Python Programming

Position neighbours

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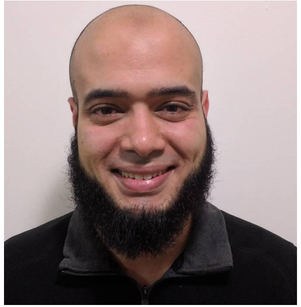
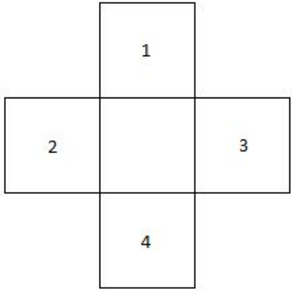


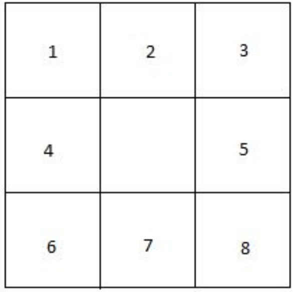
Matrix (grid) Structure

- In menu scenarios, we consider data in 2D structure where we have **same number of columns**
- We call it matrix, grid, 2D array
- Let’s see one of the code tricks that simplifies coding when necessary

Position neighbours

- For a position (i, j)
    - Sometimes we use 4 neighbours
        - **up, right, down, left**
    - Sometimes we use 8 neighbours
        - **up, right, down, left**, up right, up left, down right, down left
        - Given (i, j), can u use a loop of 8 steps and print theses 4 or 8 positions, elegantly?





Hint

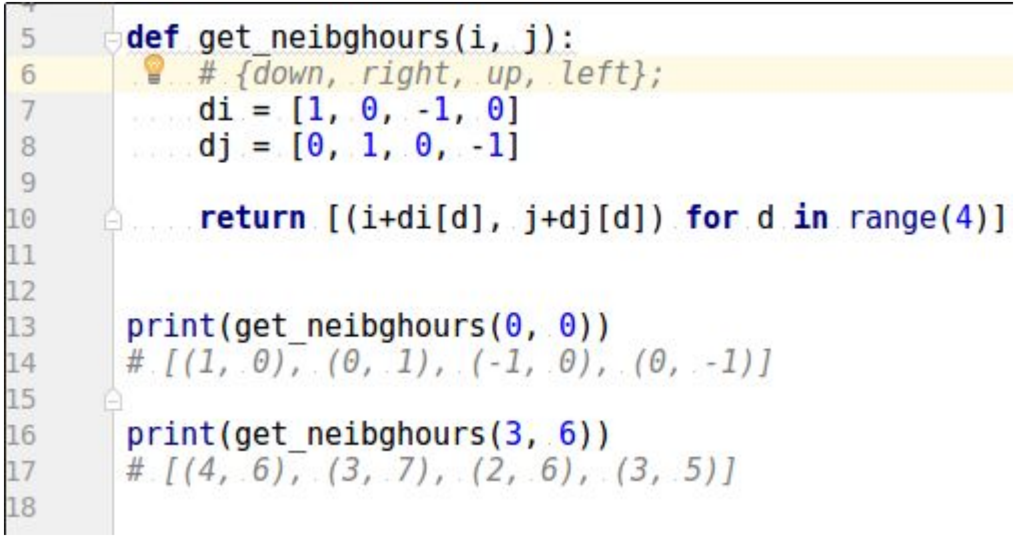
- Think in position (0, 0)
  - What is its relationships between the 8 neighbours?
  - Create 2 1D lists
  - In each list record the differences such that from any (i, j) we get neighbours?

Let’s find the relation

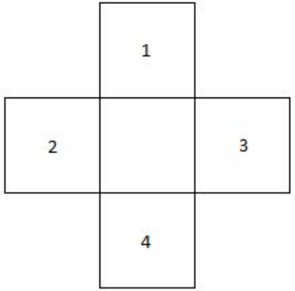
	Up = (r-1, c)	
Left = (r, c-1)	**(r, c)**	Right = (r, c+1)
	Down = (r+1, c)	Diagonal: (r+1, c+1)

- What is change from (r, c) to the down?
  - (r+1, c): row is changed by +1, col is not changed
- What is change from (r, c) to the Left?
  - (r+1, c): row is not changed, col is changed by -1
- We can create 2 arrays to encode these +1/-1/0 changes between locations!
  - Some guys call it **the direction array**

