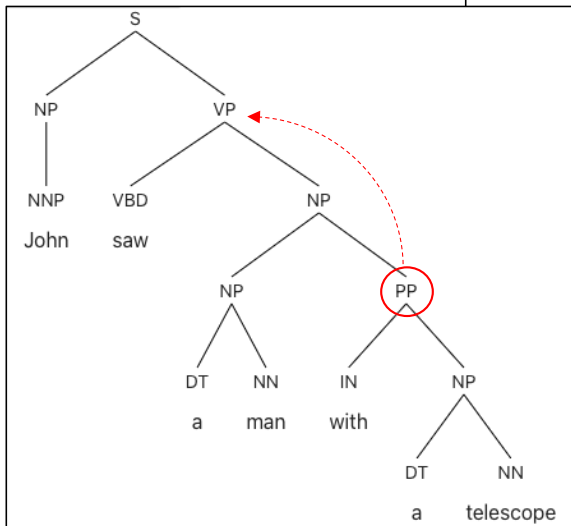
 John appears to have read a book. Who read what? 

[View other drafts](#) 

 John read a book.

    Google it 

# ChatGPT and Structural Ambiguity



But did it explicitly compute this?  
*Very unlikely*

SA Is John saw a man with a telescope an ambiguous sentence?

The sentence "John saw a man with a telescope" could be interpreted in two different ways, making it a potentially ambiguous sentence.

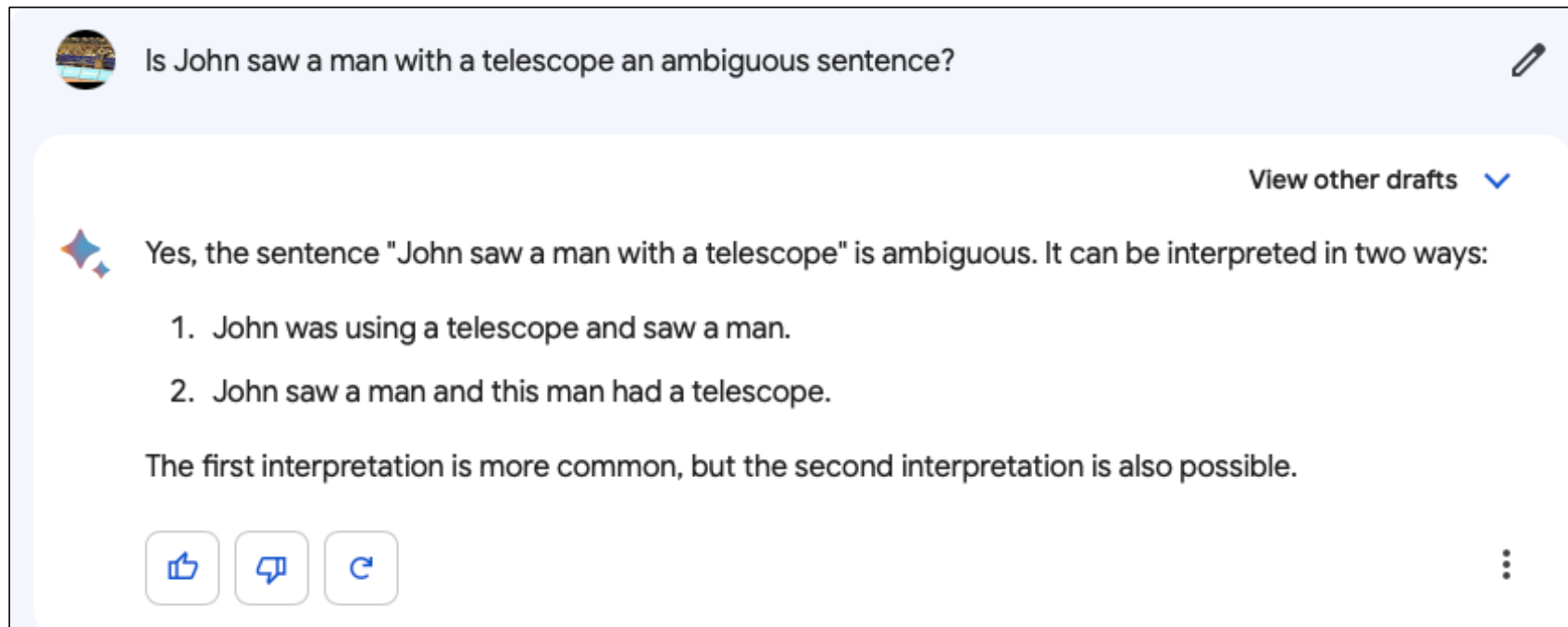
The first interpretation is that John is using the telescope to observe a man.

The second interpretation is that there is a man who has a telescope and John is observing him.


It is important to note that the sentence is not inherently ambiguous, but that the ambiguity arises from the lack of context, and additional information is needed to disambiguate the sentence.


- #1
- #2

# Google Bard






Is John saw a man with a telescope an ambiguous sentence?


View other drafts 

 Yes, the sentence "John saw a man with a telescope" is ambiguous. It can be interpreted in two ways:

1. John was using a telescope and saw a man.
2. John saw a man and this man had a telescope.




The first interpretation is more common, but the second interpretation is also possible.


  




# ChatGPT and Structural Ambiguity

SA Is John visited a man with a telescope an ambiguous sentence?

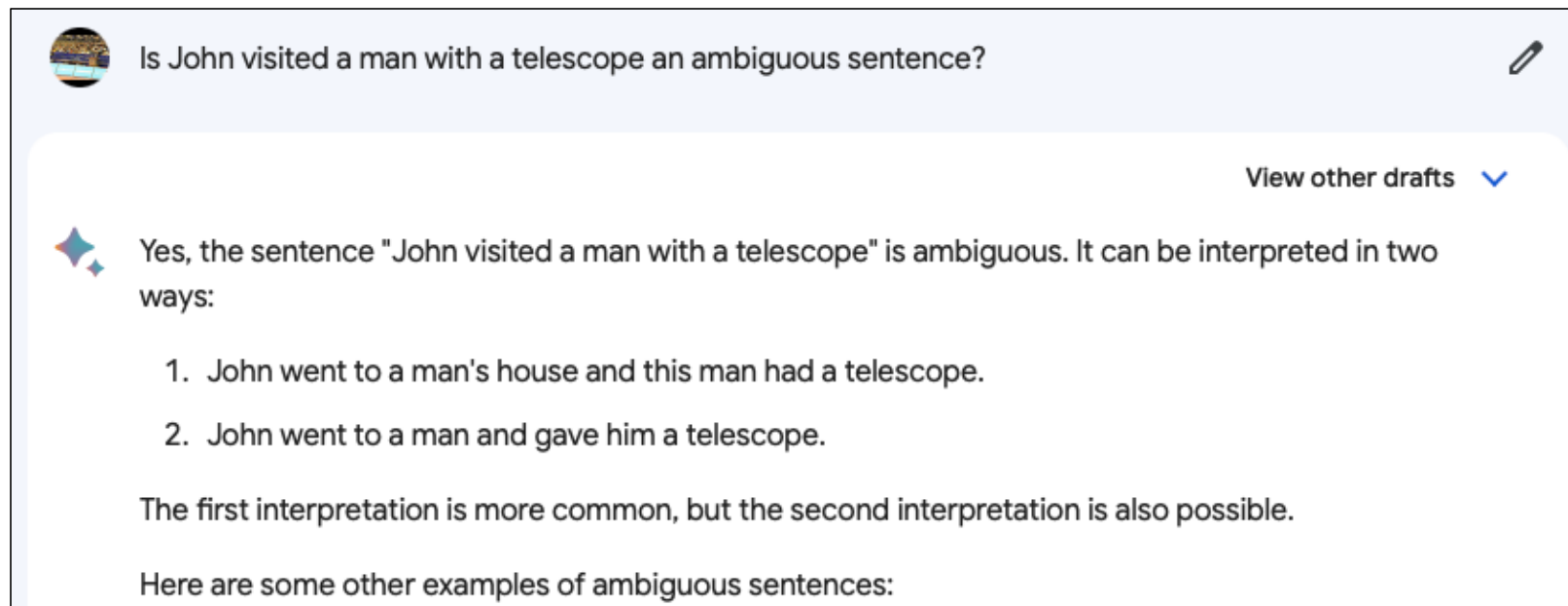
 The sentence "John visited a man with a telescope" could be interpreted in two different ways, making it a potentially ambiguous sentence.  

