BIOMEDE 517 - Neural Engineering - Labs 5 and 6 - Dr. Cindy Chestek

Appendix

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Table 1 - Equations Used for Electrostatic Modeling

#	Equation Name	Equation
1		
2		
3	Objective Function	$J = \sum_{n=1}^{N}\sum_{k=1}^{K} r_{nk}\|\|\vec{x}_n - \vec{\mu}_k\|\|^2, \quad where\ r_{nk} = \begin{cases} 1, & if\ x_n\ is\ in\ group\ k \\ 0, & if\ x_n\ is\ not\ in\ group\ k \end{cases}$
4	Mahalanobis Distance	$d_M = \sqrt{(x-\mu_k)^T S_k^{-1}(x-\mu_k)}$
5	K-Means	$\vec{\mu}_k = \frac{1}{N_k}\sum_{n}^{N_k}\vec{x}_n$
6		

Figure 1 - Common Average Referencing Data

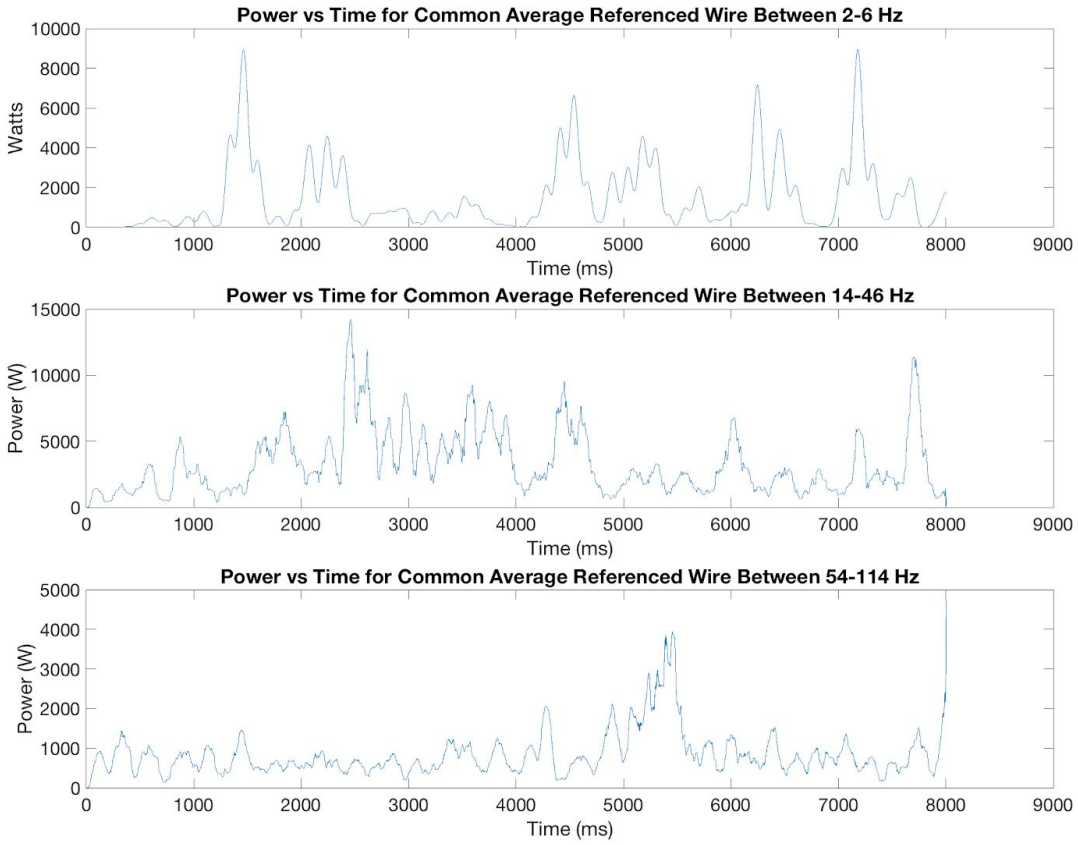


Figure 2 - Reconstructed Waveform with 9 PCs

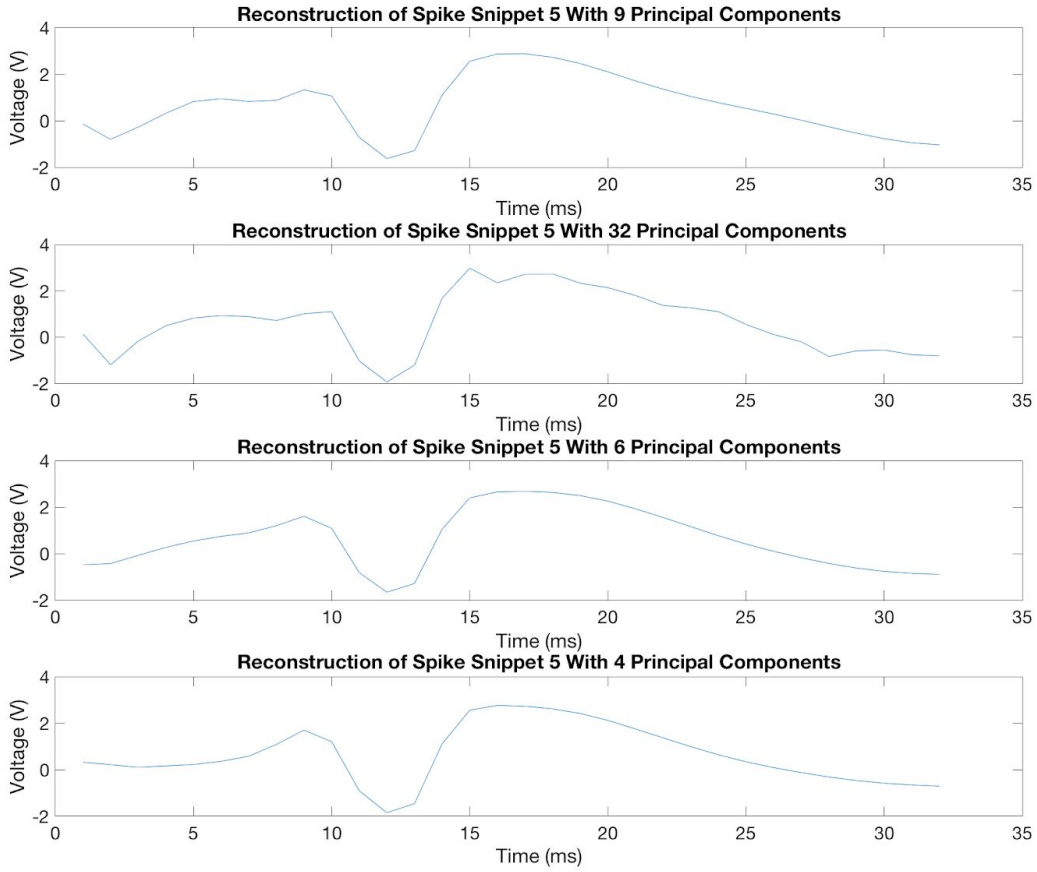


Figure 3 - Principal Component Comparison

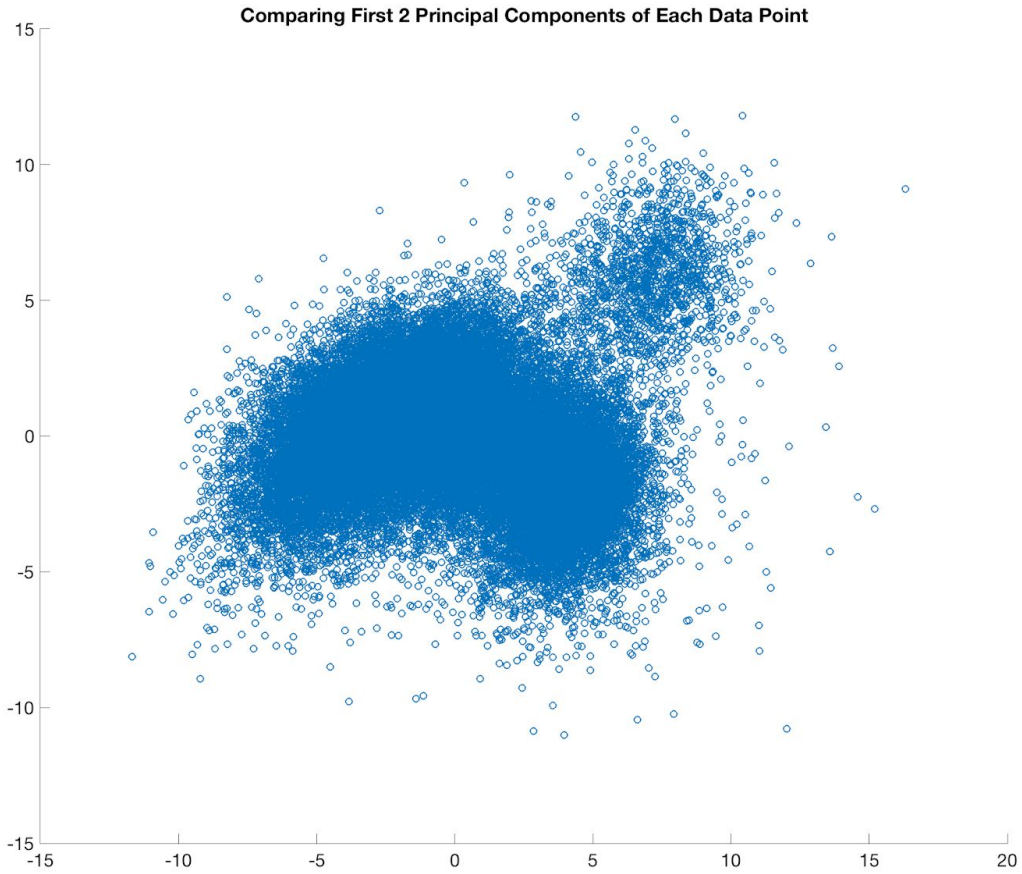
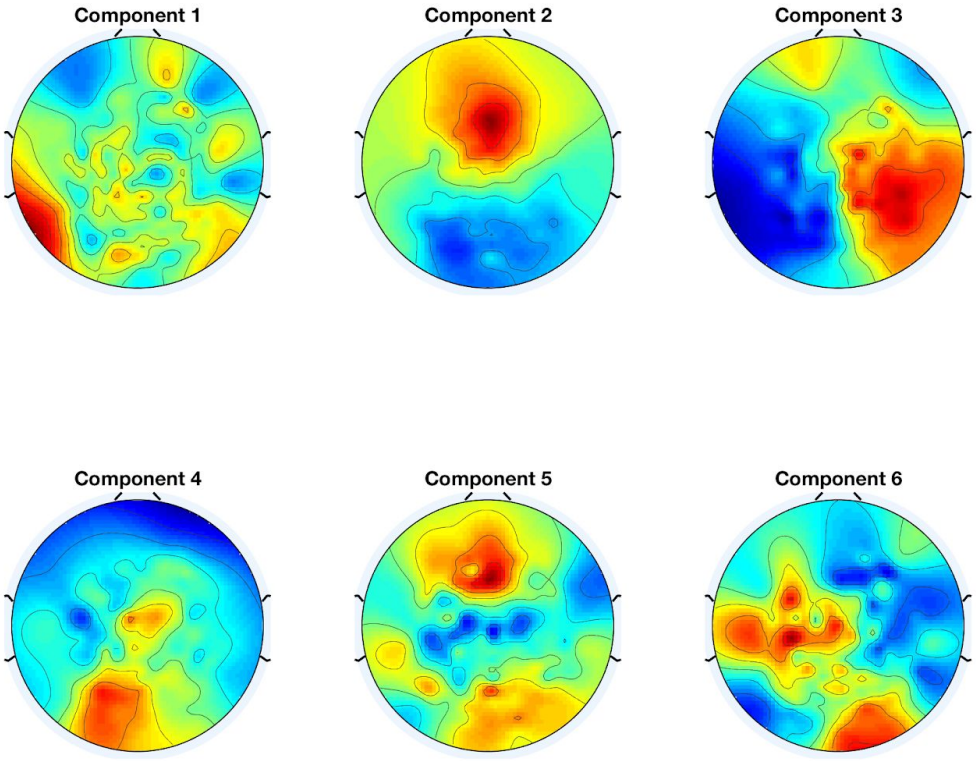


