CS7637: Knowledge-Based AI: HW 2

Jing Gan
jgan34@gatech.edu

1 QUESTION 1

1.1 Sandwich list

Type	Name	Count
Sandwich	hamburger, ham and Swiss on a potato roll, meatball sub, shawarma, Monte Cristo, chicken quesadilla, grilled cheese sandwich, veggie panini, bacon, egg and cheese biscuit, sloppy joe, French dip	11
Non-Sandwich	avocado toast, Neapolitan ice cream sandwich, Klondike bar, Pop-Tart, Oreo cookie, Mexican pizza, sushi roll, corn dog, Egg in a basket, pigs in a blanket, buttered English muffin, French toast	12

1.2 Process of incremental concept learning

Updates in models are shown in yellow.

First, I am sure that hamburger is a type of sandwich, so I make it my starting point and set it as a positive example. By variablizing this example, my model looks like this:

[bun] → $(on\ top\ of)$ → [veggies, cheese, meat patty] → $(on\ top\ of)$ → [bun]

Then, I know that ham and Swiss on a potato roll is a type of sandwich, so it is a positive example. Here, I am using the "enlarge-set" heuristic to generalize the model and abstract the feature of bread and filling. Now, an updated sandwich model can also use rolls of potato flour and does not need to include veggies:

[bun or roll] → $(on\ top\ of)$ → [cheese, meat patty, w/wo veggies] →
$(on\ top\ of)$ → [bun or roll]

Next, a grilled cheese sandwich is no doubt a positive example of a sandwich. So again, I use the "enlarge-set" heuristic to generalize and abstract the feature of filling in a sandwich:

[bun or roll] → $(on\ top\ of)$ → [cheese, w/wo (meat patty, veggies)] → $(on\ top\ of)$ → [bun or roll]

Next, I believe a sloppy joe is also a positive example in which the filling is ground beef cooked with veggies and sauce. Thus, I use the "enlarge-set" heuristic to further generalize and abstract the feature of filling:

[bun or roll] → $(on\ top\ of)$ → [one or more fillings (cheese, meat, veggies)] → $(on\ top\ of)$ → [bun or roll]

Next, Mexican pizza is of course NOT a type of sandwich and thus a negative example. I use the "require-link" heuristic here to specialize the model and require the top bun or roll:

[bun or roll] → $(must\ on\ top\ of)$ → [one or more fillings] → $(on\ top\ of)$ → [bun or roll]

Then, French toast is also a negative example. French toast is usually made by soaking bread in a mixture of eggs, milk, and other flavorings, and then cooking it in a pan until it is golden brown. I use the "require-link" heuristic here to specialize the model and require the filling:

[bun or roll] → $(must\ on\ top\ of)$ → [one or more fillings] → $(must\ on\ top\ of)$ → [bun or roll]

So far, I step through my process of incremental concept learning with 4 positive examples and 2 negative examples.

There are sandwiches that I do not include that would make a significant difference to the model. One example is **shawarma**. According to what I read on Google, shawarma can be described as a pita sandwich recipe made with thinly sliced seasoned meat, veggies, and sauce wrapped in pita bread. Wrapping one piece of bread to make a sandwich is against to what my current model's structure as only one piece of bread is now needed and, in this case, one side of the sandwich is sealed. This positive example shows a significant difference from the current one.

1.3 Classification approach

Parameters	ham-burger	ham and Swiss on a po-tato roll	Klon-dike bar	veg-gie pa-nini	sloppy joe	French toast	grilled cheese sand-wich	meatball sub
Bread on top?	YES	YES	NO	YES	YES	NO	YES	YES
Bread at the bottom?	YES	YES	NO	YES	YES	YES	YES	YES
Bread toasted or grilled?	NO	NO	NO	YES	NO	YES	YES	YES/ NO
Filling has cheese?	YES	YES	NO	YES	NO	NO	YES	YES
Filling has meat?	YES	YES	NO	YES	YES	NO	NO	YES
Filling has veggies	YES	NO	NO	YES	YES	NO	NO	YES
Wrapped by one piece of bread?	NO	NO	NO	NO	NO	NO	NO	NO
Filling is sealed around?	NO	NO	YES	NO	NO	NO	NO	NO
Is sandwich?	YES	YES	NO	YES	YES	NO	YES	YES

I select 8 parameters that would be useful in differentiating sandwiches, and they all involve information on structure or ingredients or both. The values of these parameters of 8 potential sandwiches are filled in the table.

