triple_junction

December 15, 2017

In [1]:
```
import csv
import numpy as np
import torch
import matplotlib
import matplotlib.pyplot as plt
from torch.autograd import Variable
from torch.utils.data import Dataset, DataLoader
```

In [2]:
```
# use provided supplementary load function
from supp import pytorch_nn_spiral as iai
```

In [3]:
```
class ToyDataset(Dataset):
    """ A toy dataset class which implements the abstract class torch.utils.data.Datas
    (for reference see http://pytorch.org/docs/master/data.html#torch.utils.data.Datas
    """
    def __init__(self, root_dir, txt_filename):
        super(ToyDataset, self).__init__()

        with open(root_dir + "/" + txt_filename) as txt_file:
            content = csv.reader(txt_file, delimiter = ' ')
            x = []
            y = []
            truth = np.array([],dtype=int)
            for row in content:
                x_i = row[0]
                y_i = row[1]
                t_i = row[2]

                x.append(x_i)
                y.append(y_i)
                truth = np.append(truth,t_i)
        self.raw = torch.from_numpy(np.transpose(np.array((x[:], y[:]), dtype=float)))
        truth = truth.astype(np.int)
        self.type = torch.from_numpy(self.one_hot_encode(truth))

    # write ground truth as one hot vector
    def one_hot_encode(self, x):
```

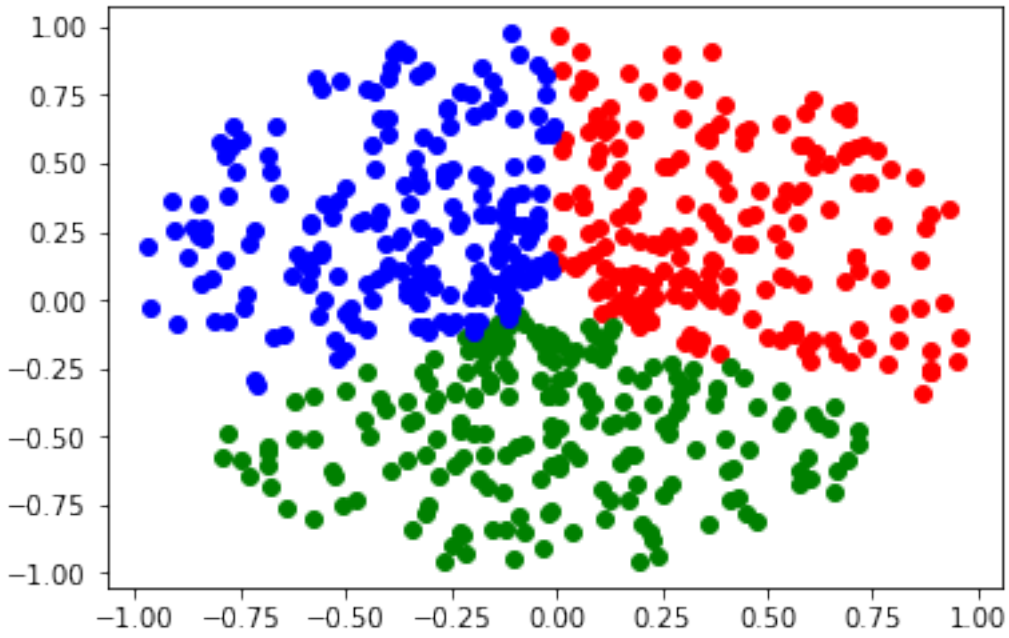
```
            n_values = np.max(x) + 1
            return np.eye(n_values, dtype=float)[x]

        def __getitem__(self, index):
            return self.raw[index], self.type[index]

        def __len__(self):
            return self.raw.__len__()
```

1 Load triple junction example

In [4]:
```
x,y = iai.load_dataset('supp/triple_junction_data_training.txt')
iai.visualize_toy_dataset(x, y)
plt.show()
```



In [5]:
```
toy = ToyDataset(root_dir='supp', txt_filename='triple_junction_data_training.txt')
#dir(toy)

def pred_quality(y1, y2):
    y1, y2 = y1.data.numpy(), y2.data.numpy()
    ix1 = y1.argmax(1)
    ix2 = y2.argmax(1)
    return float(np.sum(ix1 == ix2)) / y1.shape[0]
```

In [6]:
```
#labels = Variable(torch.FloatTensor([1, 2, 3])).view(1,-1)
```

```
        N, D_in, H, D_out = toy.__len__(), toy.raw.shape[1], 100, 4

        x = Variable(toy.raw)
        y = Variable(toy.type)
        x,y = x.type(torch.FloatTensor), y.type(torch.FloatTensor)

        model = torch.nn.Sequential(
            torch.nn.Linear(D_in, H),
            torch.nn.ReLU(),
            torch.nn.Linear(H, H),
            torch.nn.ReLU(),
            torch.nn.Linear(H, D_out),
            torch.nn.Softmax(),
        )
        loss_fn = torch.nn.MultiLabelSoftMarginLoss()
```

```
In [7]: learning_rate = 1e-4
        optimizer = torch.optim.SGD(model.parameters(), lr=0.01) #torch.optim.Adam(model.param
        loss = Variable(torch.FloatTensor([1000]))
        #while float(loss.data) > 1:
        for t in range(5000):
            # Forward pass: compute predicted y by passing x to the model.
            y_pred = model(x)

            # Compute and print loss.
            loss = loss_fn(y_pred, y)
            if t % 1000 == 0:
                print('Training acceptance: ', pred_quality(y_pred, y))
                print('Loss: ', loss.data)

            optimizer.zero_grad()

            # Backward pass: compute gradient of the loss with respect to model
            # parameters
            loss.backward()

            optimizer.step()
        #torch.save(model.state_dict(), 'net2.pk1')
```

```
/Users/lucasmueller/anaconda/lib/python3.6/site-packages/torch/nn/modules/container.py:67: User
  input = module(input)


Training acceptance:  0.3333333333333333
Loss:
 0.7616
[torch.FloatTensor of size 1]
```

```
Training acceptance:  0.5066666666666667
Loss:
 0.7420
[torch.FloatTensor of size 1]

Training acceptance:  0.63
Loss:
 0.7181
[torch.FloatTensor of size 1]

Training acceptance:  0.685
Loss:
 0.6955
[torch.FloatTensor of size 1]

Training acceptance:  0.85
Loss:
 0.6757
[torch.FloatTensor of size 1]
```

2 Training Success

```
In [8]: print('Training acceptance: ', pred_quality(y_pred, y))

Training acceptance:  0.95
```

3 Test Success

```
In [9]: toyTest = ToyDataset(root_dir='supp', txt_filename='triple_junction_data_test.txt')

        xt = Variable(toyTest.raw)
        yt = Variable(toyTest.type)
        xt,yt = xt.type(torch.FloatTensor), yt.type(torch.FloatTensor)
        y_predt = model(xt)
        print('Testing acceptance: ', pred_quality(y_predt, yt))

Testing acceptance:  0.945


/Users/lucasmueller/anaconda/lib/python3.6/site-packages/torch/nn/modules/container.py:67: User
  input = module(input)
```