CLASH OF CODE

TRONIX

Signal Processing and Machine Learning

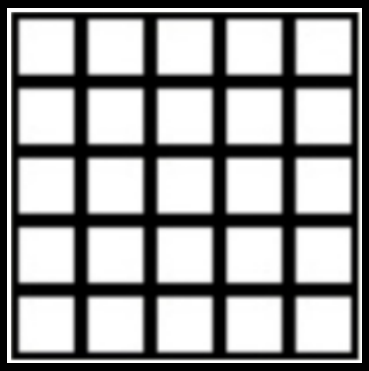
Spider R&D Club

PROBLEM STATEMENTS:

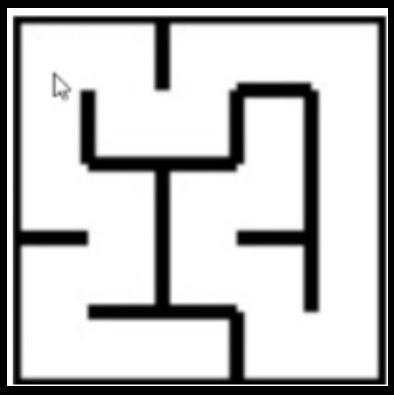
1. IMAGE PROCESSING:

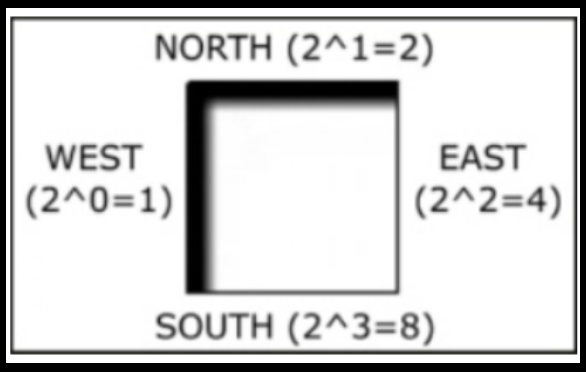
You are the ruler of Cheraisea Empire and your kingdom is under threat. To protect your people, you must outsmart the attacking army of Kira.

Main Task:



Design a Maze.





Maze Encoding:

Assign weights to each of the sides/borders of the grid cell as shown in the figure.

The resulting encoding of the grid cell is the sum of all weights wherever the dark edges are present. For the above cell, the encoding is:

1 + 2 + 0 + 0 = 3.

For example, the above maze will have the encoding is as follows:

3	6	3	10	6
5	9	12	7	5
9	6	3	12	5
3	12	9	6	5
9	10	14	9	12

Having encoded the maze manually, use **NumPy** and **OpenCV** libraries to build the maze as an image.

Bonus Task:

Say you have a red-colored sticker taped on your fingers. Use OpenCV to mask out that red-colored sticker and solve the maze by using your camera and the image designed in the previous part.

Demo Video:

Click Here

2. MACHINE LEARNING:

It is often essential to split the army into different ranks to effectively execute war strategies. As a Chief Commander, split your army into different ranks (Rank A>Rank B>Rank C) based upon the training scores of the troop members. Keep in mind that Rank A can only have 100 people.

Main Task:

Use K-Means clustering algorithm to cluster the given data points into three clusters with a constraint on the first cluster (to have maximum 100 data points). Use Pandas, Numpy and MatplotLib for Data Processing and Visualization. The Algorithm should be implemented from Scratch using **Numpy only.** You can use Combination of Features for Implementation

Bonus Task:

Perform spectral clustering and GMM along with 3D plot using Sci-kit learn **(allowed for Bonus task only)**

Tip: Try achieving best results by understanding the parameters involved.

Dataset:

Army Dataset

RESOURCES:

BASICS AND SETUP:

1. Jupyter Notebook Installation and Tutorial - Jupyter Notebook Tutorial: Introduction, Setup, and Walkthrough - YouTube
2. VS Code - VSCode Tutorial For Beginners - Getting Started With VSCode - YouTube
3. Python Tutorial - Learn Python with Jupyter Notebook from scratch - YouTube
4. Python - Python tutorials
5. Numpy - Numpy Tutorials

IMAGE PROCESSING:

1. OpenCV - Opencv Tutorials

MACHINE LEARNING:

1. Machine Learning - Machine Learning Full Course | Learn Machine Learning | Machine Learning Tutorial | Simplilearn - YouTube
2. K-Means clustering (article) - Understanding K-means Clustering in Machine Learning
3. Video on K-Means clustering - https://youtu.be/4b5d3muPQmA