**Madly Ambiguous**

**1-Line Summary**

This demo teaches guests about structural ambiguity with a fun game that prompts the player to try to trick a computer!

**Background**

Many pieces of language are *ambiguous*: that is, the same piece can mean more than one thing. For example, the word “bank” can refer either to a financial institution or it can refer to the side of a river.

*Structural Ambiguity* happens when the same sentence has more than one meaning. A famous example of this type of ambiguity is: “The girl saw the boy with the telescope”. This single string of words can mean either that the girl used the telescope to see the boy, or it can mean that the girl saw a boy who was holding a telescope. Linguists often assign different abstract syntactic structures to capture the two kinds of meanings, but the sentence itself doesn’t tell you which one is right: in fact, both meanings are correct!

In normal conversations, ambiguity doesn’t usually cause much trouble because the *context* in which you use the sentence will usually make it clear which meaning you intend. However, understanding what parts of the context are important requires a lot of background knowledge about not only language, but also about how the world works.

One way that we know that context is hard is because it is very difficult to teach it to a computer. If you can explain what context matters clearly enough so that a computer can understand it, then you really understand it yourself! But so far, no computer is nearly as good as the average human at using context, although they are a lot better than they used to be.

**Readings**

*Introductory:*

https://en.wikipedia.org/wiki/Syntactic\_ambiguity

You should also read the complete set of Instructions that are at the beginning of the game as well as the Explanation of the computer’s choice!

*Advanced:*

Pitandosi, S. T., Tily, H. & Gibson, E. (2012). The communicative function of ambiguity in language. *Cognition 122,* 280 – 291.

**Materials**

In the Madly Ambiguous folder on the iPad, you will find a link to an online site that has the game: http://madlyambiguous.osu.edu. It is also useful to use the laminated card that show pictures of the scenarios. The card also has a tiny slice of WordNet on the back if you’re doing more advanced explanations.

**The Interaction**

*The Pitch:* Do you want to try to trick a computer?

*Using the Materials*:

HOW THE GAME WORKS:

Have the online game open to the screen where people can type in a word. The game itself includes lots of additional background material that should read before you start, but you don’t want to go through that with visitors (at least not when you’re starting).

The game works completely with the sentence “Jane ate spaghetti with \_\_\_\_\_\_\_\_\_\_” and people need to fill in the blank. Then you ask the computer what interpretation it gets for the sentence and people can check the computer’s guess against their own.

This sentence is ambiguous in two ways. First: the word “with” has different senses and filling in the blank with different kinds of words will encourage people to think of one over another sense. Second (and more advanced): the prepositional phrase “with X” can be abstractly linked to different parts of the sentence (either the verb “ate”, the noun “spaghetti”, or the whole verb phrase) and those different abstract structures are connected with different interpretations.

Here are the main four interpretations for this sentence including some words that encourage the interpretation and a sentence that glosses the intended interpretation. Picture support and the glosses are also on the laminated card.

• Component Part (modifies “Spaghetti”) – the missing word tells you what kinds of things come in the spaghetti. Many food terms will encourage this interpretation: “meatballs”, “tomato sauce”, “cheese”.

🡪 *Jane ate spaghetti that had meatballs in it.*

• Method (modifies “Ate”) – the missing word tells you what tool was used to eat with. Many utensil words will encourage this interpretation: “a fork”, “chopsticks”, “the spoon”.

🡪 *Jane used chopsticks to eat her spaghetti*

• Accompaniment (modifies the whole verb phrase) – the missing word tells you who joined Jane at the table. Many people terms will encourage this interpretation: “her mom”, “the teacher”, “Obama”.

🡪 *Jane was sitting next to the teacher while she ate the spaghetti*

• Attitude (modifies the whole verb phrase) – the missing word tells you what Jane’s approach was while eating. Many emotional terms will encourage this interpretation: “gusto”, “enthusiasm”, “disgust”.

🡪 *Jane acted in a manner showing disgust while she ate the spaghetti*

ASKING THE QUESTIONS

Start by asking people to come up with a word to put in the blank. If they are having trouble, you can suggest one of the encouraging terms above. Once people have offered a word, ask them to think about the “movie they have in their head” when they picture their sentence.

You can use the laminated card at this point, but try to get people to think about both the obvious movie (“do you imagine those meatballs being in the spaghetti?”) and a crazy interpretation (“do you imagine those meatballs sitting next to Jane?”). Some people will find the crazy interpretations impossible, so you might have to suggest a word that helps them (“what if we said her mother instead of meatballs?”).

