Answers to exam exercises MAIR

EXAM EXERCISES MACHINE LEARNING AND NLP

1. DECISION BOUNDARIES

a. False

b. True

c. False

d. A=1-NN, B=decision tree, C=logistic regression

2. DECISION TREES AND LOGISTIC REGRESSION

a. True

b. True

c. True

d. False

e.

1. True
2. False

2. NATURAL LANGUAGE PROCESSING

a. Although it is a step that is frequently done, it may remove meaningful information (e.g. capitalization in informal writing, or capitalization of names), which could be problematic for some applications.

b. For example, stemming, removal of infrequent words (see slides for descriptions).

c. 1/5

d. 1/(sqrt(3) * sqrt(3)) = 1/3

2. SPEECH ACTS

a. commissive

b. directive

EXAM EXERCISES COGNITIVE MODELING AND EXPERIMENTATION

1. COGNITIVE MODELING

a. Of the class on modeling, slide 38. You should only mention the general points, so:
(1) Have human-like experience
(2) Make appropriate (adaptive decisions) due to understanding of the user

Your answer should not describe specific examples

b. This question covers the material from the cognitive modeling class, slides 69- 76

Take a look at slide 74, and notice how the measurements relate to the level of detail in the model. Similarly, for slide 73 I described how the level of the model relates to the research question. That is also summarized on slide 75 in a way,

So in this case, you get points for:

(1) making the right choice: “Cognitive band”

(2) the motivation of your answer. That for example be one of the following:

- (motivating why not the other bands) Because her focus is not on neural processes (biological band) nor on efficiency (rational band) or social processes (social band)

- (motivating that data match question) her question is about behavior at the second-level, and her measurements are also at this level (e.g., eye-movement data, data on car position over time). She does not have more fine-grained (millisecond) measures, and her interest is not about bigger time scales (minutes, hours)

1. EXPERIMENTATION

a. Really speaks for itself. For example, class on experimentation, slide 53 IN the marking, you would lose points for every incorrect argument

b. This question requires you to read the Cairns article (and to have noted my questions about it in the appendix of the slides).

You get points for:

(1) making the right choice: external validity

(2) giving a correct motivation, in this case: the sample (AI bachelor students) is not representative for the population at large (all people) about which the researcher wants to draw a conclusion

EXAM EXERCISES REASONING

1. KNOWLEDGE-BASED REASONING

a. The human beings that have at least one female friend and no male friends.

b. $\exists y\big(friend(x,y) \wedge Female(y)\big) \wedge \neg\exists y(friend(x,y) \wedge Male(y))$

c. $\forall \text{friend}.\,(\text{Male} \sqcap \exists \text{friend}.\,\text{Female})$

d. No. The fragment of FOL without function symbols and only unary predicates is decidable (slides).

e. Model $M = (D, I)$, where $D = \{a, b\}$ and $I(R) = \{(a, b), (b, a)\}$.

f. $\exists x \exists y \exists z(x \neq y \wedge y \neq z \wedge x \neq z)$

g. $\forall x(P(x) \rightarrow \exists y(x \neq y \wedge \neg R(y))$

2. SYMBOLIC VS SUBSYMBOLIC AI

The symbolic approach.

3. HUMAN REASONING

a. Slides 20 & 23 of Lecture 15.

b. Human's tend to conclude $\neg Axy$ from Ixy (slide 9 Lecture 15). Therefore, the syllogism

$$\frac{Ixy\ Azy}{Oxz}$$

will be considered to be true by (many) humans. For if they assume “some x are y” and “all z are y”, they draw the (according to FOL faulty conclusion) that not all x are y, i.e. that some x are not y. Together with the second assumption this then gives “some x are not z", that is, Oxz.

3. ARGUMENTATION

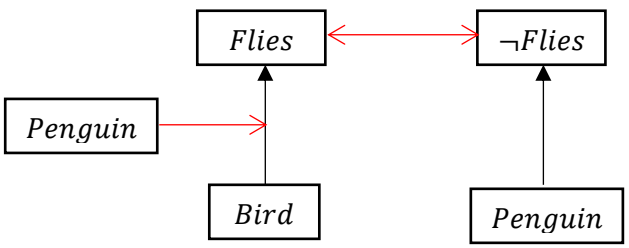
a. Attempt A: If we assume $Bird \wedge Penguin$ we can derive both $Flies$ (from $Bird, Bird \rightarrow Flies$) and $\neg Flies$ (from $Bird \wedge\ Penguin, Bird \wedge Penguin \rightarrow \neg Flies$). Contradiction.

Attempt B: If we assume only $Bird$ we cannot derive $Flies$, that is, we have to explicitly include $\neg Penguin$, that the animal is not a penguin.

b. Note that you can draw a picture (like on the right), but please clearly indicate what’s what (i.e. in the example: red arrows are attacks and black arrows are inferences).

$A_1: Bird$
$A_2: A_1 \Rightarrow Flies$
$B_1: Penguin$
$B_2: B_1 \Rightarrow \neg Flies$
$C: B_1 \Rightarrow \neg r_1$

A_2 attacks B_2 and vice versa. C attacks A_2.



c. left: {A, C}, middle: {A,D}, {B, C} right: {A,C},{A,D}