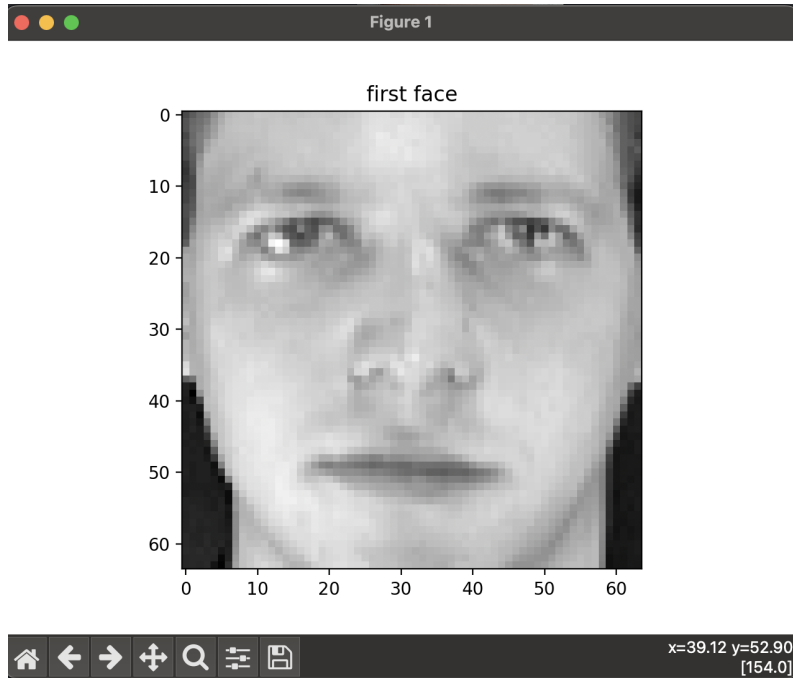
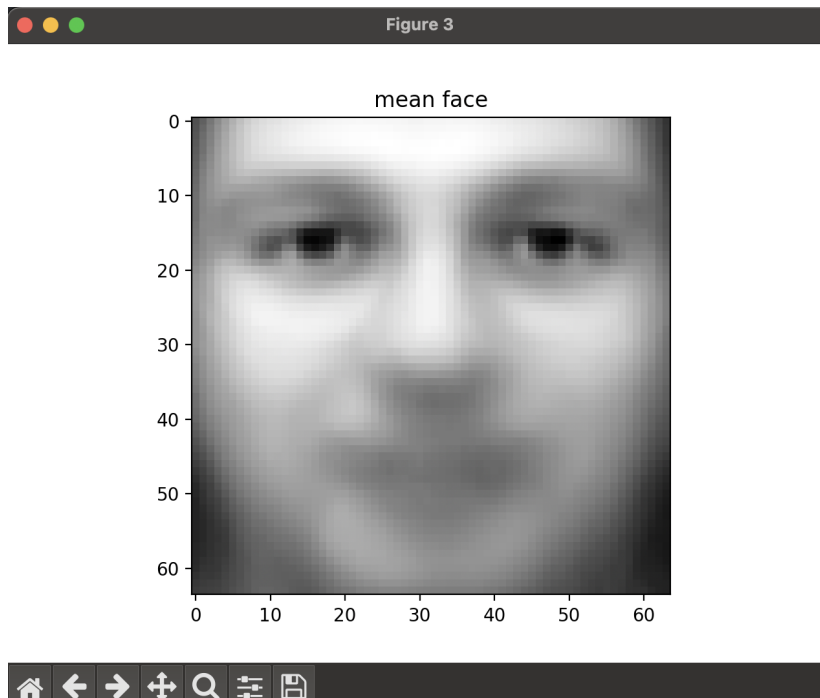


