```
import torch
import torch.nn as nn
from torch.autograd import Variable
from torch.utils.data import DataLoader
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import os


dir = './fruits-360'
classes = os.listdir(dir+'/Training')
print(classes)
```

```
['Apple Braeburn', 'Apple Crimson Snow', 'Apple Golden 1', 'Apple Golden 2', 'Apple Golden 3', 'Ap
```

```
from torchvision.datasets import ImageFolder
from torchvision.transforms import ToTensor

dataset = ImageFolder(dir + '/Training', transform=ToTensor())
print('Size of training dataset :', len(dataset))
test = ImageFolder(dir + '/Test', transform=ToTensor())
print('Size of test dataset :', len(test))
```

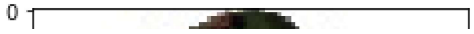
```
Size of training dataset : 67692
Size of test dataset : 22688
```

```
img, label = dataset[7005]
print(img.shape)
```

```
torch.Size([3, 100, 100])
```

```
def show_image(img, label):
    print('Label: ', dataset.classes[label], "("+str(label)+")")
    plt.imshow(img.permute(1, 2, 0))
show_image(img,label)
```

```
     Label:  Avocado (14)
```

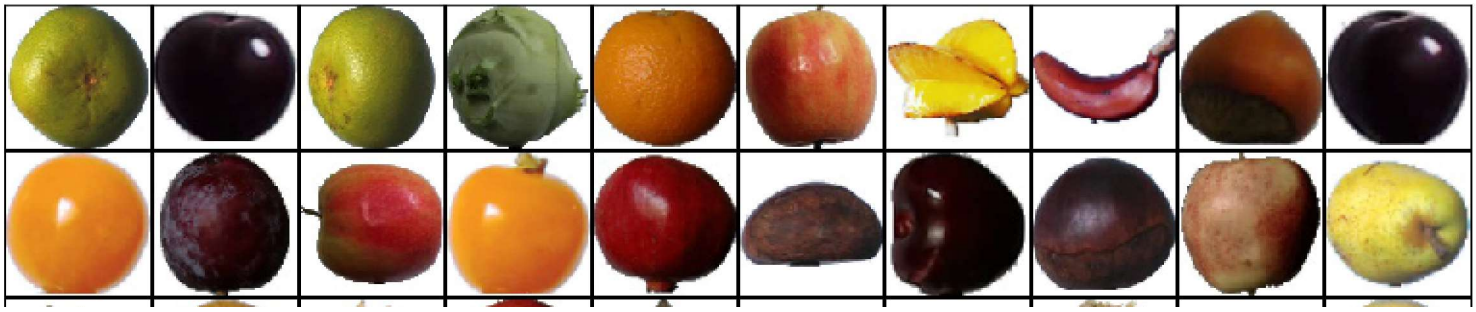


```
batch_size = 100
n_iters = 5000
num_epochs = n_iters / (len(dataset) / batch_size)
num_epochs = int(num_epochs)
```

```
train_loader = DataLoader(dataset, batch_size = batch_size, shuffle = True, num_workers=4, pin_memory=T
test_loader = DataLoader(test, batch_size = batch_size, shuffle = True, num_workers=4,pin_memory=True)
```

```
from torchvision.utils import make_grid

for images, labels in train_loader:
    fig, ax = plt.subplots(figsize=(14,14))
    ax.set_xticks([]); ax.set_yticks([])
    ax.imshow(make_grid(images, nrow=10).permute(1, 2, 0))
    break
```



```
class ANNModel(nn.Module):
    def __init__(self, input_dim, hidden_dim, output_dim):
        super(ANNModel, self).__init__()
        self.fc1 = nn.Linear(input_dim, hidden_dim)
        self.relu1 = nn.ReLU()
        self.fc2 = nn.Linear(hidden_dim, hidden_dim)
        self.tanh2 = nn.Tanh()
        self.fc3 = nn.Linear(hidden_dim, hidden_dim)
        self.relu3 = nn.ELU()
        self.fc4 = nn.Linear(hidden_dim, output_dim)
    def forward(self, x):
        out = self.fc1(x)
        out = self.relu1(out)
        out = self.fc2(out)
        out = self.tanh2(out)
        out = self.fc3(out)
        out = self.relu3(out)
        out = self.fc4(out)
        return out
input_dim = 3*100*100
hidden_dim = 150
output_dim = 131
model = ANNModel(input_dim, hidden_dim, output_dim)
error = nn.CrossEntropyLoss()
learning_rate = 0.02
optimizer = torch.optim.SGD(model.parameters(), lr=learning_rate)
```