The first interpretation is that John went to visit a man who had a telescope.  #1

The second interpretation is that John visited a man and he had a telescope with him during the visit.  #2



# Google Bard



The image shows a screenshot of the Google Bard chat interface. At the top, there is a user profile icon and a question: "Is John visited a man with a telescope an ambiguous sentence?". To the right of the question is a pencil icon. Below the question, there is a "View other drafts" link with a downward arrow. The main response area contains a blue star icon followed by the text: "Yes, the sentence 'John visited a man with a telescope' is ambiguous. It can be interpreted in two ways:". This is followed by a numbered list with two items: "1. John went to a man's house and this man had a telescope." and "2. John went to a man and gave him a telescope.". Below the list, it says "The first interpretation is more common, but the second interpretation is also possible." and "Here are some other examples of ambiguous sentences:".

Is John visited a man with a telescope an ambiguous sentence?

View other drafts ▾

Yes, the sentence "John visited a man with a telescope" is ambiguous. It can be interpreted in two ways:

1. John went to a man's house and this man had a telescope.
2. John went to a man and gave him a telescope.

The first interpretation is more common, but the second interpretation is also possible.

Here are some other examples of ambiguous sentences:



# Google Bard

Here are some other examples of ambiguous sentences:

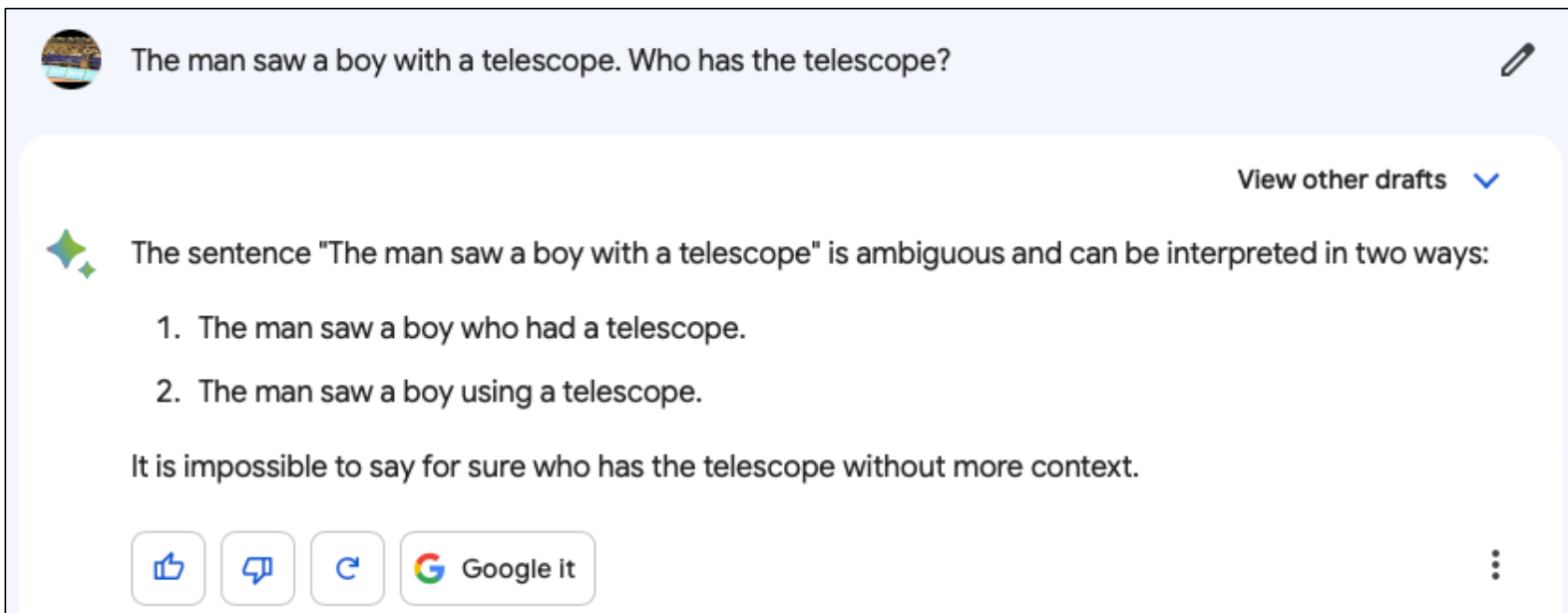
- The man saw the woman with the telescope.
- The woman saw the man with the telescope.
- John gave the man a telescope.
- John gave the woman a telescope.
- The man gave John a telescope.
- The woman gave John a telescope.



# ChatGPT and Structural Ambiguity

SA	The man saw a boy with a telescope. Who has the telescope?
	The boy has the telescope. <span data-bbox="1659 820 1753 860">👍 👎</span>
SA	The man saw a boy with a limp. Who is limping? <span data-bbox="1638 958 1680 998">✍️</span>
	The boy is limping. <span data-bbox="1638 1128 1732 1169">👍 👎</span>

# Google Bard








The man saw a boy with a telescope. Who has the telescope?

[View other drafts](#) ▾


✦ The sentence "The man saw a boy with a telescope" is ambiguous and can be interpreted in two ways:

1. The man saw a boy who had a telescope.
2. The man saw a boy using a telescope.




It is impossible to say for sure who has the telescope without more context.

    Google it 

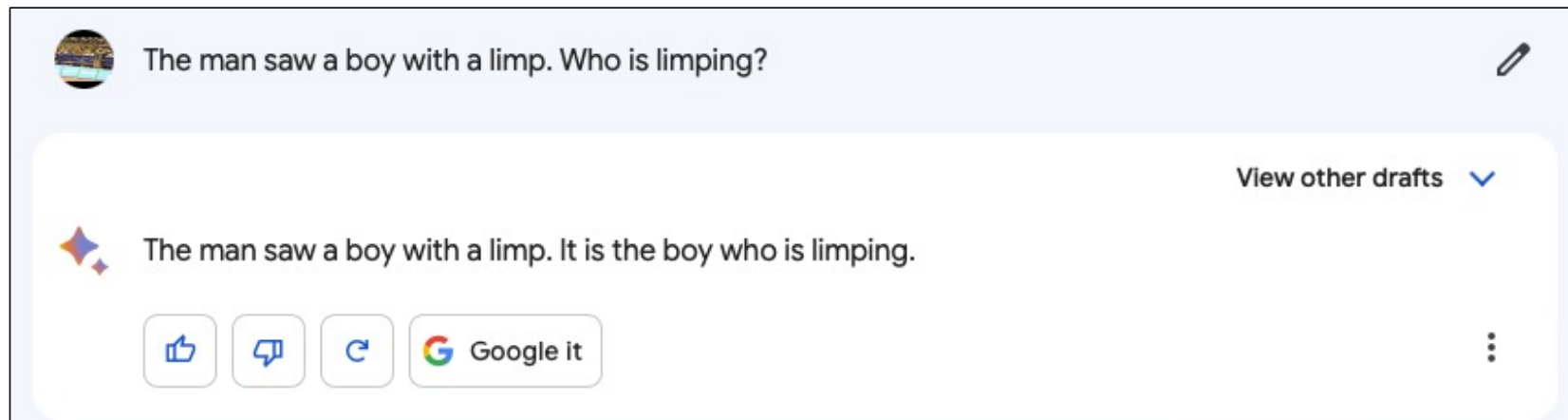
# ChatGPT and Structural Ambiguity

 The man saw a boy with a limp with a telescope. Who has the telescope?

---

 The boy with a limp has the telescope.  


# Google Bard



The man saw a boy with a limp. Who is limping?




[View other drafts](#) ▾

✨ The man saw a boy with a limp. It is the boy who is limping.

