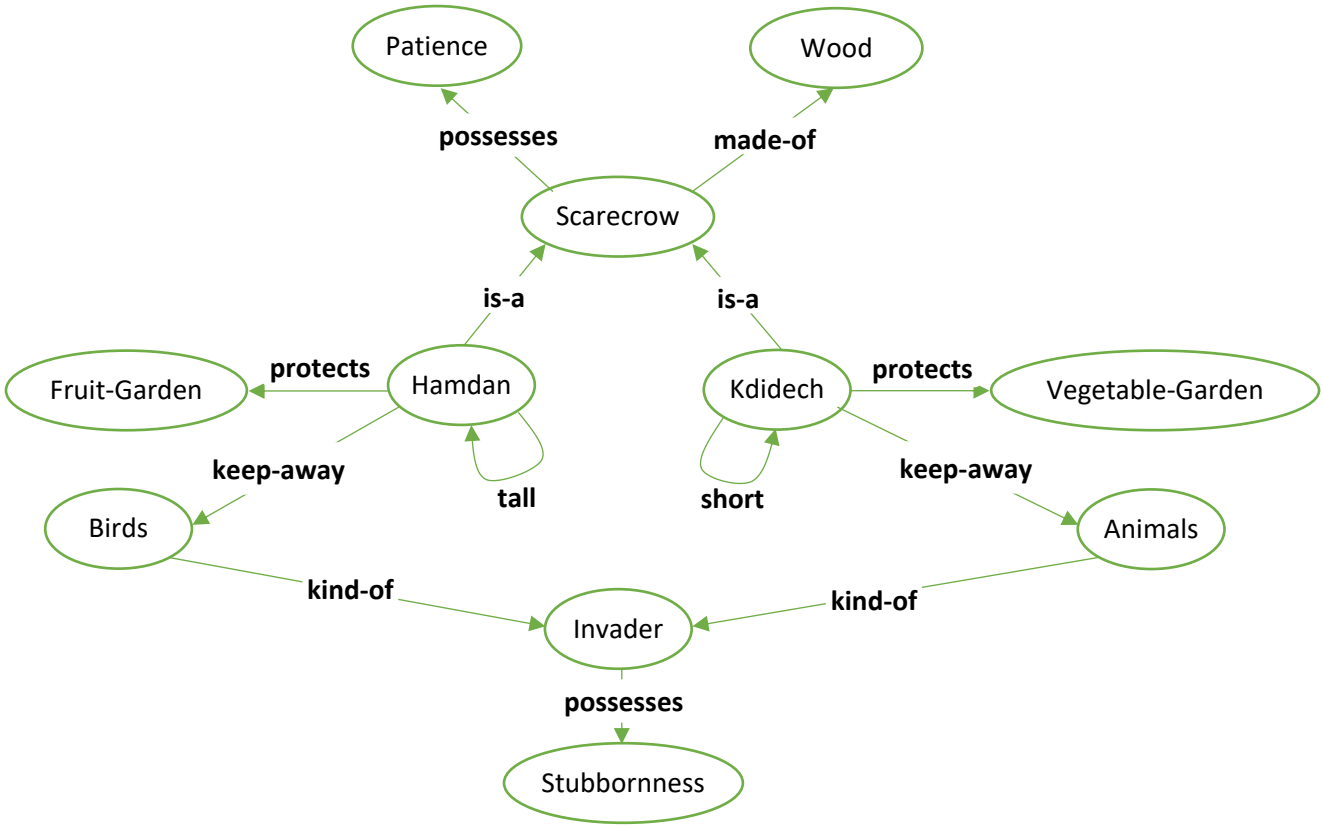
University Djilali Bounaâma of Khemis-Miliana
Department of Computer Science
L3 – Computer Systems (S6)
Final Examination – Artificial Intelligence / Correction
May 2025

Exercise 1 (07 pts): Consider the following discourse

Two wooden scarecrows (فزاعتان خشبيتان), Hamdan and Kdidech. Hamdan is tall, whereas Kdidech is short. Both scarecrows protect their respective gardens from invaders: Hamdan watches over the fruit garden to keep birds away, while Kdidech guards the vegetable garden from animals. The invaders are very stubborn (عنيدون جدا) but the scarecrows are even more patient.

