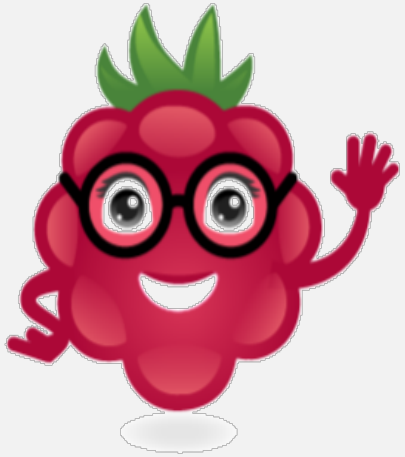
THE UNIVERSITY of NEW MEXICO

AOLME CURRICULUM

LEVEL 1

- SESSION 1: ***Basic of Raspberry PI and Linux-****(motivational overview of projects-images, ls, cd, to find and play previous videos)*
- SESSION 2: ***Introduction to Python*** *(print, for, if)*
- SESSION 3: ***Algorithms*** *(for loops-arithmetic progressions, if statements-ranges, inequalities)*
- SESSION 4: ***The Coordinate Plane and Black & White Images in Python***
- SESSION 5: ***Binary and Hexadecimal number systems***
- SESSION 6: ***Images and Their Components (histograms)***
- SESSION 7: ***Creation of Images and Video***
- FINAL PROJECT: VIDEO



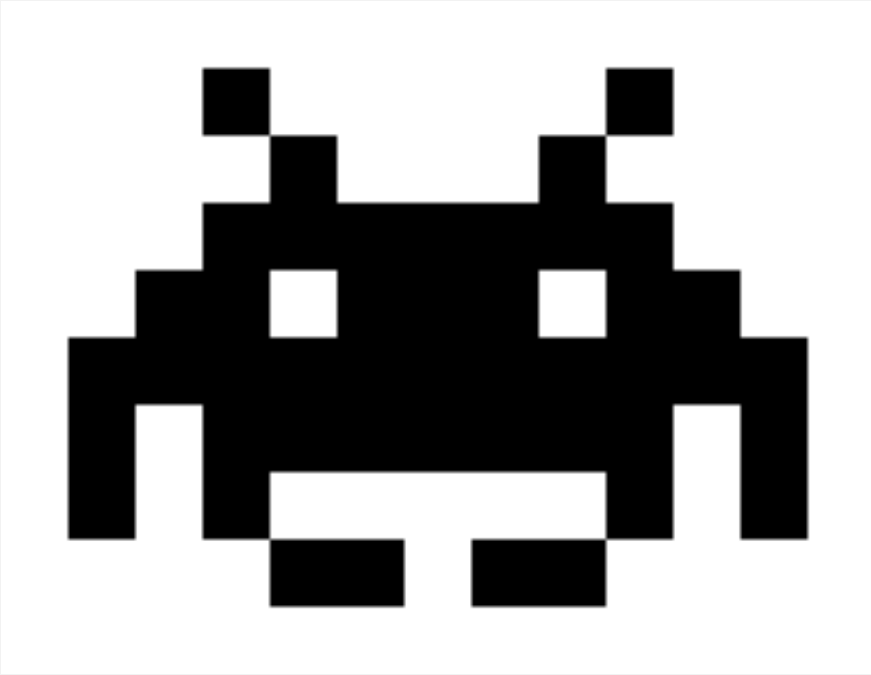
THE COORDINATE PLANE AND BLACK & WHITE IMAGES IN PYTHON

OBJECTIVES:

1. Identify the connections between x-y coordinate plane and use of binary numbers to represent black and white images.
2. Design basic black and white images.
3. Program binary images using Python.

SELECTED ACTIVITIES

1. Creating a black and white image using the "Binary Image Generator" (binary colors, open play)
2. Using Coordinates in Black & White Images w/ paper (coordinates, grouping, blocks, share and modify-'debug')
3. Creating and programming matrices, arrays, and ranges to create images with python (debug, program, share and modify-DMI)



ROLES IN ACTIVITY

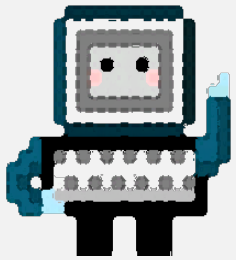
ROLES

- **Leader / Facilitator**
- **Set up Person / Take Down Person**
- **Checker**
- **Safety Monitor**
- **Recorder/ Reporter/ Synthesizer**

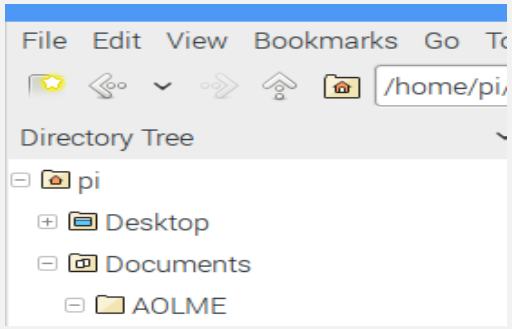
NORMS

1. Say your own ideas
2. Listen to others; give everyone a chance to talk
3. Ask others for their ideas
4. Give reasons for your ideas and discuss many different ideas (p.63).

