CS599 (Deep Learning)

Homework 02

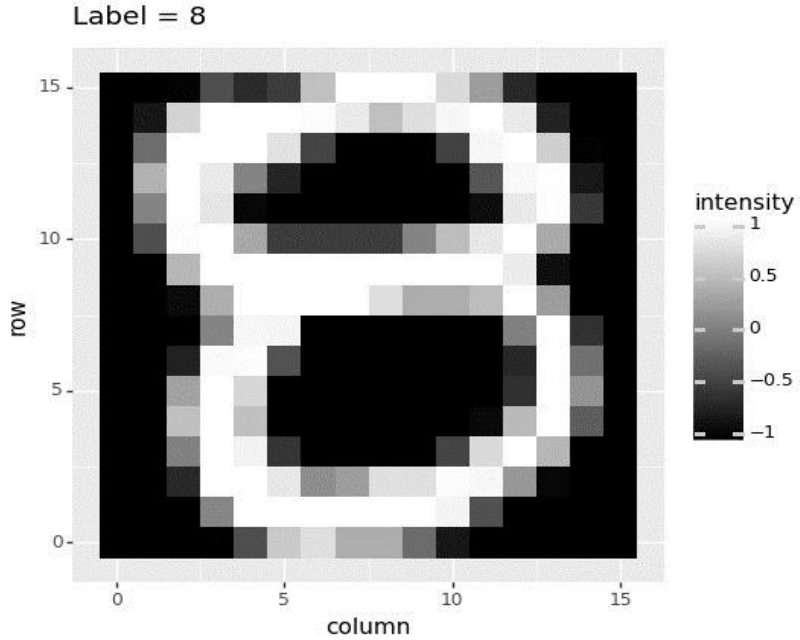
1. Python Code:

```
zip_url = "https://github.com/tdhock/cs570-spring-2022/raw/master/data/zip.test.gz"
import os
from urllib.request import urlretrieve
if not os.path.exists("zip.test.gz"):
   print("Downloading!")
   urlretrieve(zip_url, "zip.test.gz")

import pandas as pd
df = pd.read_csv("zip.test.gz", sep = " ", header = None)
print(df.shape)
print(df)

import numpy as np
from math import sqrt
image_number = 50
one_image_label = df.iloc[image_number, 0]
intensity_vec = df.iloc[image_number, 1:]
n_pixels = int(sqrt(len(intensity_vec)))
np.flip(np.repeat(np.arange(n_pixels),n_pixels))
np.tile(np.arange(n_pixels),n_pixels)
one_image_df = pd.DataFrame({
   "intensity": intensity_vec,
   "row": np.flip(np.repeat(np.arange(n_pixels),n_pixels)),
   "column": np.tile(np.arange(n_pixels),n_pixels)
})

import plotnine as p9
gg = p9.ggplot()+\
   p9.geom_tile(#draw squares
      p9.aes(
         x = "column",
         y = "row",
         fill = "intensity"
         ),
      data = one_image_df
      )+\
      p9.scale_fill_gradient(
         low = "black",
         high = "white")+\
      p9.ggtitle("Label = %d"%one_image_label)+\
      p9.coord_equal()

gg.save("HW2_image.png")
list_images = []
for image_num in [5,50,500]:
   multi_image_label = df.iloc[image_num, 0]
```

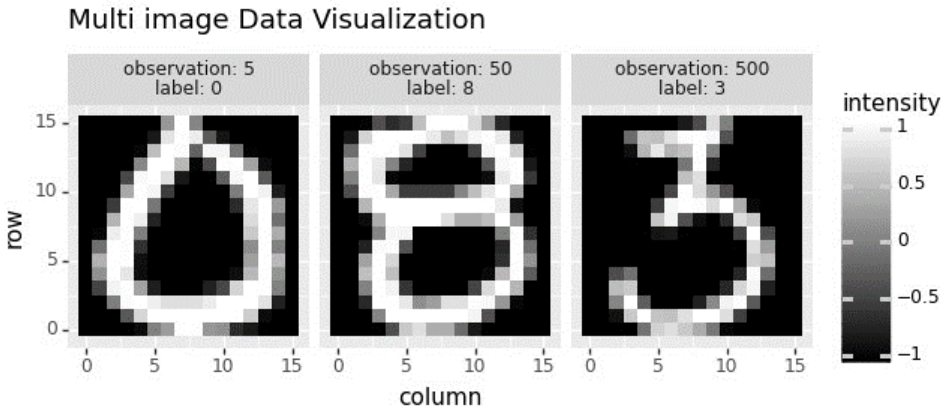
```
intensity_m_vec = df.iloc[image_num, 1:]
multi_image_df =  pd.DataFrame({
"observation" : image_num,
"label" : multi_image_label,
"intensity": intensity_m_vec,
"row": np.flip(np.repeat(np.arange(n_pixels),n_pixels)),
"column": np.tile(np.arange(n_pixels),n_pixels)
})
list_images.append(multi_image_df)
several_images = pd.concat(list_images)
gg1 =  p9.ggplot()+\
   p9.facet_wrap(["observation", "label"], labeller = "label_both")+\
   p9.geom_tile(#draw squares
      p9.aes(
         x = "column",
         y = "row",
         fill = "intensity"
   ),
      data = several_images
)+\
p9.scale_fill_gradient(
      low = "black",
      high = "white")+\
   p9.ggtitle("Multi image Data Visualization")+\
   p9.coord_equal()

gg1.save("HW2_multi_image.png")
```

2. Output:

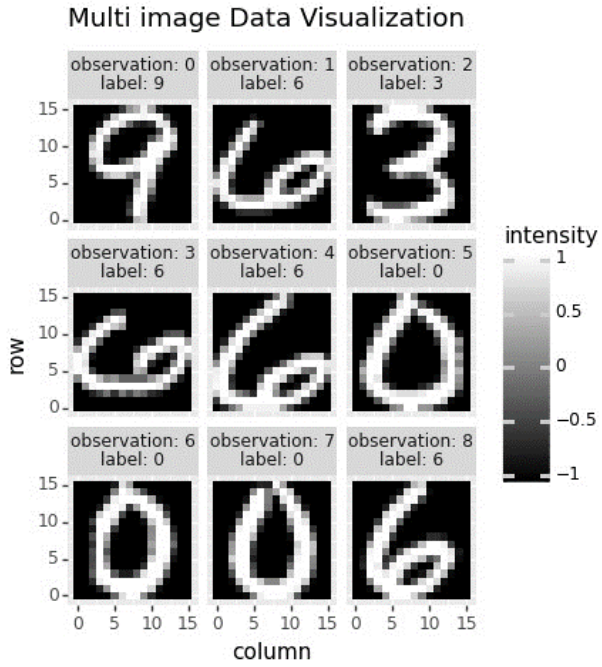
Single Image Visualization



Multi Image Visualization



Multi Image Visualization using first 9 rows



3. Summary:

- Here we have 3 sub questions. First, we need to do as HW01 download the file if not available and store it in a dataframe.
- Then, we need to create a dataframe using one row of input with columns row, col, intensity.
- We need to plot that using ggplot(). The output is Single Image Visualization.
- We need to create a multi image dataframe using several rows of data with columns observation, label, row, col, intensity.
- The output is Multi Image Data Visualization.