Handeling and Transforming Datasets

November 27, 2020

0.0.1 Handeling Simple Datasets and Transformations with Pytorch

[72]:
```
import torch
import numpy as np
import pandas as pd
import datetime
```

[73]:
```
# epoch
! ../../epochgen.py ef
datetime.datetime.now()
```

```
Epoch ~ (2020-11-26 17:07:17.498258)
Decomposed Date ~  November 26, 2020;
```

[73]:
```
datetime.datetime(2020, 11, 26, 17, 7, 17, 604296)
```

0.0.2 Numerical Data

The Following Describes the Class blueprints typically used to load the datasets

[74]:
```
import torch
from torch.utils.data import Dataset
torch.manual_seed(101)
```

[74]:
```
<torch._C.Generator at 0x7ffa242ce910>
```

[75]:
```
class simpleset:
    # constructor, an essestial function to construct the inital objects␣
 ↪required
    # transform in here is defined later, which is another class blueprint␣
 ↪which holds
    # all the transformative operations to be done on the tensor, ex add, mul␣
 ↪etc
    def __init__(self, length =100, transform=None):
        self.len = length
        self.x = 5 * torch.ones(length,3) + 1
        self.y = torch.ones(length, 1)
        self.transform = transform
```

```
    def __getitem__(self,index):
        sample = self.x[index], self.y[index]
        if self.transform != None:
            sample = self.transform(sample)
            return sample
        else:
            return sample
    def __len__(self):
        return self.len

# __ (double underscores) infront of the function definition will make the␣
 ↪objects tensors
# directly accessible without explicitly defining the function name
# ex def _getitem_ would require us to do obj._getitem_(index) to access a␣
 ↪value
# but with __getitem__ it would simple be obj[index]
```

[76]:
```
dataset0 = simpleset()
```

[77]:
```
dataset0[1]
```

[77]:
```
(tensor([6., 6., 6.]), tensor([1.]))
```

[78]:
```
our_dataset = simpleset()
print("Our toy_set object: ", our_dataset)
print("Value on index 0 of our toy_set object: ", our_dataset[0])
print("Our toy_set length: ", len(our_dataset))
print("also other way to get len: ",our_dataset.len)
```

```
Our toy_set object:  <__main__.simpleset object at 0x7ffa29359350>
Value on index 0 of our toy_set object:  (tensor([6., 6., 6.]), tensor([1.]))
Our toy_set length:  100
also other way to get len:  100
```

[79]:
```
for x,y in our_dataset:
    print(x,y)
```

```
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
```

```
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
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tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
```

```
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
tensor([6., 6., 6.]) tensor([1.])
```

0.0.3 Transform Class blueprint

[80]:
```
class add_mult:
    def __init__(self, addx = 5, mult = 2):
        self.addx = addx
        self.mult = mult

    # executor
    def __call__(self,sample):
        x,y = sample
        x += self.addx
        y *= self.mult
        sample = x,y
        return sample
```

[81]:
```
x,y = our_dataset[0]
```

[82]:
```
x,y
```

[82]:
```
(tensor([6., 6., 6.]), tensor([1.]))
```

[83]:
```
transformobj = add_mult()
```

[84]:
```
print('original data : ',x,y)
```

```
original data :  tensor([6., 6., 6.]) tensor([1.])
```

[85]:
```
x_,y_ = transformobj(our_dataset[0])
```

[86]:
```
print('transformed data:',x_,y_)
```

```
transformed data: tensor([11., 11., 11.]) tensor([2.])
```

Now, we can use this transform blueprint in the initial simpleset class blueprint

[87]:
```
newset = simpleset(transform= transformobj)
```

[88]:
```
newset
```

[88]:
```
<__main__.simpleset at 0x7ffa2902f810>
```

[89]:
```
newset[1] # transformed
```

[89]:
```
(tensor([11., 11., 11.]), tensor([2.]))
```

0.0.4 Torchvision's Compose

[90]:
```
from torchvision import transforms
```

[91]:
```
# consider a new transform mult, which multiplies 100 to x and y vectors (␣
 ↪tensors )
class mult:

    def __init__(self, mult=100):
        self.mult = mult

    # executor
    def __call__(self, sample):
        x,y = sample
        x *= self.mult
        y *= self.mult
        sample = x,y
        return sample
```

