# Introduction

This document is to provide project ideas for learning the libraries we will be using. If you have any ideas for projects, feel free to add them!

# NumPy Projects

**Tutorial:** https://www.kaggle.com/cameronfalls/intro-to-numpy

## Monte Carlo Simulation

Implement a way to find the odds of winning a game of craps. Use a brute force method to run 1 million iterations of the game. Using numpy, we can quickly find the win rate.

How Craps is played:

Roll 2 dice and sum values.

Part 1: First roll - Win if roll 7 or 11 Loose if roll 2, 3 or 12. Go onto Part 2 if did not win or lose.

Part 2: Roll until win/lose - Win if re-roll number from part 1. Lose if roll 7 Roll again if did not win or lose.

Brute force method to find probability of winning craps. 1M iterations of the game. This can be done with all games taking place in one array in order to maximize time in numpy compiler and minimize code complexity.

Answer: 49.2% win rate

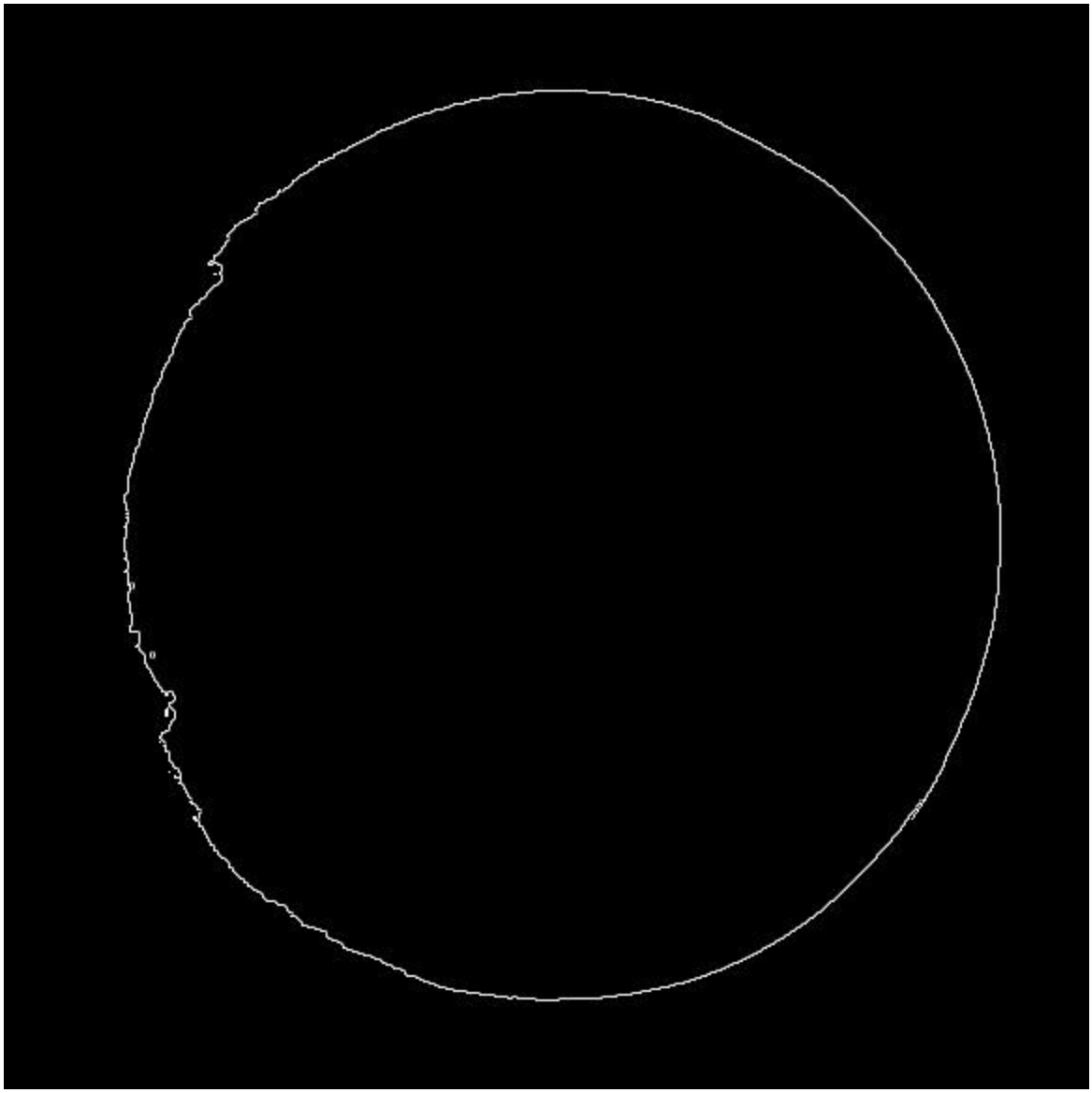
**My Solution:** https://github.com/fallscameron01/Monte_Carlo_Simulation/blob/master/craps.py