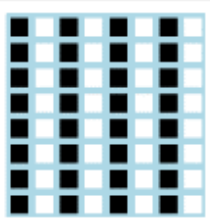
4.1. Creating Images w/ the "Binary Image Generator"



1. Navigate folders of your Raspberry Pi and go to folder: /pi/AOLME/Session 4/ and open or double click on the link **"Binary Image Generator"**



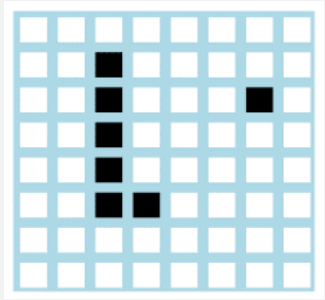
2. What are the 'i' and 'j' for? How are the numbers and the colors in the grid related?

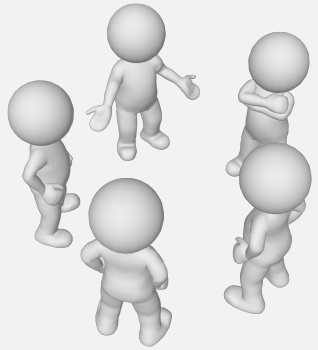


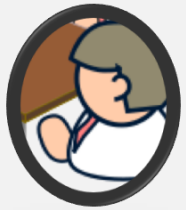
Binary images
Enter 0 for black or 1 for white for each pixel.

	j=0	j=1	j=2	j=3	j=4	j=5	j=6	j=7
i=0	0	1	0	1	0	1	0	1
i=1	0	1	0	1	0	1	0	1
i=2	0	1	0	1	0	1	0	1
i=3	0	1	0	1	0	1	0	1
i=4	0	1	0	1	0	1	0	1
i=5	0	1	0	1	0	1	0	1
i=6	0	1	0	1	0	1	0	1
i=7	0	1	0	1	0	1	0	1

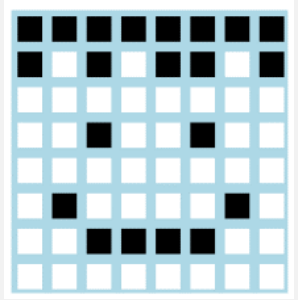
3. How are numbers and colors linked? Scroll down and look at the Python code. What does it tell us? Based on what you learned, create a black & white image.







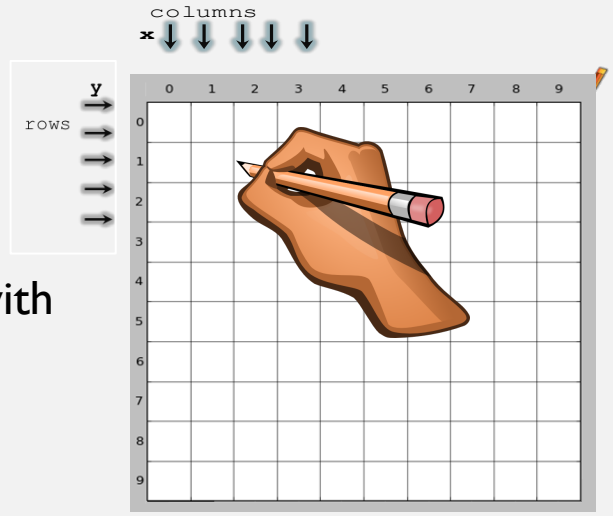
4. **Discuss & Write:** How do you make white and black pixels? Can you make a circle and round corners with the **"Binary Image Generator"** ? Why yes or why not?



4.2. Using Coordinates in Black & White Images

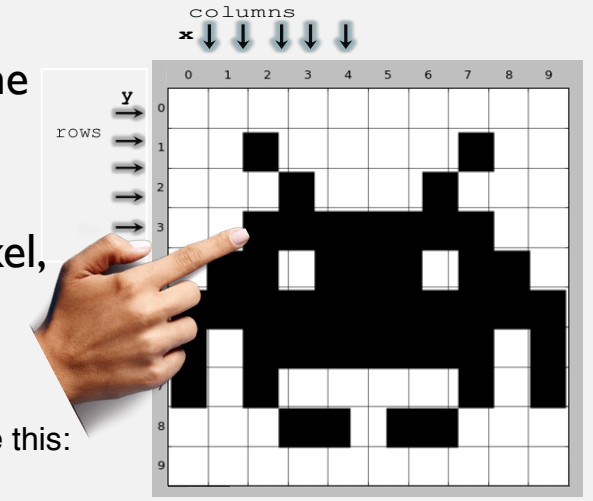
Remember the 'i' and the 'j' we used? How are these a coordinate plane?

