Foundations of Artificial Intelligence

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Exercise Session
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2022 Exercise Sessions Recordings:
https://albertometelli.github.io/teaching/2022-teaching-fai

Feedback about Exercise Sessions

https://forms.gle/cXdhh4VFFVeyHWo9A

Please fill the form!

Exam 25 Jan 2022

Constraint Satisfaction Problems (8 points). Consider 5 exams on the same day:

E1 – Foundations of Artificial Intelligence, from 8:30 to 10:00

E2 – Data Mining, from 9:00 to 11:00

E3 – Machine Learning, from 10:30 to 12:30

E4 – Multiagent Systems, from 10:30 to 12:30

E5 – Artificial Neural Networks and Deep Learning, from 11:30 to 13:00

There are 3 PhD students who can supervise the exams of the courses they know something about:

A can supervise E3 and E4

B can supervise E2, E3, E4, and E5

C can supervise E1, E2, E3, E4, and E5

Each exam requires that there is exactly one supervisor and, for a given time instant, a supervisor can only supervise a single exam.

In what follows we consider the above problem modeled as a Constraint Satisfaction Problem (CSP) in which the exams are the variables and the PhD students are the domain values.

Question 1: Write the domains of the variables, considering unary constraints (i.e., the impossibility for a value to be in the domain of a variable).

Exam 25 Jan 2022

Question 2: Write the constraints of the CSP. Use only binary constraints.

Question 3: Apply the AC-3 algorithm to the domains of Question 1 and report the main steps of the computation and the final domains.

Question 4: Looking at the final domains obtained in Question 3, what can you conclude about the existence of a solution?

Exercise 5.3

Solve the 4-Queens problem. The problem consists of placing 4 queens on a 4x4 chess board so that no queen can attack any other. Formulate the problem as a constraint satisfaction problem and solve it using backtracking with minimum-remaining-values heuristic and forward checking. Only one solution is required.