

(L) Peeled Potato Act with Annie (1/3) [5 points]

Consider the following sentence:

- 1) The girl ate rice with shrimp.

There are multiple different things that this sentence could mean. It could mean that the girl ate rice which contained shrimp; with this meaning, the phrase *with shrimp* modifies the noun *rice*. On the other hand, it could instead mean that the girl used shrimp as tools that allowed her to eat the rice; with this meaning, *with shrimp* modifies the verb *ate*. For this sentence, it is obvious to a human reader that the intended meaning is the one where *with shrimp* modifies the noun rather than the verb, because it is common for shrimp to appear in rice while it is uncommon for people to use shrimp as eating implements. However, this changes if we change the word *shrimp* to *chopsticks*:

- 2) The girl ate rice with chopsticks.

Now it is much more likely that *with chopsticks* modifies the verb *ate* rather than the noun *rice* because chopsticks are usually eating implements rather than ingredients.

With chopsticks and *with shrimp* are examples of prepositional phrases, which modify other phrases to provide more information about those phrases. Prepositional phrases always start with a preposition, such as *to*, *for*, *of*, or *with*. In ambiguous sentences (such as 1 or 2), it is usually easy for humans to tell whether the prepositional phrase is intended to modify the noun or the verb, but for computers this task can be much harder because the computers might not have all of the background knowledge that humans use to make this judgment. In the following article about Annie, a circus performer, each italicized component contains a prepositional phrase that could potentially be describing a noun or a verb:

Annie [1] *joined the circus as tightrope walker*, but she [2] *is now head of the acrobats*. She [3] *performs her main act in a purple leotard*. Annie best [4] *likes the routine with the trapeze*, because she [5] *had liked that act as a child*. She usually [6] *performs this act with gusto*, but yesterday she [7] *performed this act with sadness*. She [8] *had just lost her lucky penny in the street*. But, at least she [9] *likes her new good luck charm with the inscription*. Because he was sick, Annie [10] *practiced her routine with Charley* alone yesterday. While Charley is an acrobat, he usually [11] *performs his main act with the clowns*. Charley [12] *likes the act with the bananas*, but Charley best [13] *likes the one with the peach pie*. Tonight, Charley gets to [14] *perform his main act with Annie*. Unfortunately, the peach pie act is not very popular with the audience, so they have to [15] *do the act with the peeled potatoes*.

L1. The table on the next page lists each instance of an ambiguously positioned prepositional phrase in the article about Annie. Some instances are already correctly labeled as either modifying the noun (N) or the verb (V). Fill in the remaining labels in the “Correct Label” column with the most likely label given the context of the instance. Note that adjectives within the sentences are not listed in the table.



(L) Peeled Potato Act with Annie (2/3)

Instance	Preposition	Verb	Noun1	Noun2	Correct Label	Algorithm1	Baseline
[1]	as	joined	circus	walker			
[2]	of	is	head	acrobats	N		
[3]	in	performs	act	leotard			
[4]	with	likes	routine	trapeze			
[5]	as	liked	act	child			
[6]	with	performs	act	gusto			
[7]	with	perform	act	sadness			
[8]	in	lost	penny	street			
[9]	with	likes	charm	inscription			
[10]	with	practiced	routine	Charley			
[11]	with	performs	act	clowns			
[12]	with	likes	act	bananas			
[13]	with	likes	one	pie			
[14]	with	perform	act	Annie	V		
[15]	with	do	act	potatoes	N		

L2. A computer would struggle to predict the correct labels for these instances, but you can help it by giving it some rules to guide its decisions. These rules will be interpreted in a specified order such that, once an instance has been labeled by one rule, its label cannot be changed by any later rules, even if those rules would apply if it had not yet been labeled.

You are considering using the following rules:

- A. If the Verb is a form of “to like” (e.g., likes, like, liked), label the instance as N.
- B. If the Preposition is “with” and Noun2 contains a food item, label the instance as N.
- C. If Noun1 is “act”, label the instance as V.

For Algorithm1, you order the rules as follows:

1. A
2. B
3. C

Fill in the label that Algorithm1 would assign to each instance in the “Algorithm1” column of the table above. If the algorithm does not produce a label for an instance, leave that cell blank.



(L) Peeled Potato Act with Annie (3/3)

L3. A baseline is a starting point (the default predictions) that can be used to determine whether an algorithm improves labelling prediction. Because it is a default, the baseline consists of only one rule and applies to all instances (ie, there will be no blank labels). If you were a computer scientist developing Algorithm1, before testing Algorithm1, you should have already made a baseline algorithm for the article about Annie, and you found that Algorithm1 gets 10 labels right, gets 1 label wrong, and leaves 4 blank. The baseline gets 8 right and 7 wrong, leaving 0 blank. State a single rule that could have been the rule you used as your baseline.

Then, in the “Baseline” column of the table on the previous page, fill in the label for that instance given by your baseline.

L4. What order should the rules A, B, and C be placed in an algorithm in order to obtain the highest accuracy possible? Write the letter of the rule next to the number of the order that it is placed in.

1. 2. 3.

L5. Explain how you chose the baseline in L3 and why you ordered the rules the way that you did in L4.

