**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")+\

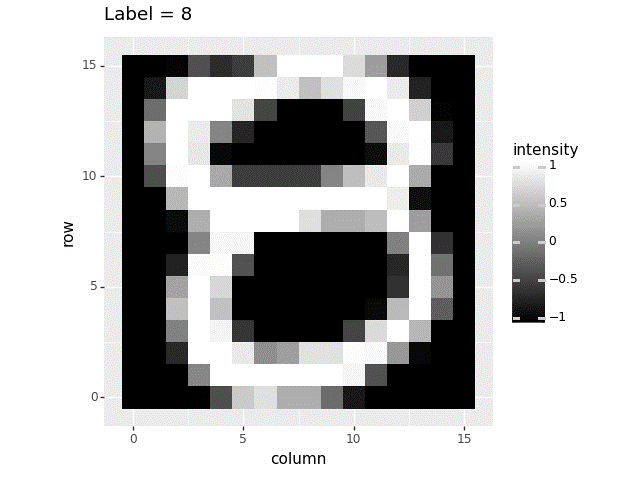
p9.ggtitle("Multi image Data Visualization")+\

p9.coord\_equal()

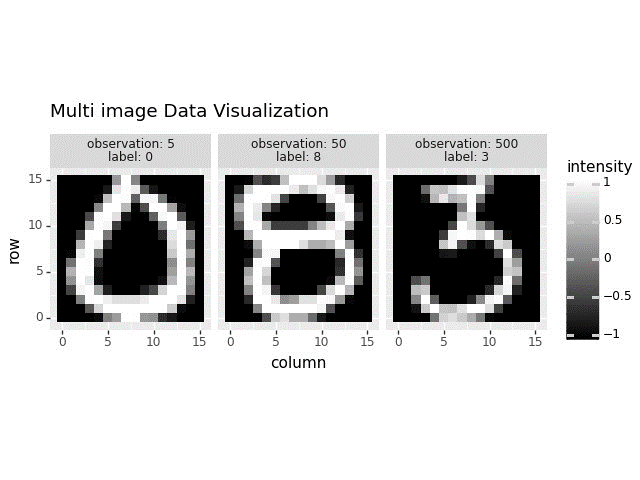
gg1.save("HW2\_multi\_image.png")

1. **Output:**

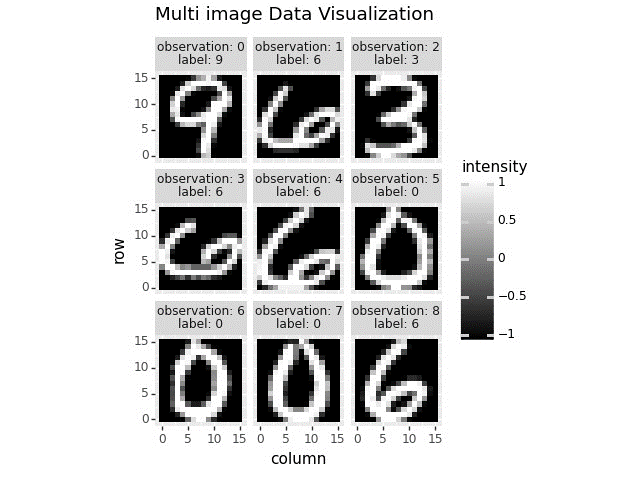
Single Image Visualization



Multi Image Visualization



Multi Image Visualization using first 9 rows



1. **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.