2306aml108-adnaan-aiml16

October 26, 2023

[24]:
```
import tensorflow as tf
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler, Normalizer
from sklearn.decomposition import PCA as sklearnPCA

# Supress unnecessary warnings so that presentation looks clean
import warnings
warnings.filterwarnings("ignore")
```

[25]:
```
wbcd = pd.read_csv("../input/data.csv")
wbcd.head()
```

[25]:

	id	diagnosis	…	fractal_dimension_worst	Unnamed: 32
0	842302	M	…	0.11890	NaN
1	842517	M	…	0.08902	NaN
2	84300903	M	…	0.08758	NaN
3	84348301	M	…	0.17300	NaN
4	84358402	M	…	0.07678	NaN

[5 rows x 33 columns]

[26]:
```
print("This WBCD dataset is consisted of",wbcd.shape)
```

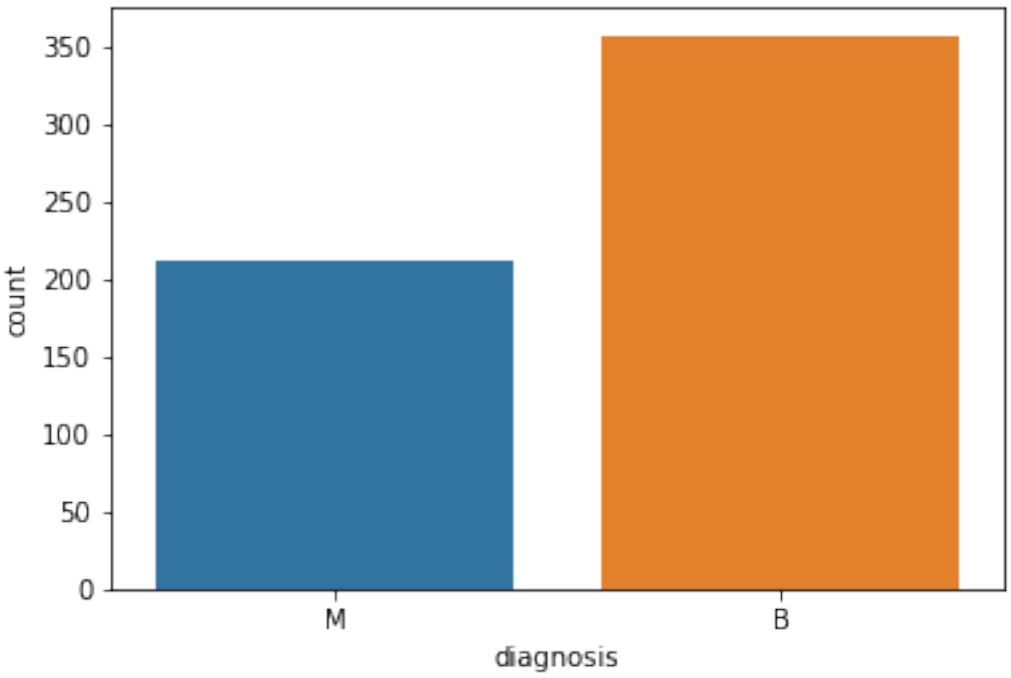
```
This WBCD dataset is consisted of (569, 33)
```

[27]:
```
wbcd = wbcd.iloc[:,:-1]
print("This WBCD dataset is consisted of",wbcd.shape)
```

```
This WBCD dataset is consisted of (569, 32)
```