1. Create a figure by filling in complete squares with black.



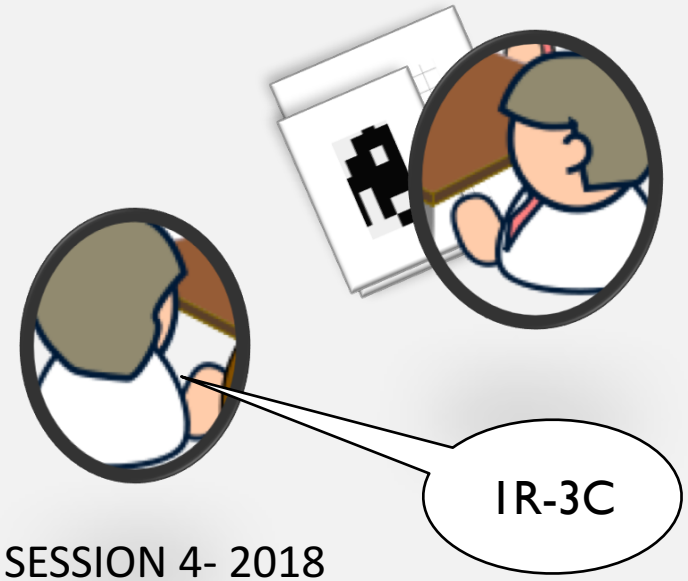
2. After completing the image, notice how each square, or pixel, has a specific position.

name each pixel like this:
1R – 3C

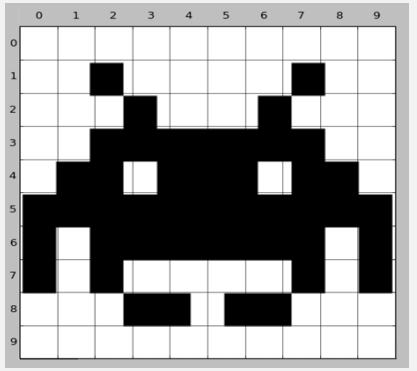


How are the coordinate system different from what we have studied before?

3. Find a partner in your group-and tell her/him and try to have them draw the same as you but without looking at your sheet.



4. Would there be a way of telling your partner the information for your image in a briefer way? (other pairs)



4.3. Programming images with Python

1. Open in python script to see how images are programmed.
Go to: /pi/AOLME/Session 4/Student Projects/ called "BW1.py"

```
from AOLME import *

matrix = [["1"]*10 for i in range(10)]
'''
************************************************
Put your code below this line
************************************************
'''


'''
************************************************
Put your code above this line
************************************************
'''
im_show(matrix)
```

← Here we import the AOLME library.

← This creates a blank matrix!

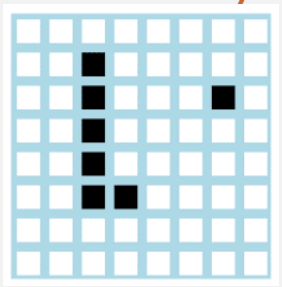
What do these codes do?

← Your code goes here!

← This function defined in AOLME.py lets us see the matrix we created.

2. What would these codes show? Why?

Predict images and change the code of image from an image created by cohort !



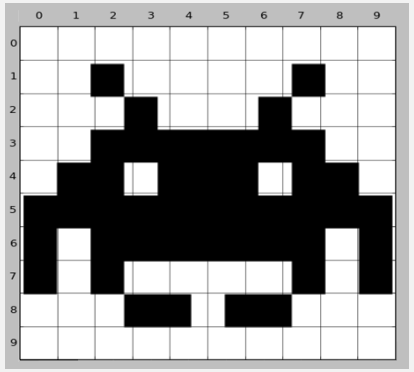
```
>>> [["1"]*10 for i in range(10)]
[['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1'],
['1', '1', '1', '1', '1', '1', '1', '1', '1', '1']]
```

3. What do these codes do?

```
from AOLME import *

matrix = [["1"]*10 for i in range(10)]


for row in range(10):
    matrix[row][4] = "0"

for col in range(10):
    matrix[0][col] = "0"

im_show(matrix)
```

Think: If you were to create rectangle (*vertical or horizontal*), what would be the fastest way to create a rectangle?

4. In your group, design and program an image that will represent your team. Take turns typing in the codes. Save it with a funny name. Then, show it to another team.



2. CREATING A BLACK AND WHITE IMAGE USING THE "BINARY IMAGE GENERATOR"

- Navigate the file system and open the link to **"Binary Image Generator"** inside the folder /pi/AOLME/Session 4/ by double clicking.
- The 8x8 matrices show black and white images. Each tiny square is called **"pixel".**
- In Python, the white squares (white pixels) are represented by the value '1' and the black squares (black pixels) by the value '0'.