James Schiavo
jcs188
ECE1395

1a.
X_train_0 shape: (390,8)
X_train_1 shape: (210,8)

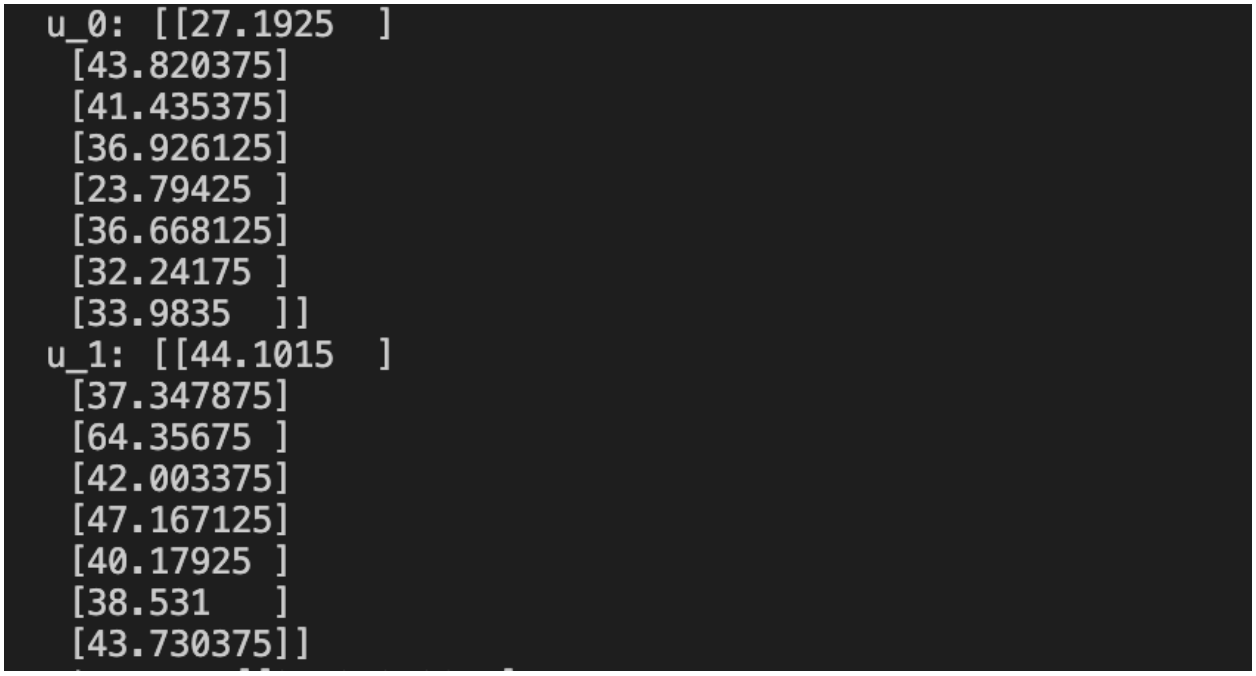
1b.
u_0: [[30.218875]
 [54.751375]
 [37.36625]
 [35.648375]
 [31.189125]
 [34.05725]
 [34.04025]
 [35.004625]]
u_1: [[32.333125]
 [62.552375]
 [60.5015]
 [53.49275]
 [109.839375]
 [35.705125]
 [87.466   ]
 [40.005   ]]
sigma_0: [[40.72336484]
 [52.17689192]
 [33.12012566]
 [36.73256635]
 [28.01215322]
 [40.28544455]
 [27.96041649]
 [39.1699917]]
sigma_1: [[35.74774197]
 [58.11240188]
 [55.82705183]
 [49.400986]
 [154.82202759]
 [35.72013135]
 [98.51428167]
 [54.05021438]]

1c. accuracy: 0.6547619047619048

2a.
covariance_0 shape: (8,8)
covariance_1 shape: (8,8)

```
covariance_0: [[ 8.83346557e+00  4.63819095e+00  6.88406947e+00 -6.35453584e+00
  -4.22468042e+01 -4.37490082e-01 -6.03834523e-02  1.91507978e+01]
 [ 4.63819095e+00  6.83803302e+02  9.20778894e+01 -6.86934673e+00
   9.98720388e+02  2.14647523e+01  7.95918521e-01  6.71783920e+01]
 [ 6.88406947e+00  9.20778894e+01  3.41638015e+02  4.78918276e+01
   1.49948206e+02  5.14085163e+01  5.50532487e-02  4.05389668e+01]
 [-6.35453584e+00 -6.86934673e+00  4.78918276e+01  2.22477916e+02
   6.17780878e+02  5.34408093e+01  4.44512298e-01 -3.43501719e+01]
 [-4.22468042e+01  9.98720388e+02  1.49948206e+02  6.17780878e+02
   1.06963331e+04  2.26037762e+02  7.96607791e+00 -1.79998237e+02]
 [-4.37490082e-01  2.14647523e+01  5.14085163e+01  5.34408093e+01
   2.26037762e+02  6.10832301e+01  1.54166925e-01  1.21463898e+00]
 [-6.03834523e-02  7.95918521e-01  5.50532487e-02  4.44512298e-01
   7.96607791e+00  1.54166925e-01  9.06865793e-02  1.55495856e-01]
 [ 1.91507978e+01  6.71783920e+01  4.05389668e+01 -3.43501719e+01
  -1.79998237e+02  1.21463898e+00  1.55495856e-01  1.29976285e+02]]
covariance_1: [[ 8.83346557e+00  4.63819095e+00  6.88406947e+00 -6.35453584e+00
  -4.22468042e+01 -4.37490082e-01 -6.03834523e-02  1.91507978e+01]
 [ 4.63819095e+00  6.83803302e+02  9.20778894e+01 -6.86934673e+00
   9.98720388e+02  2.14647523e+01  7.95918521e-01  6.71783920e+01]
 [ 6.88406947e+00  9.20778894e+01  3.41638015e+02  4.78918276e+01
   1.49948206e+02  5.14085163e+01  5.50532487e-02  4.05389668e+01]
 [-6.35453584e+00 -6.86934673e+00  4.78918276e+01  2.22477916e+02
   6.17780878e+02  5.34408093e+01  4.44512298e-01 -3.43501719e+01]
 [-4.22468042e+01  9.98720388e+02  1.49948206e+02  6.17780878e+02
   1.06963331e+04  2.26037762e+02  7.96607791e+00 -1.79998237e+02]
 [-4.37490082e-01  2.14647523e+01  5.14085163e+01  5.34408093e+01
   2.26037762e+02  6.10832301e+01  1.54166925e-01  1.21463898e+00]
 [-6.03834523e-02  7.95918521e-01  5.50532487e-02  4.44512298e-01
   7.96607791e+00  1.54166925e-01  9.06865793e-02  1.55495856e-01]
 [ 1.91507978e+01  6.71783920e+01  4.05389668e+01 -3.43501719e+01
  -1.79998237e+02  1.21463898e+00  1.55495856e-01  1.29976285e+02]]
```

2b.



2c. Accuracy: 0.6607142857142857

The accuracy is pretty similar between the naive bayes classifier which assumes statistical independence of each feature and the MLE classifier which gets an estimate of the data covariance matrix without assuming statistical independence. The reason for this is because the dataset we are using allowed us to assume statistical independence of each feature, however, when using other datasets you may get much lower accuracy when using the naive classifier because it makes a lot of assumptions which may not be true.