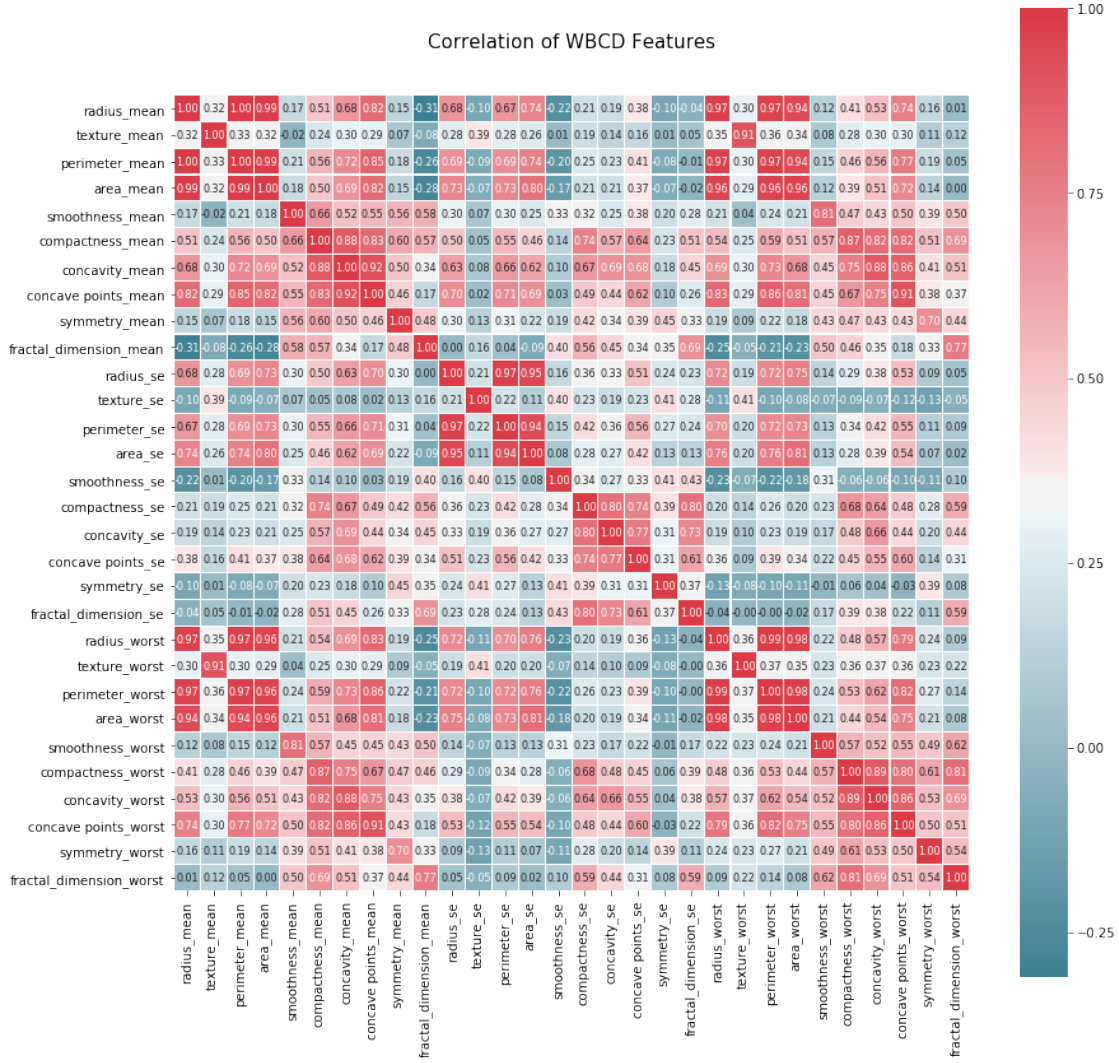
[28]:
```
sns.countplot(wbcd['diagnosis'],label="Count")
```

[28]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7ef939838630>
```



[29]:
```
corr = wbcd.iloc[:,2:].corr()
colormap = sns.diverging_palette(220, 10, as_cmap = True)
plt.figure(figsize=(14,14))
sns.heatmap(corr, cbar = True,  square = True, annot=True, fmt= '.
 ↪2f',annot_kws={'size': 8},
           cmap = colormap, linewidths=0.1, linecolor='white')
plt.title('Correlation of WBCD Features', y=1.05, size=15)
```

[29]: Text(0.5,1.05,'Correlation of WBCD Features')



[30]:
```
train,test = train_test_split(wbcd, test_size=0.3, random_state=42)
print("Training Data :",train.shape)
print("Testing Data :",test.shape)
```

```
Training Data : (398, 32)
Testing Data : (171, 32)
```

[31]:
```
train_id = train['id']
test_id = test['id']

train_data = train.iloc[:,1:]
test_data = test.iloc[:,1:]

print("Training Data :",train_data.shape)
```

```
print("Testing Data :",test_data.shape)
```

```
Training Data : (398, 31)
Testing Data : (171, 31)
```

[32]:
```
# Training Data
train_x = train_data.iloc[:,1:]
train_x = MinMaxScaler().fit_transform(train_x)
print("Training Data :", train_x.shape)

# Testing Data
test_x = test_data.iloc[:,1:]
test_x = MinMaxScaler().fit_transform(test_x)
print("Testing Data :", test_x.shape)
```

```
Training Data : (398, 30)
Testing Data : (171, 30)
```

[33]:
```
# Training Data
train_y = train_data.iloc[:,:1]
train_y[train_y=='M'] = 0
train_y[train_y=='B'] = 1
print("Training Data :", train_y.shape)