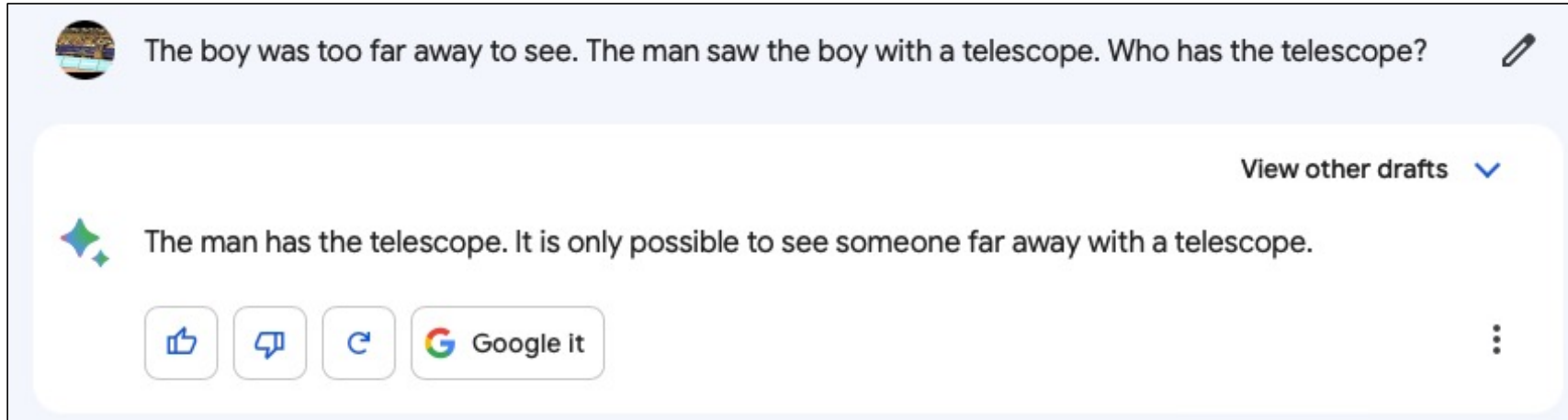
👍 🗨️ ↻  Google it ⋮

The screenshot shows the Google Bard interface. At the top, there is a user profile picture and the text "The man saw a boy with a limp. Who is limping?". To the right of this text is an edit icon. Below this is a white box containing the AI's response: "The man saw a boy with a limp. It is the boy who is limping." To the right of the response is a link "View other drafts" with a dropdown arrow. Below the response are four buttons: a thumbs up icon, a speech bubble icon, a refresh icon, and a "Google it" button with the Google logo. To the right of these buttons is a vertical ellipsis menu icon.



# ChatGPT and Structural Ambiguity


SA	The boy was too far away to see. The man saw the boy with a telescope. Who has the telescope.	
	The man saw the boy who was too far away to see with a telescope, so the man has the telescope.	 


# Google Bard








The screenshot displays a chat window with a light blue header. On the left is a circular profile picture of a beach. The user's question is: "The boy was too far away to see. The man saw the boy with a telescope. Who has the telescope?". To the right of the question is a pencil icon for editing. Below the question, the AI response is: "The man has the telescope. It is only possible to see someone far away with a telescope." Above the response is a link that says "View other drafts" with a downward arrow. At the bottom of the chat area are four buttons: a thumbs-up icon, a thumbs-down icon, a refresh icon, and a "Google It" button with the Google logo. A vertical ellipsis menu icon is on the far right.

 The boy was too far away to see. The man saw the boy with a telescope. Who has the telescope? 

[View other drafts](#) 

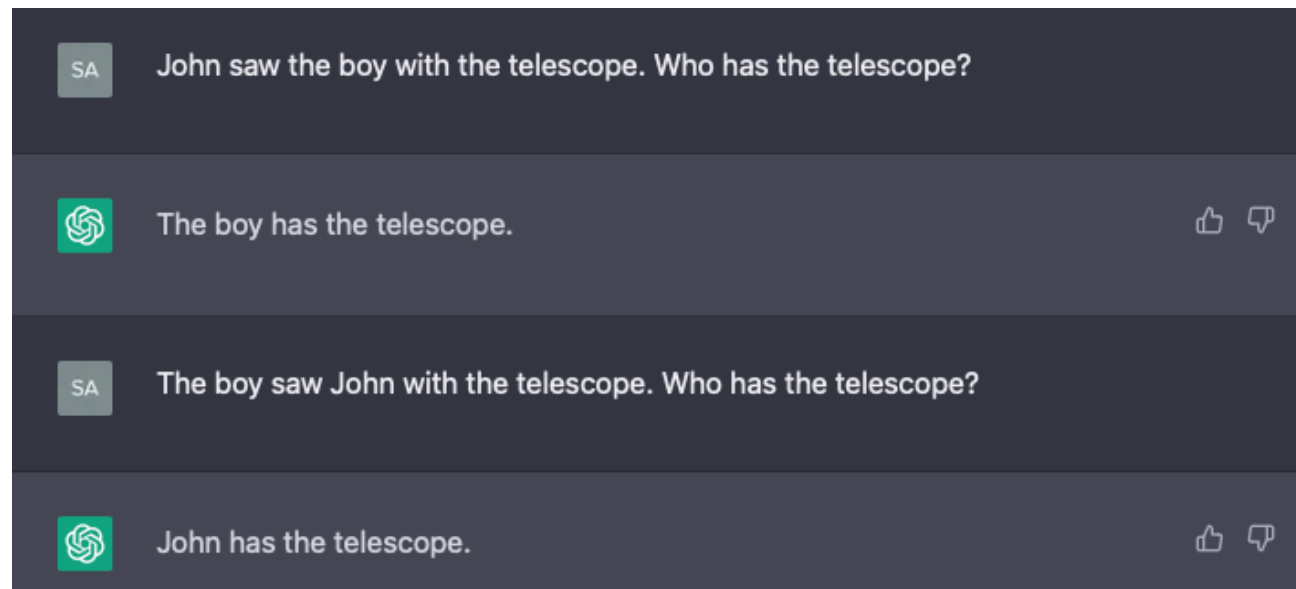
 The man has the telescope. It is only possible to see someone far away with a telescope.

    Google It 

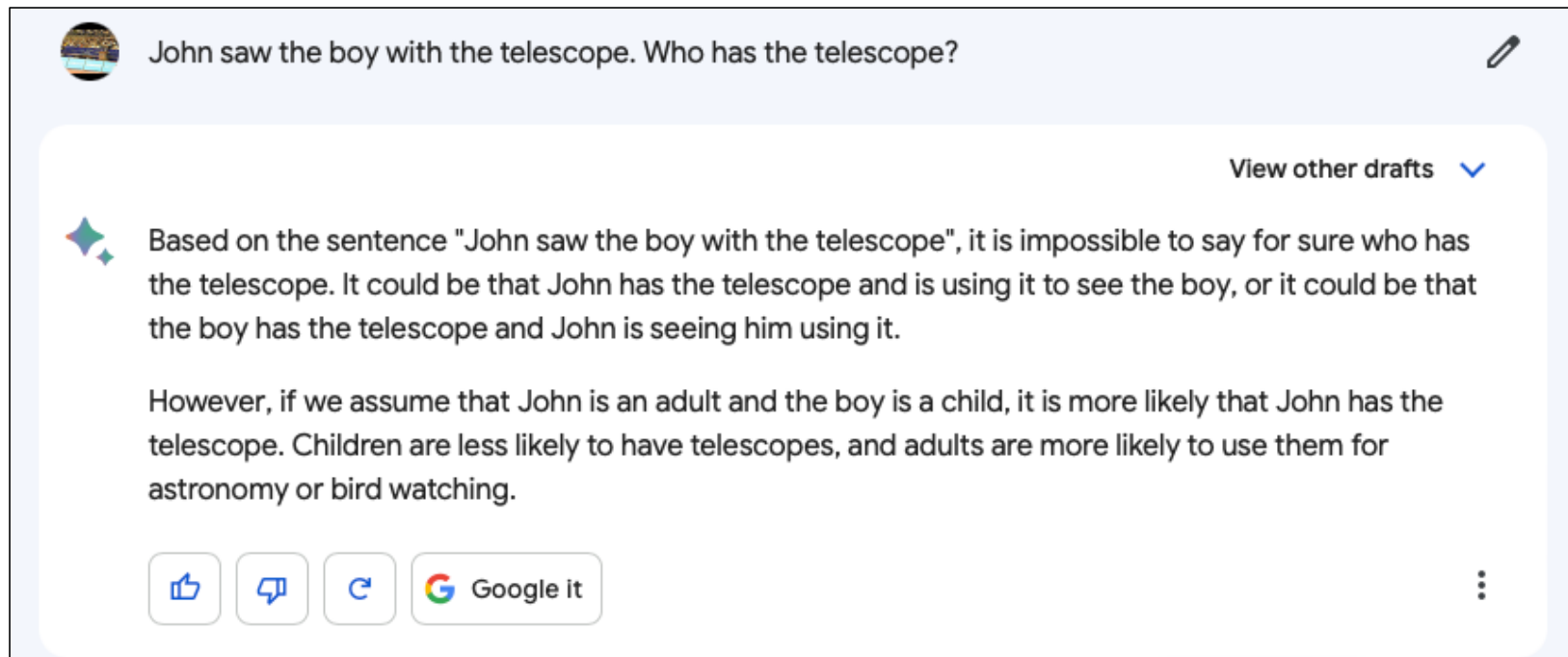



# ChatGPT and Structural Ambiguity


- proper noun vs. common noun:
  - seems to affect PP modification (*originally noted by a student*)



# Google Bard








John saw the boy with the telescope. Who has the telescope? 