Figure 4 - Topoplots



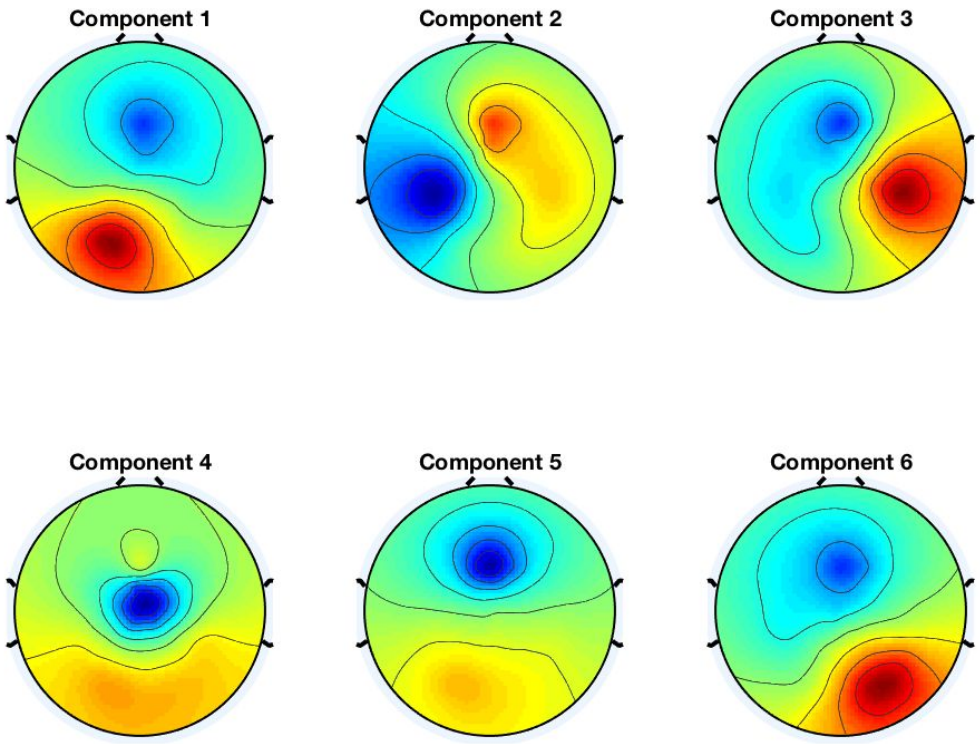
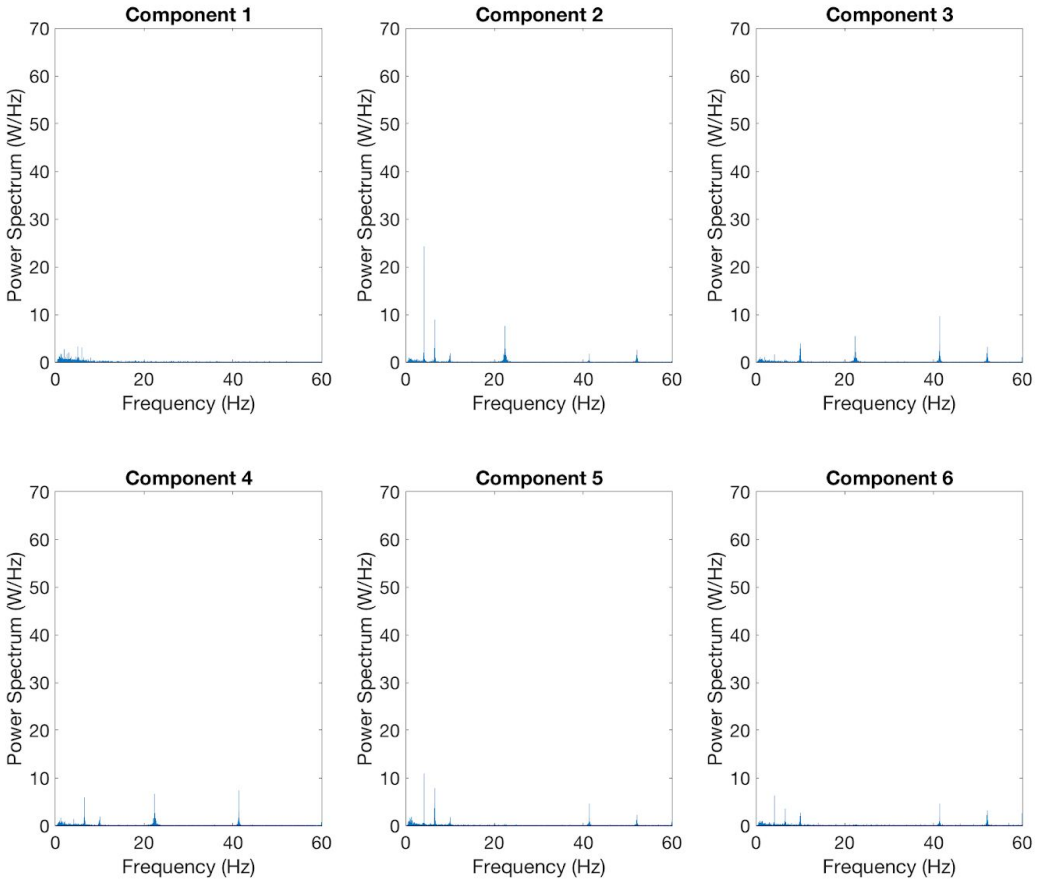

