# CHALLENGE: DYNAMIC PROGRAMMING
## INTERNSHIP PROGRAM

## 1 OBJECTIVE

Evaluate how you solve an optimization problem using dynamic programming

- Evaluate how you understand a problem from an explanation and solve it through an algorithm
- Validate your capacity of determine the time complexity of a dynamic algorithm
- Validate your capacity of determine the space complexity of a dynamic algorithm

## 2 PROBLEM

Some weeks ago, Endava decided to buy a robot vacuum cleaner, to keep their building as clean as possible.

The vacuum is programmed to clean a floor once every day. This is how it works; the vacuum checks all the rooms or spaces in the floor and define a serial default route to clean the floor. This means, once the route is defined, each time the vacuum cleans the floor, it traverses the rooms in the same order always.

Nevertheless, Endavans realize some rooms were dirty, but some others were perfectly cleaned. At the beginning, they thought the robot was cleaning rooms randomly. After an exhaust investigation of the smart Endavans, they discovered a pattern that the robot was following. They realized once the robot cleaned a room, it only could clean the next room if it has the same or less amount of garbage of the previous room.

So, decision was clear, robot must be replaced by a new one. However, some Endavans feel the robot was part of the Endava family too, it only needed a little help. Therefore, the company decided to assemble a super team to help the robot to clean as much number rooms as were possible, and of course YOU will be part of this team.

The team received an approval to buy the new IoT dirtiness check sensors. These sensors could determine a level of dirtiness in a room and sent the data through and specific device or machine through a network. Each of these sensors were installed in each room and sent a trace with the level of dirtiness of each room to the robot, every day before the robot start to clean the floor. The Super team figured it out the way of modifying the compiled code inside the vacuum. There was only one ticket to complete and this one was assigned to YOU.

The ticket said:

“As a vacuum I ask you to create an algorithm to allow me to clean the maximum number of rooms, with these constrains.

1. I always clean the rooms in the same order
2. Once I clean a room, the next room I going to clean must have the same or less amount of garbage than the previous one
3. I can not go back to clean a room that I already ignored

Your input is going to be a file that has the next format.

---

```
n
name_0, g_0
name_1, g_1
name_2, g_2
.
.
name_n, g_n
```

---

Where ‘n’ is the number of rooms in the floor, ‘name’ the name of the room, and ‘g’ the amount of garbage in that room.

Your output must be the list of rooms that the robot should traverse in order, to clean as many rooms as possible. i.e for the next input file:

---

```
6
Elevator, 57
Hall, 889
Pingpong, 546
Cafeteria, 867
Terrace, 587
Terrace offices, 34
```

---

The output should be a file with this list of rooms

```
4
Hall, 889
Cafeteria, 867
Terrace, 587
Terrace offices, 34
```

Variables limits:

0 <= n <= 1000, n is integer
0 <= g <= 1000, g is integer
name just has letters and blanks, and maximum 50 characters

Furthermore, the algorithm should not take more than 5 secs to produce the output (in your computer)
“
One more thing, the directives just give 1 more week to resolve the problem of the vacuum, else the vacuum will be replaced. Are you going to let the vacuum dies? It is all on you.

# 3 DELIVERABLES

- Algorithm in your preferred language
  - It receives the input file path by command line
  - Output is a file named “result.txt” in the same location of the code file
- List of your test cases
- Explanation of the time complexity of your algorithm
- Explanation of the space complexity of your algorithm
- Bonus: Add to your algorithm the capacity to calculate sub problems concurrently.

PD: If you have trouble with something or have any question, don’t hesitate to contact Andres Felipe Rodriguez Ortega, the persons who imagined all this.

Good luck 😊