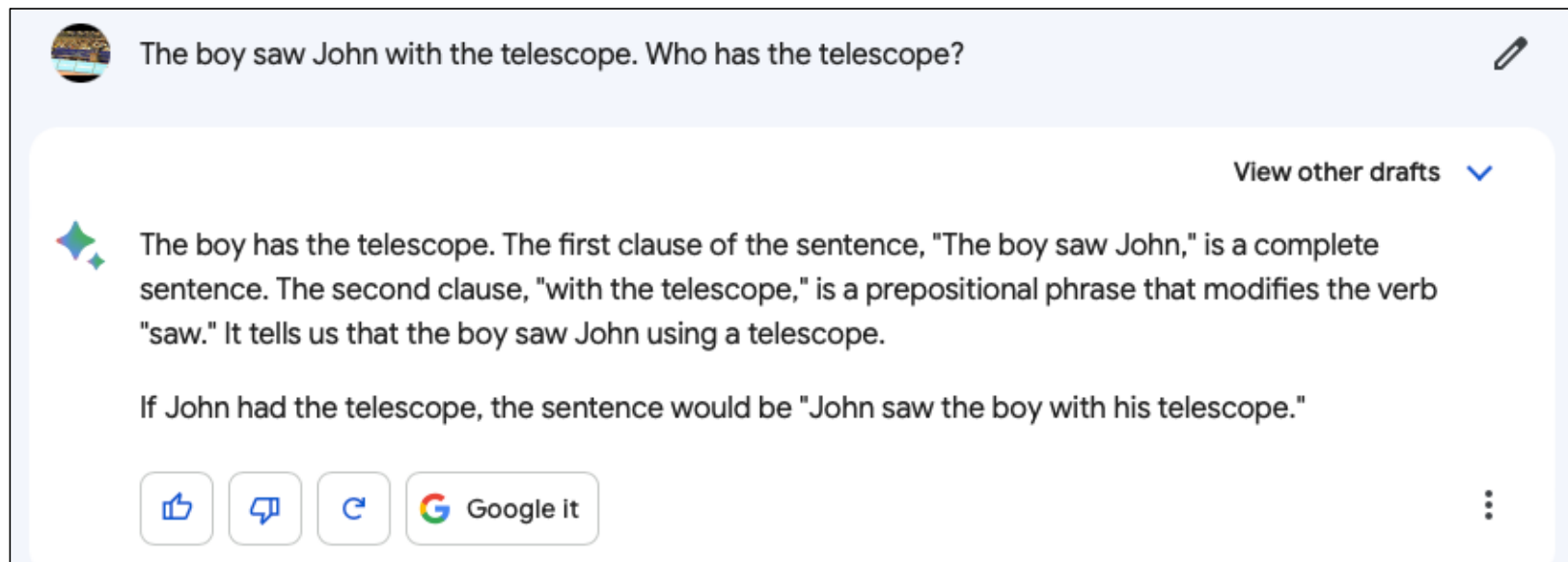
View other drafts 

Based on the sentence "John saw the boy with the telescope", it is impossible to say for sure who has the telescope. It could be that John has the telescope and is using it to see the boy, or it could be that the boy has the telescope and John is seeing him using it.

However, if we assume that John is an adult and the boy is a child, it is more likely that John has the telescope. Children are less likely to have telescopes, and adults are more likely to use them for astronomy or bird watching.


    Google it 

# Google Bard








The boy saw John with the telescope. Who has the telescope?

[View other drafts](#) ▾

 The boy has the telescope. The first clause of the sentence, "The boy saw John," is a complete sentence. The second clause, "with the telescope," is a prepositional phrase that modifies the verb "saw." It tells us that the boy saw John using a telescope.

If John had the telescope, the sentence would be "John saw the boy with his telescope."

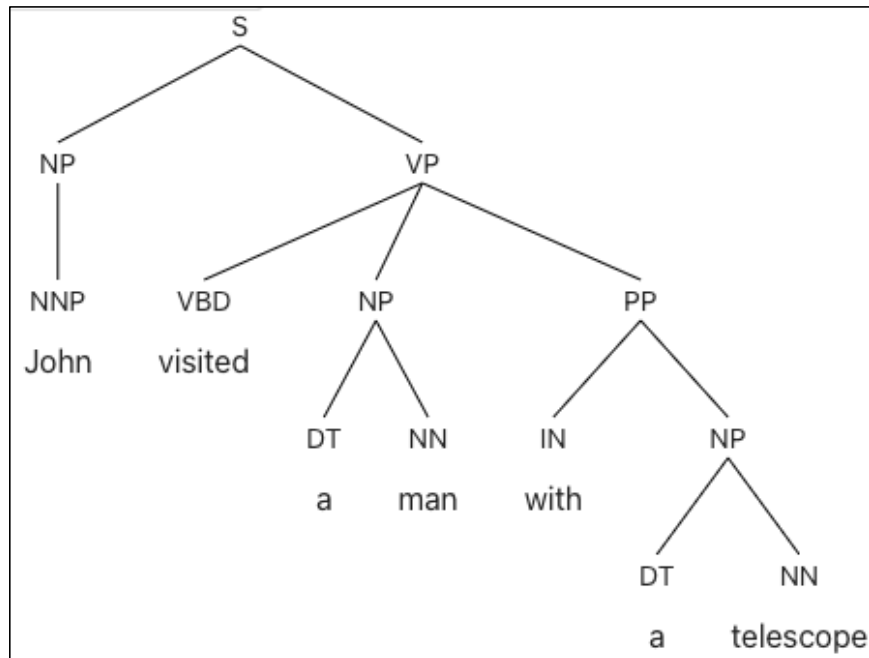
    Google it 

# ChatGPT and Structural Ambiguity

- Generally, PP attachment not easy for Deep Learning (DL)-based parsers.

## Example:



- Berkeley Neural Parser  
<https://parser.kitaev.io>






# ChatGPT and Structural Ambiguity

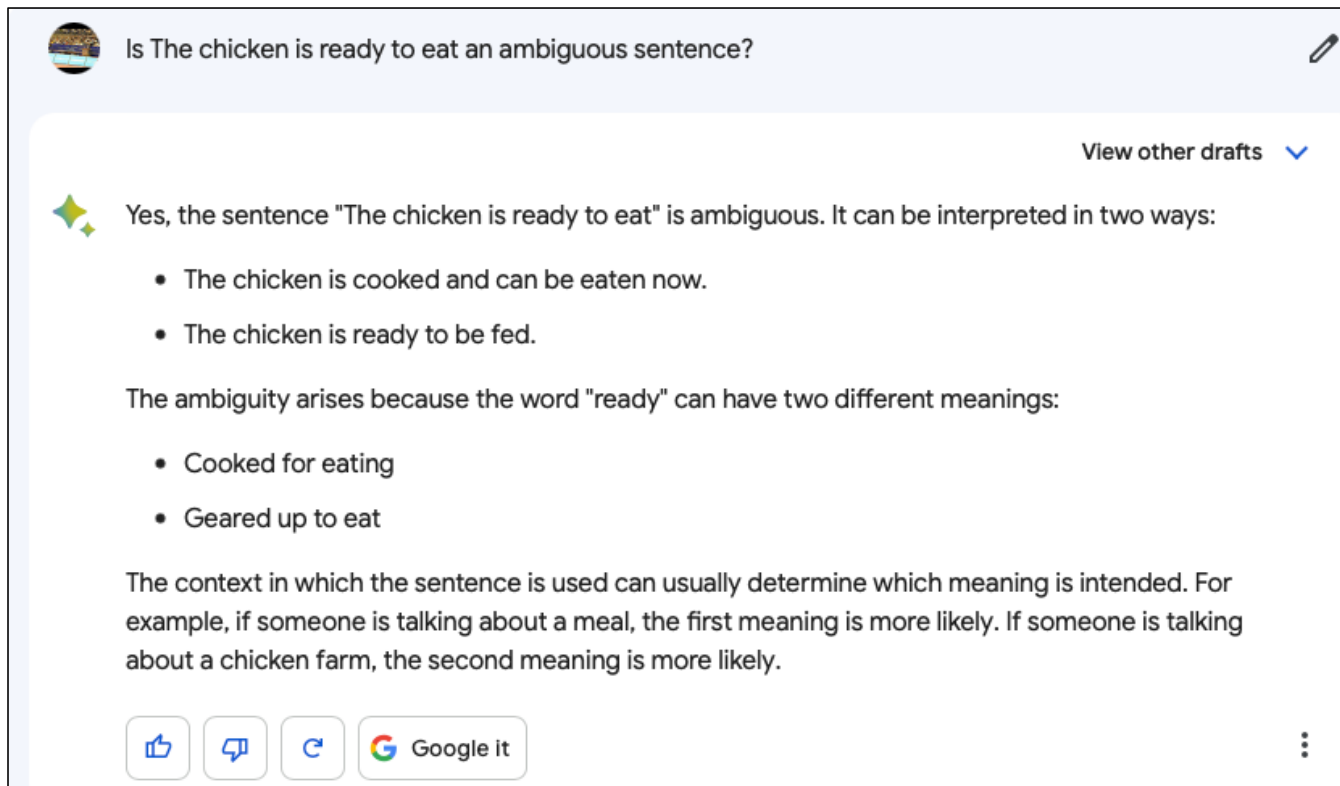
*the chicken is ready to eat*

- the chicken<sub>i</sub> is ready PRO<sub>i</sub> to eat
- *the chicken* is ready PRO<sub>arb</sub> to eat *the chicken*

 Is The chicken is ready to eat an ambiguous sentence? 