Component 1
Component 2
Component 3
Component 4
Component 5
Component 6

Figure 5 - FFT Power Spectra



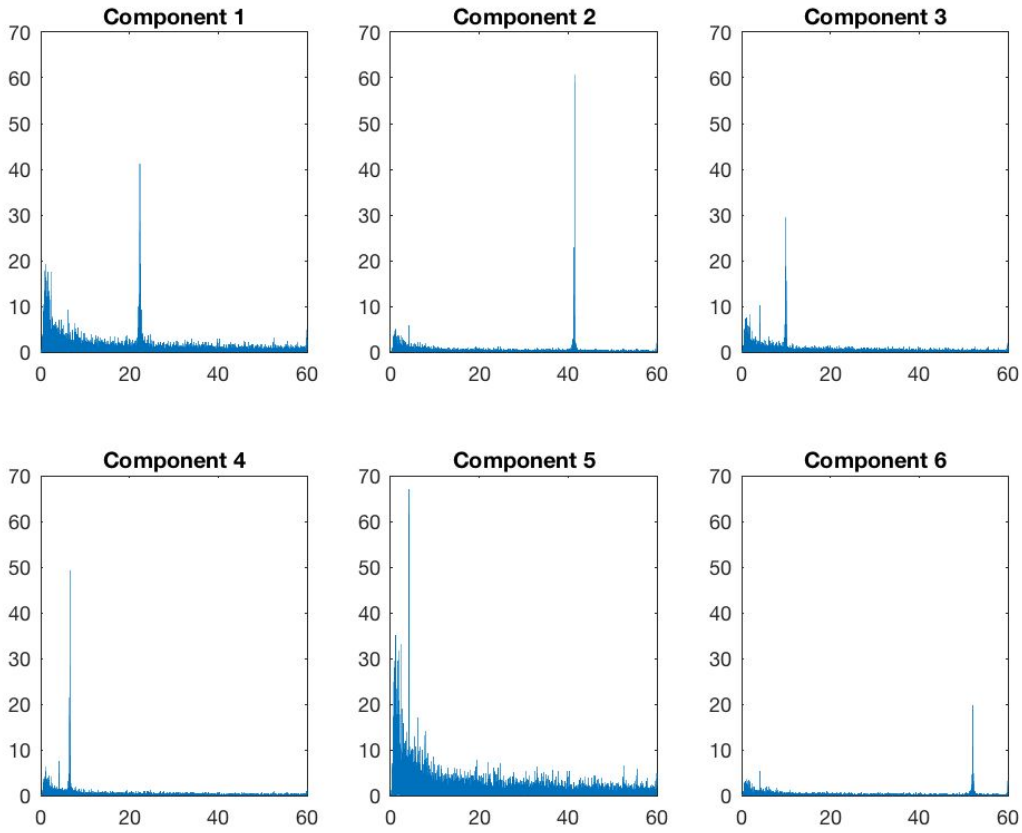
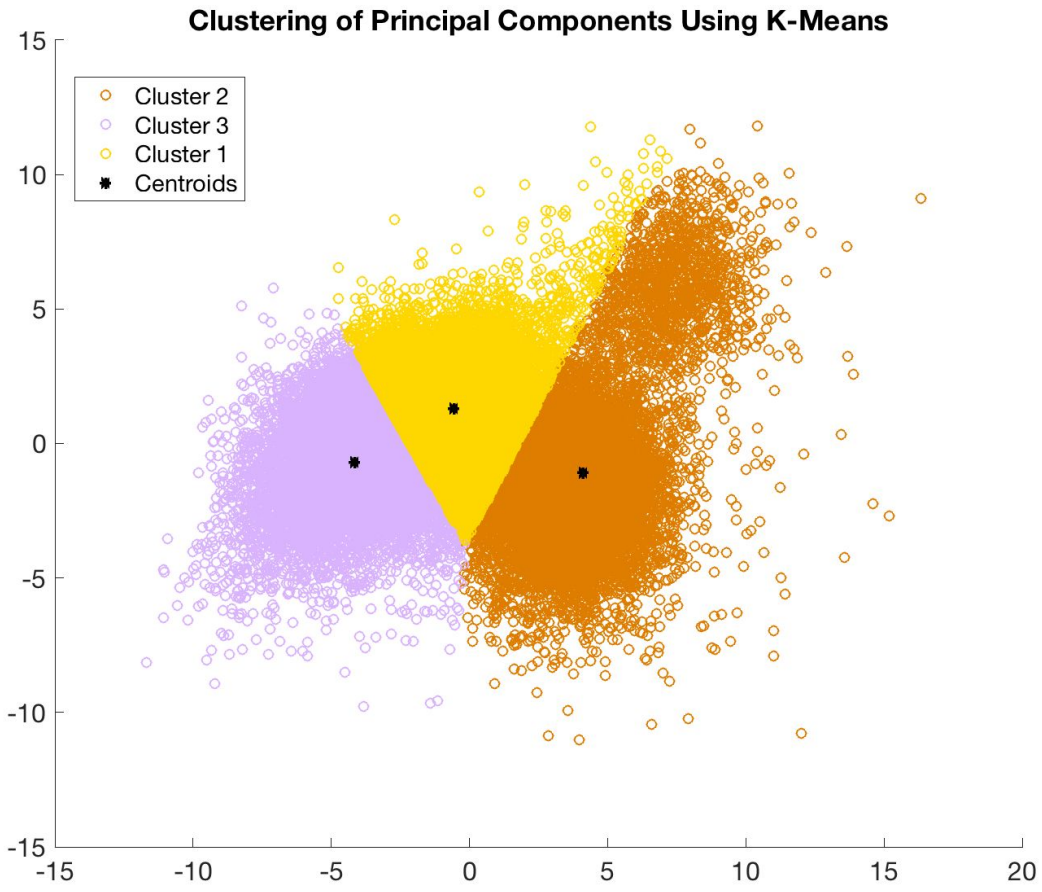