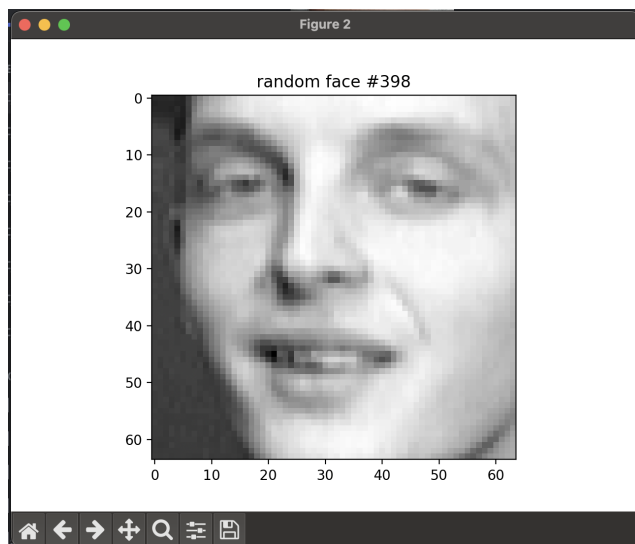
### Part 1



### Part 2



### Part 3



#### Part 4

eigenvalues:

[ 4.40239066e+08 2.58714264e+08 1.47320160e+08 9.24069090e+07  
6.67372505e+07 5.83640784e+07 4.48661876e+07 3.76480075e+07  
3.62007359e+07 3.09134387e+07 2.94917442e+07 2.65662212e+07  
2.30491898e+07 2.12076841e+07 1.96499999e+07 1.80756550e+07  
1.69911745e+07 1.50779530e+07 1.39372943e+07 1.38099199e+07  
1.29149928e+07 1.13629704e+07 1.07953938e+07 1.05327747e+07  
1.00977304e+07 9.83270271e+06 9.49920393e+06 9.16689142e+06  
8.46108813e+06 8.15640109e+06 7.43202735e+06 7.10272942e+06  
6.69158729e+06 6.18486978e+06 5.92305537e+06 5.84282214e+06  
5.64142690e+06 5.52102519e+06 5.21609650e+06 5.06570923e+06  
4.80254795e+06 4.69565990e+06 4.52107723e+06 4.43404674e+06  
4.26859826e+06 4.18593464e+06 4.10953113e+06 4.07545038e+06  
3.86243567e+06 3.78963523e+06 3.63914464e+06 3.53918182e+06  
3.42104840e+06 3.30814329e+06 3.28354018e+06 3.18878292e+06  
-2.21032364e-09 3.11672430e+06 3.03506735e+06 2.99286566e+06  
2.92832286e+06 2.87348843e+06 2.81441406e+06 2.77234677e+06  
2.73083717e+06 2.63649002e+06 2.59930486e+06 2.53170499e+06  
2.47682838e+06 2.42029683e+06 2.37971090e+06 2.35583110e+06  
2.33371246e+06 2.28877263e+06 2.24316370e+06 2.17937314e+06  
2.12387758e+06 2.11098798e+06 1.93556546e+06 1.96956840e+06  
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9.69248495e+05 9.78014818e+05 1.02445420e+06 9.95166645e+05  
1.00148569e+06 1.00787141e+06 1.01269917e+06 9.46283829e+05  
9.21841000e+05 9.12388211e+05 8.98923463e+05 8.89132721e+05  
8.82625836e+05 8.74219467e+05 8.62838433e+05 8.55685801e+05  
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7.73139174e+05 7.58359283e+05 7.53223697e+05 7.46816994e+05

