# Intelligent Systems

## Assignment 7: Solving Problems with Local Search

In this task you will put into practice the topics seen on Problem Solving Agents through local search.

## Set-Covering Problem

In a set-covering model, each member of a given set (set 1) must be "covered" by an acceptable member of another set (set 2). The objective in a set-covering problem is to minimize the number of elements in set 2 that are needed to cover all of the elements in set 1.

## CBS Cameras' Location Problem

CBS has received the TV contract for this year's Super Bowl LIV festivities in Miami. Producers have identified 12 potential camera locations within the stadium. They have also identified 25 stadium areas that may require camera coverage during the pre-game, game, and post-game activities. The camera locations and the stadium areas the camera can cover are given below.

| Camera Location | Stadium Areas |
|---|---|
| 1 | 1, 3, 4, 6, 7 |
| 2 | 4, 7, 8, 12 |
| 3 | 2, 5, 9, 11, 13 |
| 4 | 1, 2, 18, 19, 21 |
| 5 | 3, 6, 10, 12, 14 |
| 6 | 8, 14, 15, 16, 17 |
| 7 | 18, 21, 24, 25 |
| 8 | 2, 10, 16, 23 |
| 9 | 1, 6, 11 |
| 10 | 20, 22, 24, 25 |
| 11 | 2, 4, 6, 8 |
| 12 | 1, 6, 12, 17 |

CBS executives are concerned about costs for the production. Consequently, they set an objective of minimizing the number of camera locations used. In seeking this objective, they want at least one camera to be available to cover each stadium area. Camera location 7 is the "blimp," and executives have decided that the blimp will be used because of viewer expectation and fascination with the shots from this location. Stadium areas 1 and 2 are locker room locations. The viewer interest in football personalities has led the executives to request that at least two camera locations be available to cover each of these areas. Solve the problem to determine the minimum number of cameras needed for coverage.

## Solution with Simulated Annealing or Genetic Algorithms

a) Choose a solution method from Simulated Annealing or Genetic Algorithms.
b) Document your solution by specifying:
    i) How do you describe and codify a solution and how will you represent it in Python for the chosen method?
    ii) How do you generate the initial solution(s)?
    iii) How are the neighbors (or offspring) of the current solution(s) generated during the execution of the method?
    iv) How do you calculate the objective function (or fitness) you want to optimize?
c) Implement the Python functions needed to solve this problem by using the aima code for your chosen method.
d) You must experiment with different parameters trying to find suitable values to solve the problem. Summarize the results of the experiments.

## Notes:

- Be concise in your report, but at the same time clear: describe only the detail needed to understand what you are presenting.
- For me, it is very important to understand how you represented and evaluated the solutions to the problem, as well as your strategies for generating the new solutions in the search process.

## Delivery instructions:

- AIMA files cannot be modified and must not be delivered with the assignment.
- Only one of the team members must upload the completed assignment07.ipynb jupyter notebook file to Blackboard.
- The solution must be contained within the compressed M.zip file, where M must be replaced by the student ids of the team members. For example, A01111111_A00999999.zip should contain the solution of the team whose members are A01111111 and A00999999.
- The notebook must include the team data.

### EVALUATION CRITERIA:

The weights assigned to the activities for the evaluation of this activity are:

- Documentation of the solution: 30%
- Code for solving the problem: 25%

- Correct execution of the notebook: 30%
- Summarize the results of the experiments: 15%

The grade will be augmented (awarded) or reduced (penalized) depending on the quality of the notebook documentation with markdown text, the internal documentation of the Python code, and the writing of the conclusions.