In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn import svm
```

In [2]:

```
data =  np.loadtxt('/home/bhavy/Dropbox/7th-semester/courses/ML/Assignments/Assignm
```

In [3]:

```
def sig(data, mu):
    ans = 0
    temp = data - mu
    for i in range(len(data)):
        ans  = ans + np.dot(temp[i], temp[i])
    return np.sqrt(ans/(2*len(data)))
```

In [4]:

```
mu_p = np.zeros((2, 1), dtype ='float32')
mu_m = np.zeros((2, 1), dtype ='float32')
sig_p  =  0.0
sig_m = 0.0
```

In [5]:

```
pos_data = data[data[: , -1] == 1]
neg_data = data[data[: , -1] == -1]
```

In [6]:

```
pos_data = pos_data[: , 0:2]
neg_data = neg_data[: , 0:2]
```

In [7]:

```
mu_p = np.sum(pos_data, axis = 0)/len(pos_data)
mu_m = np.sum(neg_data, axis = 0)/len(neg_data)
```

In [8]:

```
sig_p = sig(pos_data, mu_p)
sig_m = sig(neg_data, mu_m)
```

In [9]:

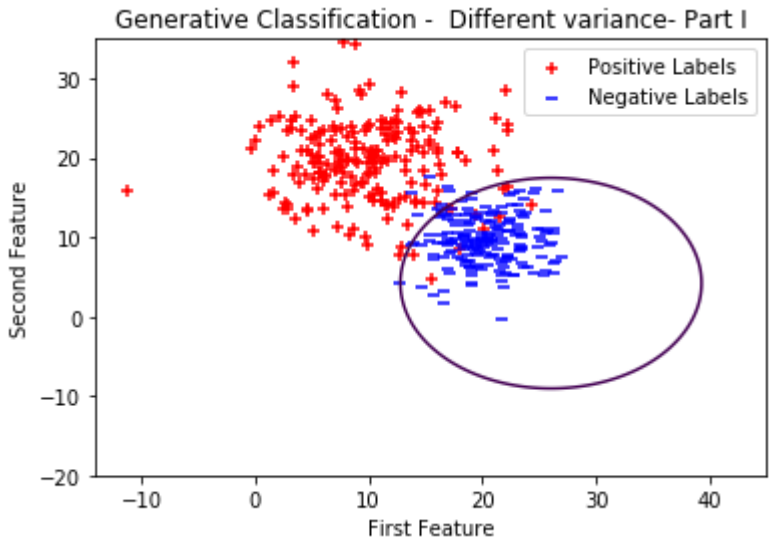
```
x = np.arange(-10, 45, 0.01)
y = np.arange(-20, 35, 0.01)
X, Y = np.meshgrid(x, y)
Z = ((X - mu_p[0])**2 + (Y - mu_p[1])**2 )/sig_p**2 - ((X - mu_m[0])**2 + (Y - mu_m
```

In [10]:

```
plt.figure()
plt.scatter(pos_data[:, 0], pos_data[:, 1], c ='r', marker='+')
plt.scatter(neg_data[:, 0], neg_data[:, 1], c ='b', marker='_')
plt.contour(X, Y, Z, levels = [0])
plt.xlabel("First Feature")
plt.ylabel("Second Feature")
plt.title("Generative Classification -  Different variance- Part I")
plt.legend(["Positive Labels", "Negative Labels"])
```

Out[10]:

```
<matplotlib.legend.Legend at 0x7f50e2931208>
```



In [11]:

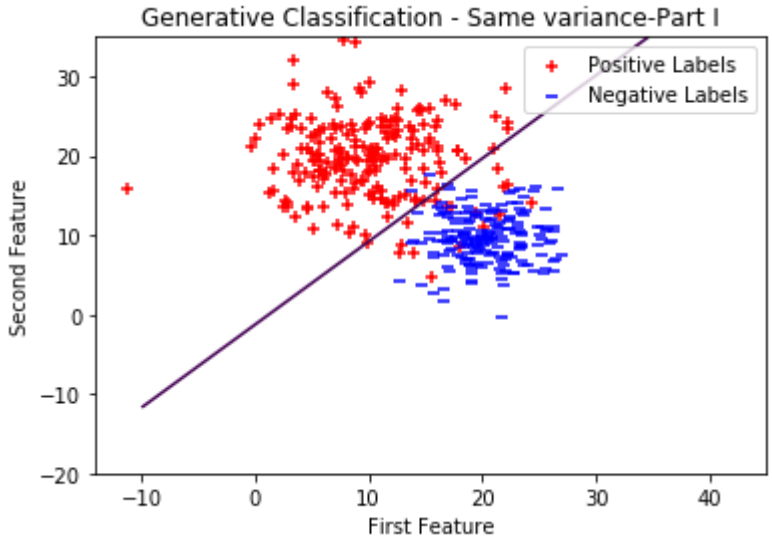
```
Z = ((X - mu_p[0])**2 + (Y - mu_p[1])**2 ) - ((X - mu_m[0])**2 + (Y - mu_m[1])**2 )
```

In [12]:

```
plt.figure()
plt.scatter(pos_data[:, 0], pos_data[:, 1], c ='r', marker='+')
plt.scatter(neg_data[:, 0], neg_data[:, 1], c ='b', marker='_')
plt.contour(X, Y, Z, levels = [0])
plt.xlabel("First Feature")
plt.ylabel("Second Feature")
plt.title("Generative Classification - Same variance-Part I")
plt.legend(["Positive Labels", "Negative Labels"])
```

Out[12]:

```
<matplotlib.legend.Legend at 0x7f50e0b9ef60>
```



In [13]:

```
clf = svm.SVC(kernel = 'linear')
clf.fit(data[:, 0:2], data[:, -1])
Z = clf.predict(np.c_[X.ravel(), Y.ravel()])
Z = Z.reshape(X.shape)
```

In [14]:

```
plt.figure()
plt.scatter(pos_data[:, 0], pos_data[:, 1], c ='r', marker='+')
plt.scatter(neg_data[:, 0], neg_data[:, 1], c ='b', marker='_')
plt.contour(X, Y, Z, levels = [0])
plt.xlabel("First Feature")
plt.ylabel("Second Feature")
plt.title("Svm with Linear Kernel-Part I")
plt.legend(["Positive Labels", "Negative Labels"])
```

Out[14]:

```
<matplotlib.legend.Legend at 0x7f50e0b70cf8>
```