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6.75581187e+05 6.68906264e+05 6.64101326e+05 6.10679227e+05  
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5.55899909e+05 5.45634606e+05 5.40286889e+05 5.32561399e+05  
5.04558236e+05 5.06013748e+05 5.15528446e+05 5.26152048e+05  
5.19087652e+05 4.55610187e+05 4.60147773e+05 4.63296878e+05  
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4.41583266e+05 4.28741432e+05 4.31815337e+05 4.33961799e+05  
4.34537286e+05 4.14117746e+05 4.06348019e+05 4.03696477e+05  
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3.17120346e+05 3.14501055e+05 5.87816816e+04 5.93839457e+04  
6.07669926e+04 6.11334991e+04 6.33385464e+04 6.56842108e+04  
6.74548431e+04 6.67093306e+04 6.24578315e+04 3.09927669e+05  
3.08229752e+05 3.06221428e+05 3.04675053e+05 2.98429372e+05  
2.96448139e+05 2.94224229e+05 2.86212504e+05 2.91227979e+05  
2.89353498e+05 2.83094359e+05 2.82505332e+05 2.79013405e+05  
2.74765363e+05 2.73715781e+05 2.68574781e+05 2.67967979e+05  
2.63833775e+05 2.50991883e+05 2.59780645e+05 2.58432457e+05  
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7.00352517e+04 8.10729980e+04 7.97489942e+04 7.15372075e+04  
7.21416661e+04 7.32629204e+04 7.76996067e+04 7.71142023e+04  
7.64797317e+04 7.56106694e+04 7.43750063e+04 2.48316544e+05  
2.55319087e+05 8.44538982e+04 8.58107793e+04 2.41214062e+05  
2.44445061e+05 2.46272942e+05 2.35753726e+05 8.95498132e+04  
8.79916514e+04 8.75538066e+04 8.56204717e+04 2.37533299e+05  
2.33427222e+05 2.31403882e+05 2.27914503e+05 2.26426557e+05

```
2.23829513e+05 2.22949635e+05 2.20920914e+05 9.85810543e+04
9.12484182e+04 9.26131200e+04 9.40051819e+04 9.50234949e+04
9.12991848e+04 9.80289836e+04 1.01280219e+05 1.01139748e+05
1.03621704e+05 1.05046872e+05 1.07405230e+05 2.34269978e+05
2.18450978e+05 2.16094499e+05 2.15193813e+05 2.10524405e+05
2.13038842e+05 2.08543622e+05 2.05381763e+05 9.57786732e+04
1.06682370e+05 1.10056737e+05 1.12682732e+05 1.13645546e+05
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1.93447502e+05 1.88061347e+05 2.07260034e+05 1.97305580e+05
2.02106365e+05 1.99804103e+05 2.00845657e+05 1.06525685e+05
1.18629076e+05 1.22459467e+05 1.36287877e+05 1.90731808e+05
1.60231153e+05 1.65847534e+05 1.79944284e+05 1.78367439e+05
1.75305826e+05 1.73902874e+05 1.96639037e+05 1.11787469e+05
1.19760937e+05 1.24519890e+05 1.25173369e+05 2.03374612e+05
1.59648534e+05 1.68764945e+05 1.72159678e+05 1.50744390e+05
1.56258497e+05 1.77080345e+05 1.71393149e+05 1.20306281e+05
1.28302468e+05 1.27174858e+05 1.33127233e+05 1.31704885e+05
1.29681820e+05 1.30659016e+05 1.39105395e+05 1.40577008e+05
1.43785719e+05 1.52265080e+05 1.57515082e+05 1.67455120e+05
1.67160176e+05 1.80806243e+05 1.27534347e+05 1.34700072e+05
1.55090830e+05 1.54647704e+05 1.46054025e+05 1.46939591e+05
1.46461382e+05 1.52541451e+05 1.42763226e+05 1.40289985e+05]
```

eigenvalues shape:

```
(400,)
```

eigenvectors\_L shape:

