

# CS 335: Beyond Search

Francisco Iacobelli

January 29, 2018

## 1 TASK

Answer the questions and code a program that implements two algorithms to solve the 8 queens problem.

1. Give the name of the algorithm that results from:
  - Simulated Annealing with  $T=0$  at all times and omitting the termination test
  - Genetic algorithm with population of size 1
2. Create a python program called `8-queens.py` that takes in one parameter from the command line: an integer. It then generates as many 8-queens instances as that number indicates. Puzzles will be lists with 8 elements. Each element indicates the position of a queen in a column.
3. In that program, there should be two functions that implement a different algorithm to solve a puzzle. each of these should implement one of the following algorithms: regular hill climbing with steepest ascent, random restart, genetic algorithms or simulated annealing.
4. Each function should also measure the search cost (number of boards generated until convergence) and whether the problem was solved.
5. At the end of the execution of `8-queens.py` there should be a message with: The number of problems tried percentage of solved problems using each algorithm and search cost of each algorithm. A program testing hill-climbing and simulated annealing may output something along the following lines<sup>1</sup>:

```
350 puzzles.  
Hill-climbing:75% solved, search cost:2489;  
Simulated Annealing:97% solved, search cost:1453;
```

## 2 MUST HAVE

- You must explain your reasoning for the first question.
- The answers to the two questions must be in a PDF document.

---

<sup>1</sup>I made up the numbers. Your numbers will be different

- You must have only ONE python file called `8-queens.py` that can read directly from the command line. It should not ask the user for a number. For example, to test 350 puzzles you could invoke the program as follows:

```
python 8-queens.py 350
```

- You must comply with the guidelines for python listed in the next section.

### 3 SUBMIT

ONE ZIP file with (a) a PDF with the solutions to the first question and (b) one PYTHON file with the program.

The python file must comply with the following convention (THIS IS VERY IMPORTANT)

- The first line of your file should indicate the python version as follows:
  - If you are using a flavor of python 3.x, your first line should be: `#!/usr/bin/env python3`
  - If you are using a flavor of python 2.7.x your first line should be: `#!/usr/bin/env python2`
- The second line should have the name of the homework and optionally a couple of words about it. These should be enclosed in three quotation marks. For example: `""" Eliza homework. Relationship advisor """`
- The third line should have your name assigned to the `__author__` variable. For example if your name is "John Doe" your next line should be:
 

```
__author__="John Doe"
```
- Optionally, you can specify a file encoding on your second line and then follow the convention. You do this by adding the following line as a second line:
 

```
# # -*- coding: utf-8 -*-
```

A sample hello world file created with python 2.7.x for John Doe looks like this:

```
#!/usr/bin/env python2
# # -*- coding: utf-8 -*-
""" Hello World program """
__author__="John Doe"

print "Hello World"
```

The same file created with python 3.x looks like:

```
#!/usr/bin/env python3
# # -*- coding: utf-8 -*-
""" Hello World program """
__author__="John Doe"

print ("Hello World")
```