# Testing Data
test_y = test_data.iloc[:,:1]
test_y[test_y=='M'] = 0
test_y[test_y=='B'] = 1
print("Testing Data :", test_y.shape)
```

```
Training Data : (398, 1)
Testing Data : (171, 1)
```

[34]:
```
X = tf.placeholder(tf.float32, [None,30])
Y = tf.placeholder(tf.float32, [None, 1])
```

[35]:
```
# weight
W = tf.Variable(tf.random_normal([30,1], seed=0), name='weight')

# bias
b = tf.Variable(tf.random_normal([1], seed=0), name='bias')
```

[36]:
```
logits = tf.matmul(X,W) + b
```

[37]:
```
hypothesis = tf.nn.sigmoid(logits)

cost_i = tf.nn.sigmoid_cross_entropy_with_logits(logits=logits,labels=Y)
```

```
cost = tf.reduce_mean(cost_i)
# cost = -tf.reduce_mean(Y * tf.log(hypothesis) + (1 - Y) * tf.log(1 -␣
 ↪hypothesis))
```

[38]:
```
train = tf.train.GradientDescentOptimizer(learning_rate=0.1).minimize(cost)
```

[39]:
```
prediction = tf.cast(hypothesis > 0.5, dtype=tf.float32)
correct_prediction = tf.equal(prediction, Y)
accuracy = tf.reduce_mean(tf.cast(correct_prediction, dtype=tf.float32))
```

[40]:
```
with tf.Session() as sess:
    sess.run(tf.global_variables_initializer())
    for step in range(10001):
        sess.run(train, feed_dict={X: train_x, Y: train_y})
        if step % 1000 == 0:
            loss, acc = sess.run([cost, accuracy], feed_dict={X: train_x, Y:␣
 ↪train_y})
            print("Step: {:5}\tLoss: {:.3f}\tAcc: {:.2%}".format(step, loss,␣
 ↪acc))

    train_acc = sess.run(accuracy, feed_dict={X: train_x, Y: train_y})
    test_acc,test_predict,test_correct = sess.
 ↪run([accuracy,prediction,correct_prediction], feed_dict={X: test_x, Y:␣
 ↪test_y})
    print("Model Prediction =", train_acc)
    print("Test Prediction =", test_acc)
```

```
Step:     0     Loss: 0.848     Acc: 39.70%
Step:  1000     Loss: 0.238     Acc: 91.21%
Step:  2000     Loss: 0.180     Acc: 94.72%
Step:  3000     Loss: 0.154     Acc: 96.23%
Step:  4000     Loss: 0.138     Acc: 96.98%
Step:  5000     Loss: 0.128     Acc: 97.49%
Step:  6000     Loss: 0.120     Acc: 97.74%
Step:  7000     Loss: 0.114     Acc: 97.99%
Step:  8000     Loss: 0.110     Acc: 98.24%
Step:  9000     Loss: 0.106     Acc: 98.24%
Step: 10000     Loss: 0.102     Acc: 98.24%
Model Prediction = 0.982412
Test Prediction = 0.947368
```

[41]:
```
def ann_slp():
    print("===========Data Summary==========")
    print("Training Data :", train_x.shape)
    print("Testing Data :", test_x.shape)

    X = tf.placeholder(tf.float32, [None,30])
```

```
    Y = tf.placeholder(tf.float32, [None, 1])

    W = tf.Variable(tf.random_normal([30,1], seed=0), name='weight')
    b = tf.Variable(tf.random_normal([1], seed=0), name='bias')

    logits = tf.matmul(X,W) + b
    hypothesis = tf.nn.sigmoid(logits)

    cost_i = tf.nn.sigmoid_cross_entropy_with_logits(logits=logits,labels=Y)
    cost = tf.reduce_mean(cost_i)

    train = tf.train.GradientDescentOptimizer(learning_rate=0.1).minimize(cost)

    prediction = tf.cast(hypothesis > 0.5, dtype=tf.float32)
    correct_prediction = tf.equal(prediction, Y)
    accuracy = tf.reduce_mean(tf.cast(correct_prediction, dtype=tf.float32))

    print("\n============Processing============")
    with tf.Session() as sess:
        sess.run(tf.global_variables_initializer())
        for step in range(10001):
            sess.run(train, feed_dict={X: train_x, Y: train_y})
            if step % 1000 == 0:
                loss, acc = sess.run([cost, accuracy], feed_dict={X: train_x, Y:
 ↪ train_y})
                print("Step: {:5}\tLoss: {:.3f}\tAcc: {:.2%}".format(step,␣
 ↪loss, acc))