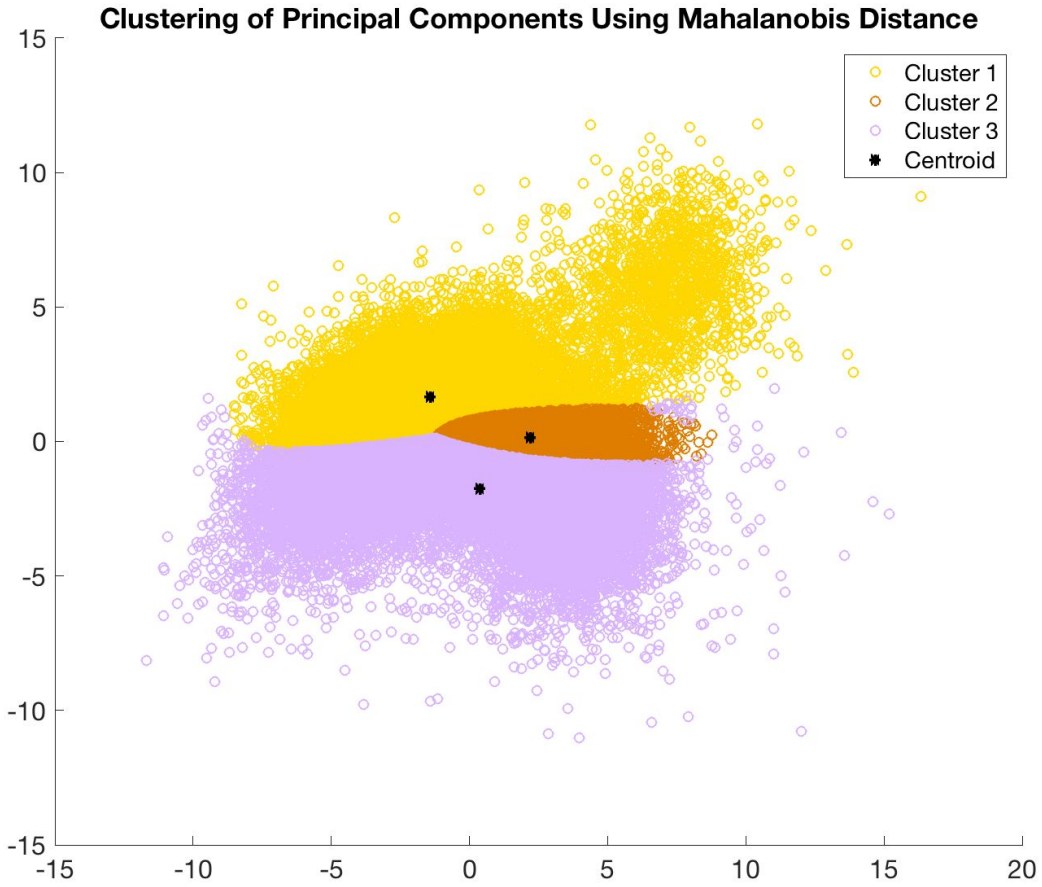
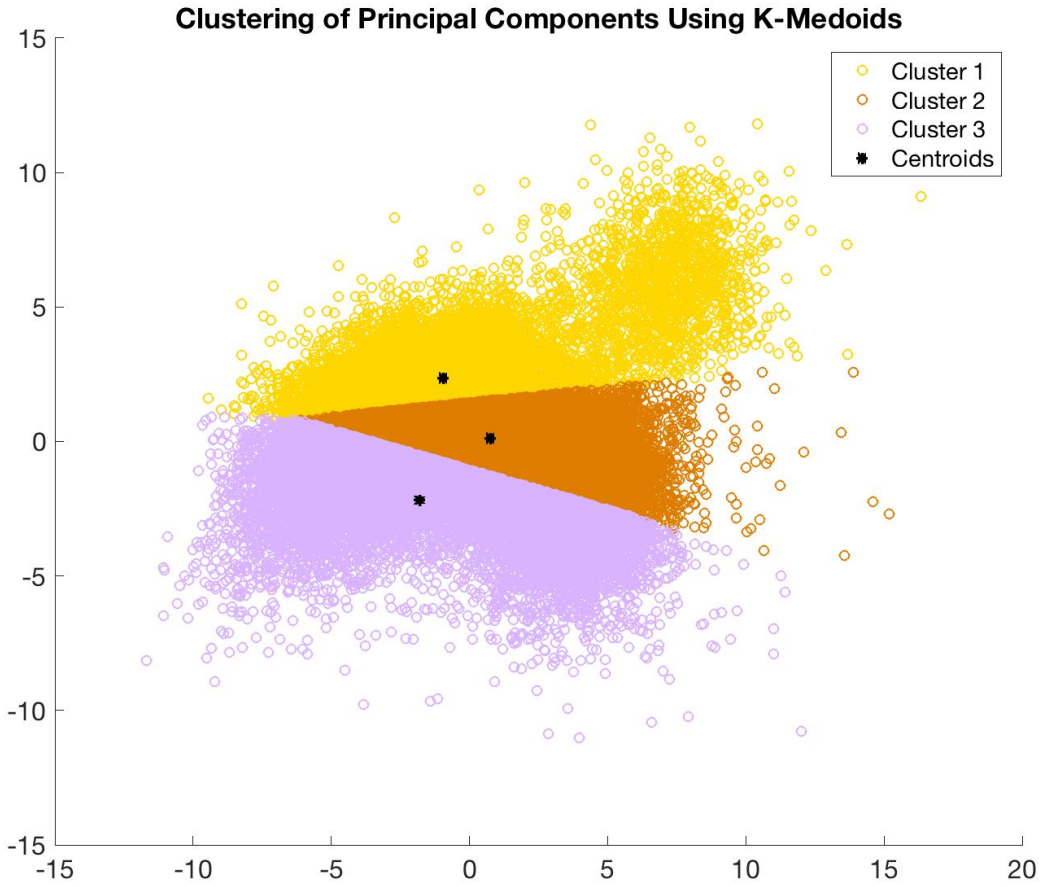