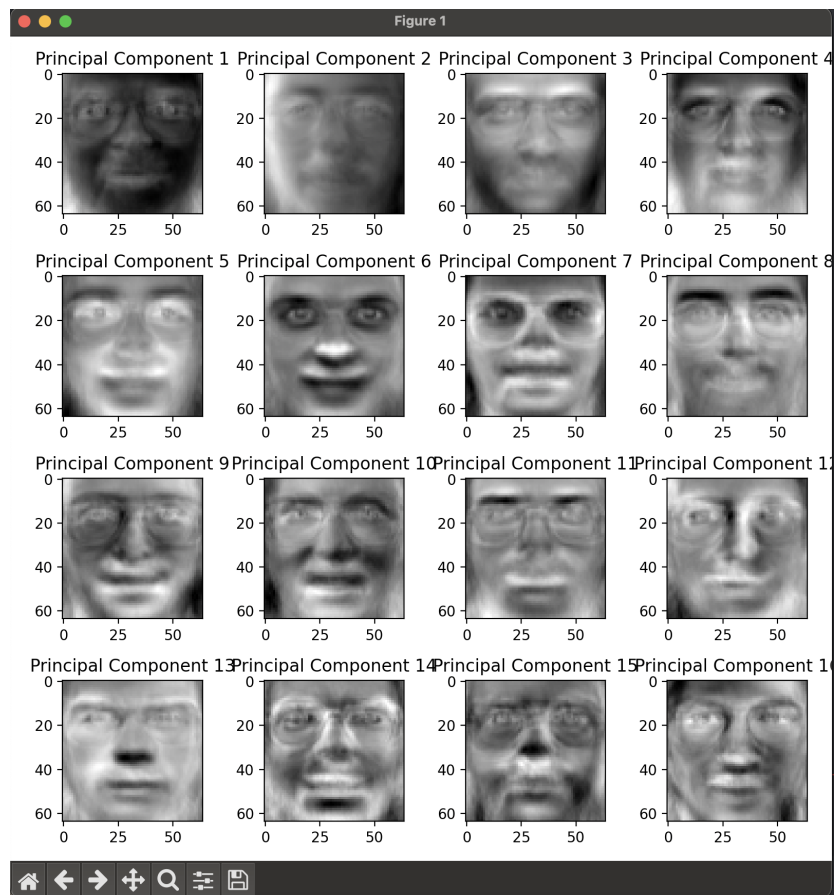
```
(400, 400)
```

eigenvectors:

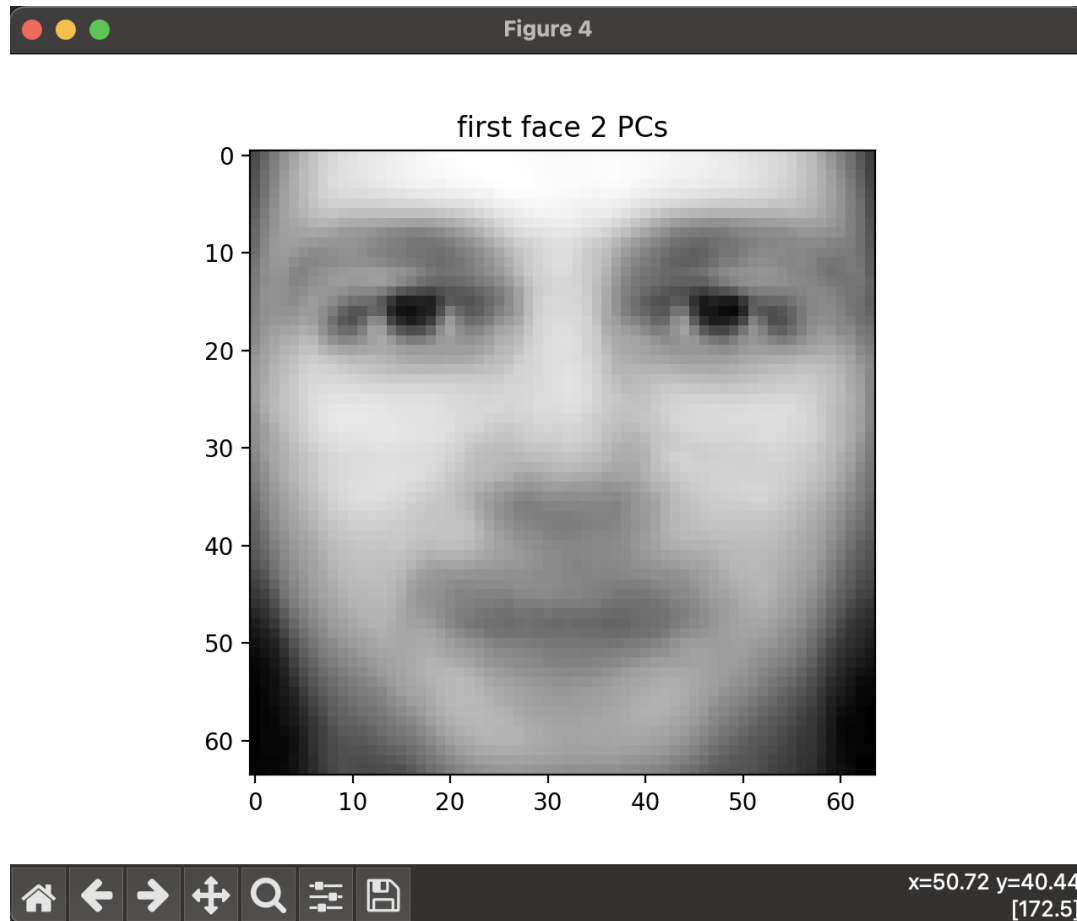
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[[-0.0041911  0.02859139  0.00135691 ...  0.00212228  0.00745984
  0.01591554]
 [-0.00454849  0.02970844 -0.00137597 ...  0.02171574 -0.00724232
  0.02120619]
 [-0.00504107  0.03133229 -0.0050605 ...  0.01440886  0.00521853
  0.01089346]
 ...
 [ 0.00097803 -0.02413049 -0.01308033 ... -0.00131382  0.01927607
