ASCII Art

June 14, 2018

ASCII Art

ASCII (pronounced “askey”) art is popular on message boards because of the ease of which it can be copy and pasted.

```
 _
/\\
\ \\  \__/ \__/
 \ \\ (oo) (oo)
  \_\\/~~\_/~~\_
 _.-~============~-._
(___/________________)
   /  \_______/
```

ASCII Art

Every since the typewriter was created, people have enjoyed creating art out of text.

```
 ------------------------
< Hi Python Programmers! >
 ------------------------
        \   ^__^
         \  (oo)\_______
            (__)\       )\/\
                ||----w |
                ||     ||
```

In this session

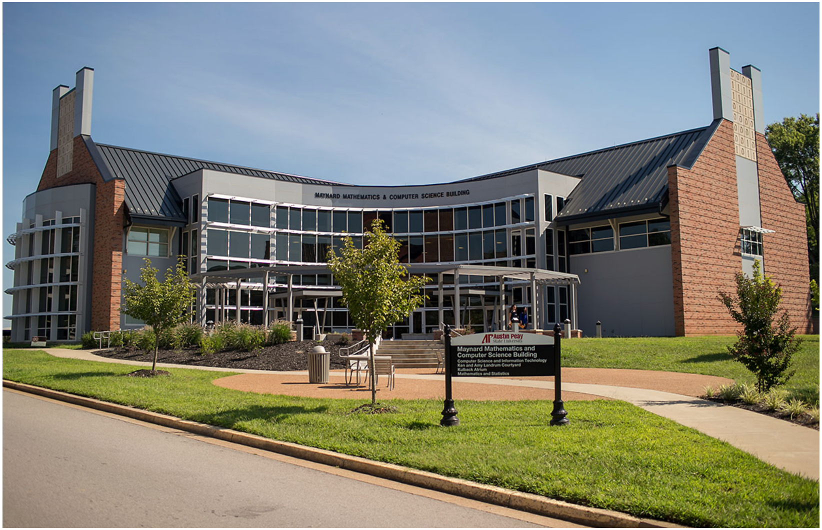
- We are going to explore the Pillow library.
- The Pillow library is used to open images.
    - If you are wondering how it got the name “Pillow”, it is because the older version was called “PIL” (for “Python Image Library”).
- The library in Python is still named “PIL”.

In this session

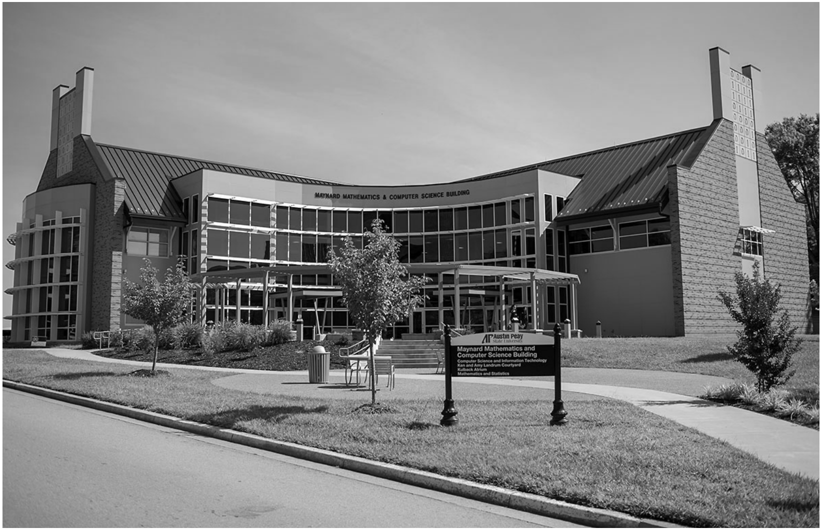
We are going to auto-generate ASCII art. Here's the theory.

1. Take a color image.
2. Convert it to grayscale.
3. Chop it up into smaller blocks.
4. Compute the average color of each block.
5. Pick out an alphanumerical character with the same black-to-white ratio as the grayscale image.

Color Image


MAYNARD MATHEMATICS & COMPUTER SCIENCE BUILDING
Austin Peay State University
Maynard Mathematics and Computer Science Building
Computer Science and Information Technology
Ken and Amy Landrum Courtyard
Kulback Atrium
Mathematics and Statistics

Grayscale Image


MAYNARD MATHEMATICS & COMPUTER SCIENCE BUILDING
AP Austin Peay State University
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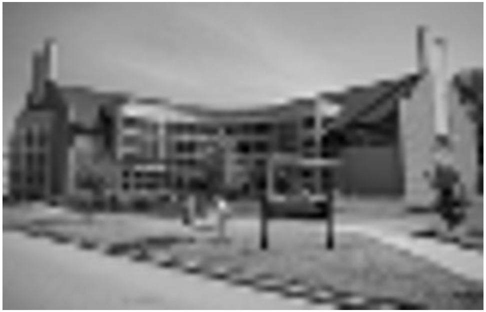
Computer Science and Information Technology
Ken and Amy Landrum Courtyard
Kulback Atrium
Mathematics and Statistics

