AI: Principles & Techniques
Programming task 2 (Linear Programming block)

The goal of this assignment is to get some experience with defining a problem for a linear programming library and with using this problem definition to solve it. Formalize and implement a linear program (LP) of the 8-Queens problem (8 Queens 8x8 board) in Python (version 3.6 or later) using the PuLP package (see the HowTo for installation steps).

For inspiration consult the case studies on the PuLP documentation page (https://www.coin-or.org/PuLP/CaseStudies/a_sudoku_problem.html). In particular the sudoku puzzle is very useful (also shows an example of how to display your final solution). At the very least your implementation should compile, run and return some solution. If you cannot fully solve the problem (i.e. your final solution has Queens threatening each other) clearly explain where you think you've made a mistake and explain how resolving that mistake would have led to a correct solution.

Write a short report, according to the IMRAD method in which you:

- Describe the constraints involved in this problem and formalize it into a LP along with an appropriate objective;
- Describe the main aspects of your formalization and implementation, and argue the choices you made;
- Analyze the complexity of your solution for the general *N-Queens problem* (N queens N x N board) in terms of the number of constraints and decision variables involved.

In your report, answer at least the following questions:

- What are the decision variables in this problem? What values can they take on?
- What are the constraints involved in this problem and why do you need these constraints? How many constraints do you need?
- What is the objective that you need to optimize? Do you need to minimize or maximize this objective or does it not matter whether you minimize or maximize and why wouldn't it matter?
- What is the complexity (Big O notation) of your solution (as a function of N)?
- Is your solution optimal? What does your solution look like (paste it into your report)?

Also check out the assessment form on Brightspace!

The **programming language** for the task is:

1. Python (version 3.6 or later + the PuLP package)

To hand in:
Both report (in .pdf) and (zipped) code. Do not forget your name(s), student number(s), course, number of the task, date, etc. Hand in via Brightspace. If you submit in a couple, let one of the students submit report and code and the other just a text file with the name of the other student for easy reference.

Deadline:
Friday 16-10-2020 23.59 via Brightspace.