Homework 2

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1 QUESTION 1 – THE SANDWICH DEBATE

1.1 Manual labeling of sandwiches

In this section, we determine whether a selection of 25 dishes is considered sandwiches, based on our pre-conceptions.

Is sandwich:

BLT on white bread; hamburger; turkey and swiss on potato roll; meatball sub; tuna salad on brioche; chip butty; ice cream sandwich; grilled cheese; turkey hero; ice cream taco; vada pav; cheese quesadilla; veggie burger; patty melt; sloppy joe

Is not sandwich:

chicken wrap; burrito; toast; toaster strudel (people eat this for breakfast?!?); Klondike bar; egg & cheese biscuit; buttered biscuit; gyro; calzone

1.2 Incremental concept learning

We start with a general concept of sandwich using BLT on white bread (figure 1).

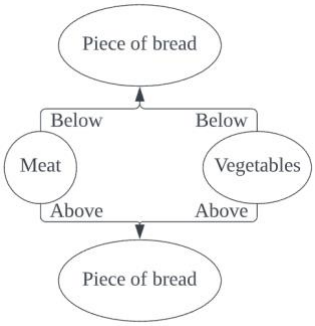

Figure 1— Concept graph based on BLT on white bread.

The concept graph classifies ice cream sandwich as not a sandwich, which is wrong. We generalize it using enlarge-set heuristic (figure 2).

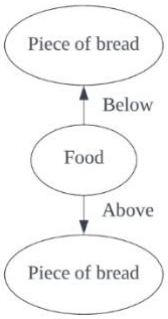

Figure 2 — Updated concept graph based on ice cream sandwich

The concept graph classifies ice cream taco as not a sandwich, which is wrong. We generalize it using drop-link heuristic and climb-tree heuristic (figure 3).

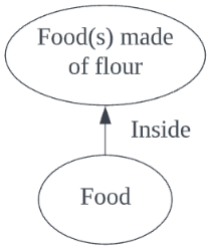

Figure 3 — Updated concept graph based on ice cream taco

The concept graph classifies burrito as a sandwich, which is wrong. We specialize it using forbid-link heuristic (figure 4).

Figure 4 — Updated concept graph based on burrito

The concept graph classifies egg & cheese biscuit as a sandwich, which is wrong. We specialize it using close-interval heuristic (figure 5).

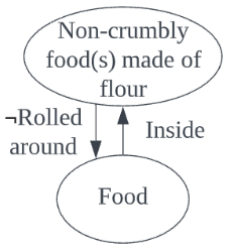

Figure 5— Updated concept graph based on egg & cheese biscuit

The concept graph labels calzone as a sandwich but it is not, so including it would have changed the model. Specifically, the "Non-crumbly food(s) made of flour" cannot be fused together with itself on the ends, which is the close-interval heuristic.

1.3 Sandwich classification

Table 1 shows the sandwich classification based on 5 parameters and 6 sandwiches. The overall abstracted classification of what a sandwich is, is listed in the last column.

Table 1 — Sandwich classification parameters

	BLT on white bread	**Ice cream taco**	**Ice cream sandwich**	**Cheese quesadilla**	**Grilled cheese**	**Veggie burger**	**Overall**
Is outer layer made of flour?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does item float in water	No	No	No	No	No	No	No
Are there 2 outer layers?	Yes	No	Yes	No	Yes	Yes	Maybe
Is there an inner layer containing meat?	Yes	No	No	No	No	No	Maybe
Is there an inner layer containing vegetables?	Yes	No	No	No	No	Yes	Maybe
Is there an inner layer containing food?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Put another way, a sandwich can be defined as

is outer layer made of flour(item) ∧ is there an inner layer containing food(item) ∧ ¬floats in water(item)

1.4 Is a hot dog a sandwich?

Incremental concept learning: Yes, sandwich.

Classifier: Yes, sandwich.

Case-based reasoning: Yes. Closest example of sandwich is meatball sub. Both contain meat, and the outer layer is an elongated bun. Where I'm from, meatball subs essentially come in the same bun as hot-dog buns, with a longer bun.

2 QUESTION 2 – WHO WASN'T WHERE?

2.1 Understanding the statement "She wasn't there"

We first use the thematic role system to represent this sentence as a frame, using background knowledge on what each of the words mean. (table 2)

Table 2 — Frame representation of statement

Thematic role	
agent	she
location	there
time	in the past
presence	false

Certain words in the sentence are also represented in the working memory, or episodic memory, accounting for the context of the sentence. (Table 3)

Table 3 — Frame representation of context

Episodic memory	
location	Room where characters were when murder took place elsewhere
time	Time when murder occurred
Suspects	Mrs. Swettenham, Mrs. Easterbrook, Julia Simmons
Non-suspects	Everyone else

By combining frame representation of statement with the context, we get a better idea of what several of the fillers can refer to – e.g. location of "there" probably refers to "Room where characters were when murder took place elsewhere".

2.2 Differentiating 3 different meanings based on emphasis

Depending on the emphasis, the meaning of each of the fillers in the sentence's frame representation can change. We start by showing most likely frame representation that combines frame representation of sentence with background knowledge.

Table 4 — Most likely frame representation

Thematic role	
agent	Suspects
location	Room where characters were when murder took place elsewhere
time	in the past
Presence	false

If the emphasis was on "she", the agent probably differs from the expected value of suspects, meaning it refers to the non-suspects

Table 5 — Frame representation of statement with emphasis on "she"

Thematic role	
agent	Non-suspects
location	Room where characters were when murder took place elsewhere
time	in the past
presence	false

If the emphasis was on "wasn't", the presence slot is probably true instead of false.

Table 1 — Frame representation of statement with emphasis on "wasn't"

Thematic role	
agent	Non-suspects
location	Room where characters were when murder took place elsewhere
time	in the past
presence	true

And if the emphasis was on "there", the location slot probably refers to a different location than "Room where characters were when murder took place elsewhere".

2.3 Possibility to explore alternate interpretations

Similar to what we have done above, the agent can create a "most likely" frame based on context and background knowledge.

Background knowledge can have multiple values, e.g. a most likely agent of "suspects" and an alternative agent of "everyone else". Any indication that the sentence refers to the alternative, such as different emphasis, can then point to the alternative instead of most likely agent.