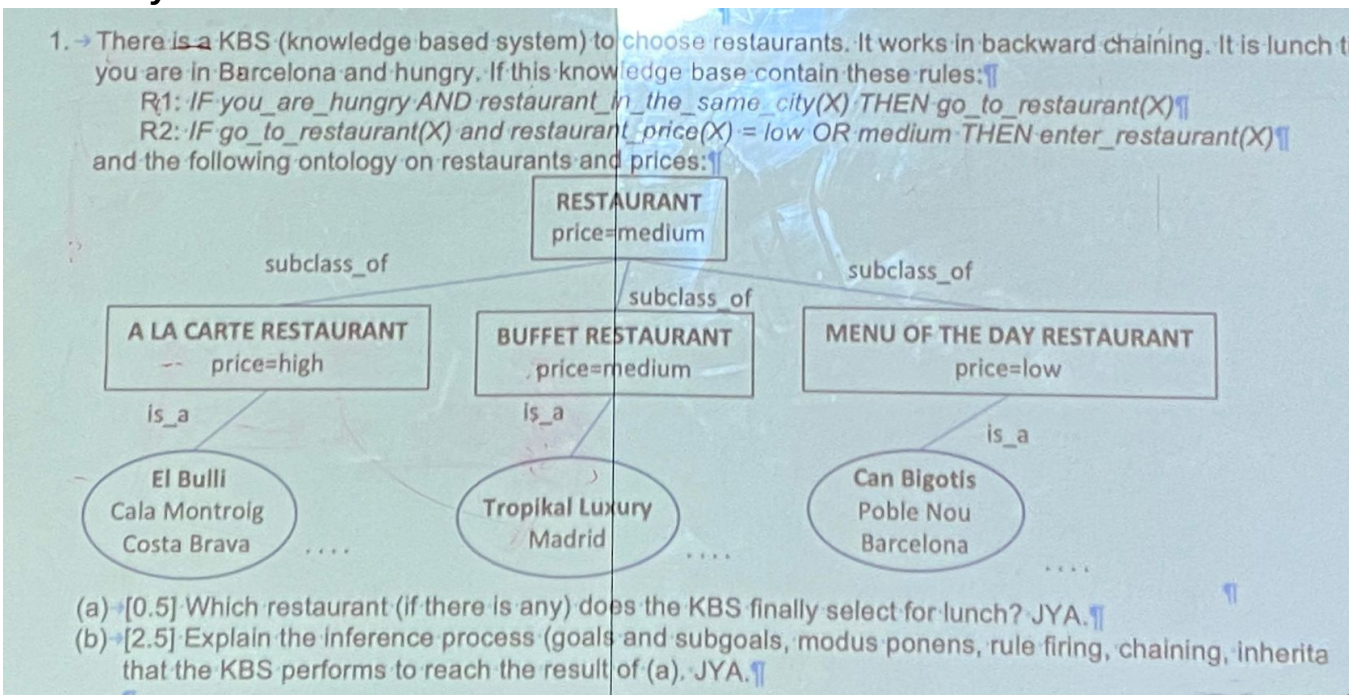
IntroAI Exam Final

1 - KBS system



a) We should go to Can Bigotis.
b)

- Goal: `enter_restaurant`
- Sub goals: `go_to_restaurant`
- Modus ponens:
  If we try to prove $R1$, we try to prove the result of the rule by checking that the left side of the equation is true $\text{Hungry} \land \text{SameCity} \rightarrow GoRestaurant$
- Rule firing:

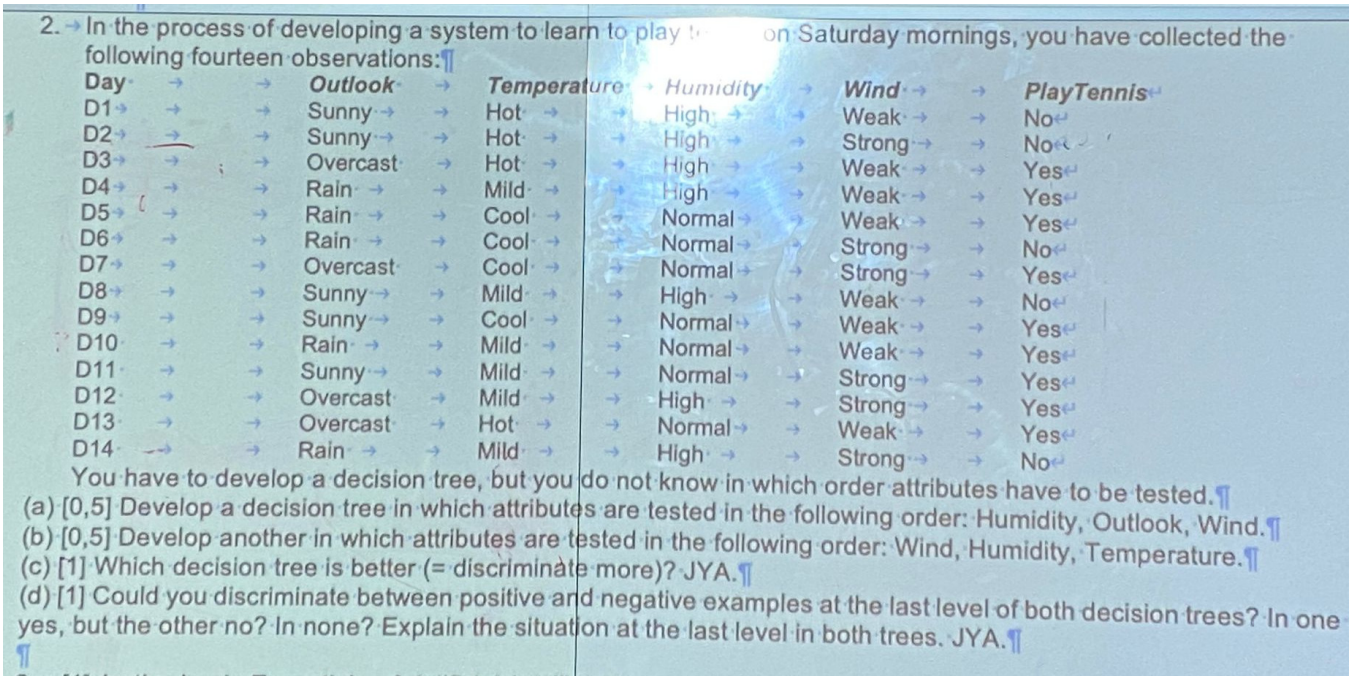
  $$R1 \rightarrow R2$$

  Rule firing is always left to right, in this case it follows $R1 \rightarrow R2$, because of the subgoal `go_to_restaurant`. For rule firing is done by *modus ponens* as well
- Inheritance:
  - e.g. the price of a *Menu of the Day Restaurant* is low, it inheres the price from *Restaurant* but it is overwritten.
  - e.g. the price of *Can Bigotis* is low because it is a *Menu of the Day Restaurant*
  - The `restaurant_price` is deduced from the properties and not from any rule. Whereas the `go_to_restaurant` is deduced from the rule $R1$.

Technically, there are only two rules, *modus ponens* and Inheritance.
Rule firing will always we done by *modus ponens*, the conditions inside the rule are the ones that can be proved by inheritance.

> Just putting down a formula doesn't constitute an answer. What you want is a specific response; you have to explain more. "Given the rules, the solution is... because...". We need to provide more explanation beyond just drawing and writing formulas.
> There's also no need to repeat the obvious.
> Don't shy away from explaining things; there's no need to be reluctant about it.

2 - Inductive Learning (Decision Tree)



2. In the process of developing a system to learn to play t… on Saturday mornings, you have collected the following fourteen observations:

Day	Outlook	Temperature	Humidity	Wind	PlayTennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

You have to develop a decision tree, but you do not know in which order attributes have to be tested.
(a) [0,5] Develop a decision tree in which attributes are tested in the following order: Humidity, Outlook, Wind.
(b) [0,5] Develop another in which attributes are tested in the following order: Wind, Humidity, Temperature.
(c) [1] Which decision tree is better (= discriminate more)? JYA.
(d) [1] Could you discriminate between positive and negative examples at the last level of both decision trees? In one yes, but the other no? In none? Explain the situation at the last level in both trees. JYA.