Based on these values and the conclusions, an abstracted classification of a sandwich is 1) bread on top, 2) bread at the bottom, 3) one or more fillings, 4) fillings are not sealed around, and 5) not wrapped by one piece of bread.

1.4 Answer "Is a hot dog a sandwich?"

I would like to use the classifier to answer this question. The answer is NO.

A hot dog indeed satisfies 4 parameters of a sandwich: 1) bread on top, 2) bread at the bottom, 3) one or more fillings, and 4) fillings are not sealed around. However, a hot dog is wrapped in a partially sliced bun or roll. To be classified as a sandwich by my classifier, a hot dog must have 2 separate buns and fillings in between.

2 QUESTION 2

2.1 4-year-old joke frame

Call and response Joke

- Setup (call):
- Punchline (response):

Since children at this age do not (or cannot) understand the wordplay and they only care about the structure of a joke, I think only 2 slots are needed: a call (setup) and a response (punchline).

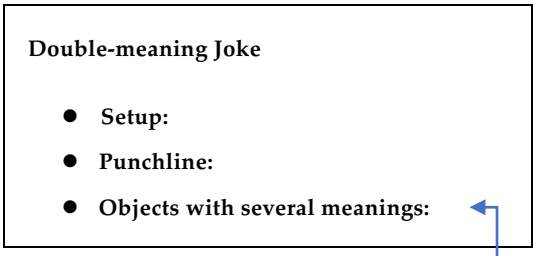
I have considered other slots such as subject, action, object, etc. but find them all unnecessary because children do not care about the actual meaning of the question, who does what, or the grammar. Instead, if a response is yelled out, they laugh.

Example joke I write:

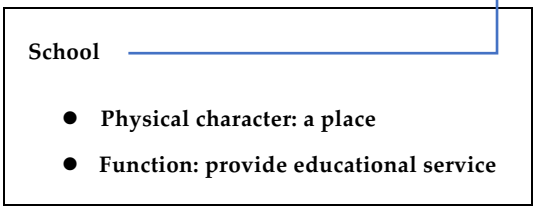
Call and Response Joke Example

- **Setup:** Why is a car not a bus?
- **Punchline:** Because car plane! (You should laugh now if you are 4 years old lol)

2.2 8-year-old joke frame

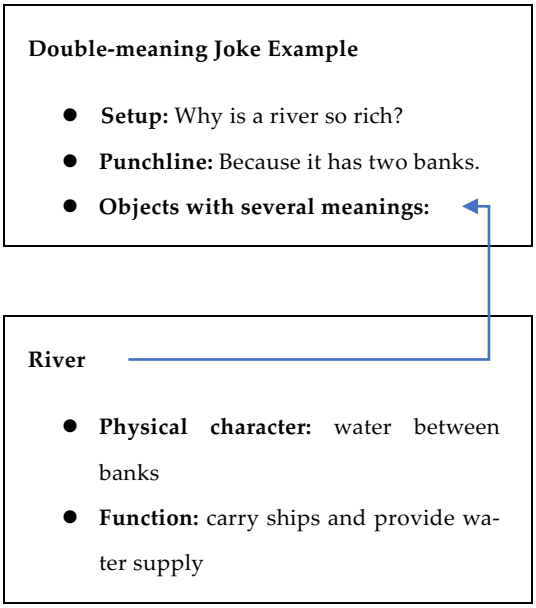


Since I need to include slots representing what generally must be present in *all* such jokes, I generalize the third slot as "Objects with several meanings". Due to the same reason, I don't think other slots are necessary as other more specific slots may fail to cover the common characteristics of all such jokes. In the given higher education joke, the filler here will be "school" which is a location and can function as a provider of education. So:



By considering both the physical character and its function, we can figure out that "ladder in school" refers to "higher education".

