Departamento de Engenharia de Eletrónica e Telecomunicações e de Computadores
Licenciatura em Engenharia Informática e de Computadores

First Practical Project

Artificial Intelligence course

2021/2022 Summer Semester

Version 1.00

Teacher: Nuno Leite

ISEL, 14 March 2022

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Learning objectives

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

- ☐ Understand and master the syntax of Prolog programs;
- ☐ Understand and master Prolog basic programming constructs such as atoms, numbers, compound terms, lists, operators and arithmetic;
- ☐ Understand and control backtracking;
- ☐ Know how to use typical built-in predicates;
- ☐ Understand how to apply Constraint Logic Programming;
- ☐ Understand how to implement a Two-person, perfect-information game;
- ☐ Understand the minimax principle;
- ☐ Understand the alpha-beta algorithm: an efficient implementation of minimax.

Connect 4 - A two-person game

In this project, your group will design and program the famous game Connect 4. This is a two-person game where players take turns inserting colored discs (each player chooses one color) into a suspended rack. Once dropped into the top of each column, the pieces slot into the lowest spaces in each column.

By inserting discs, players aim to form a row of 4 colored discs all in a row. For instance, if a player is playing with red discs and manages to get 4 red-colored discs in a horizontal, vertical, or diagonal row, the game is won.

The rules of the game can be consulted in:
`https://www.gamesver.com/the-rules-of-connect-4-according-to-m-bradley-hasbro/`.

Your assignment is to develop a Prolog program that allow two human players to play, using the standard input to enter game commands. The Connect 4 table, points, and other info is displayed in the standard output. Hence, the input/output is text-based.

Your program could use Constraint Logic Programming in order to be more efficient.

In addition to allow playing by humans, the program should have an operation mode where a human player plays against the computer. The computer player (AI player) is programmed using the alpha-beta algorithm, an efficient implementation of the minimax principle.

Due date: **11 April 2022 until 23:59**.

The delivery of the work must present the report and Prolog code developed, 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.