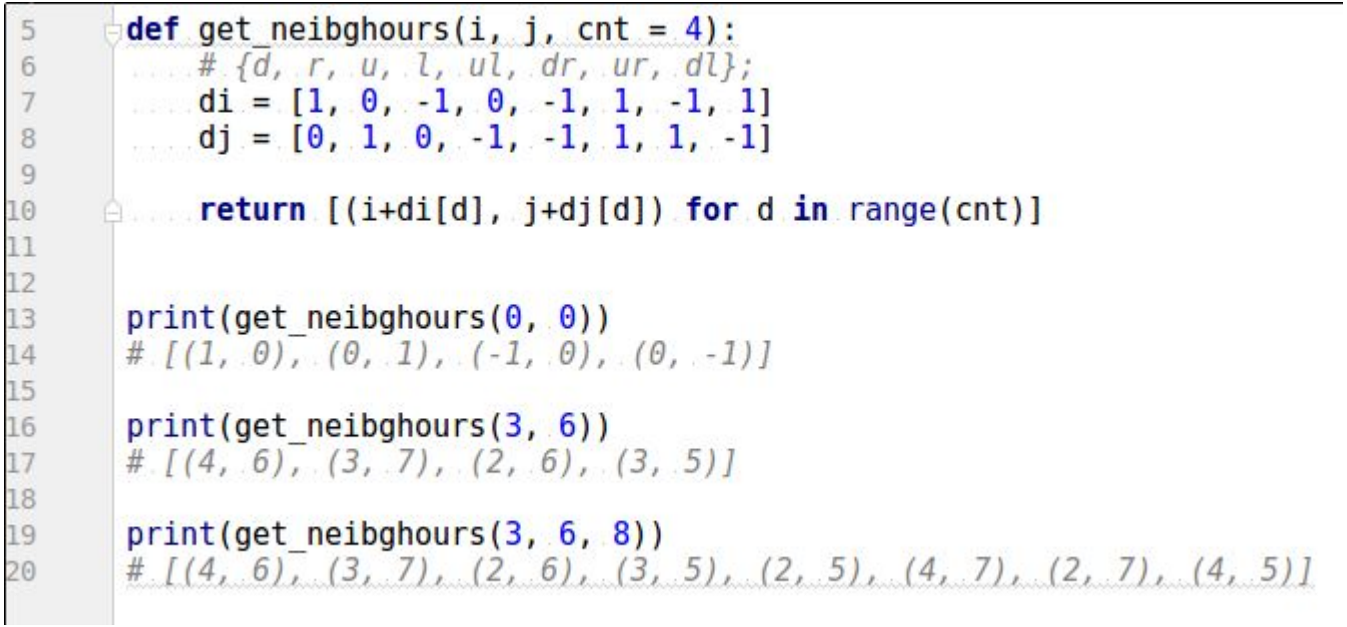
4 Neighbours



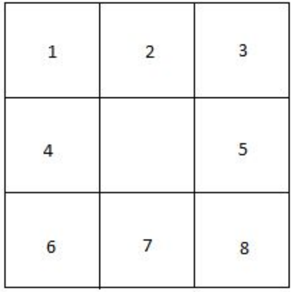
```
def get_neibghours(i, j):
    # {down, right, up, left};
    di = [1, 0, -1, 0]
    dj = [0, 1, 0, -1]

    return [(i+di[d], j+dj[d]) for d in range(4)]


print(get_neibghours(0, 0))
# [(1, 0), (0, 1), (-1, 0), (0, -1)]

print(get_neibghours(3, 6))
# [(4, 6), (3, 7), (2, 6), (3, 5)]

```



4 or 8 Neighbours



```python
def get_neibghours(i, j, cnt = 4):
    # {d, r, u, l, ul, dr, ur, dl};
    di = [1, 0, -1, 0, -1, 1, -1, 1]
    dj = [0, 1, 0, -1, -1, 1, 1, -1]

    return [(i+di[d], j+dj[d]) for d in range(cnt)]


print(get_neibghours(0, 0))
# [(1, 0), (0, 1), (-1, 0), (0, -1)]

print(get_neibghours(3, 6))
# [(4, 6), (3, 7), (2, 6), (3, 5)]

print(get_neibghours(3, 6, 8))
# [(4, 6), (3, 7), (2, 6), (3, 5), (2, 5), (4, 7), (2, 7), (4, 5)]
```



1	2	3
4		5
6	7	8

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”