Component 1
Component 2
Component 3
Component 4
Component 5
Component 6
0
10
20
30
40
50
60
70
0
20
40
60

Figure 6 - Clustering Algorithms




Clustering of Principal Components Using Mahalanobis Distance
Cluster 1
Cluster 2
Cluster 3
Centroid
15
10
5
0
-5
-10
-15
-15
-10
-5
0
5
10
15
20


Clustering of Principal Components Using K-Medoids
Cluster 1
Cluster 2
Cluster 3
Centroids
15
10
5
0
-5
-10
-15
-15
-10
-5
0
5
10
15
20

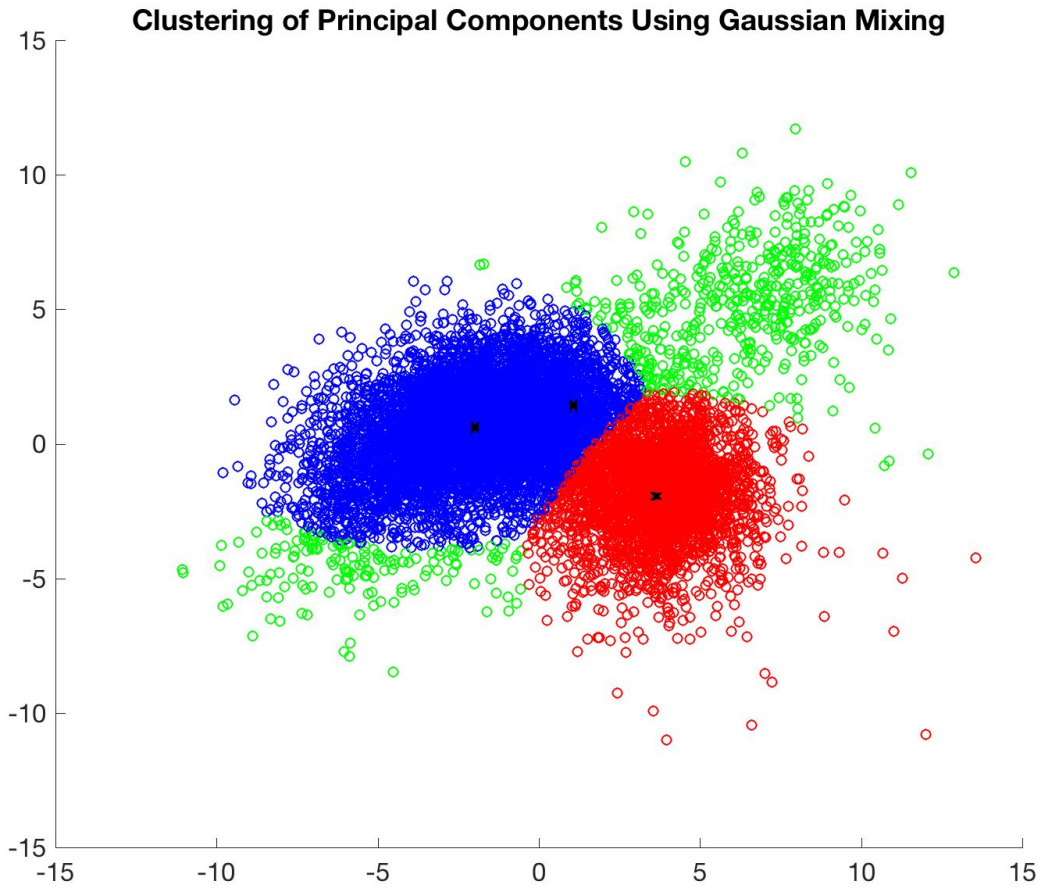

Clustering of Principal Components Using Gaussian Mixing
15
10
5
0
-5
-10
-15
-15
-10
-5
0
5
10
15

Figure 7 - Average Spike from Clusters