Chop into parts and compute average



Select a alphanumerical character for each square.

```
+++++++==================-========================
+++++=================-------------==-----=+======
+++**=======-------------------------------+-----=
+++##++======------------------------===+**+=-=**#
==*#%%#***#*+=========-----===+++=+######*+==-+*#%
=*########%%+++++++***##########*+##%%%%%*===-=++%
+####%#***%%+**++*##**#*%%%%#%%##%@%%###%*===*+++%
+#%##%*****#####*######**#######*########*==+**++#
*#%%#%**####***###%#%%%###%##%##*%########==+#%*+#
**+++*********#*#****++++**%####%@*++++++++**#%%**
++++*++++++++=++++++=++====*=====++===----=+******
=====--====+*****++++++++++*++++++++++++===----==+
=========--------====++++**+++++++++++++++++++++==
+++=============-----------==+=+++*************###
```

Hopefully you get the idea.

(Not all images turn out great.)

(But several do!)

How do we delect a character?

```
$@B&MokbdqwmO0QCJUXzcunxjft\|(1{}?+>lI:\"^`'.
```

- Some characters use more ink from a printer than others.
- For example, you'll need more ink to print the "$" than to print the ".".
- The other characters exist somewhere in between.
- If we rank these characters from "most ink" to "least ink", we can create ASCII art.

The above sequence is one such ranking of characters. The characters on the left use more ink than the ones on the right.

Code

Let's write some code. Here are the import statements and the grayscale variable. Make sure that you get the grayscale characters in order.

```
import numpy as np
from PIL import Image

gscale = "@%#*+=-:. "
```

Averaging Code

This code will compute the average of an image passed to it. We will pass it tiny, cropped samples of the full image.

```
def computeAverage(image):
    im = np.array(image)
    w,h = im.shape
    return np.average(im.reshape(w*h))
```

Converting code.

This code will open an image, convert it to grayscale, and then determine how large we should make our ASCII art. The number of columns on an image will typically be 80. Everything else is computed based on that.

```
def convertImageToAscii(fileName, cols, scale):
    image = Image.open(fileName).convert('L')
    W, H = image.size
    print("input image dims: %d x %d" % (W, H))

    w = W // cols
    h = w // scale
    rows = int(H // h)
```

Converting code.

This is still inside of "convertImageToAscii". This determines if our image is big enough.

```
print("cols: %d, rows: %d" % (cols, rows))
print("tile dims: %d x %d" % (w, h))

if cols > W or rows > H:
    print("Image too small for specified cols!")
    exit(0)
```

Converting code.

Again, still inside of "convertImageToAscii". This code will compute how wide to create a crop slice. Why do we have that `if` statement?

```
asciiImg = []
for j in range(rows):
    y1 = int(j*h)
    y2 = int((j+1)*h)
    if j == rows-1:
        y2 = H
    asciiImg.append("")
```

Converting code.

Again, still inside of “convertImageToAscii” and inside of our “for j in range(rows)” loop. Now that we have the y’s figured out, time for the x’s.

```
for i in range(cols):
    x1 = i * w
    x2 = (i + 1) * w
    if i == cols-1:
        x2 = W
```

Converting code.

Again, still inside of “convertImageToAscii” and inside of our “for i in range(cols)” loop (which is inside of another loop). Time to crop the image and figure out a character.

```
img = image.crop((x1, y1, x2, y2))
avg = int(computeAverage(img))
asciiImg[j] += gscale[int((avg*len(gscale))/255)]
```

Converting code.

Again, still inside of “convertImageToAscii”. This is after all of the loops. This code will return our image.

```
return asciiImg
```

The main function.

We begin by asking for an image filename and an output file name.

```
def main():
    imgFile = input("Enter an filename to read: ")
    outFile = input("Enter the output file to write: ")
```

The main function.

Still inside the main function. Here, we call “convertImageToAscii” with our requested image.

```
scale = 0.43
cols = 50

print('generating ASCII art...')
asciiImg = convertImageToAscii(imgFile, cols, scale)
```

Open a file for writing.

Still inside the main function. Here, we open a file and write our `asciiImg` list of strings to the file. Make sure that you close the file!

```
f = open(outFile, 'w')
for row in asciiImg:
    f.write(row + '\n')

f.close()
print("ASCII art written to %s" % outFile)
```

Last bit.

After main. You need this to call the main function.

```
main()
```

Try it out!