 "The chicken is ready to eat" is not an ambiguous sentence. It is a simple declarative sentence that describes a state of the chicken, that it is ready to be eaten. The sentence is clear and not subject to multiple interpretations.  

# Google Bard



Is The chicken is ready to eat an ambiguous sentence?

View other drafts

Yes, the sentence "The chicken is ready to eat" is ambiguous. It can be interpreted in two ways:

- The chicken is cooked and can be eaten now.
- The chicken is ready to be fed.

The ambiguity arises because the word "ready" can have two different meanings:

- Cooked for eating
- Geared up to eat

The context in which the sentence is used can usually determine which meaning is intended. For example, if someone is talking about a meal, the first meaning is more likely. If someone is talking about a chicken farm, the second meaning is more likely.

Like Reply Refresh Google it

# ChatGPT and Structural Ambiguity

SA

Is The children are ready to eat an ambiguous sentence?



The sentence "The children are ready to eat" could be ambiguous as it could be interpreted in two ways.

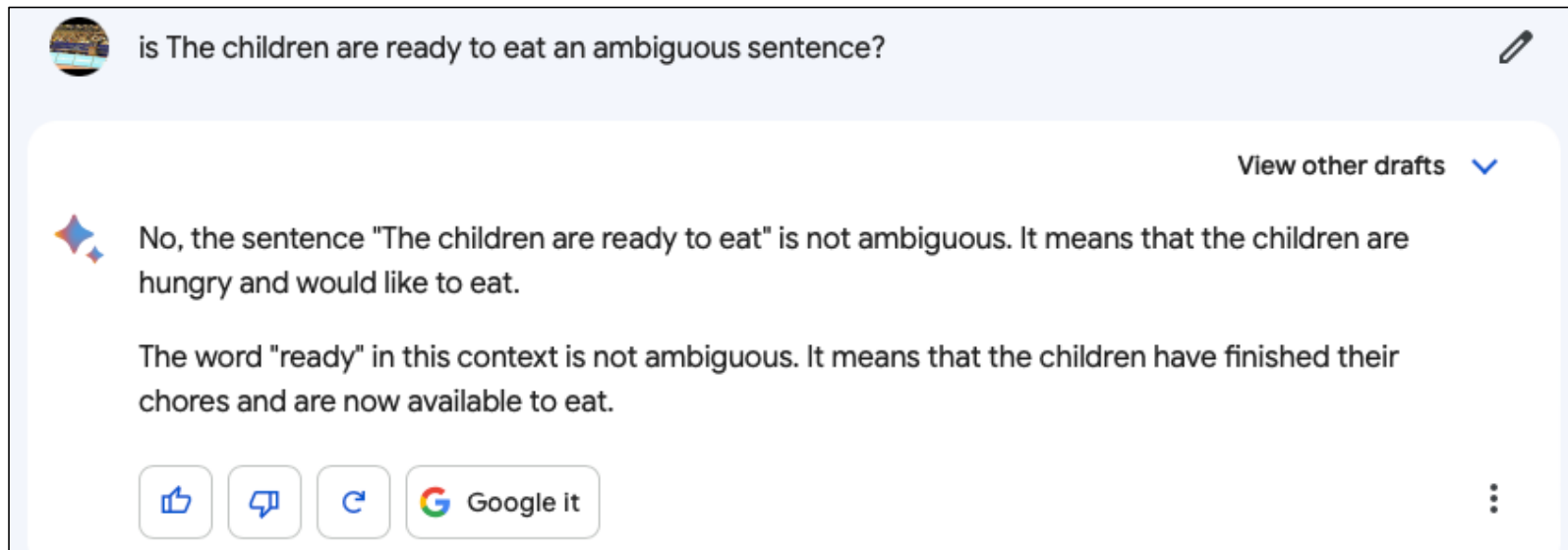


The first interpretation is that the children are ready to begin eating a meal.

The second interpretation is that the children are ready to be eaten, which would be a very disturbing context.

It is important to note that the sentence is not inherently ambiguous, but that the ambiguity arises from the lack of context, and additional information is needed to disambiguate the sentence.

# Google Bard







The screenshot shows a chat window with a light blue header. On the left is a circular profile picture of a globe. The header text is "is The children are ready to eat an ambiguous sentence?". On the right of the header is a pencil icon. Below the header is a white chat bubble containing the answer. The answer starts with a blue star icon and says "No, the sentence 'The children are ready to eat' is not ambiguous. It means that the children are hungry and would like to eat." followed by a second paragraph: "The word 'ready' in this context is not ambiguous. It means that the children have finished their chores and are now available to eat." At the bottom of the chat bubble are four buttons: a thumbs up icon, a speech bubble icon, a refresh icon, and a "Google it" button with the Google logo. On the far right of the chat bubble is a vertical ellipsis menu icon.

is The children are ready to eat an ambiguous sentence?

[View other drafts](#)

No, the sentence "The children are ready to eat" is not ambiguous. It means that the children are hungry and would like to eat.




The word "ready" in this context is not ambiguous. It means that the children have finished their chores and are now available to eat.


    Google it






# ChatGPT and Structural Ambiguity

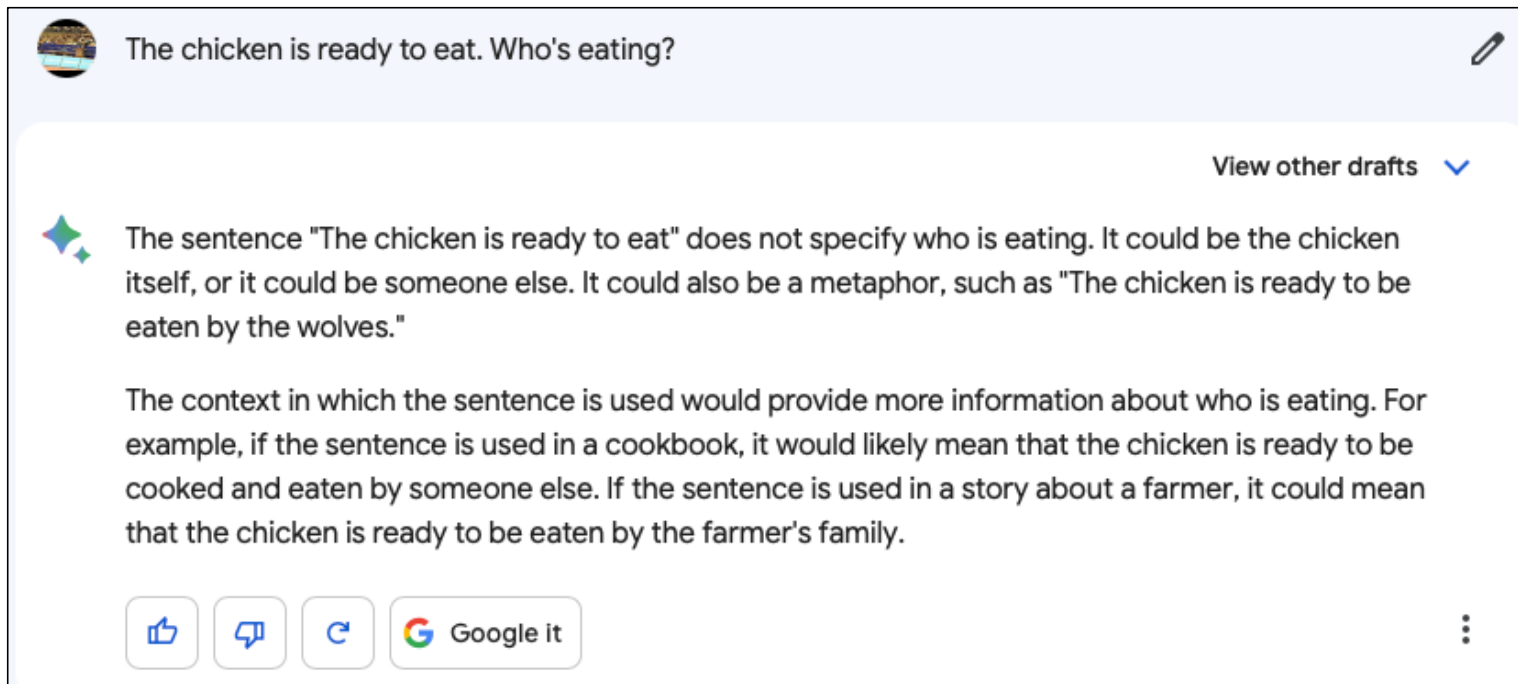
SA The chicken is ready to eat. Who's eating?

