

[5 points = 2*2.5]

1. Contextual knowledge

1.1

Kai-Fu Lee, former president of Google China, now CEO of SinoVation Ventures, completed his PhD at Carnegie Mellon in 1988. When he started the course, his advisor suggested that he should work on expert systems by "classic" Artificial Intelligence (AI), but Lee argued that such approach was "not scalable" and became a pioneer on Machine-Learning (ML).

→ What could this perspective of a classic expert system being "not scalable" mean?, and to what extent does ML solve this problem?

1.2

Some authors write that Artificial Intelligence is experiencing a "summer", but that the past "winter" should not be forgotten.

→ What is this "AI winter"? Characterize this period by at least two attributes.

[5 points = $8 * (5/8)$]

2. The questions in this group are in the context of propositional logic, with adapted notation.

→ 2.1 What is "satisfaction" of a Boolean expression, by a model?

→ 2.2 What is "logical consequence" between expressions?

Answer T (True) or F (False), depending, respectively, on following model M satisfying the Boolean expression that appears to the right of the satisfaction operator \models .

$M = \{a/\text{True}, b/\text{True}, c/\text{False}\}$

→ 2.3.1

$M \models (a \text{ and } b \text{ and } c)$

→ 2.3.2

$M \models a \text{ and } b \text{ or } c$

→ 2.3.3

$M \models a \Rightarrow c \text{ and } b$

→ 2.3.4

$M \models a \Rightarrow c \text{ or } b$

2.4

Let a, b, c be any Boolean propositions.

Answer T (True) or F (False), depending on whether there is a logical implication.

If you answer F, state ALL models that invalidate the logical implication.

→ 2.4.1

$a, b \text{ or } c \models c$

→ 2.4.2

$a, b, c \models c$

[3 points = 1.5 + 2*0.75]

3. Recall the search algorithms you studied.

→ 3.1 What is the relevance of the access discipline (LIFO or FIFO) in uninformed search algorithms, for the "frontier"/"frontier" data structure?

→ 3.2 True (T) or False (F)?

The BFS (Breadth-First Search) algorithm will, always and guaranteed, find the optimal path/solution.

→ 3.3 True (T) or False (F)?

The BFS (Breadth-First Search) algorithm may be the slowest to find the solution.

[3.5 points]

4. In multi-class classification problems, it is very common to find Python code like the following:

```
from sklearn import model_selection
X_train, X_test, y_train, y_test = \
model_selection.train_test_split (amostras, classesPorAmostra)
```

→ What are the X_train, X_test, y_train, y_test values? Why is it important to separate them?

[3.5 points]

5. Interpretation of solutions.

A neural network model, using the Keras framework for images classification, was declared like this:

```
from keras.models import Sequential
from keras.layers import Dense

iUnits = 32
model = Sequential ( [
    Dense(iUnits, activation="relu", input_shape=(28*28,)),
    Dense(iUnits, activation="relu"),
    Dense(8, activation="softmax") ] )
```

→ What is the number of parameters of the first layer of the network? It is enough to present the mathematical expression, it is not necessary to calculate the value.