DATA
MACHINE LEARNING
VISUALIZATION

Data Engineer Challenge

Damavis 2023

Data Engineer Challenge

Hello, future Damavis teammate! First of all, thanks for accepting our challenge. You are free to use any programming language from among Scala, Python or Java.

Here's the challenge to evaluate how you code, so please **do not use ChatGPT** or similar, not even to get ideas about which algorithm to develop. Trust us when we say that we are capable of discerning between code generated using concepts from ChatGPT and code produced through independent development. **Send us your own code**, thought and written by yourself without any help from anyone. **We value the presence of documentation** regarding the utilized code structure, the implemented algorithm, and instructions on its execution.

Try not to use any framework or external library, use only the base language capabilities. We value readable code, structure, tests, good code principles and best practices. You are free to choose the programming code paradigm and architecture that you think that fits best. Therefore, **aim to avoid coding in Jupyter Notebooks or in a single file without any structure**.

If you cannot finish the challenge, please send us your partial solution anyway.

It's preferably you to **create a Version Control System (VCS) repository**. Git could be a good choice to track your commits, and easily share your results with us. Although, if you are not familiar with VCS, simply send us a zip file containing your code.

BEST OF LUCK!

The goal is to carry the rod from the top left corner of the labyrinth to the bottom right corner. This rod is not exactly the lightest thing you can imagine, so the participant would naturally want to do it as fast as possible.

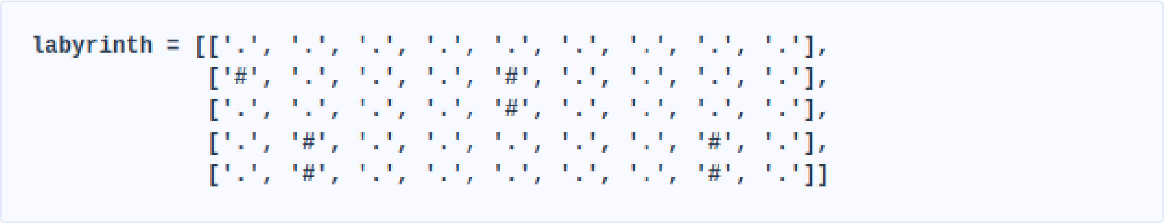
Find the minimal number of moves required to carry the rod through the labyrinth. The labyrinth can be represented as a rectangular matrix, some cells of which are marked as blocked, and the rod can be represented as a 1 × 3 rectangle. The rod can't collide with the blocked cells or the walls, so it's impossible to move it into a position in which one of its cells coincides with the blocked cell or the wall. The goal is thus to move the rod into position in which one of its cells is in the bottom right cell of the labyrinth.

There are 5 types of moves that the participant can perform: move the rod one cell down or up, to the right or to the left, or to change its orientation from vertical to horizontal and vice versa. The rod can only be rotated about its center, and only if the 3 × 3 area surrounding it is clear from the obstacles or the walls.

The rod is initially positioned horizontally, and its left cell lies in [0, 0].

Example 1

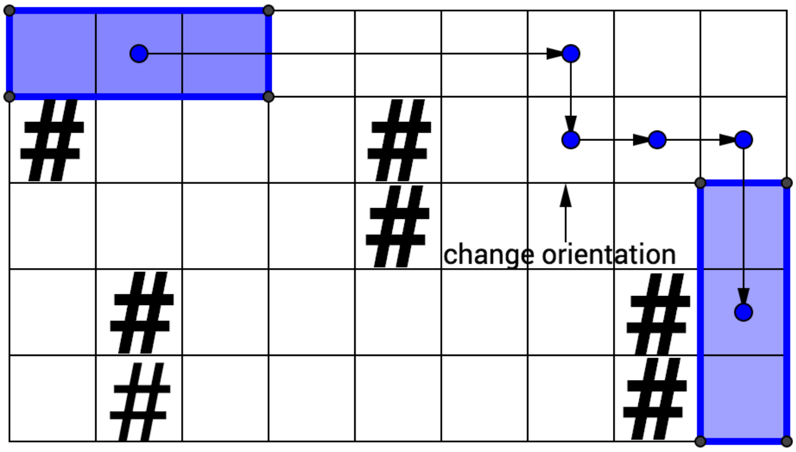
For input



```
labyrinth = [['.', '.', '.', '.', '.', '.', '.', '.', '.'],
             ['#', '.', '.', '.', '#', '.', '.', '.', '.'],
             ['.', '.', '.', '.', '#', '.', '.', '.', '.'],
             ['.', '#', '.', '.', '.', '.', '.', '#', '.'],
             ['.', '#', '.', '.', '.', '.', '.', '#', '.']]
```