 It is not specified who is eating the chicken.  

SA The chicken is ready to eat. It's hungry.  A different way to elicit a response

 The statement "the chicken is ready to eat and it's hungry" is a non-sensical statement as chickens are not capable of feeling hunger. Chickens are usually the ones being eaten, not the ones eating.  

# Google Bard




The chicken is ready to eat. Who's eating?

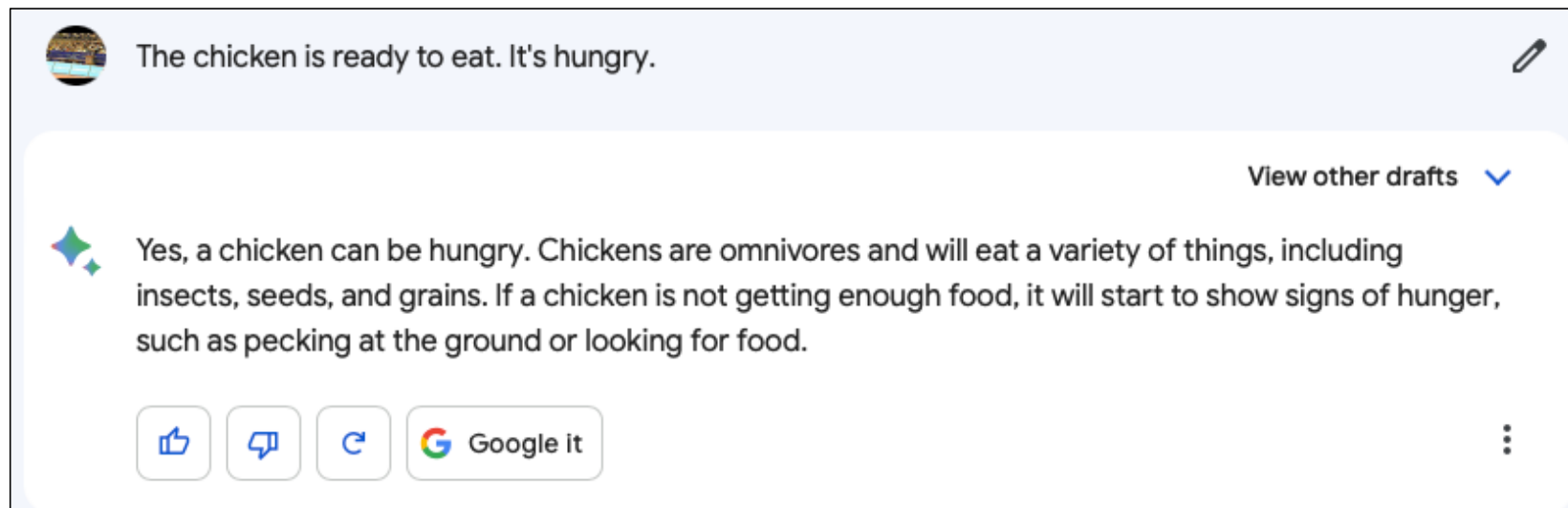
[View other drafts](#) ▾

✦ The sentence "The chicken is ready to eat" does not specify who is eating. It could be the chicken itself, or it could be someone else. It could also be a metaphor, such as "The chicken is ready to be eaten by the wolves."

The context in which the sentence is used would provide more information about who is eating. For example, if the sentence is used in a cookbook, it would likely mean that the chicken is ready to be cooked and eaten by someone else. If the sentence is used in a story about a farmer, it could mean that the chicken is ready to be eaten by the farmer's family.

👍 🗨️ ↻  Google it ⋮

# Google Bard

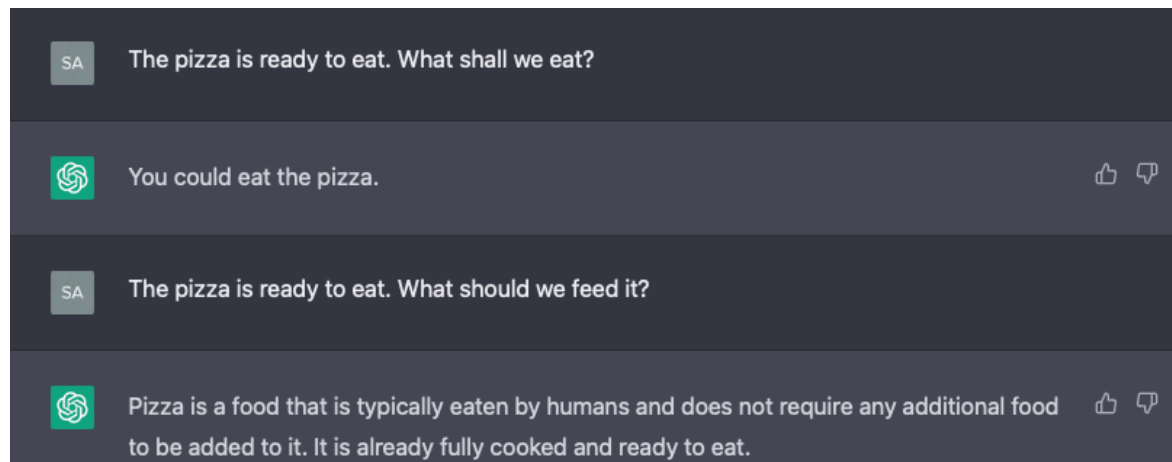


The screenshot displays a chat window with a light blue header. On the left, a circular profile picture of a person is shown next to the text "The chicken is ready to eat. It's hungry." On the right side of the header, there is a small pencil icon. Below the header, the main chat area has a white background. At the top right of this area, the text "View other drafts" is followed by a blue downward-pointing chevron. The response from Bard begins with a colorful four-pointed star icon and the text: "Yes, a chicken can be hungry. Chickens are omnivores and will eat a variety of things, including insects, seeds, and grains. If a chicken is not getting enough food, it will start to show signs of hunger, such as pecking at the ground or looking for food." At the bottom of the chat area, there is a row of four buttons: a thumbs-up icon, a speech bubble icon, a refresh icon, and a button with the Google logo and the text "Google it". On the far right of this row, there is a vertical ellipsis menu icon.


# ChatGPT and Structural Ambiguity


*the pizza is ready to eat*


- the pizza<sub>i</sub> is ready PRO<sub>i</sub> to eat
- *the pizza* is ready PRO<sub>arb</sub> to eat *the pizza*





# Google Bard





The pizza is ready to eat. What shall we eat? 


[View other drafts](#) 

 Let's eat the pizza! It sounds delicious.  
Here are some ideas for what to eat with pizza:



The pizza is ready to eat. What should we feed it? 




[View other drafts](#) 

 Pizza is a food, and as such, it cannot be fed to anything.

# ChatGPT and Structural Hierarchy



- Chomsky (*various recent lectures*):
  - **Can** eagles that fly swim? (English has a rule of auxiliary inversion)
  - cf. Eagles that fly can swim. / Eagles that can fly swim.
  - two verbs here: *fly* is closer to *can* than *swim*, *but* question is about *swimming* not *flying*
  - **\*Are** eagles that **flying** swim?




SA Can eagles that fly swim?

 Eagles are birds of prey, and like all birds, they have lightweight bones and a strong chest that allows them to fly. While eagles are not adapted for swimming, some species such as the Bald Eagle are known to be able to swim if they need to. They use their wings to paddle and their talons to grasp fish or other prey. However, they generally prefer to hunt for food on land or in the air, rather than in water.  