Now what if we want the data to be transformed by the first transform first i.e (add_mult) and then pass through the second tranform, something like this

[92]:
```
compose_obj = transforms.Compose([add_mult(),mult()])
print("The combination of transforms (Compose): ", compose_obj)
```

```
The combination of transforms (Compose):  Compose(
    <__main__.add_mult object at 0x7ffa29404250>
    <__main__.mult object at 0x7ffa29404650>
)
```

[93]:
```
newsample = simpleset()
```

[94]:
```
newsample[0]
```

[94]:
```
(tensor([6., 6., 6.]), tensor([1.]))
```

[95]:
```
# transforming through the compose object
compose_trans_sample = compose_obj(newsample[0])
```

[96]:
```
compose_trans_sample
```

[96]:
```
(tensor([1100., 1100., 1100.]), tensor([200.]))
```

0.0.5 Image Data

[97]:
```
'''
! wget https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-data/
 ↪CognitiveClass/DL0110EN/datasets/img.tar.gz
!tar -xf ./img.tar.gz
!wget https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-data/
 ↪CognitiveClass/DL0110EN/datasets/index.csv
'''
```

[97]:
```
'\n! wget https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-
data/CognitiveClass/DL0110EN/datasets/img.tar.gz \n!tar -xf ./img.tar.gz \n!wget
https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-
data/CognitiveClass/DL0110EN/datasets/index.csv \n'
```

[100]:
```
from torch.utils.data import Dataset, DataLoader
import matplotlib.pyplot as plt
from PIL import Image
import pandas as pd
import os
import warnings
warnings.filterwarnings("ignore", category=DeprecationWarning)
```

[103]:
```
def plotimg(datasample, shape =(26,26)):
    plt.imshow(datasample[0].numpy().reshape(shape),cmap='gray')
    plt.title('y = ' + data_sample[1])
    plt.show()
```

[113]:
```
directory="./IBMpynbs/"
csv_file ='index.csv'
csv_path=os.path.join(directory,csv_file)
```

[114]:
```
csv_path
```

[114]:
```
'./IBMpynbs/index.csv'
```

[115]:
```
data_name = pd.read_csv(csv_path)
data_name.head()
```

[115]:

	category	image
0	Ankle boot	img/fashion0.png
1	T-shirt	img/fashion1.png
2	T-shirt	img/fashion2.png
3	Dress	img/fashion3.png
4	T-shirt	img/fashion4.png

The first column of the dataframe corresponds to the type of clothing. The second column is the name of the image file corresponding to the clothing. You can obtain the path of the first file by

using the method DATAFRAME.iloc[0, 1]. The first argument corresponds to the sample number, and the second input corresponds to the column index.

[116]:
```
print('File name:', data_name.iloc[0, 1])
```

```
File name: img/fashion0.png
```

[117]:
```
print('File name:', data_name.iloc[1, 1])
print('class or y:', data_name.iloc[1, 0])
```

```
File name: img/fashion1.png
class or y: T-shirt
```

[118]:
```
print('The number of rows: ', data_name.shape[0])
```

```
The number of rows:  60000
```

[120]:
```
data_name.shape
```

[120]:
```
(60000, 2)
```

[121]:
```
# opening an Image
```

[130]:
```
directory # where the images exist
```

[130]:
```
'./IBMpynbs/'
```

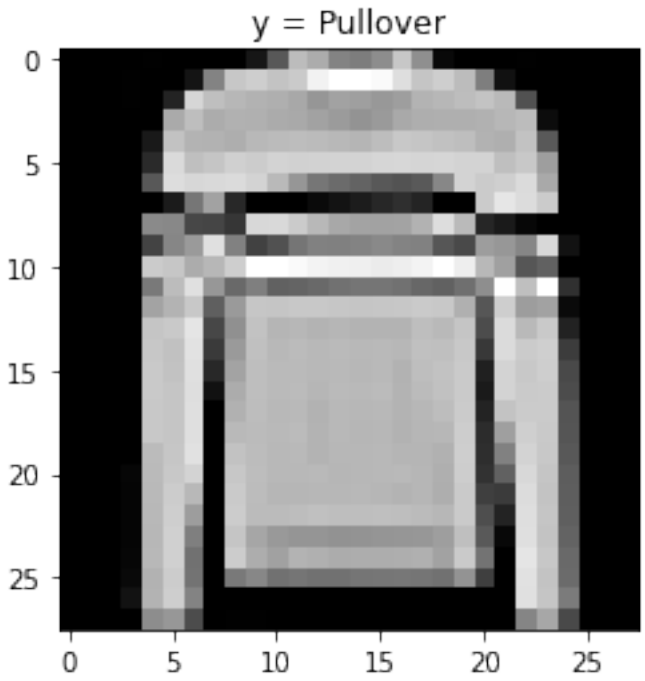
[131]:
```
imgpath = data_name.iloc[5,1]
imgpath = os.path.join(directory, imgpath)
```