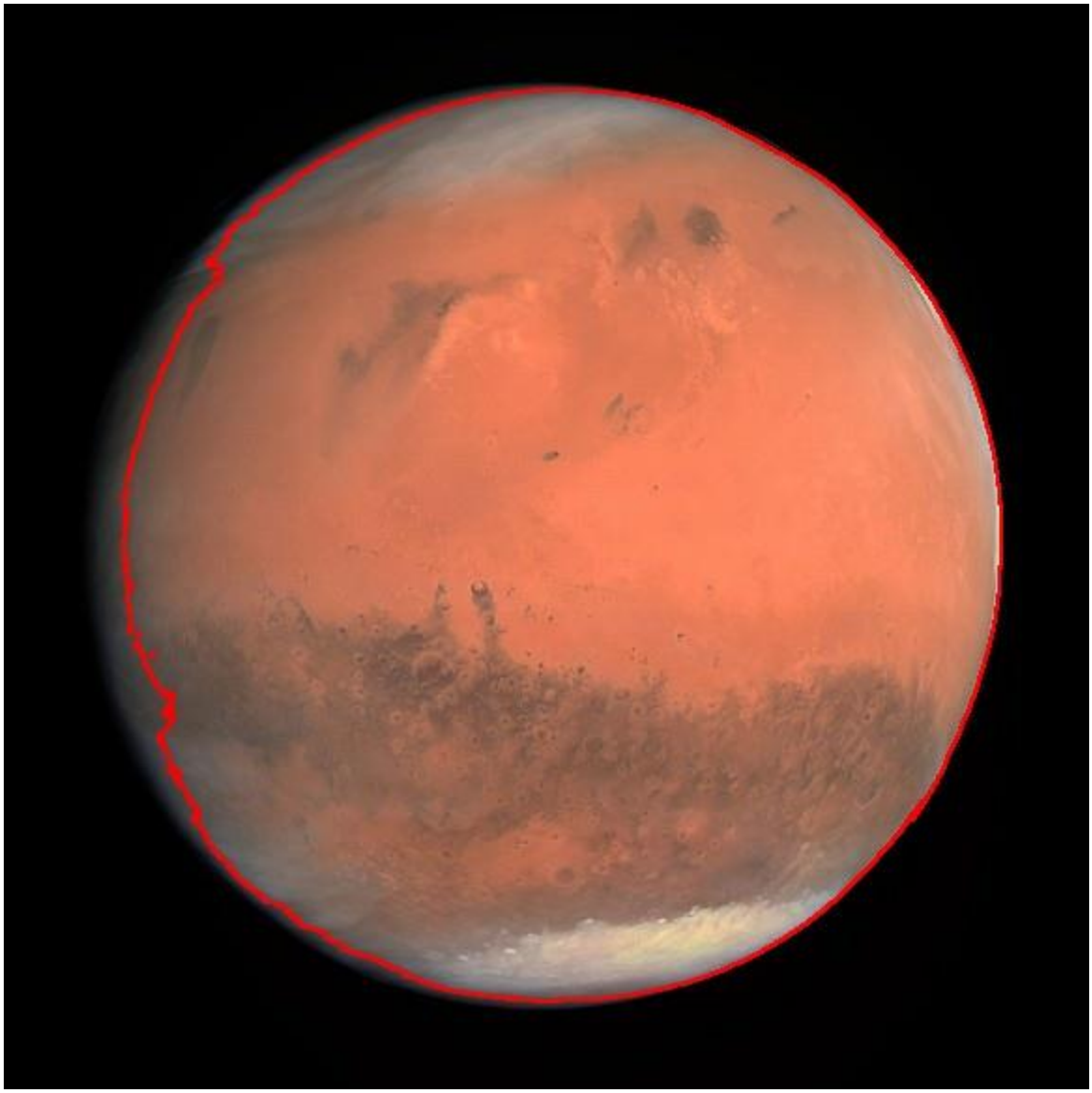
# OpenCV Projects

**Tutorial Part 1:** https://www.kaggle.com/cameronfalls/intro-to-computer-vision
**Tutorial Part 2:** https://www.kaggle.com/cameronfalls/intro-to-computer-vision-2