        train_acc = sess.run(accuracy, feed_dict={X: train_x, Y: train_y})
        test_acc,test_predict,test_correct = sess.
 ↪run([accuracy,prediction,correct_prediction], feed_dict={X: test_x, Y:␣
 ↪test_y})

        print("\n============Results============")
        print("Model Prediction =", train_acc)
        print("Test Prediction =", test_acc)

        return train_acc,test_acc

ann_slp_train_acc, ann_slp_test_acc = ann_slp()
```

```
==========Data Summary==========
Training Data : (398, 30)
Testing Data : (171, 30)

============Processing============
Step:     0     Loss: 0.848     Acc: 39.70%
```

```
Step:  1000     Loss: 0.238     Acc: 91.21%
Step:  2000     Loss: 0.180     Acc: 94.72%
Step:  3000     Loss: 0.154     Acc: 96.23%
Step:  4000     Loss: 0.138     Acc: 96.98%
Step:  5000     Loss: 0.128     Acc: 97.49%
Step:  6000     Loss: 0.120     Acc: 97.74%
Step:  7000     Loss: 0.114     Acc: 97.99%
Step:  8000     Loss: 0.110     Acc: 98.24%
Step:  9000     Loss: 0.106     Acc: 98.24%
Step: 10000     Loss: 0.102     Acc: 98.24%

============Results============
Model Prediction = 0.982412
Test Prediction = 0.947368
```

[42]:
```python
def ann_slp_pca():
    sklearn_pca = sklearnPCA(n_components=10)

    print("============Data Summary============")
    pca_train_x = sklearn_pca.fit_transform(train_x)
    print("PCA Training Data :", pca_train_x.shape)

    pca_test_x = sklearn_pca.fit_transform(test_x)
    print("PCA Testing Data :", pca_test_x.shape)

    X = tf.placeholder(tf.float32, [None,10])
    Y = tf.placeholder(tf.float32, [None, 1])

    W = tf.Variable(tf.random_normal([10,1], seed=0), name='weight')
    b = tf.Variable(tf.random_normal([1], seed=0), name='bias')

    logits = tf.matmul(X,W) + b
    hypothesis = tf.nn.sigmoid(logits)

    cost_i = tf.nn.sigmoid_cross_entropy_with_logits(logits=logits,labels=Y)
    cost = tf.reduce_mean(cost_i)

    train = tf.train.GradientDescentOptimizer(learning_rate=0.2).minimize(cost)

    prediction = tf.cast(hypothesis > 0.5, dtype=tf.float32)
    correct_prediction = tf.equal(prediction, Y)
    accuracy = tf.reduce_mean(tf.cast(correct_prediction, dtype=tf.float32))

    print("\n============Processing============")
    with tf.Session() as sess:
        sess.run(tf.global_variables_initializer())
        for step in range(10001):
```

```
            sess.run(train, feed_dict={X: pca_train_x, Y: train_y})
            if step % 1000 == 0:
                loss, acc = sess.run([cost, accuracy], feed_dict={X:␣
 ↪pca_train_x, Y: train_y})
                print("Step: {:5}\tLoss: {:.3f}\tAcc: {:.2%}".format(step,␣
 ↪loss, acc))

        train_acc = sess.run(accuracy, feed_dict={X: pca_train_x, Y: train_y})
        test_acc,test_predict,test_correct = sess.
 ↪run([accuracy,prediction,correct_prediction], feed_dict={X: pca_test_x, Y:␣
 ↪test_y})

        print("\n============Results============")
        print("PCA Model Prediction =", train_acc)
        print("PCA Test Prediction =", test_acc)

        return train_acc, test_acc

ann_slp_pca_train_acc, ann_slp_pca_test_acc = ann_slp_pca()
```

```
==========Data Summary==========
PCA Training Data : (398, 10)
PCA Testing Data : (171, 10)

============Processing============
Step:     0     Loss: 0.701     Acc: 54.52%
Step:  1000     Loss: 0.142     Acc: 96.23%
Step:  2000     Loss: 0.117     Acc: 96.98%
Step:  3000     Loss: 0.106     Acc: 97.49%
Step:  4000     Loss: 0.100     Acc: 97.74%
Step:  5000     Loss: 0.095     Acc: 97.74%
Step:  6000     Loss: 0.092     Acc: 97.74%
Step:  7000     Loss: 0.089     Acc: 97.74%
Step:  8000     Loss: 0.087     Acc: 97.99%
Step:  9000     Loss: 0.086     Acc: 97.99%
Step: 10000     Loss: 0.084     Acc: 97.99%