 -0.01309582]
 [ 0.0024609 -0.0246791 -0.0132958 ...  0.00783363  0.03411206
 -0.00378316]
 [ 0.00318826 -0.02488899 -0.01188341 ...  0.00991323  0.01021639
  0.02635732]]
```

normalized eigenvectors shape: (4096, 400)

## Part 5



## Part 6





## Part 7

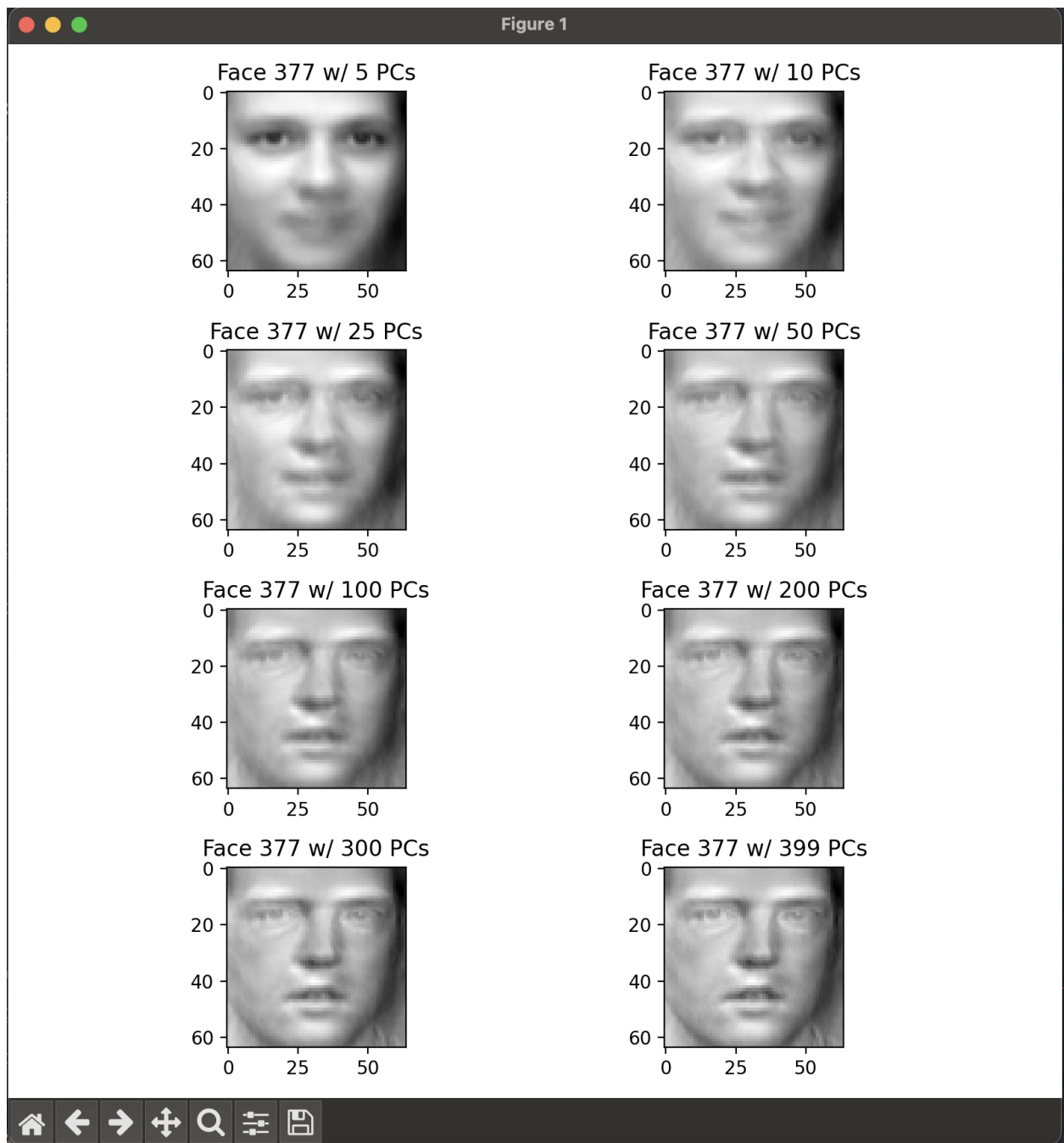
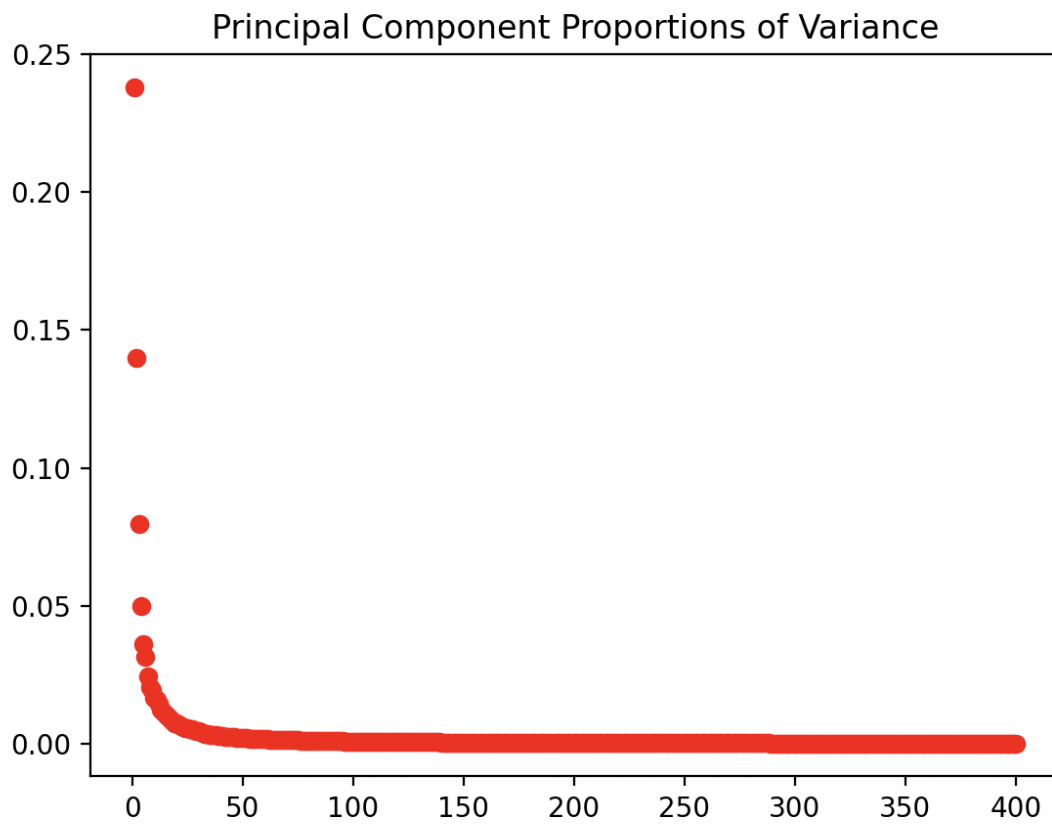


Figure 1



x=81.0 y=0.2069