## Detect the “Edges” of a Planet

Find the outline of a planet using an edge detection kernel and convolution. You may need to apply another algorithm first, like kmeans, to reduce noise.
**My solution:**
https://github.com/fallscameron01/Planet-Edge-Detection/blob/master/Edge_Detection.py





## Change Image Size

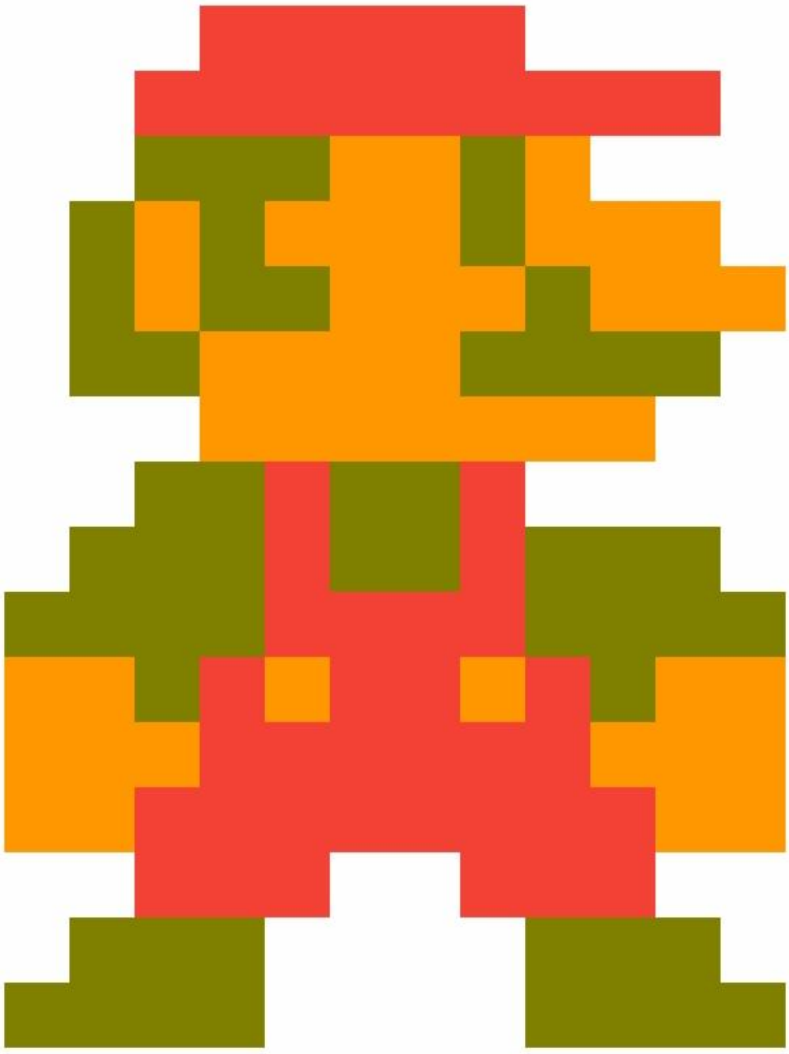
https://en.wikipedia.org/wiki/Interpolation
Write a function that when passed a scaling factor, the function will resize the image accordingly. For example, if passed 2, the function would resize the image to 2x the original dimensions. When passed 0.5, the function would resize the image to 0.5x the original dimensions.
You can shrink an image through selective column dropping. You can grow an image using interpolation (estimation). My solution uses a simple interpolation to do both growing and shrinking.
**My solution:** https://github.com/fallscameron01/Resize_Image/blob/master/resize.py