============Results============
PCA Model Prediction = 0.9799
PCA Test Prediction = 0.964912
```

[43]:
```
def ann_mlp():
    print("==========Data Summary==========")
    print("Training Data :", train_x.shape)
    print("Testing Data :", test_x.shape)

    X = tf.placeholder(tf.float32, [None,30])
```

```
    Y = tf.placeholder(tf.float32, [None, 1])

    # input
    W1 = tf.Variable(tf.random_normal([30,60], seed=0), name='weight1')
    b1 = tf.Variable(tf.random_normal([60], seed=0), name='bias1')
    layer1 = tf.nn.sigmoid(tf.matmul(X,W1) + b1)

    # hidden1
    W2 = tf.Variable(tf.random_normal([60,60], seed=0), name='weight2')
    b2 = tf.Variable(tf.random_normal([60], seed=0), name='bias2')
    layer2 = tf.nn.sigmoid(tf.matmul(layer1,W2) + b2)

    # hidden2
    W3 = tf.Variable(tf.random_normal([60,90], seed=0), name='weight3')
    b3 = tf.Variable(tf.random_normal([90], seed=0), name='bias3')
    layer3 = tf.nn.sigmoid(tf.matmul(layer2,W3) + b3)

    # output
    W4 = tf.Variable(tf.random_normal([90,1], seed=0), name='weight4')
    b4 = tf.Variable(tf.random_normal([1], seed=0), name='bias4')
    logits = tf.matmul(layer3,W4) + b4
    hypothesis = tf.nn.sigmoid(logits)

    cost_i = tf.nn.sigmoid_cross_entropy_with_logits(logits=logits,labels=Y)
    cost = tf.reduce_mean(cost_i)

    train = tf.train.GradientDescentOptimizer(learning_rate=0.001).
↪minimize(cost)

    prediction = tf.cast(hypothesis > 0.5, dtype=tf.float32)
    correct_prediction = tf.equal(prediction, Y)
    accuracy = tf.reduce_mean(tf.cast(correct_prediction, dtype=tf.float32))

    print("\n============Processing============")
    with tf.Session() as sess:
        sess.run(tf.global_variables_initializer())
        for step in range(10001):
            sess.run(train, feed_dict={X: train_x, Y: train_y})
            if step % 1000 == 0:
                loss, acc = sess.run([cost, accuracy], feed_dict={X: train_x, Y:
↪ train_y})
                print("Step: {:5}\tLoss: {:.3f}\tAcc: {:.2%}".format(step,␣
↪loss, acc))

        train_acc = sess.run(accuracy, feed_dict={X: train_x, Y: train_y})
```

```
        test_acc,test_predict,test_correct = sess.
↪run([accuracy,prediction,correct_prediction], feed_dict={X: test_x, Y:␣
↪test_y})

        print("\n============Results============")
        print("Model Prediction =", train_acc)
        print("Test Prediction =", test_acc)

        return train_acc,test_acc

ann_mlp_train_acc, ann_mlp_test_acc = ann_mlp()
```

```
==========Data Summary==========
Training Data : (398, 30)
Testing Data : (171, 30)

============Processing============
Step:     0     Loss: 2.073     Acc: 37.44%
Step:  1000     Loss: 0.335     Acc: 89.95%
Step:  2000     Loss: 0.266     Acc: 92.71%
Step:  3000     Loss: 0.226     Acc: 93.72%
Step:  4000     Loss: 0.199     Acc: 93.97%
Step:  5000     Loss: 0.180     Acc: 95.23%
Step:  6000     Loss: 0.166     Acc: 95.98%
Step:  7000     Loss: 0.155     Acc: 96.23%
Step:  8000     Loss: 0.147     Acc: 96.73%
Step:  9000     Loss: 0.139     Acc: 96.98%
Step: 10000     Loss: 0.133     Acc: 96.98%

============Results============
Model Prediction = 0.969849
Test Prediction = 0.929825
```

[44]:
```
def ann_mlp_pca():
    sklearn_pca = sklearnPCA(n_components=10)

    print("==========Data Summary==========")
    pca_train_x = sklearn_pca.fit_transform(train_x)
    print("PCA Training Data :", pca_train_x.shape)

    pca_test_x = sklearn_pca.fit_transform(test_x)
    print("PCA Testing Data :", pca_test_x.shape)

