Departamento de Engenharia de Eletrónica e Telecomunicações e de Computadores

Licenciatura em Engenharia Informática e de Computadores

Third Practical Project

Artificial Intelligence course

2021/2022 Summer Semester

Version 1.00

Teacher: Nuno Leite

ISEL, 3 June 2022

Learning objectives

At the end of the **Third practical project**, students should be able to:

☐ Understand algorithms of Automatic Planning: Total order and partial order planners;

☐ Apply partial order planner to solve the Sokoban game;

☐ Understand how Neural Networks work;

☐ Apply Neural Networks to a classification problem.

First exercise

Extend the planning domain definition of Figures 18.1 and 18.2 (p. 407-408) of Ivan Bratko's book to a Sokoban-like domain. In this domain, there are boxes in the grid, in addition to the Sokoban (instead of robots we have just one Sokoban player). Like the Sokoban, a box occupies a whole cell. The Sokoban at a cell adjacent to a box can push the box to the next cell.

Experiment with the POP planner presented in classes in this domain, and test with puzzles with a single and multiple boxes with increasing difficulty (see links in the Second project assignment).

The developed program must be written in the Prolog language. The input/output is text-based.

Due date: 20 June 2022 until 23:59.

Second exercise

In this exercise, the objective is to study and implement a Neural Network for classification of hand-written digits from a public database.

Study the code from the book "Make your own Neural Network", by Tariq Rashid. The complete code in Python is located in `https://github.com/makeyourownneuralnetwork/makeyourownneuralnetwork/blob/master/part2_neural_network.ipynb`.

You could adapt the code to Java or other language.

The MNIST Dataset of Handwritten Numbers

The format of the MNIST database (available from the researcher Yann LeCun's website `http://yann.lecun.com/exdb/mnist/`) isn't the easiest to work with, so others have helpfully created data files of a simpler format, such as this one `http://pjreddie.com/projects/mnist-in-csv/`. These files are called CSV files (comma separated values).

This website provides two CSV files:

- A training set `http://www.pjreddie.com/media/files/mnist_train.csv`

- A test set `http://www.pjreddie.com/media/files/mnist_test.csv`

See section about this subject in the book.

The application should be as simple as possible (console based). You can generate your own files of handwritten digits and test with the trained Neural Network.

<u>Due date:</u> Until date of Final Discussion in July.

The delivery of the work must present the report and all developed code, delivered in the Moodle system. The report must be concise and justify all decisions taken. It must indicate the student group composition and the curricular unit info.