[132]:
```
imgpath
```

[132]:
```
'./IBMpynbs/img/fashion5.png'
```

[142]:
```
img = Image.open(imgpath)
plt.imshow(img,cmap='gray', vmin=0, vmax=255)
plt.title('y = '+data_name.iloc[5,0])
```

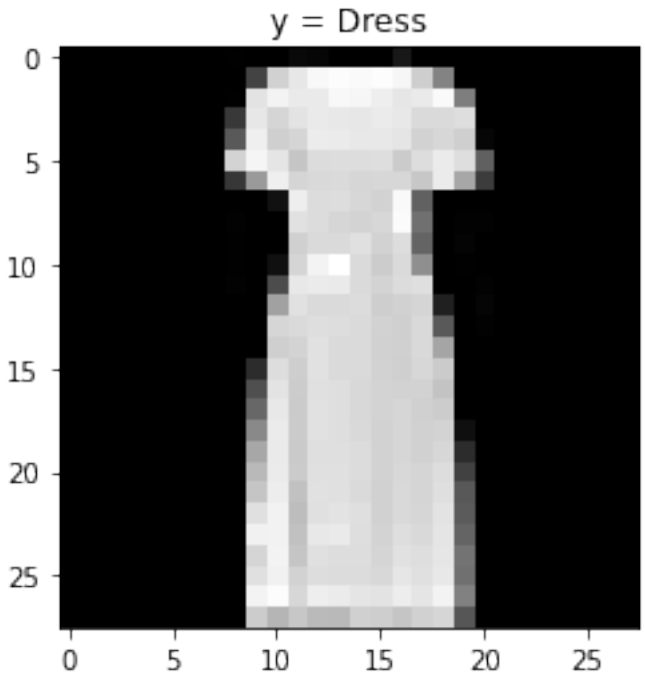
[142]:
```
Text(0.5, 1.0, 'y = Pullover')
```



[148]:
```
# we can do the same with a makeshift function for this to grab any index
def show_img(index,data,directory='./'):
    imgpath = data.iloc[index,1]
    imgpath = os.path.join(directory,imgpath)

    img = Image.open(imgpath)
    plt.imshow(img,vmin=0,vmax=255,cmap='gray')
    plt.title('y = '+data.iloc[index,0])
    plt.show()
```

[150]:
```
show_img(50,data_name,directory)
```



0.0.6 Class blueprint to handle Image Data

[175]:
```
class imagedataset:
    def __init__(self,csv_file,data_dir,transform=None):
        self.csv_file = csv_file
        self.data_dir = data_dir
        self.transform = transform

        datapath = os.path.join(self.data_dir,self.csv_file)
        self.dataset = pd.read_csv(datapath)

        self.len = self.dataset.shape[0]

    def __len__(self):
        return self.len

    def __getitem__(self,index):

        imgpath = os.path.join(self.data_dir,self.dataset.iloc[index,1])
        image = Image.open(imgpath)

        y = self.dataset.iloc[index,0]

        if self.transform != None:
```

```
            image = self.transform(image)
            return image, y
        else:
            return image, y
```