    X = tf.placeholder(tf.float32, [None,10])
    Y = tf.placeholder(tf.float32, [None, 1])

    # input
```

```
    W1 = tf.Variable(tf.random_normal([10,64], seed=0), name='weight1')
    b1 = tf.Variable(tf.random_normal([64], seed=0), name='bias1')
    layer1 = tf.nn.sigmoid(tf.matmul(X,W1) + b1)

    # hidden1
    W2 = tf.Variable(tf.random_normal([64,128], seed=0), name='weight2')
    b2 = tf.Variable(tf.random_normal([128], seed=0), name='bias2')
    layer2 = tf.nn.sigmoid(tf.matmul(layer1,W2) + b2)

    # hidden2
    W3 = tf.Variable(tf.random_normal([128,128], seed=0), name='weight3')
    b3 = tf.Variable(tf.random_normal([128], seed=0), name='bias3')
    layer3 = tf.nn.sigmoid(tf.matmul(layer2,W3) + b3)

    # output
    W4 = tf.Variable(tf.random_normal([128,1], seed=0), name='weight4')
    b4 = tf.Variable(tf.random_normal([1], seed=0), name='bias4')
    logits = tf.matmul(layer3,W4) + b4
    hypothesis = tf.nn.sigmoid(logits)

    cost_i = tf.nn.sigmoid_cross_entropy_with_logits(logits=logits,labels=Y)
    cost = tf.reduce_mean(cost_i)

    train = tf.train.GradientDescentOptimizer(learning_rate=0.01).minimize(cost)

    prediction = tf.cast(hypothesis > 0.5, dtype=tf.float32)
    correct_prediction = tf.equal(prediction, Y)
    accuracy = tf.reduce_mean(tf.cast(correct_prediction, dtype=tf.float32))

    print("\n============Processing============")
    with tf.Session() as sess:
        sess.run(tf.global_variables_initializer())
        for step in range(10001):
            sess.run(train, feed_dict={X: pca_train_x, Y: train_y})
            if step % 1000 == 0:
                loss, acc = sess.run([cost, accuracy], feed_dict={X:␣
↪pca_train_x, Y: train_y})
                print("Step: {:5}\tLoss: {:.3f}\tAcc: {:.2%}".format(step,␣
↪loss, acc))

        train_acc = sess.run(accuracy, feed_dict={X: pca_train_x, Y: train_y})
        test_acc,test_predict,test_correct = sess.
↪run([accuracy,prediction,correct_prediction], feed_dict={X: pca_test_x, Y:␣
↪test_y})

        print("\n============Results============")
        print("PCA Model Prediction =", train_acc)
```

```
        print("PCA Test Prediction =", test_acc)

        return train_acc,test_acc

ann_mlp_pca_train_acc, ann_mlp_pca_test_acc = ann_mlp_pca()
```

```
==========Data Summary==========
PCA Training Data : (398, 10)
PCA Testing Data : (171, 10)

============Processing============
Step:     0     Loss: 2.958     Acc: 62.56%
Step:  1000     Loss: 0.109     Acc: 97.74%
Step:  2000     Loss: 0.086     Acc: 98.24%
Step:  3000     Loss: 0.075     Acc: 98.24%
Step:  4000     Loss: 0.068     Acc: 98.49%
Step:  5000     Loss: 0.063     Acc: 98.74%
Step:  6000     Loss: 0.059     Acc: 98.99%
Step:  7000     Loss: 0.055     Acc: 98.99%
Step:  8000     Loss: 0.053     Acc: 98.99%
Step:  9000     Loss: 0.051     Acc: 98.99%
Step: 10000     Loss: 0.049     Acc: 98.99%

============Results============
PCA Model Prediction = 0.98995
PCA Test Prediction = 0.953216
```

[45]:
```
sub = pd.DataFrame()
sub['id'] = test_id
sub['Predict_Type'] = test_predict.astype(int)
sub['Origin_Type'] = test_y
sub['Correct'] = test_correct
sub.head(10)
```

[45]:

	id	Predict_Type	Origin_Type	Correct
204	87930	1	1	True
70	859575	0	0	True
131	8670	0	0	True
431	907915	1	1	True
540	921385	1	1	True
567	927241	0	0	True
369	9012000	0	0	True
29	853201	0	0	True
81	8611161	0	1	False
477	911673	1	1	True

[46]:
```
sub[['id','Predict_Type']].to_csv('submission.csv',index=False)
```