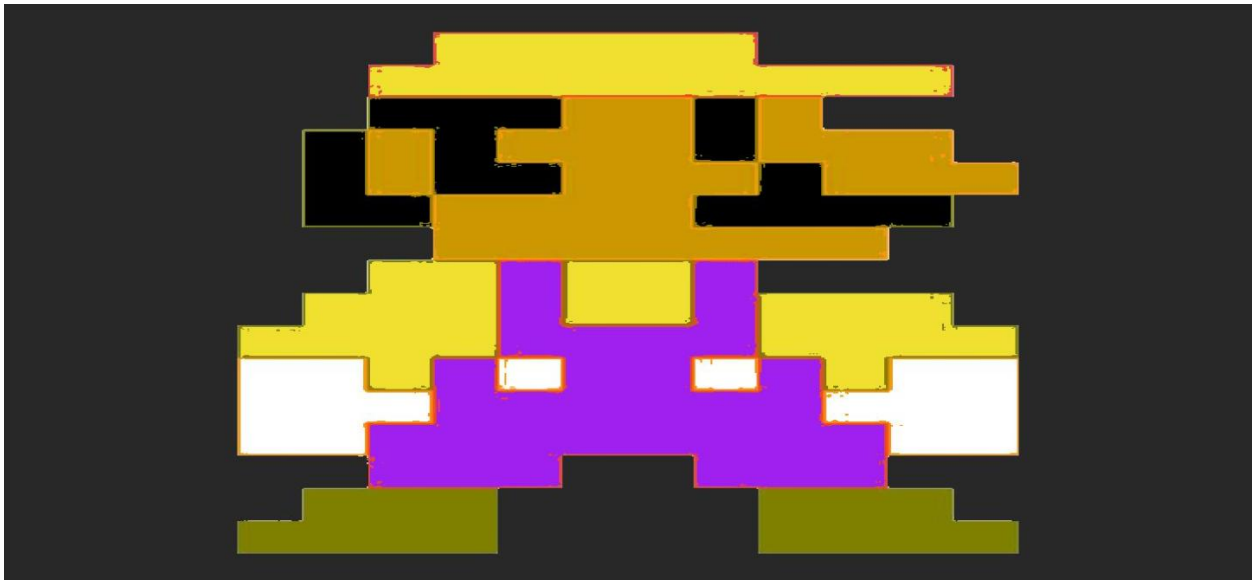
## Chroma Key (Greenscreen)

https://en.wikipedia.org/wiki/Chroma_key
Write a function that applies a background to an image with a green screen.
**My Solution:** https://github.com/fallscameron01/Chroma_Key/blob/master/chroma_key.py
(has a bit of extra stuff since it applies a background to every image in a directory)

## Mario Bros

Change a Mario image into the different Mario characters (Luigi, Wario, Waluigi). With Wario, stretch the image horizontally. With Waluigi, stretch the image vertically.





## Turn Tomatoes Blue

Change the color of tomatoes in a salad from red to blue. Try to only change the tomatoes and to make the tomatoes look as good as possible.

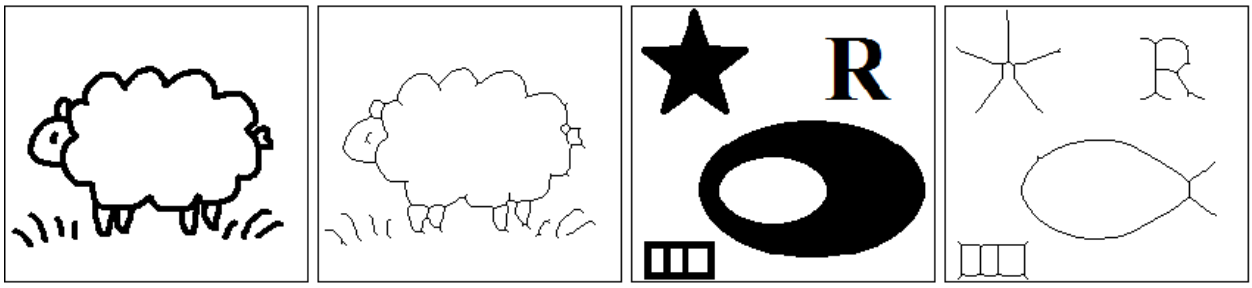
**My Solution:**

https://github.com/fallscameron01/Blue_Tomatoes/blob/master/make_tomato_blue.py

# Advanced Projects

## Image Skeletonization

https://en.wikipedia.org/wiki/Morphological_skeleton
Perform skeletonization on an image.
(no solution yet - post yours here)
Example:




## Cleaning up Images

https://en.wikipedia.org/wiki/Erosion_(morphology)
https://en.wikipedia.org/wiki/Dilation_(morphology)
https://docs.scipy.org/doc/scipy/reference/generated/scipy.ndimage.binary_erosion.html#scipy.ndimage.binary_erosion
https://docs.scipy.org/doc/scipy/reference/generated/scipy.ndimage.binary_dilation.html#scipy.ndimage.binary_dilation
Clean up images using erosion and dilation convolutions.
(no solution yet - post yours here)