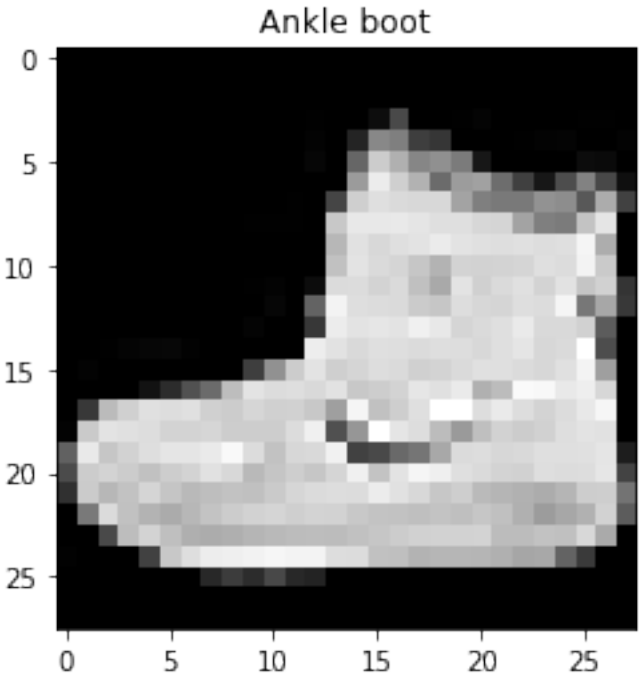
[176]:
```
dataset = imagedataset(csv_file=csv_file, data_dir=directory)
```

[177]:
```
dataset
```

[177]:
```
<__main__.imagedataset at 0x7ffa2aa5f4d0>
```

[185]:
```
image=dataset[0][0]
y=dataset[0][1]

plt.imshow(image,cmap='gray', vmin=0, vmax=255)
plt.title(y)
plt.show()
```



0.0.7 TorchVision Transforms

[186]:
```
# transformations in the Images are ususally done to create data augmentation
```

[194]:
```
from torchvision import transforms
```

[195]:
```
centercropobj = transforms.Compose([transforms.CenterCrop(20),transforms.
↪ToTensor()])
newtransforms = imagedataset(csv_file,directory,transform=centercropobj)
```

[196]:
```
newtransforms[0][0] # since we passed transform, now the returned output in a␣
↪tensor
```

[196]:
```
tensor([[[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.0118, 0.0000, 0.1412, 0.5333, 0.4980, 0.2431, 0.2118, 0.0000,
          0.0000, 0.0000, 0.0039, 0.0118],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.0235, 0.0000, 0.4000, 0.8000, 0.6902, 0.5255, 0.5647, 0.4824,
          0.0902, 0.0000, 0.0000, 0.0000],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.0000, 0.0000, 0.6078, 0.9255, 0.8118, 0.6980, 0.4196, 0.6118,
          0.6314, 0.4275, 0.2510, 0.0902],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039,
          0.0000, 0.2706, 0.8118, 0.8745, 0.8549, 0.8471, 0.8471, 0.6392,
          0.4980, 0.4745, 0.4784, 0.5725],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039, 0.0039, 0.0039,
          0.0000, 0.7843, 0.9098, 0.9098, 0.9137, 0.8980, 0.8745, 0.8745,
          0.8431, 0.8353, 0.6431, 0.4980],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.0000, 0.7176, 0.8824, 0.8471, 0.8745, 0.8941, 0.9216, 0.8902,
          0.8784, 0.8706, 0.8784, 0.8667],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.0000, 0.7569, 0.8941, 0.8549, 0.8353, 0.7765, 0.7059, 0.8314,
          0.8235, 0.8275, 0.8353, 0.8745],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039, 0.0118, 0.0000,
          0.0471, 0.8588, 0.8627, 0.8314, 0.8549, 0.7529, 0.6627, 0.8902,
          0.8157, 0.8549, 0.8784, 0.8314],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0235, 0.0000,