You have to develop decision tree, you do not know in which order attributes have to be tested.

a) Develop a decision tree in which attributes are tested in the order *Humidity, Outlook, Wind*

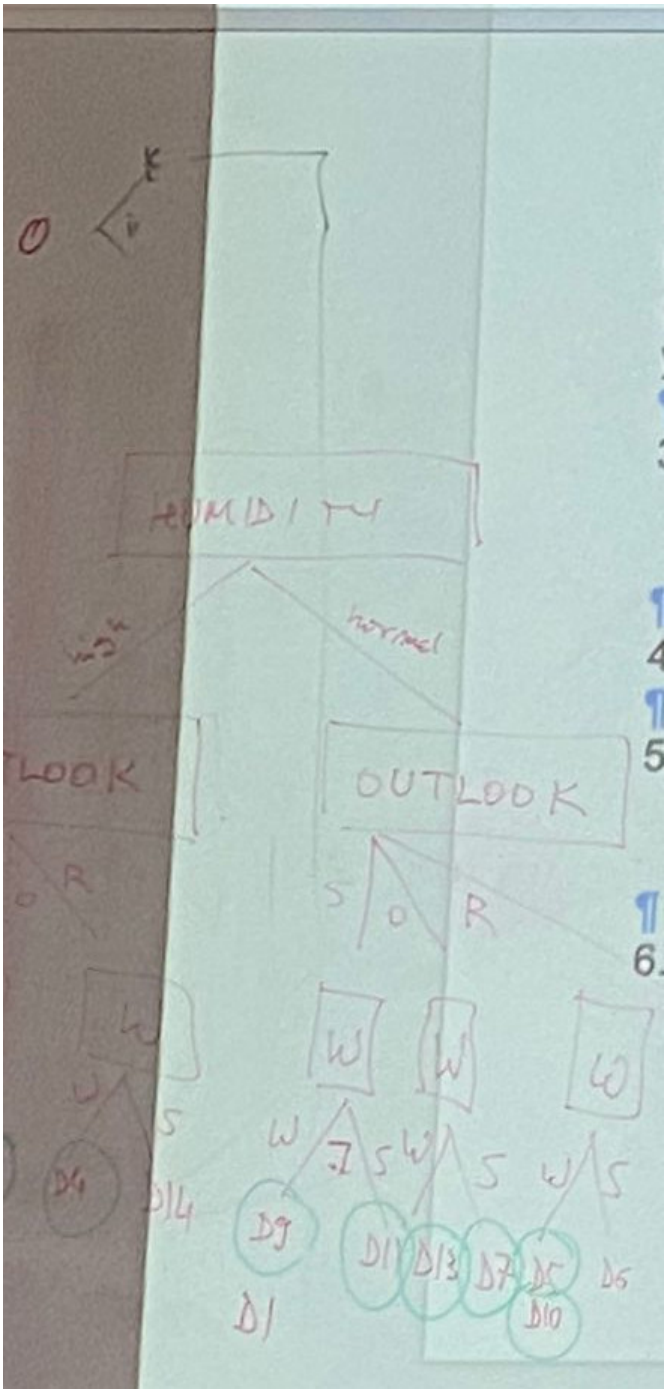
b) ... are tested in the order *Wind, Humidity, Temperature*

c) Answer: Compare to see what performs best.

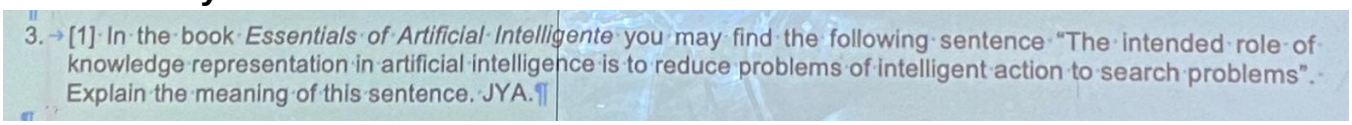
d) Answer: We can discriminate with the first tree at the last level because, for example if we have high humidity and its sunny we don't play.

We need to compare and see if there are more right guesses and fails.

