

HW4 – Understanding Propositional Logic and Entailment – 75pts

(Study homework before the exam – even though due date is Apr. 17, please solve before the exam)

Imaging you have two rules in your simple medical robot that will diagnose patients (lets assume symptoms and diseases are independent and can all happen, one does not preclude the other etc):

LossofSmell \Rightarrow Covid19

RunnyNose \Rightarrow Cold

You can think that the initial KB is $KB_0 = (\text{LossofSmell} \Rightarrow \text{Covid19}) \wedge (\text{RunnyNose} \Rightarrow \text{Cold})$

1 – 25pts

- a. 5pts - How many possible worlds are there in total with 4 propositions? *This is the number of rows in the table.*

$2^4 = 16$ possible worlds

- b. 20pts - How many possible worlds are in agreement with the knowledge base KB_0 ?

These are the worlds that are agreeable with the knowledgebase (in which KB makes sense).

To answer this, you should fill the table below.

9 possible worlds

2. 50pts - Assume someone came and they have LossofSmell, and you added this to the knowledge base. $KB_1 = (\text{LossofSmell} \Rightarrow \text{Covid19}) \wedge (\text{RunnyNose} \Rightarrow \text{Cold}) \wedge \text{LossofSmell}$

- a) 40pts - Does the new KB (KB_1) entail Covid19? Give your answer and show your work/explain your answer. You should use the table below again.

YES, when KB_1 is True, $\alpha(\text{Covid19})$ is also True. Therefore, this new KB **entails** the Covid19.

- b) 5pts – True or **False**: “The truth values of the other propositions (RunnyNose and Cold) are unknown.” *This is so that you think about what a proposition is. :) Circle the correct answer only.*

- c) 5pts - How many possible worlds are in agreement with this final knowledge base (KB_1)?

3 possible worlds

LossofSmell	RunnyNose	Cold	Covid19	LossofSmell => Covid19	RunnyNose => Cold	KB ₀	KB ₁
T	T	T	T	T	T	T	T
T	T	T	F	F	T	F	F
T	T	F	T	T	F	F	F
T	T	F	F	F	F	F	F
T	F	T	T	T	T	T	T
T	F	T	F	F	T	F	F
T	F	F	T	T	T	T	T
T	F	F	F	F	T	F	F
F	T	T	T	T	T	T	F
F	T	T	F	T	T	T	F
F	T	F	T	T	F	F	F
F	T	F	F	T	F	F	F
F	F	T	T	T	T	T	F
F	F	T	F	T	T	T	F
F	F	F	T	T	T	T	F
F	F	F	F	T	T	T	F