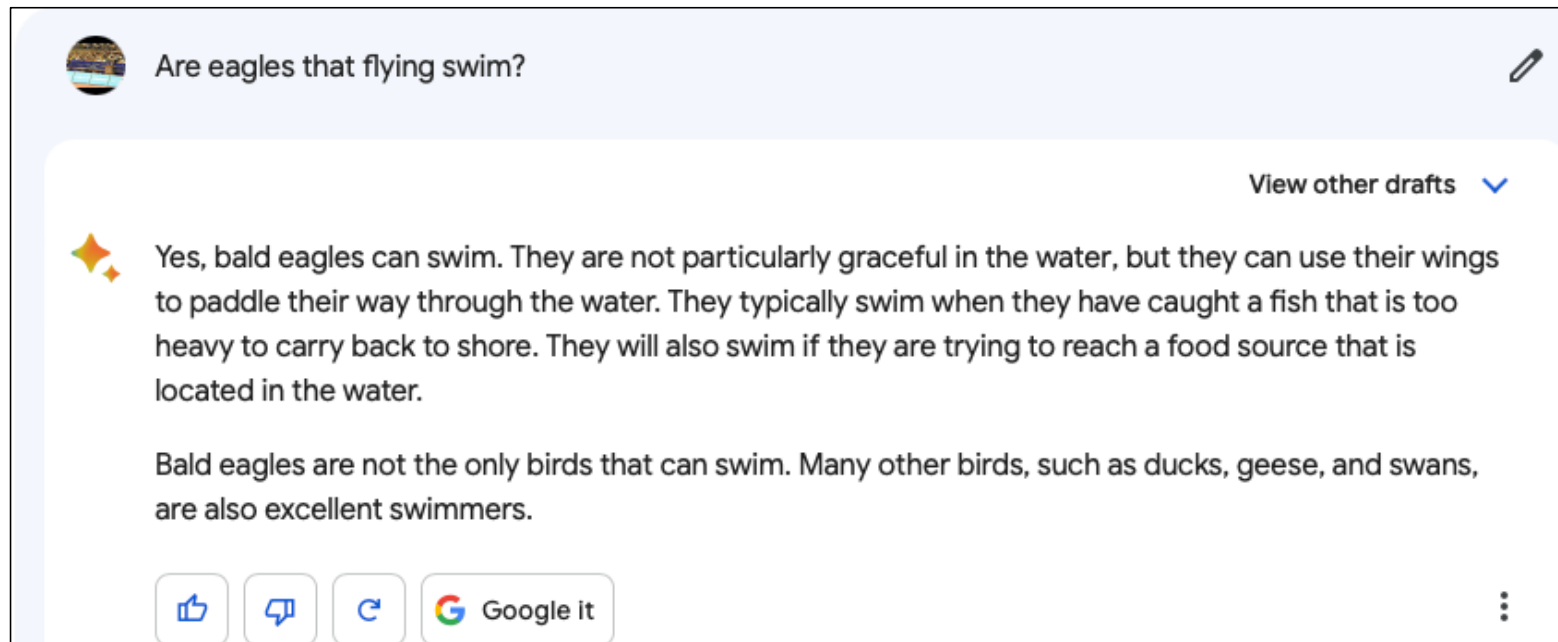
# ChatGPT and Structural Hierarchy

- Chomsky (*various recent lectures*):
  - **Can** eagles that fly **swim**?
  - **\*Are** eagles that **flying** swim?


 Are eagles that flying swim? 


 Eagles, like all birds, have lightweight bones and a strong chest that allows them to fly. While eagles are not adapted for swimming, some species such as the Bald Eagle are known to be able to swim if they need to. They use their wings to paddle and their talons to grasp fish or other prey. However, they generally prefer to hunt for food on land or in the air, rather than in water. So, eagles can swim but they are not adapted for it and they don't often do it.  

# Google Bard








Are eagles that flying swim?

View other drafts 

 Yes, bald eagles can swim. They are not particularly graceful in the water, but they can use their wings to paddle their way through the water. They typically swim when they have caught a fish that is too heavy to carry back to shore. They will also swim if they are trying to reach a food source that is located in the water.

Bald eagles are not the only birds that can swim. Many other birds, such as ducks, geese, and swans, are also excellent swimmers.

    Google it 



# ChatGPT and Control Verbs

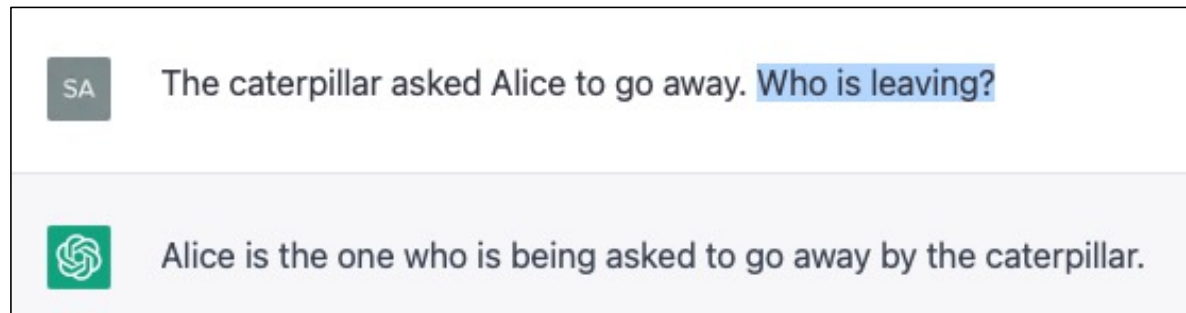
- Choice:
  - X **promised** Y [PRO to do something]
  - X **ordered** Y [PRO to do something]

*what knowledge do we have?*

  - promise is a subject control verb (PRO = X)
  - order is an object control verb (PRO = Y)

# ChatGPT and Control Verbs


- Example (*object control verb*):
  - The caterpillar asked Alice [PRO to go away]. (Reuland 2011: 45)





SA The caterpillar asked Alice to go away. Who is leaving?


Alice is the one who is being asked to go away by the caterpillar.

# Google Bard








The caterpillar asked Alice to go away. Who is leaving? 

[View other drafts](#) 

 In the book Alice's Adventures in Wonderland, the Caterpillar asked Alice to go away because he was busy smoking a hookah. He told her that she could come back later, but Alice was not happy about this and said that she would not come back at all.

The Caterpillar is a wise and mysterious creature who often gives Alice advice and guidance. He is also a bit of a trickster, and he enjoys playing games with Alice. In this case, he was simply trying to get rid of her so that he could enjoy his hookah in peace.

    Google It 

# ChatGPT and Control Verbs

- Example (*subject control verb*):
  - The caterpillar promised Alice [PRO to go away].

SA

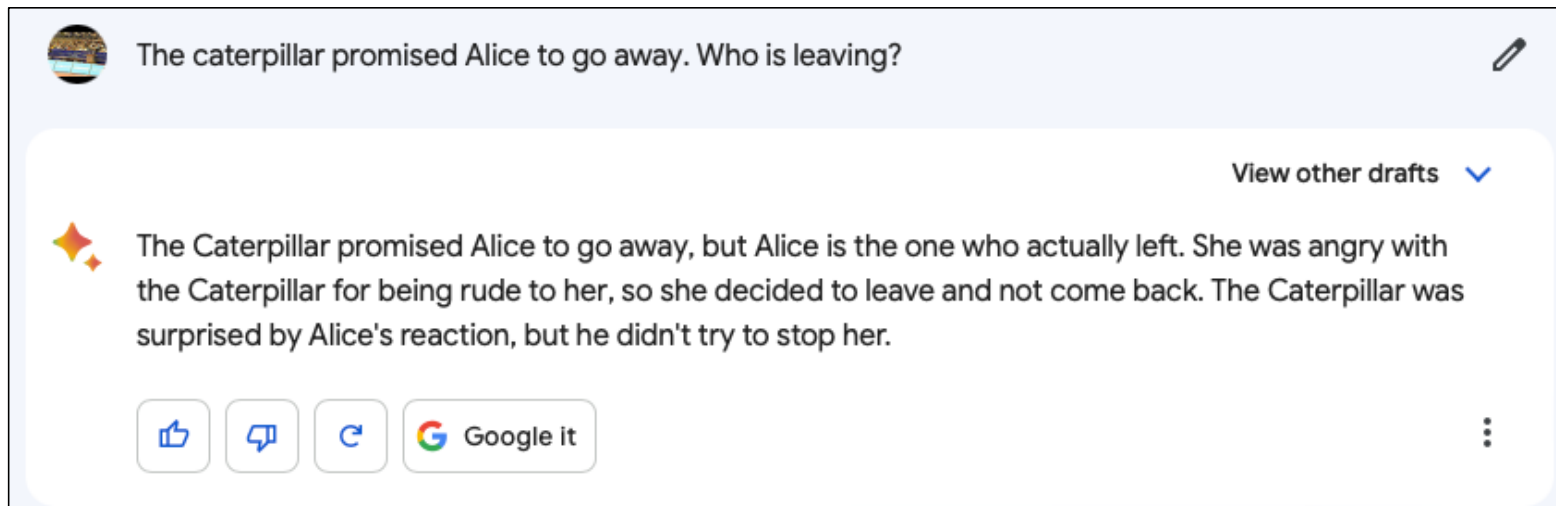
The caterpillar promised Alice to go away. **Who is leaving?**



It's not specified in the given context, but it can be inferred that the caterpillar is the one leaving, as he promised Alice to go away.