Here there is a sneak peak of the tree (sry i could get a better picture)

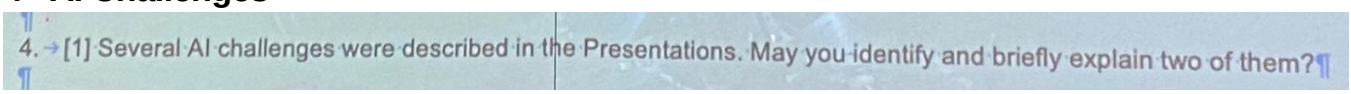


3 - KR Theory


3. [1] In the book *Essentials of Artificial Intelligente* you may find the following sentence "The intended role of knowledge representation in artificial intelligence is to reduce problems of intelligent action to search problems". Explain the meaning of this sentence. JYA.

> knowledge representation allows us to reduce the size of the search space

4 - AI Challenges

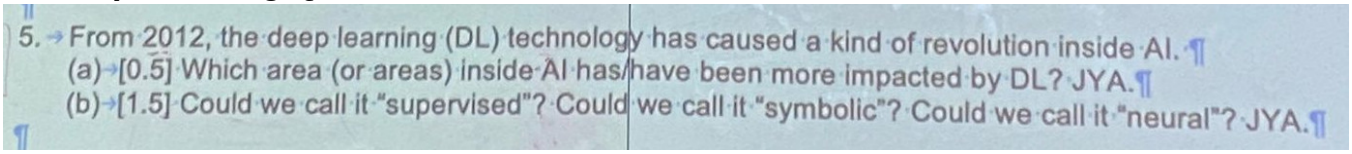

4. [1] Several AI challenges were described in the Presentations. May you identify and briefly explain two of them?

Several AI challenges were described in the presentations (the ones done by students). May you describe and briefly explain two of them?

- Scarcity of training data: There are some problems which are very complicated to solve with large AI models because we have few datasets available.

- Math reasoning abstraction: AI models are not good at abstract math questions and even simple calculations, they have the math knowledge of a 5 year old.
- Computational Expensive models (e.g. Large Languages models)
- Problems with ethics (mainly data collection and privacy)
- Alignment in AI (i.e. no rogue AIs)

5 - Deep Learning Questions


5. From 2012, the deep learning (DL) technology has caused a kind of revolution inside AI. ¶
(a) [0.5] Which area (or areas) inside AI has/have been more impacted by DL? JYA. ¶
(b) [1.5] Could we call it "supervised"? Could we call it "symbolic"? Could we call it "neural"? JYA. ¶

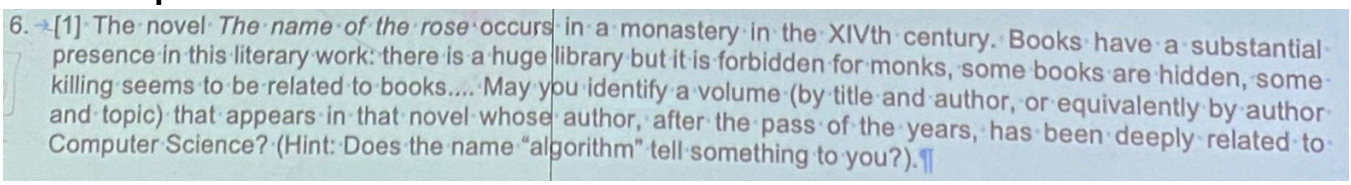
a) Which areas of AI have been more impacted by Deep Learning?

> Computer vision and Natural Language Processing

b) Could we call it "supervised"? Could we call it "symbolic"? Could we call it "neural"?

> It is obviously "neural" because is based on large (deep) neural network, therefore it cannot be "symbolic" because these concepts are the opposite of each other.
> There can be unsupervised deep learning models, for example, for unlabeled image classification. But the vast majority are supervised, because the models require large amounts of data that are usually labeled.

6 - Extra question


6. [1] The novel *The name of the rose* occurs in a monastery in the XIVth century. Books have a substantial presence in this literary work: there is a huge library but it is forbidden for monks, some books are hidden, some killing seems to be related to books.... May you identify a volume (by title and author, or equivalently by author and topic) that appears in that novel whose author, after the pass of the years, has been deeply related to Computer Science? (Hint: Does the name "algorithm" tell something to you?). ¶

This was an extra question, don't think much about it.

> This book.