

# SSN College of Engineering

## Department of Computer Science and Engineering

### CS1504 — Artificial Intelligence

2020 – 2021

**Session — 02**

September 08, 2020

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- This homework is due by 11pm on September 11, 2020
  - Grace period may be given up to midnight on September 11, 2020
  - Coding should be done using Python programming language — you may use online coding platforms such as <https://repl.it/>
  - Reference code available at <https://github.com/aimacode/aima-python> may be used
  - Plagiarism is strictly prohibited and strict academic actions may be taken against those who violate
  - You can upload only one ZIP file
  - The naming convention is “<Your first name (first letter capital and all the other letters small)>-CS1504-S02.zip”
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1. Consider the problem of solving a SuDoKu puzzle (See, for example, <https://en.wikipedia.org/wiki/Sudoku>).
    - (a) Formulate this problem as a state-space search by defining the states, initial state, goal test, actions, and path cost. Take extra care when you design your actions to keep the branching factor low.
    - (b) Formulate this problem in Python by subclassing the Problem class in “search.py” of the reference implementation.
    - (c) Create several instances (at least 100) of your problem at different difficulty levels (easy, medium, and hard).
    - (d) Solve all the instances using the following basic search strategies:
      - Breadth-First Search
      - Depth-First Search
      - Depth-Limited Search (is it possible to fix a reasonable limit a priori?)
      - Iterative Deepening Search

You may use the reference Python code to implement these basic search mechanisms.

    - (e) Perform an empirical analysis in terms of number of nodes generated, expanded, actual time taken, completeness, optimality, etc. Which algorithm performs better, in general, on all the instances?
    - (f) What are your ideas to go beyond the basic search strategies to efficiently solve a SuDoKu puzzle?