          0.3882, 0.9569, 0.8706, 0.8627, 0.8549, 0.7961, 0.7765, 0.8667,
          0.8431, 0.8353, 0.8706, 0.8627],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0157, 0.0000, 0.0000,
          0.2157, 0.9255, 0.8941, 0.9020, 0.8941, 0.9412, 0.9098, 0.8353,
          0.8549, 0.8745, 0.9176, 0.8510],
         [0.0235, 0.0275, 0.0078, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
          0.9294, 0.8863, 0.8510, 0.8745, 0.8706, 0.8588, 0.8706, 0.8667,
          0.8471, 0.8745, 0.8980, 0.8431],
         [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.2431, 0.5686, 0.8000,
          0.8941, 0.8118, 0.8353, 0.8667, 0.8549, 0.8157, 0.8275, 0.8549,
          0.8784, 0.8745, 0.8588, 0.8431],
         [0.0706, 0.1725, 0.3216, 0.4196, 0.7412, 0.8941, 0.8627, 0.8706,
          0.8510, 0.8863, 0.7843, 0.8039, 0.8275, 0.9020, 0.8784, 0.9176,
          0.6902, 0.7373, 0.9804, 0.9725],
         [0.8784, 0.8667, 0.8784, 0.8157, 0.8000, 0.8392, 0.8157, 0.8196,
```

```
          0.7843, 0.6235, 0.9608, 0.7569, 0.8078, 0.8745, 1.0000, 1.0000,
          0.8667, 0.9176, 0.8667, 0.8275],
         [0.8667, 0.8275, 0.8275, 0.8392, 0.8039, 0.8039, 0.8039, 0.8627,
          0.9412, 0.3137, 0.5882, 1.0000, 0.8980, 0.8667, 0.7373, 0.6039,
          0.7490, 0.8235, 0.8000, 0.8196],
         [0.8706, 0.8980, 0.8980, 0.9176, 0.9765, 0.8627, 0.7608, 0.8431,
          0.8510, 0.9451, 0.2549, 0.2863, 0.4157, 0.4588, 0.6588, 0.8588,
          0.8667, 0.8431, 0.8510, 0.8745],
         [0.7569, 0.8039, 0.8275, 0.8824, 0.8471, 0.7255, 0.7725, 0.8078,
          0.7765, 0.8353, 0.9412, 0.7647, 0.8902, 0.9608, 0.9373, 0.8745,
          0.8549, 0.8314, 0.8196, 0.8706],
         [0.8353, 0.7725, 0.7255, 0.7451, 0.7608, 0.7529, 0.7922, 0.8392,
          0.8588, 0.8667, 0.8627, 0.9255, 0.8824, 0.8471, 0.7804, 0.8078,
          0.7294, 0.7098, 0.6941, 0.6745],
         [0.7020, 0.6706, 0.7176, 0.7686, 0.8000, 0.8235, 0.8353, 0.8118,
          0.8275, 0.8235, 0.7843, 0.7686, 0.7608, 0.7490, 0.7647, 0.7490,
          0.7765, 0.7529, 0.6902, 0.6118],
         [0.8314, 0.7490, 0.6863, 0.6745, 0.6863, 0.7098, 0.7255, 0.7373,
          0.7412, 0.7373, 0.7569, 0.7765, 0.8000, 0.8196, 0.8235, 0.8235,
          0.8275, 0.7373, 0.7373, 0.7608]]])
```