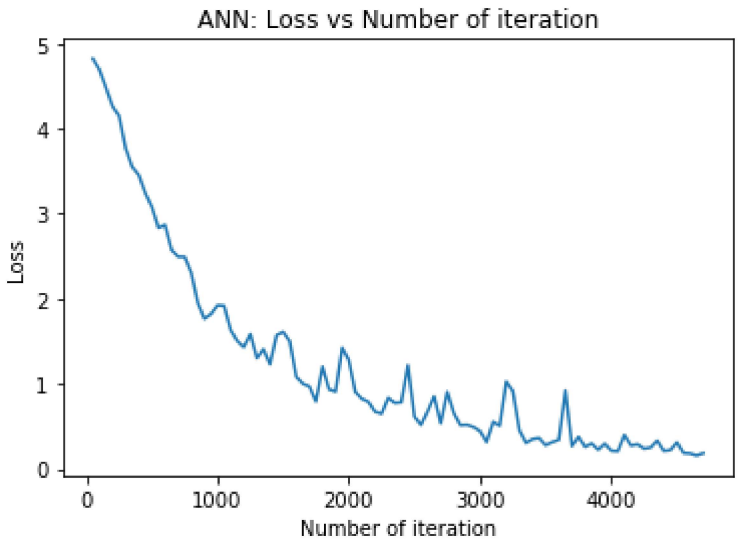
```
count = 0
loss_list = []
iteration_list = []
accuracy_list = []

for epoch in range(num_epochs):
    for i, (images, labels) in enumerate(train_loader):
        train = Variable(images.view(-1, 3*100*100))
        labels = Variable(labels)
        optimizer.zero_grad()
        outputs = model(train)
        loss = error(outputs,labels)
        loss.backward()
        optimizer.step()
        count += 1
        if count % 50 == 0:
            correct = 0
```

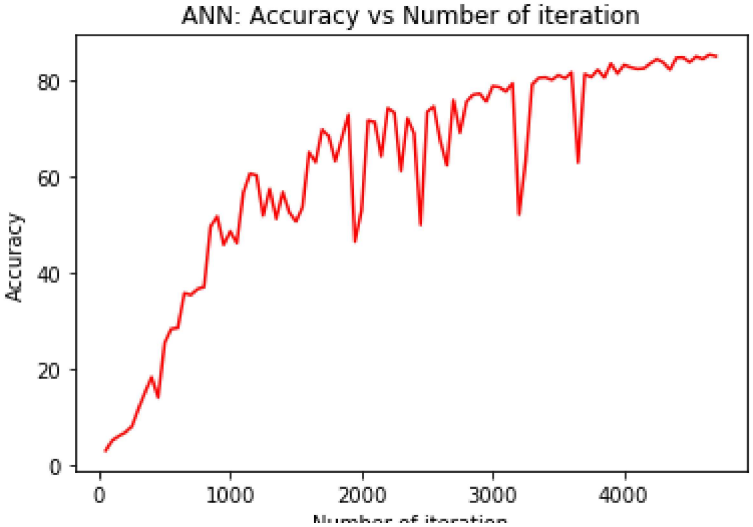
```
            total = 0
            for images, labels in test_loader:
                test = Variable(images.view(-1, 3*100*100))
                outputs = model(test)
                predicted = torch.max(outputs.data, 1)[1]
                total += len(labels)
                correct += (predicted == labels).sum()
            accuracy = 100 * correct / float(total)
            loss_list.append(loss.data)
            iteration_list.append(count)
            accuracy_list.append(accuracy)
        if count % 500 == 0:
            print('Iteration: {} Loss: {} Accuracy: {} %'.format(count, loss.data, accuracy))
```

```
Iteration: 500 Loss: 3.0783495903015137 Accuracy: 25.32175636291504 %
Iteration: 1000 Loss: 1.9218456745147705 Accuracy: 48.519039154052734 %
Iteration: 1500 Loss: 1.6085598468780518 Accuracy: 50.55976867675781 %
Iteration: 2000 Loss: 1.2802330255508423 Accuracy: 52.85172653198242 %
Iteration: 2500 Loss: 0.6132445931434631 Accuracy: 73.36917877197266 %
Iteration: 3000 Loss: 0.44314566254615784 Accuracy: 78.75969696044922 %
Iteration: 3500 Loss: 0.2777440845966339 Accuracy: 81.05606842041016 %
Iteration: 4000 Loss: 0.21184797585010529 Accuracy: 83.1761245727539 %
Iteration: 4500 Loss: 0.3103707432746887 Accuracy: 83.73149108886719 %
```

```
plt.plot(iteration_list,loss_list)
plt.xlabel("Number of iteration")
plt.ylabel("Loss")
plt.title("ANN: Loss vs Number of iteration")
plt.show()
```




```
plt.plot(iteration_list,accuracy_list,color = "red")
plt.xlabel("Number of iteration")
plt.ylabel("Accuracy")
plt.title("ANN: Accuracy vs Number of iteration")
plt.show()
```


ANN: Accuracy vs Number of iteration
Accuracy
0
20
40
60
80
0
1000
2000
3000
4000

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