1) Construct a semantic network that accurately represents the given scenario. **(3.5 pts)**



Two correct concepts = 0.25 pt, Two correct relations = 0.25 pt, Correct overall meaning = 0.5 pt

2) Develop a Prolog program that encodes the semantic network. The program should be capable of logically demonstrating that both Hamdan and Kdidech possess the attribute of patience. **(3.5 pts)**

(0.25 pt each)

```
is_a(hamdan,scarecrow).
is_a(kdidech,scarecrow).
tall(hamdan).
short(kdidech).
made_of(scarecrow,wood).
protects(hamdan,fruit-garden).
protects(kdidech,vegetable-garden).
keep_away(hamdan,birds).
keep_away(kdidech,animals).
kind_of(birds,invader).
kind_of(animals,invader).
possesses(scarecrow,patience).
possesses(invader,stubbornness).
possesses(X,Y):-is_a(X,Z),possesses(Z,Y).
```

Exercise 2 (10 pts): We aim to address a color classification task using the K-Nearest Neighbors (K-NN) algorithm. We have a dataset, stored in JSON format. It comprises 100 labeled samples categorized into two color classes: RED and BLUE. Each example is characterized by its corresponding RGB (Red, Green, Blue) color values (see Table 1). The objective is to build a K-NN-based classification model capable of predicting the class label of a given sample based solely on its RGB representation.

Class	R	G	B
RED	179	26	52
	192	12	80
	..	..	..
BLUE	21	13	191
	57	49	155
	…	…	..

Table1. RGB representation

Provide a Python program that accomplishes the following:

- Import all required libraries.
- Load the dataset from the JSON file.
- Separate the RGB features from the class labels.
- Partition the dataset into training and testing subsets.
- Build and train the K-NN classifier.
- Evaluate the classification accuracy of the model on the test set.
- Save the trained model to disk.
- Reload the saved model and use it to predict the classes of three new color samples simultaneously.

Python program:

```python
# Import all required libraries
import json
import pandas as pd
import joblib
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score

# Load the dataset from the JSON file and put it into dataframe
with open("dataset.json", "r") as data:
    content = json.load(data)
df = pd.DataFrame(content)

# Separate the RGB features from the class labels
X = df.drop(columns = ["class"])
y = df["class"]

# Partition the dataset into training and testing subsets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2)

# Build and train the K-NN classifier
knn = KNeighborsClassifier(n_neighbors = 3)
knn.fit(X_train, y_train)

# Evaluate the classification accuracy of the model on the test set
y_pred = knn.predict(X_test)
accuracy = accuracy_score(y_pred, y_test)
print(accuracy)

# Save the trained model to disk
model = joblib.dump(knn, "my_model.pkl")

# Reload the saved model and use it to predict the classes of three new color
# samples simultaneously
my_model = joblib.load("my_model.pkl")
samples = [[153, 41, 25],
           [91, 252, 147],
           [38, 82, 13]]
for sample in samples:
   print(sample, my_model.predict([sample]) )
```

02 pt

01 pt

01 pt

01 pt

1.25 pt

01 pt

1.5 pt

Exercise 3 (03 pts): Match each **year** with the appropriate **event**

1) 1950	A) John McCarthy coins the term 'artificial intelligence'
2) 1956	B) IBM's Deep Blue beats the world chess champion Garry Kasparov
3) 1967	C) Frank Rosenblatt builds the Mark 1 Perceptron
4) 1980s	D) Alan Turing publishes 'Computing Machinery and Intelligence'
5) 1997	E) The revolutionary transformer architecture
6) 2017	F) Neural networks which use a backpropagation algorithm

1) – D)
2) – A)
3) – C)
4) – F)
5) – B)
6) – E)