the output should be `solution(labyrinth) = 11`

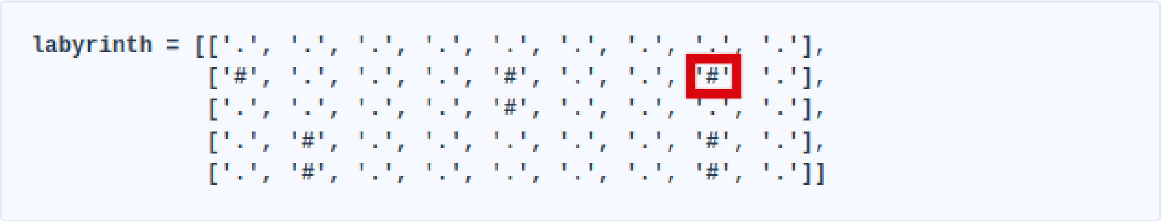
Graphical example



Example 2

Sometimes the goal could be impossible to achieve, in such cases the output will be -1.

For input



```
labyrinth = [['.', '.', '.', '.', '.', '.', '.', '.', '.'],
             ['#', '.', '.', '.', '#', '.', '.', '#', '.'],
             ['.', '.', '.', '.', '#', '.', '.', '.', '.'],
             ['.', '#', '.', '.', '.', '.', '.', '#', '.'],
             ['.', '#', '.', '.', '.', '.', '.', '#', '.']]
```

the output should be `solution(`**`labyrinth`**`) = `**`-1`**

Contract Input Output.

Input

- `labyrinth: List[List[str]]`

  A rectangular array of chars representing the labyrinth, where *`labyrinth[i][j] = '.'`* if the corresponding cell is empty and *`labyrinth[i][j] = '#'`* if the corresponding cell is blocked.

  Guaranteed constraints:

  3 ≤ labyrinth.length ≤ 1000,
  3 ≤ labyrinth[i].length ≤ 1000

Output

- `result: Integer`

A number of moves required to carry the rod to the end of labyrinth or -1 if it is impossible.

Acceptance tests

- **Test 1**:

  labyrinth =
  ```
  [[".",".",".",".",".",".",".",".","."],
   ["#",".",".",".","#",".",".",".","."],
   [".",".",".",".","#",".",".",".","."],
   [".","#",".",".",".",".",".","#","."],
   [".","#",".",".",".",".",".","#","."]]
  ```
  Result 11

- **Test 2**

  labyrinth =
  ```
  [[".",".",".",".",".",".",".",".","."],
   ["#",".",".",".","#",".",".","#","."],
   [".",".",".",".","#",".",".",".","."],
   [".","#",".",".",".",".",".","#","."],
   [".","#",".",".",".",".",".","#","."]]
  ```
  Result -1

- **Test 3**:

  labyrinth =
  ```
  [[".",".","."],
   [".",".","."],
   [".",".","."]]
  ```
  Result 2

- **Test 4**:

  labyrinth =
  ```
  [[".",".",".",".",".",".",".",".",".","."],
   [".","#",".",".",".",".","#",".",".","."],
   [".","#",".",".",".",".",".",".",".","."],
   [".",".",".",".",".",".",".",".",".","."],
   [".",".",".",".",".",".",".",".",".","."],
   [".","#",".",".",".",".",".",".",".","."],
   [".","#",".",".",".","#",".",".",".","."],
   [".",".",".",".",".",".","#",".",".","."],
   [".",".",".",".",".",".",".",".",".","."],
   [".",".",".",".",".",".",".",".",".","."]]
  ```
  Result 16