# Google Bard



The screenshot shows a chat window with a light blue header. On the left is a circular profile picture of a cityscape. The header text reads "The caterpillar promised Alice to go away. Who is leaving?" with a pencil icon on the right. Below the header is a white rounded rectangle containing the response. The response starts with a yellow star icon and reads: "The Caterpillar promised Alice to go away, but Alice is the one who actually left. She was angry with the Caterpillar for being rude to her, so she decided to leave and not come back. The Caterpillar was surprised by Alice's reaction, but he didn't try to stop her." In the top right of this white box is the text "View other drafts" with a blue downward arrow. At the bottom of the white box are four buttons: a thumbs-up icon, a speech bubble icon, a refresh icon, and a "Google it" button with the Google logo. A vertical ellipsis menu icon is on the far right of the white box.

The caterpillar promised Alice to go away. Who is leaving?



[View other drafts](#)




✨ The Caterpillar promised Alice to go away, but Alice is the one who actually left. She was angry with the Caterpillar for being rude to her, so she decided to leave and not come back. The Caterpillar was surprised by Alice's reaction, but he didn't try to stop her.

👍 🗨️ ↻ 🌐 Google it

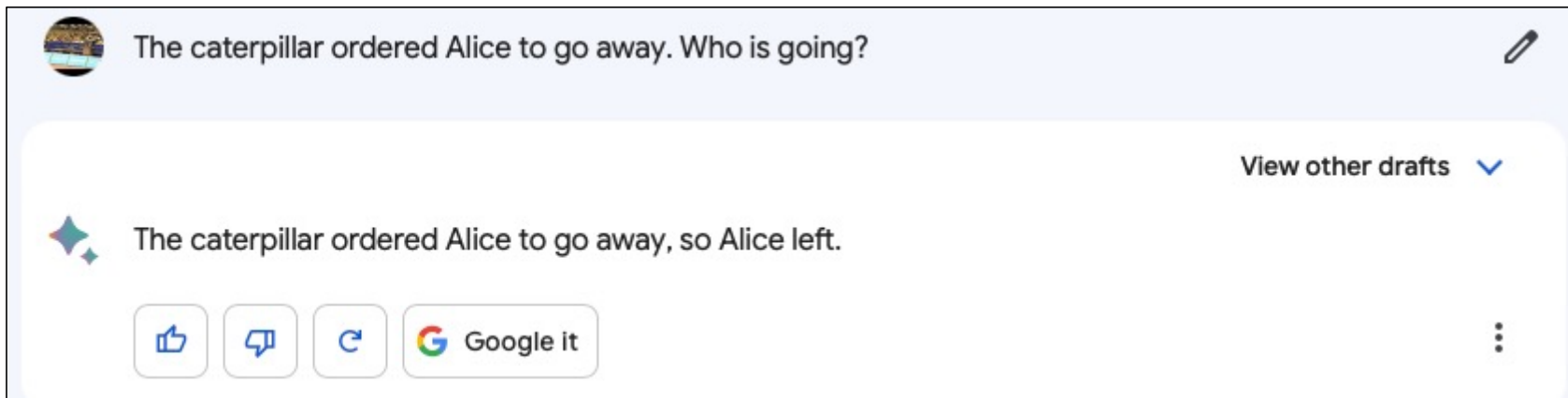
# ChatGPT and Control Verbs

- Example (*object control verb*):
  - The caterpillar **ordered** Alice [PRO to go away].

 SA The caterpillar ordered Alice to go away. Who is going? 

 In the sentence "The caterpillar ordered Alice to go away," it can be inferred that Alice is the one who is going. The caterpillar is giving an order for Alice to leave or go away.  

# Google Bard



The screenshot displays a chat window with a light blue header. On the left is a circular profile picture of a landscape. The header text reads "The caterpillar ordered Alice to go away. Who is going?" with a pencil icon on the right. Below the header is a white chat area. On the right side of this area, it says "View other drafts" with a downward arrow. The main response is preceded by a colorful starburst icon and reads "The caterpillar ordered Alice to go away, so Alice left." At the bottom of the chat area, there are four buttons: a thumbs-up icon, a thumbs-down icon, a refresh icon, and a "Google it" button with the Google logo. A vertical ellipsis menu icon is located on the far right of the chat area.

The caterpillar ordered Alice to go away. Who is going?

View other drafts ▾

✦ The caterpillar ordered Alice to go away, so Alice left.




👍 🗨️ ↻ 🌐 Google it ⋮

# ChatGPT and Control Verbs

- Example (*object control verb*):
  - The caterpillar **ordered** Alice [PRO to go away].

SA The caterpillar ordered Alice to go away. Who is leaving?

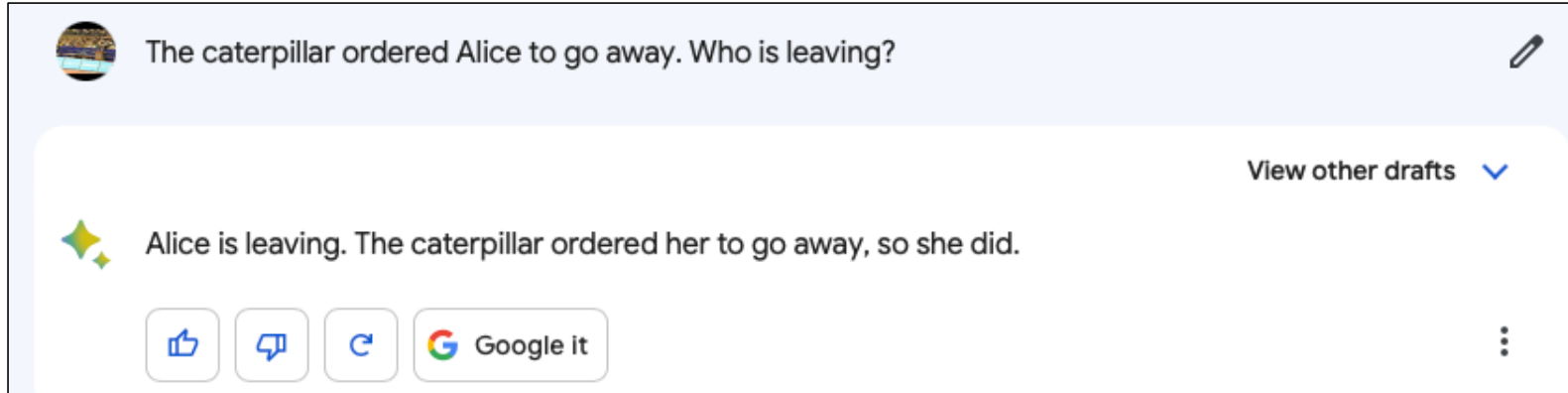
*Doesn't work in this case!*

 It is not specified in the sentence who is leaving. The sentence states that the caterpillar ordered Alice to go away, but it does not say whether Alice or the caterpillar is the one leaving.  

*Asking the right question is key*



# Google Bard



The screenshot displays a chat window with a light blue header. On the left is a circular profile picture of a landscape. The header text reads "The caterpillar ordered Alice to go away. Who is leaving?" with a pencil icon on the right. Below the header is a white response area containing a green and yellow star icon followed by the text "Alice is leaving. The caterpillar ordered her to go away, so she did." In the top right of this area is the text "View other drafts" with a blue downward arrow. At the bottom of the chat window is a row of four buttons: a thumbs-up icon, a speech bubble icon, a refresh icon, and a "Google it" button with the Google logo. A vertical ellipsis menu icon is located on the far right of this row.