[197]:
```
image = newtransforms[0][0]
label = newtransforms[0][1]
```

[198]:
```
image.shape
```

[198]:
```
torch.Size([1, 20, 20])
```

[199]:
```
label
```

[199]:
```
'Ankle boot'
```

[208]:
```
newtransforms[0]
```

[208]:
```
(tensor([[[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
           0.0118, 0.0000, 0.1412, 0.5333, 0.4980, 0.2431, 0.2118, 0.0000,
           0.0000, 0.0000, 0.0039, 0.0118],
          [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
           0.0235, 0.0000, 0.4000, 0.8000, 0.6902, 0.5255, 0.5647, 0.4824,
           0.0902, 0.0000, 0.0000, 0.0000],
          [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
           0.0000, 0.0000, 0.6078, 0.9255, 0.8118, 0.6980, 0.4196, 0.6118,
           0.6314, 0.4275, 0.2510, 0.0902],
          [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039,
           0.0000, 0.2706, 0.8118, 0.8745, 0.8549, 0.8471, 0.8471, 0.6392,
           0.4980, 0.4745, 0.4784, 0.5725],
          [0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039, 0.0039, 0.0039,
```

```
 0.0000, 0.7843, 0.9098, 0.9098, 0.9137, 0.8980, 0.8745, 0.8745,
 0.8431, 0.8353, 0.6431, 0.4980],
[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
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 0.8784, 0.8706, 0.8784, 0.8667],
[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
 0.0000, 0.7569, 0.8941, 0.8549, 0.8353, 0.7765, 0.7059, 0.8314,
 0.8235, 0.8275, 0.8353, 0.8745],
[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0039, 0.0118, 0.0000,
 0.0471, 0.8588, 0.8627, 0.8314, 0.8549, 0.7529, 0.6627, 0.8902,
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[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0235, 0.0000,
 0.3882, 0.9569, 0.8706, 0.8627, 0.8549, 0.7961, 0.7765, 0.8667,
 0.8431, 0.8353, 0.8706, 0.8627],
[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0157, 0.0000, 0.0000,
 0.2157, 0.9255, 0.8941, 0.9020, 0.8941, 0.9412, 0.9098, 0.8353,
 0.8549, 0.8745, 0.9176, 0.8510],
[0.0235, 0.0275, 0.0078, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
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 0.8471, 0.8745, 0.8980, 0.8431],
[0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.2431, 0.5686, 0.8000,
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 0.8510, 0.8863, 0.7843, 0.8039, 0.8275, 0.9020, 0.8784, 0.9176,
 0.6902, 0.7373, 0.9804, 0.9725],
[0.8784, 0.8667, 0.8784, 0.8157, 0.8000, 0.8392, 0.8157, 0.8196,
 0.7843, 0.6235, 0.9608, 0.7569, 0.8078, 0.8745, 1.0000, 1.0000,
 0.8667, 0.9176, 0.8667, 0.8275],
[0.8667, 0.8275, 0.8275, 0.8392, 0.8039, 0.8039, 0.8039, 0.8627,
 0.9412, 0.3137, 0.5882, 1.0000, 0.8980, 0.8667, 0.7373, 0.6039,
 0.7490, 0.8235, 0.8000, 0.8196],
[0.8706, 0.8980, 0.8980, 0.9176, 0.9765, 0.8627, 0.7608, 0.8431,
 0.8510, 0.9451, 0.2549, 0.2863, 0.4157, 0.4588, 0.6588, 0.8588,
 0.8667, 0.8431, 0.8510, 0.8745],
[0.7569, 0.8039, 0.8275, 0.8824, 0.8471, 0.7255, 0.7725, 0.8078,
 0.7765, 0.8353, 0.9412, 0.7647, 0.8902, 0.9608, 0.9373, 0.8745,
 0.8549, 0.8314, 0.8196, 0.8706],
[0.8353, 0.7725, 0.7255, 0.7451, 0.7608, 0.7529, 0.7922, 0.8392,
 0.8588, 0.8667, 0.8627, 0.9255, 0.8824, 0.8471, 0.7804, 0.8078,
 0.7294, 0.7098, 0.6941, 0.6745],
[0.7020, 0.6706, 0.7176, 0.7686, 0.8000, 0.8235, 0.8353, 0.8118,
 0.8275, 0.8235, 0.7843, 0.7686, 0.7608, 0.7490, 0.7647, 0.7490,
 0.7765, 0.7529, 0.6902, 0.6118],
[0.8314, 0.7490, 0.6863, 0.6745, 0.6863, 0.7098, 0.7255, 0.7373,
 0.7412, 0.7373, 0.7569, 0.7765, 0.8000, 0.8196, 0.8235, 0.8235,
 0.8275, 0.7373, 0.7373, 0.7608]]]),
```
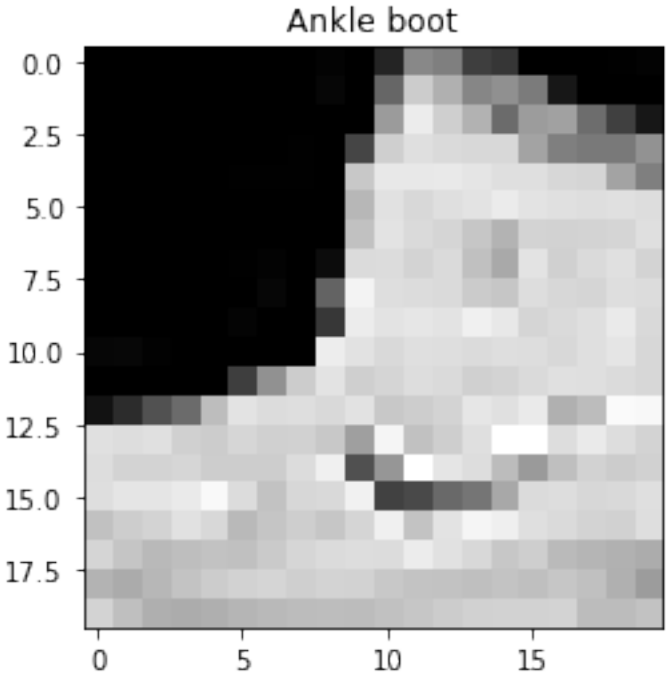

```
'Ankle boot')
```