Example joke I find:



If we dig deeper into the word "river", the physical character provides the idea of "bank" that relates to "rich". Therefore, we can hit the punchline. The word "rich" cannot have more meanings than "wealthy" so we ignore it.

2.3 Anti-joke frame

Anti-joke

- **Setup:**
- **Punchline:**
- **Expectation:**

According to Wikipedia, there are 3 types of anti-jokes: the yarn, the obvious punchline, the unobvious punchline, and the no-punchline. Here I will only consider the most common type: obvious punchline anti-jokes (the given truck joke is of this type, too).

Except for the setup and punchline, I include one more slot named "expectation". The filler of this slot would be the humorous answer that audiences expect but will never happen. The punchline, however, is the most obvious to the narrative and is intentionally not funny or lacking in intrinsic meaning. I don't think I need other slots as the beauty of anti-jokes is that any humorous expectations or word-plays will not work.

Example joke I find:

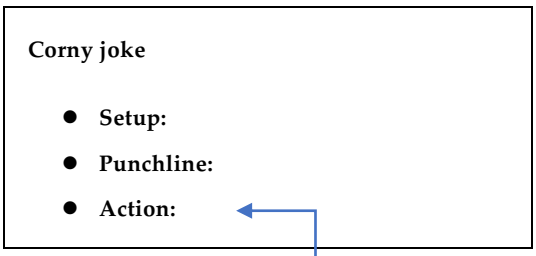
Anti-joke

- **Setup:** Why did the chicken cross the road?
- **Punchline:** To get to the other side
- **Expectation:** Probably something funny about road or chicken?

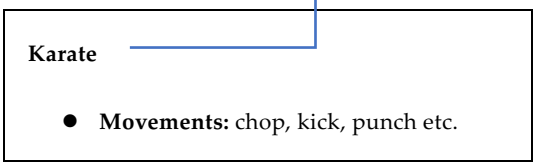
2.4 One more kind of joke - corny joke frame

Corny jokes can be like double-meaning jokes, but they are usually meant to get a laugh. Some of them are so corny that kids might just roll their eyes and walk

away. One example is that "What do you call a pig that does karate?" "A pork chop!" The frame includes 3 slots and looks like this:

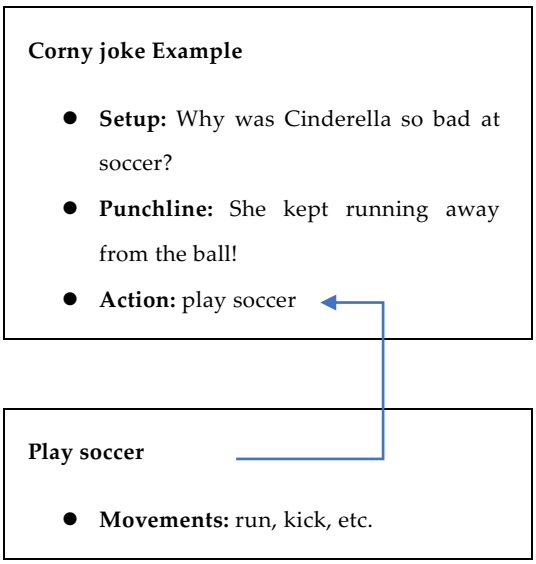


In most corny jokes, to get the punchline people need to think about the actions mentioned in the setup. Just like the pig karate joke, if we can think more about karate, we may be able to combine "pork" with "chop":



I do not include other slots such as objects, subjects, or locations as the main beauty of corny jokes focuses on the action.

Example joke I find:



The word "ball" also has double meanings. Since the word is embedded in the action "play soccer", I do not create a new slot for it.