Once people know what they mean, ask the computer! See if the computer agrees with the person about what the sentence should mean. People can play multiple times. It’s fun to try and trick the computer (see suggestions for tricky words below) and it’s fun to see if you can use a word that will help the computer get a particular interpretation (see the encouraging words above).

It’s important for this demo that you can get people to understand what you mean by MEANING. Framing this as being about the movie or picture that you have in your head is a technique for helping people separate the linguistic form of the sentence from the meaning that form is referring to.

**Messages**

*Critical Take Home*: Sometimes, sentences can have more than one meaning. As humans, we can use context and other cues to figure out the intended meaning, but computers can sometimes have a hard time doing this.

*But wait, there’s more*: Isn’t it a problem that languages have ambiguity in them? Basically, no. Every now and then, ambiguity does cause a problem and we do notice when that happens – an easy way to show this is to refer to someone using a pronoun (anytime there is more than one female around “she” becomes ambiguous). But most of the time we never even notice that ambiguity is happening: our understanding of the context solves the problem before it even arises.

*And still more:* Linguists use fancy tools (like syntactic trees and structural descriptions) to describe the ambiguities used in this demo. Part of a linguist’s job is being able to notice ambiguities even when they aren’t causing troubles, and they need to be able to describe all the different meanings we have in our head even if they aren’t all that common. After all, if you really did want to eat spaghetti sitting next to a giant meatball, you’d want to know how you could talk about it! A lot of what we know when we know a language is about how things are organized abstractly.

This particular program actually draws on a technical on-line thesaurus called WordNet (so long as it is in the default, “basic mode”). WordNet has a lot of words in it and they are organized into hierarchical groups based on their meaning. On the back of the meanings card you’ll see a very small piece of what those grouping look like. This is one kind of tool linguists use to help them think about how words are related to each other (and it’s probably similar, if a lot less complete, to what people actually have in their heads).

A drawback of using WordNet is that it is a fixed thesaurus, so if a particular sense of a word isn’t in there, you can’t find it (even if people really do use it). However, the program does have an “advanced” mode which is a little more sophisticated! In the advanced mode, the program is trained on massive quantities of real text (from online sources), including phrases that people have previously entered into the program! So the program is make its guesses based on the kinds of things people actually do say. Advanced mode is generally better about guessing right, but it still is very far from perfect.

*And a bit more*: Why aren’t computers better at this? We tend to think of sentences as creating meaning in a pretty straightforward way: you know the meanings of the words and you know what they mean when you put them together. But really, we are always drawing on a large amount of background information, including how words are typically used, what the goals of the speaker are, and what we know about the world. It’s not that hard to get computers to learn about some kinds of information – like how frequently a word is used – but the kind that depends on common sense interactions with others and the world is much more difficult to program.

*And one more thing:* Ambiguity is often used for humorous purposes! Groucho Marx has a famous bit involving structural ambiguity (“I woke up in the morning and shot an elephant in my pajamas. How he got into my pajamas I’ll never know!”) and there’s a whole snarky meme out there about “Let’s eat grandma” that focuses on the fact that you can use punctuation (or prosody) to provide useful contextual information.

**Homework**

Computers are getting smarter and smarter but you can still trick most programs that talk to you or that try to understand what you type. See if you can trick your auto-correct or SIRI. Computers have a long way to go to be able to do what people can!

**Make the Link**

**•** Trick Sentences – it’s also a tricky game, and it also involves how we use background knowledge when we process sentences

**Target Audience**

This works for older kids and adults.

**Tips from the Field**

**•** It can be hard for people to come up with words to try out. Try asking them to come up with something super goofy to eat in spaghetti (like “candy”) or something crazy to eat their spaghetti with (like “a shovel” or “a straw”). Or you can ask them to fill in their favorites (favorite foods, favorite cartoon characters, favorite things they saw at COSI).

• If you’re looking for things that really do trick the computer, try “trash”, “seasoning”, “her best friend”, “Doritos”, “metal”, “Trump”, “worms”

• The game is pitched as if the point is to trick it, but it’s just as useful to have the computer get it right, and sometimes that easier for people to do. So feel free to be supportive of the idea that you can help the computer and find words that make the contexts easy!

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