[213]:
```
plt.imshow(image.numpy().reshape(20,20),cmap='gray')
plt.title(label) # center cropped image
```

[213]:
```
Text(0.5, 1.0, 'Ankle boot')
```

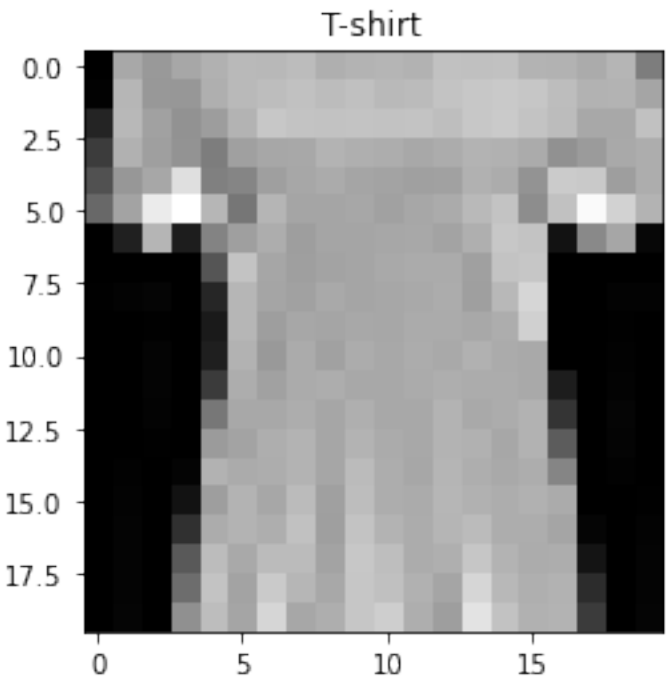


[215]:
```
# another example
```

[218]:
```
image = newtransforms[10][0]
label = newtransforms[10][1]
```

[219]:
```
plt.imshow(image.numpy().reshape(20,20),cmap='gray')
plt.title(label) # center cropped image
```

[219]:
```
Text(0.5, 1.0, 'T-shirt')
```



Let's try another Transform, transform.RandomVerticalFlip

[235]:
```
verticalflipobj = transforms.Compose([transforms.
↪RandomVerticalFlip(p=1),transforms.ToTensor()])
fliptransforms = imagedataset(csv_file,directory,transform=verticalflipobj)
```

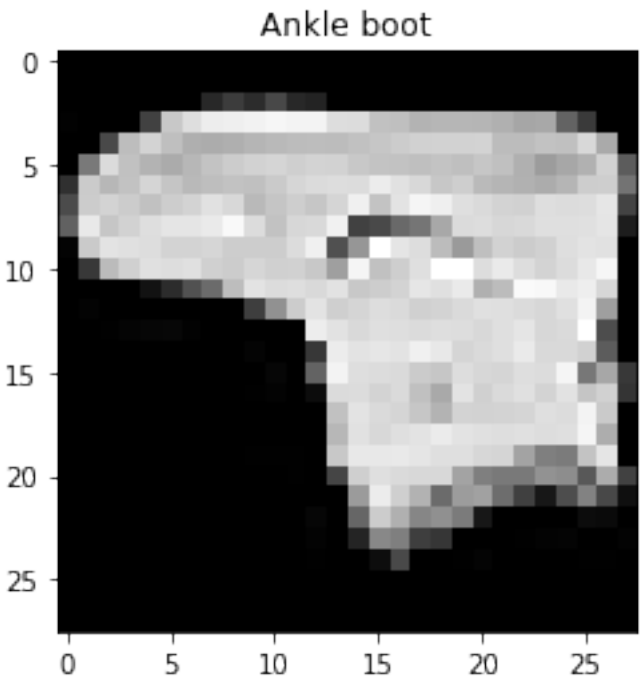
[238]:
```
flipimage = fliptransforms[0][0]
fliplabel = fliptransforms[0][1]
```

[239]:
```
flipimage.shape
```

[239]:
```
torch.Size([1, 28, 28])
```

[245]:
```
plt.imshow(flipimage.numpy().reshape(28,28),cmap='gray')
plt.title(fliplabel) # vertical flipped
```

[245]:
```
Text(0.5, 1.0, 'Ankle boot')
```


Ankle boot
0
5
10
15
20
25
0
5
10
15
20
25

[ ]: