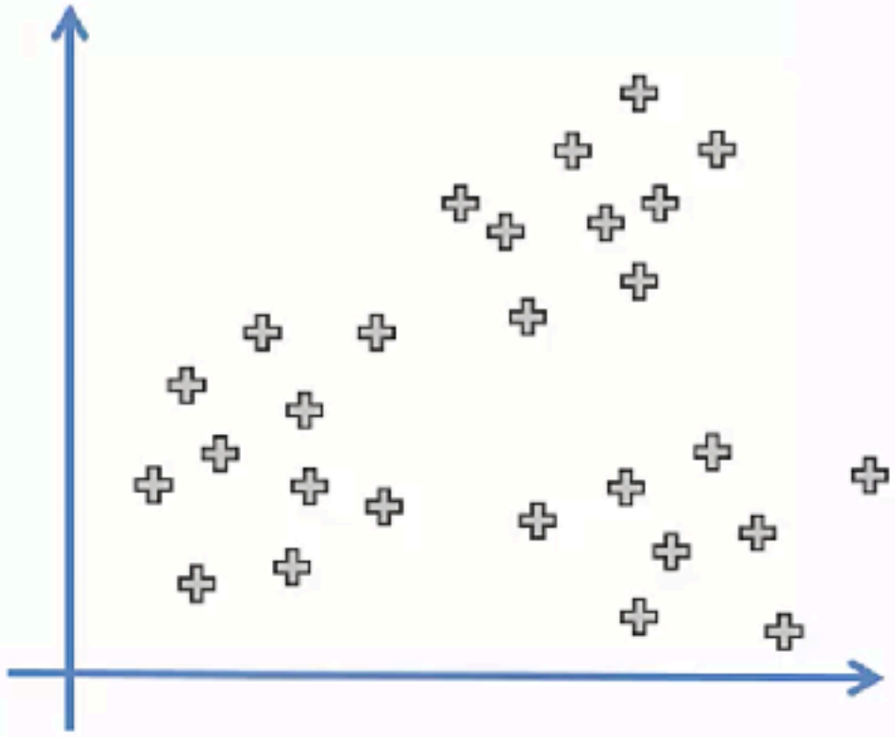
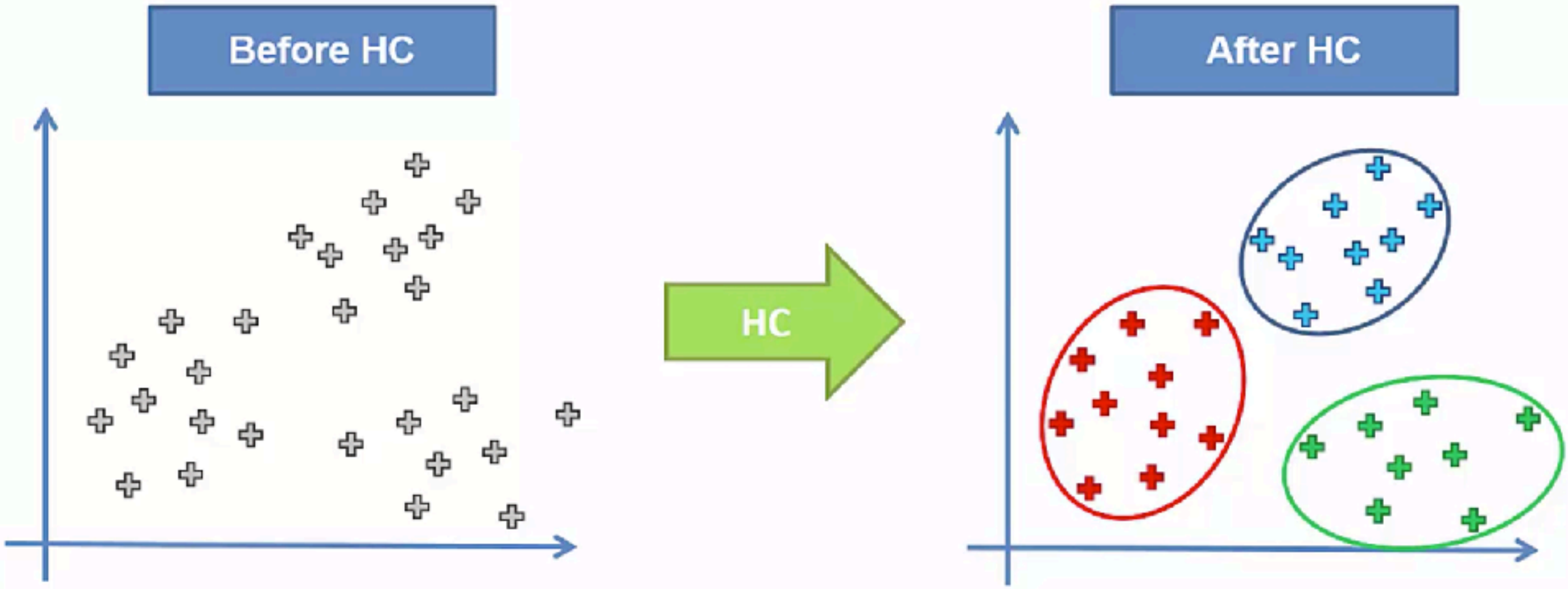
HC Intuition: Understanding HC

What HC does for you

Before HC



What HC does for you



Same as K-Means but different process

NOTE:
Agglomerative
&
Divisive

Agglomerative HC

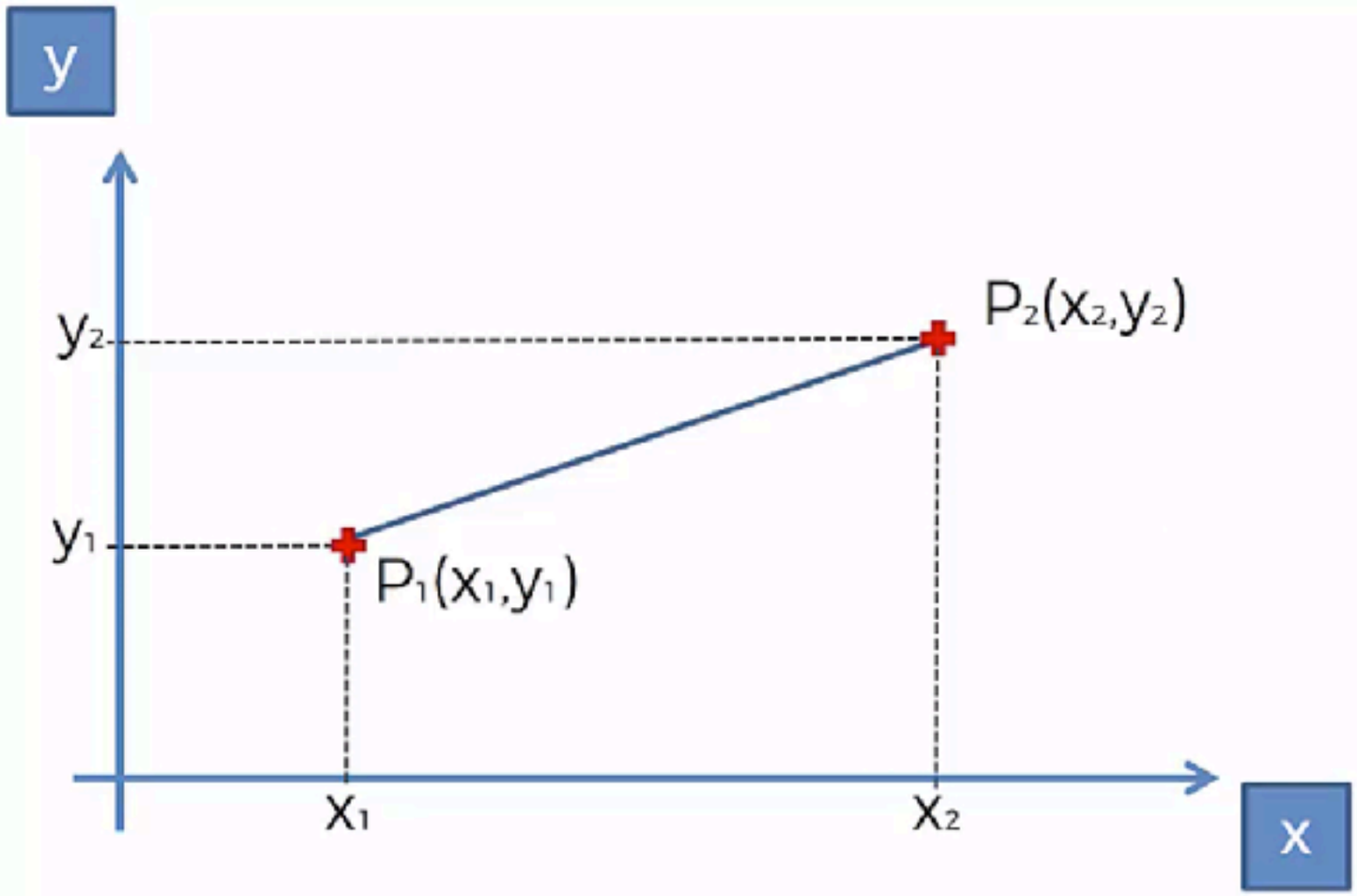
STEP 1: Make each data point a single-point cluster ➡ That forms N clusters

STEP 2: Take the two closest data points and make them one cluster ➡ That forms N-1 clusters

STEP 3: Take the two closest clusters and make them one cluster ➡ That forms N - 2 clusters

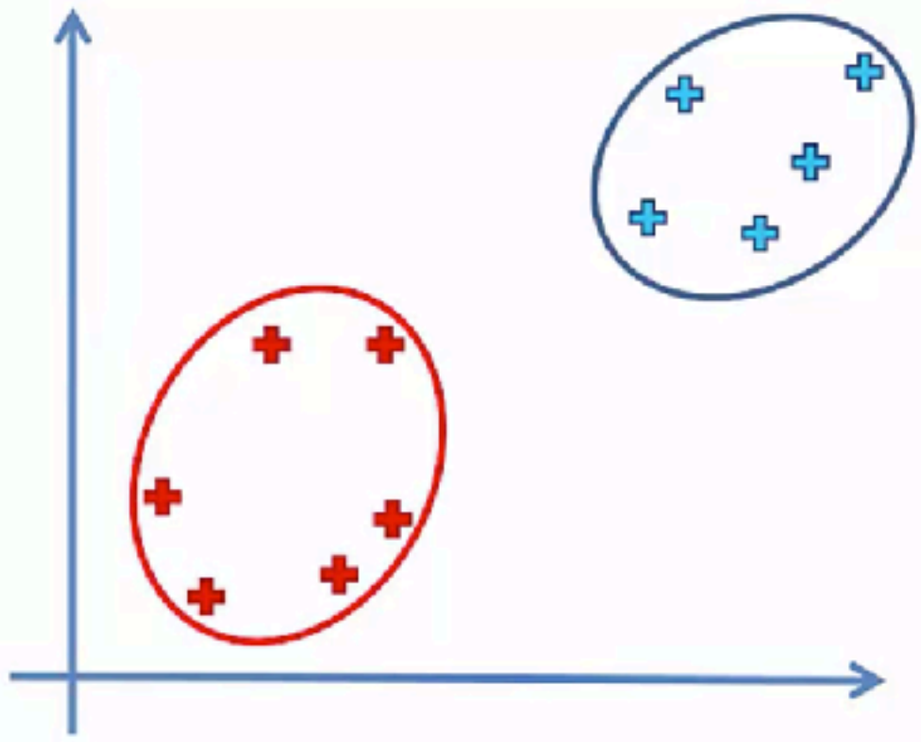
STEP 4: Repeat STEP 3 until there is only one cluster

Euclidean Distance



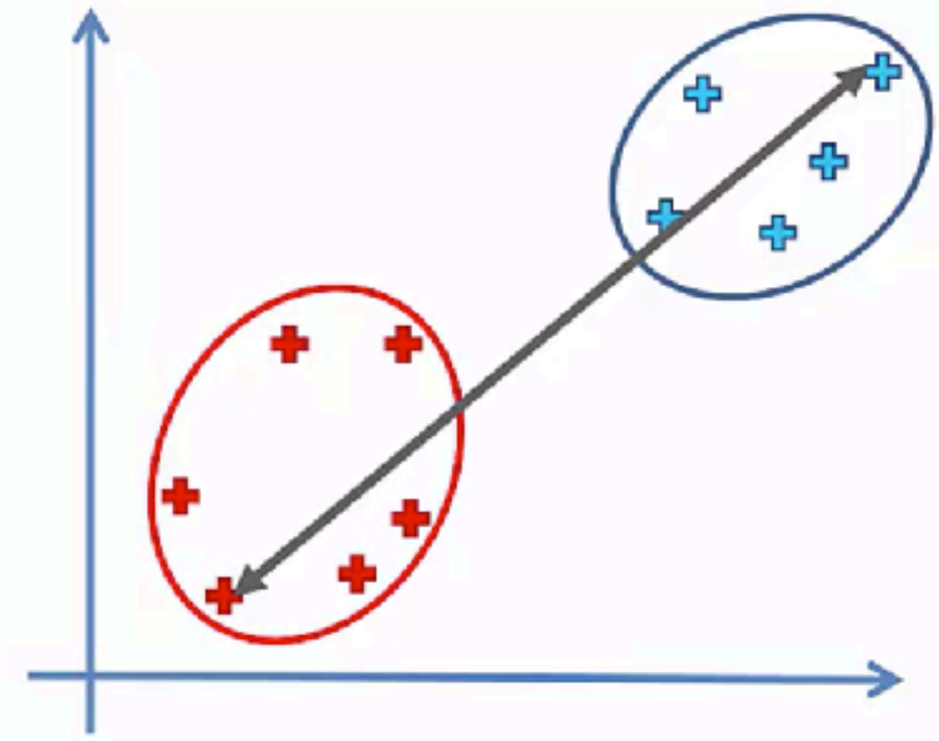
Euclidean Distance between P_1 and $P_2 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Distance Between Clusters



Distance Between Two Clusters:

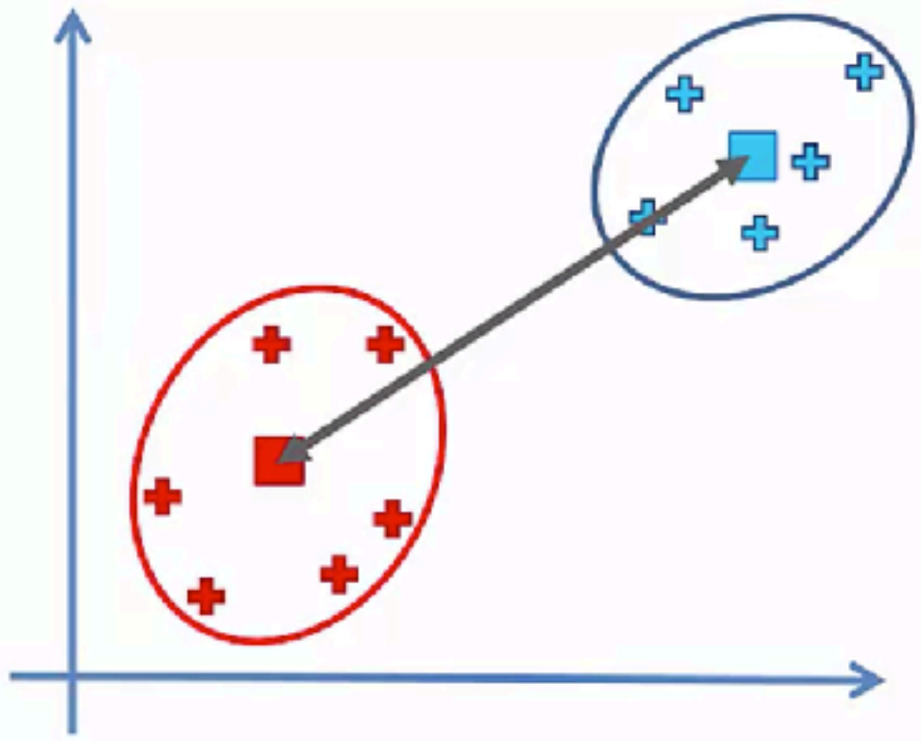
Distance Between Clusters



Distance Between Two Clusters:

- Option 1: Closest Points
- Option 2: Furthest Points

Distance Between Clusters

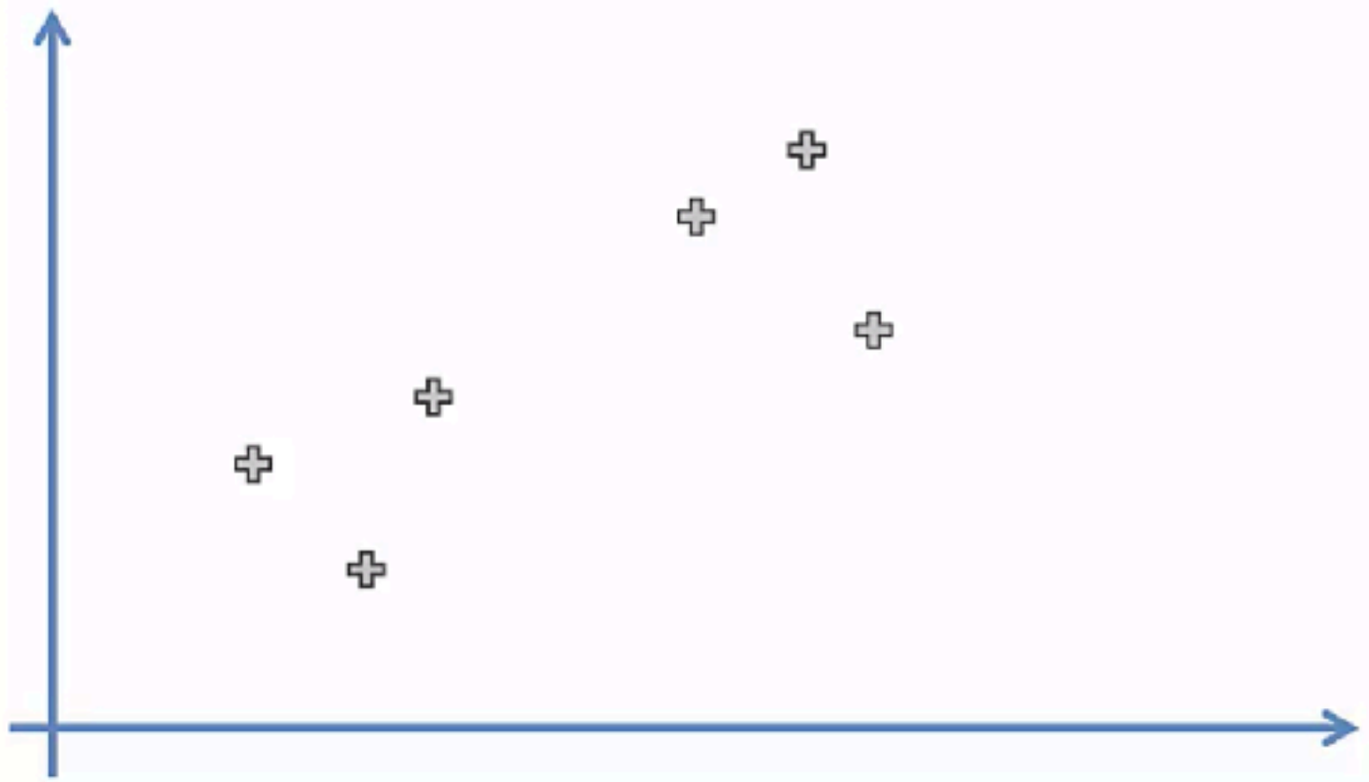


Distance Between Two Clusters:

- Option 1: Closest Points
- Option 2: Furthest Points
- Option 3: Average Distance
- Option 4: Distance Between Centroids

Agglomerative HC

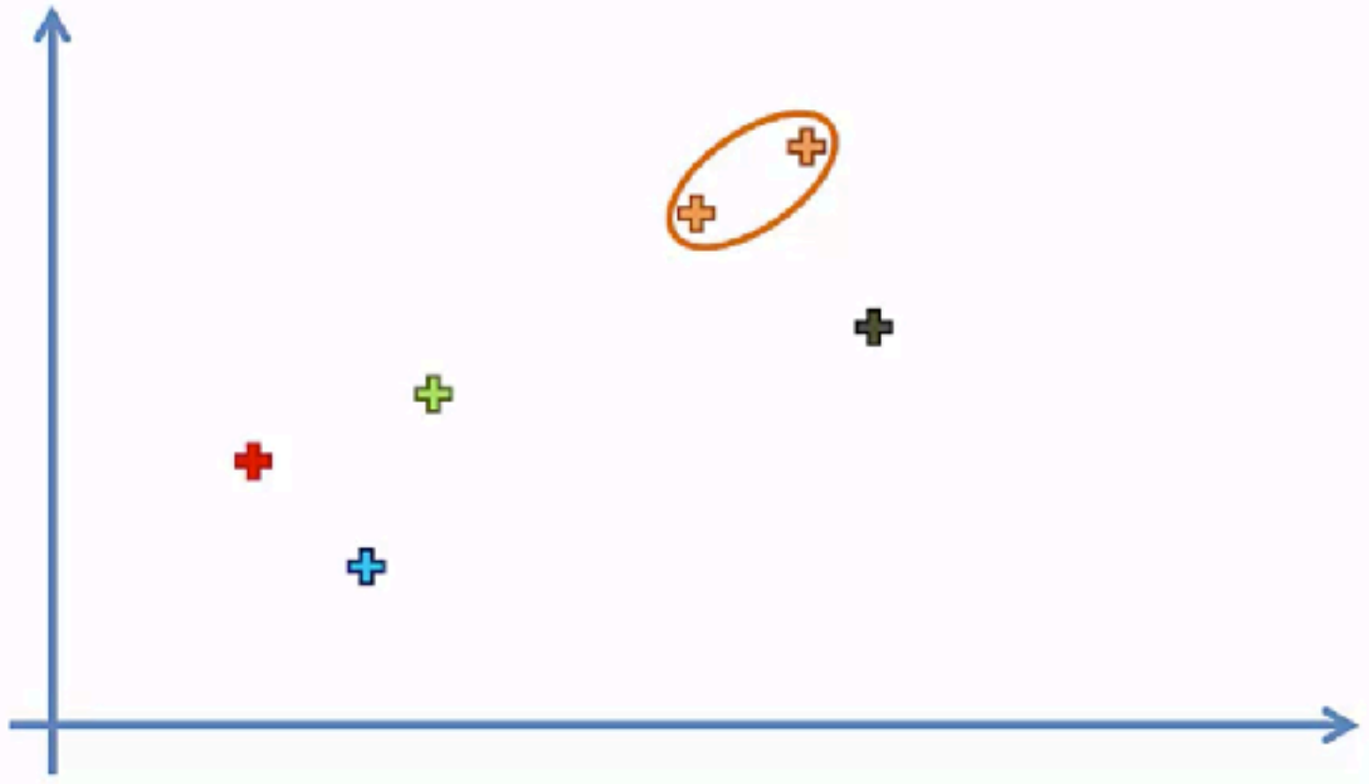
Consider the following dataset of N = 6 data points



Agglomerative HC

STEP 2: Take the two closest data points and make them one cluster

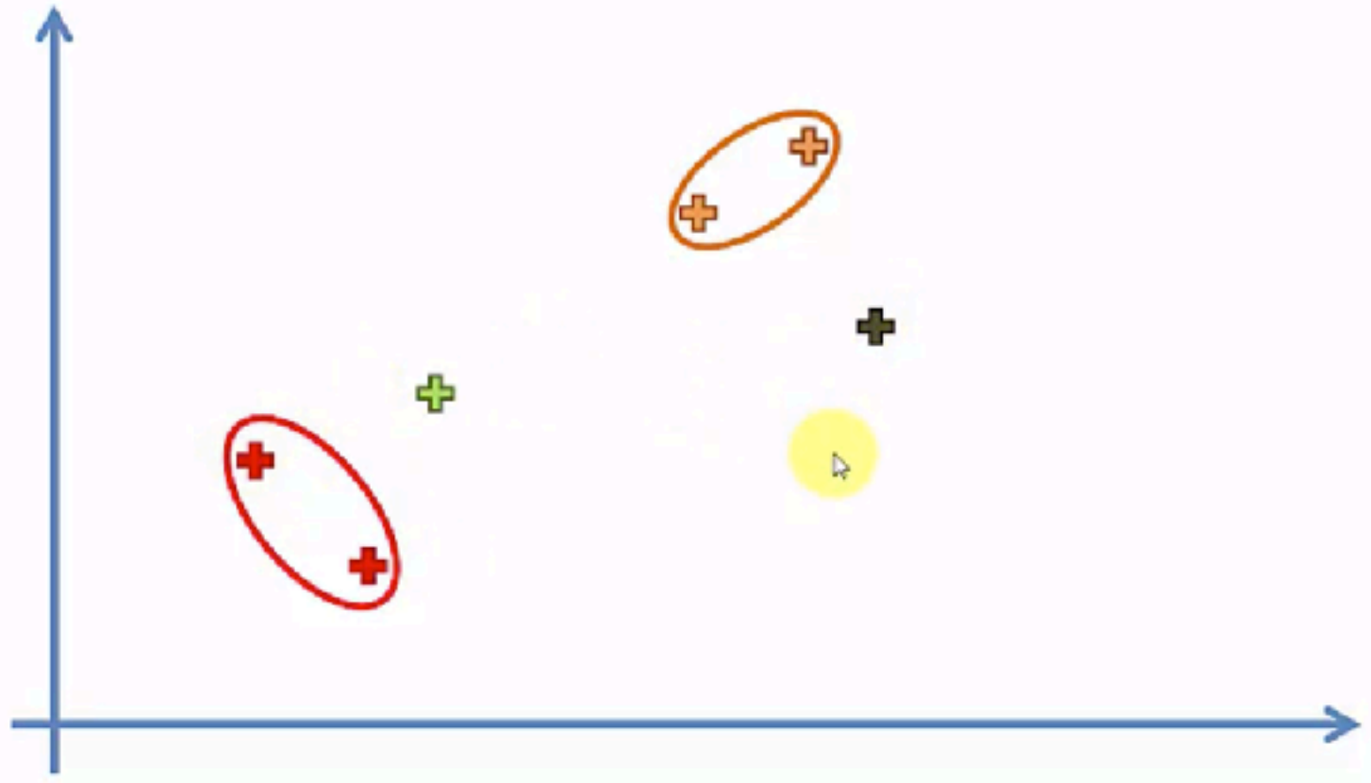
➞ That forms 5 clusters



Agglomerative HC

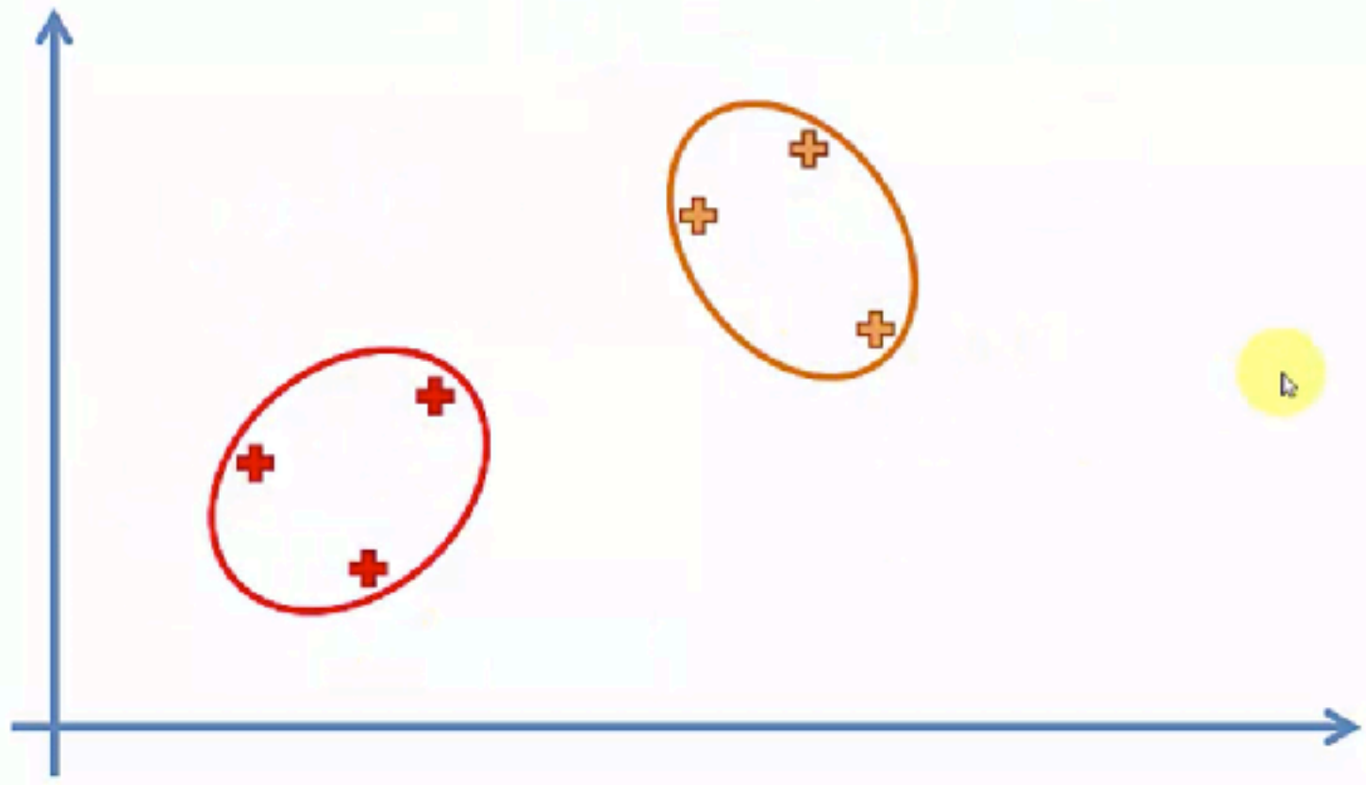
STEP 3: Take the two closest clusters and make them one cluster

➡That forms 4 clusters



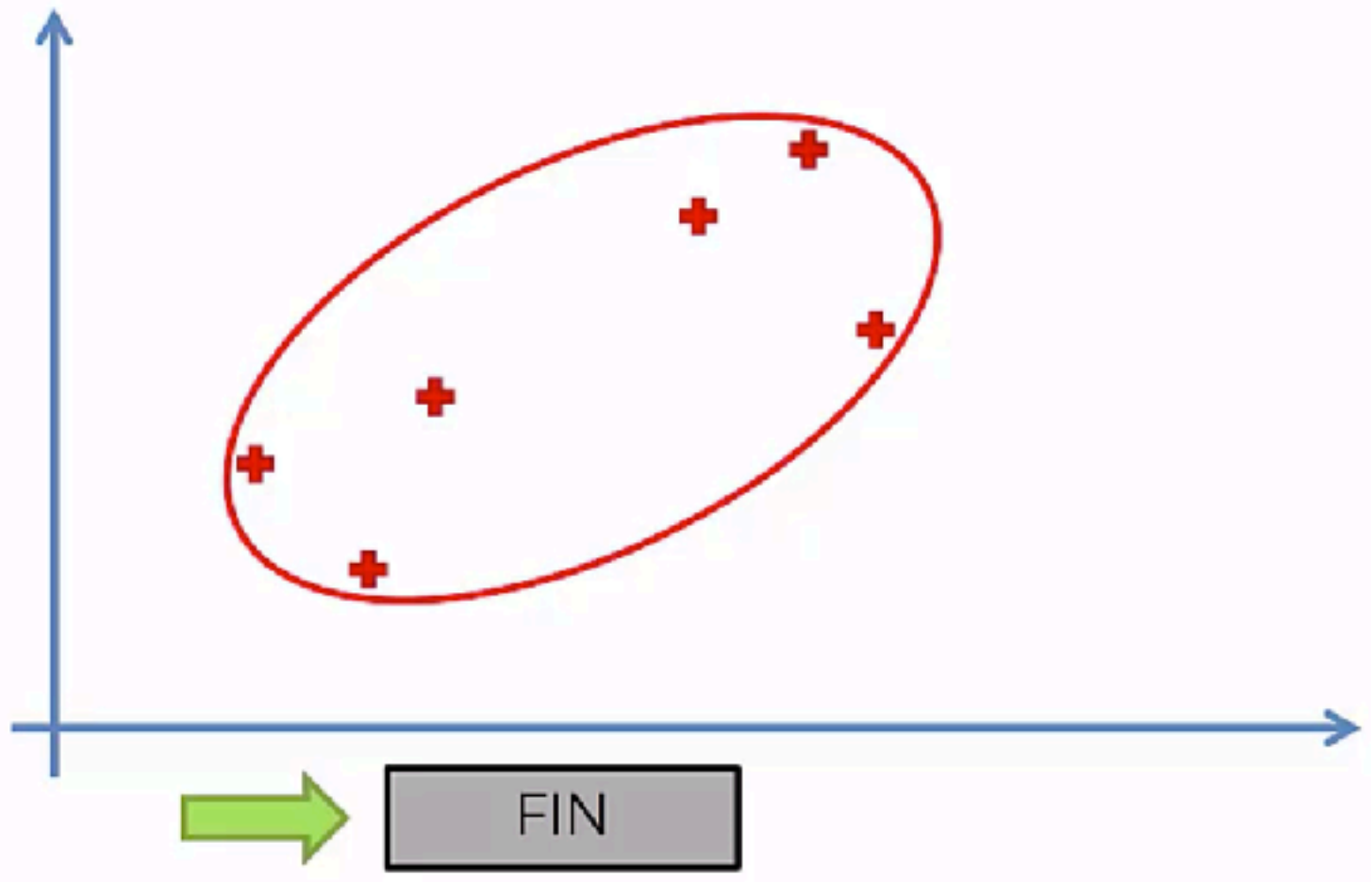
Agglomerative HC

STEP 4: Repeat STEP 3 until there is only one cluster



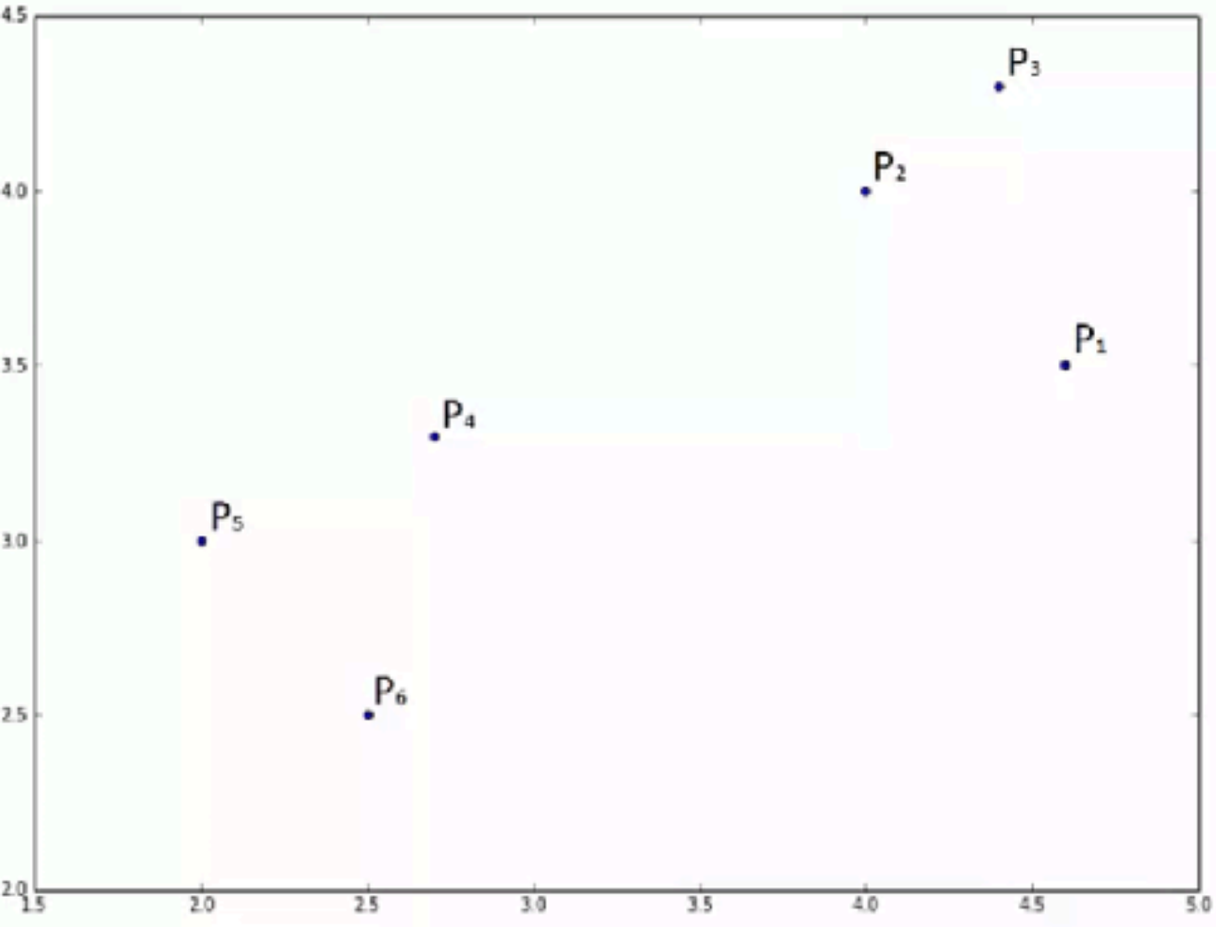
Agglomerative HC

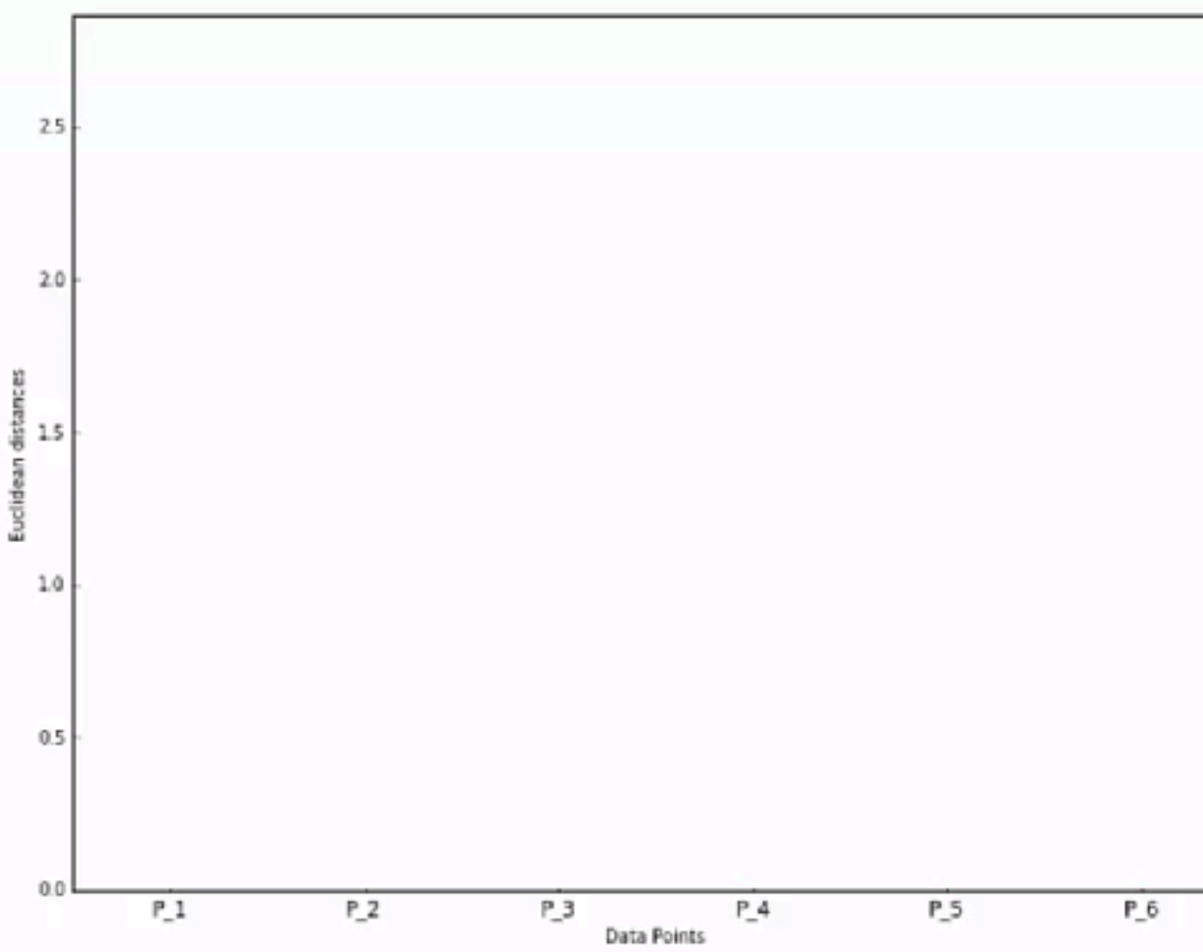
STEP 4: Repeat STEP 3 until there is only one cluster



HC Intuition:
How Do Dendograms Work?

How Do Dendograms Work?





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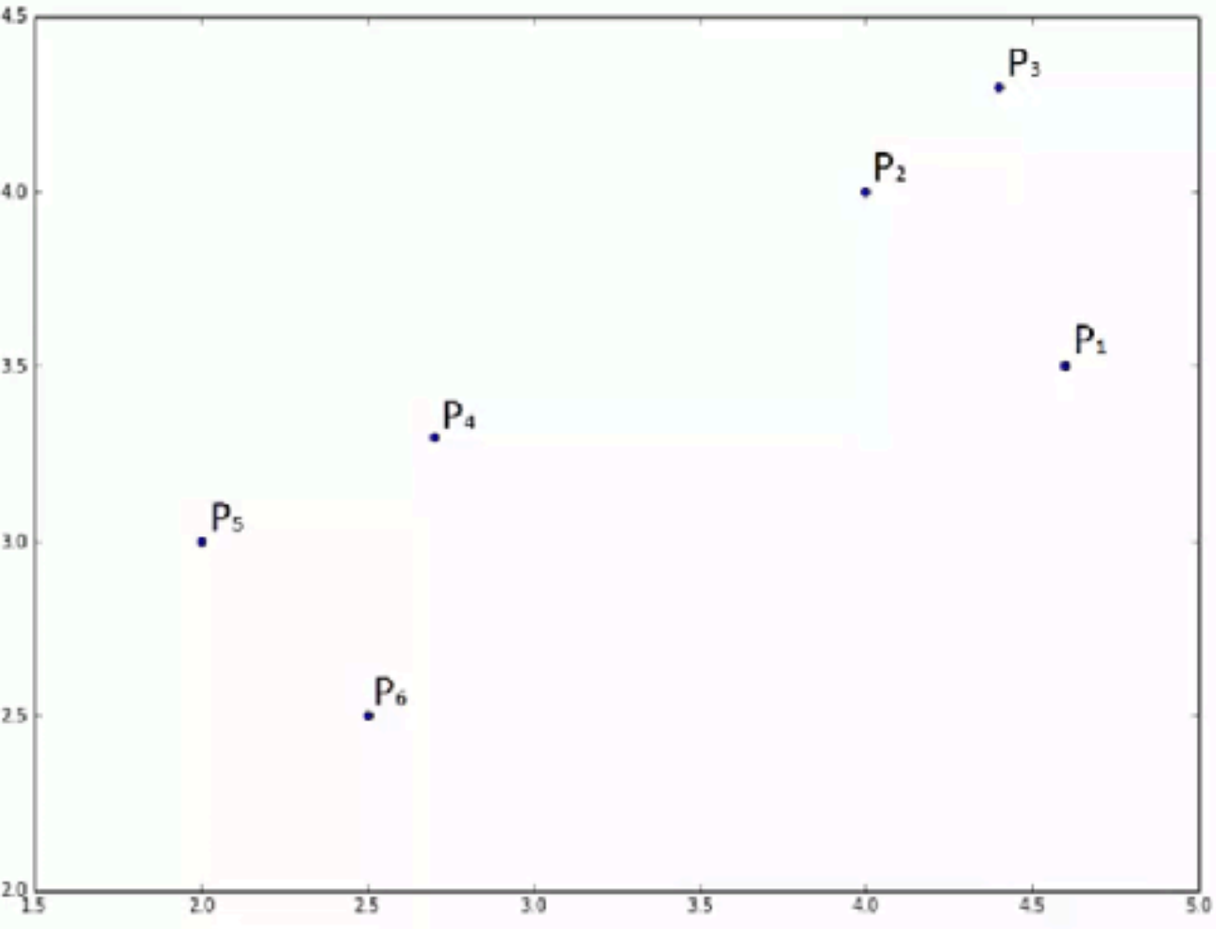

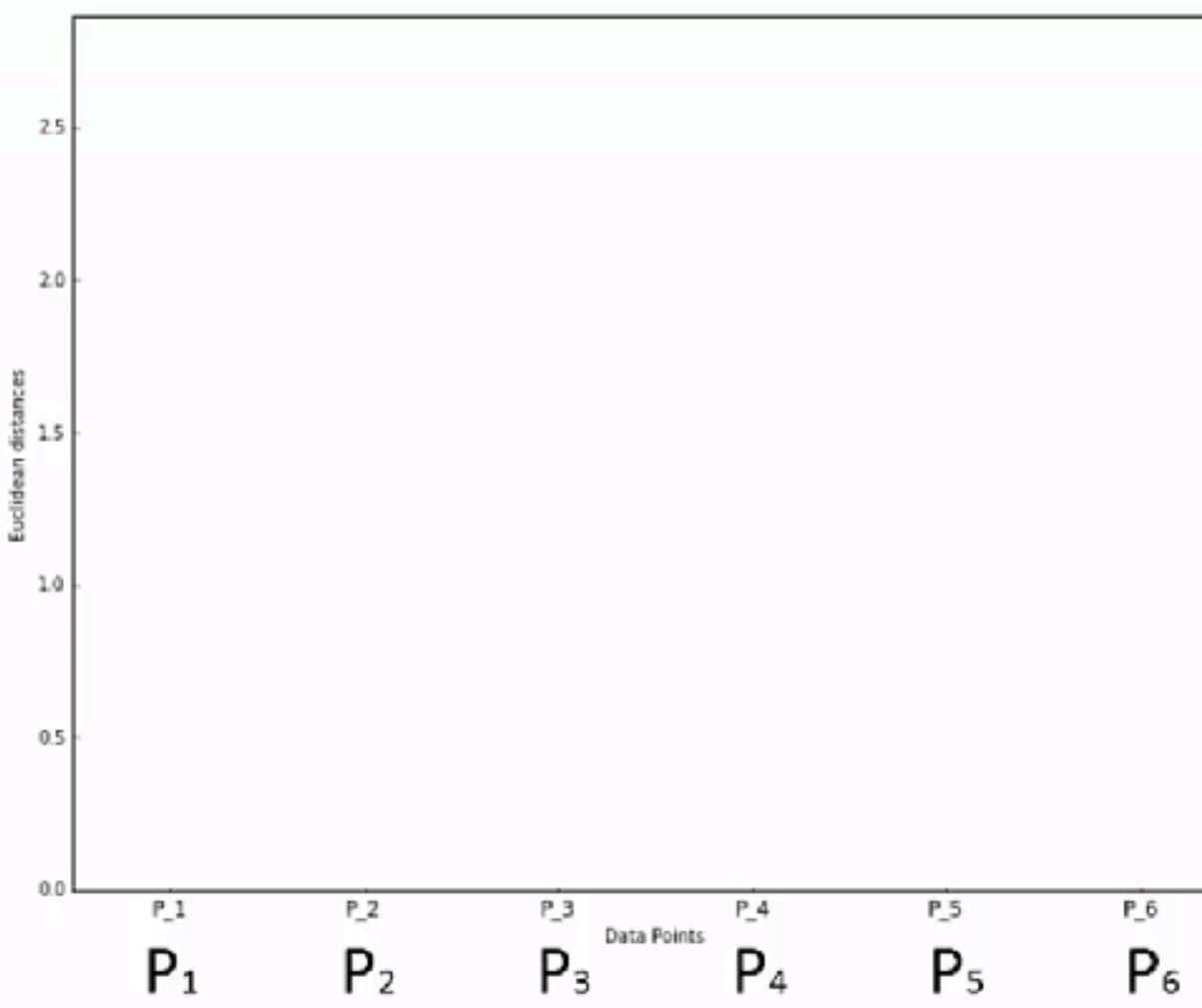

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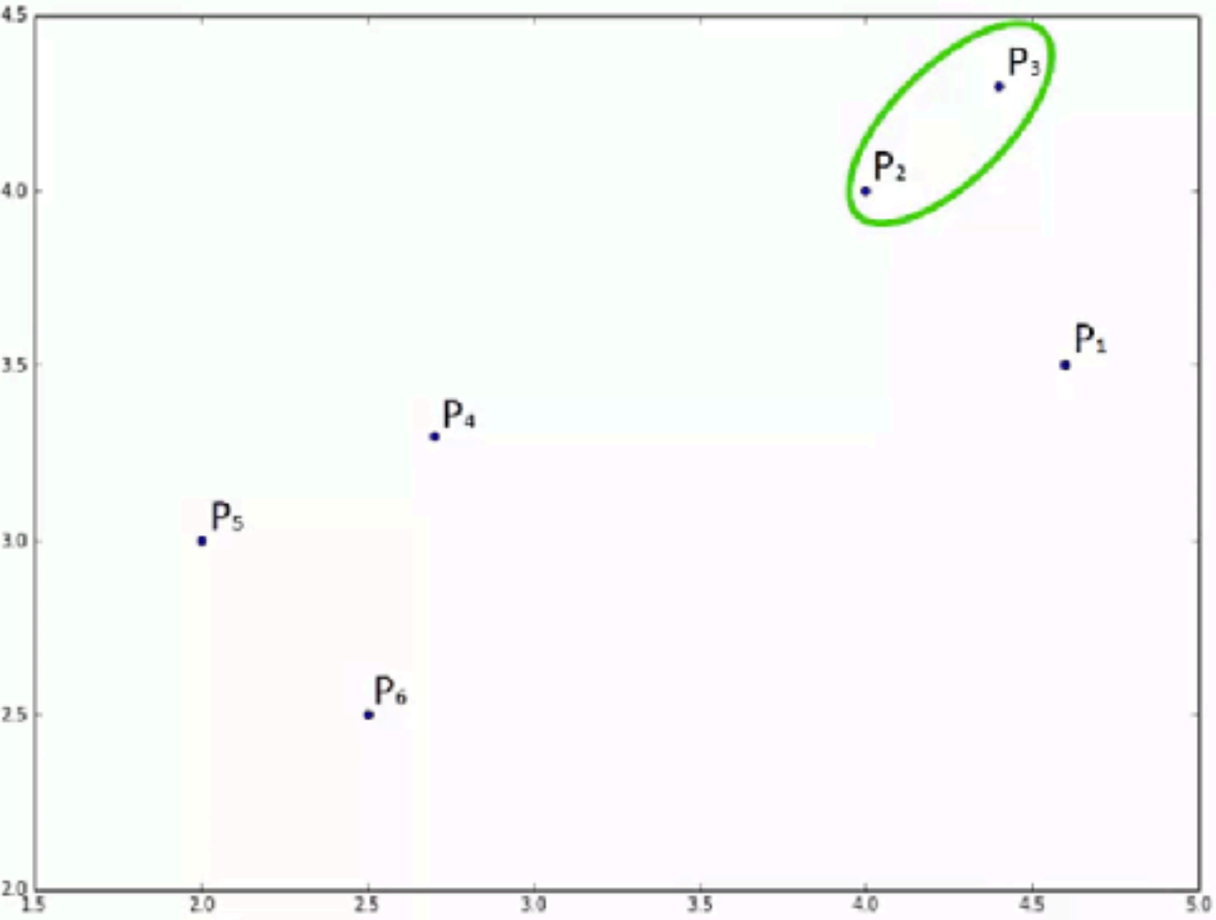

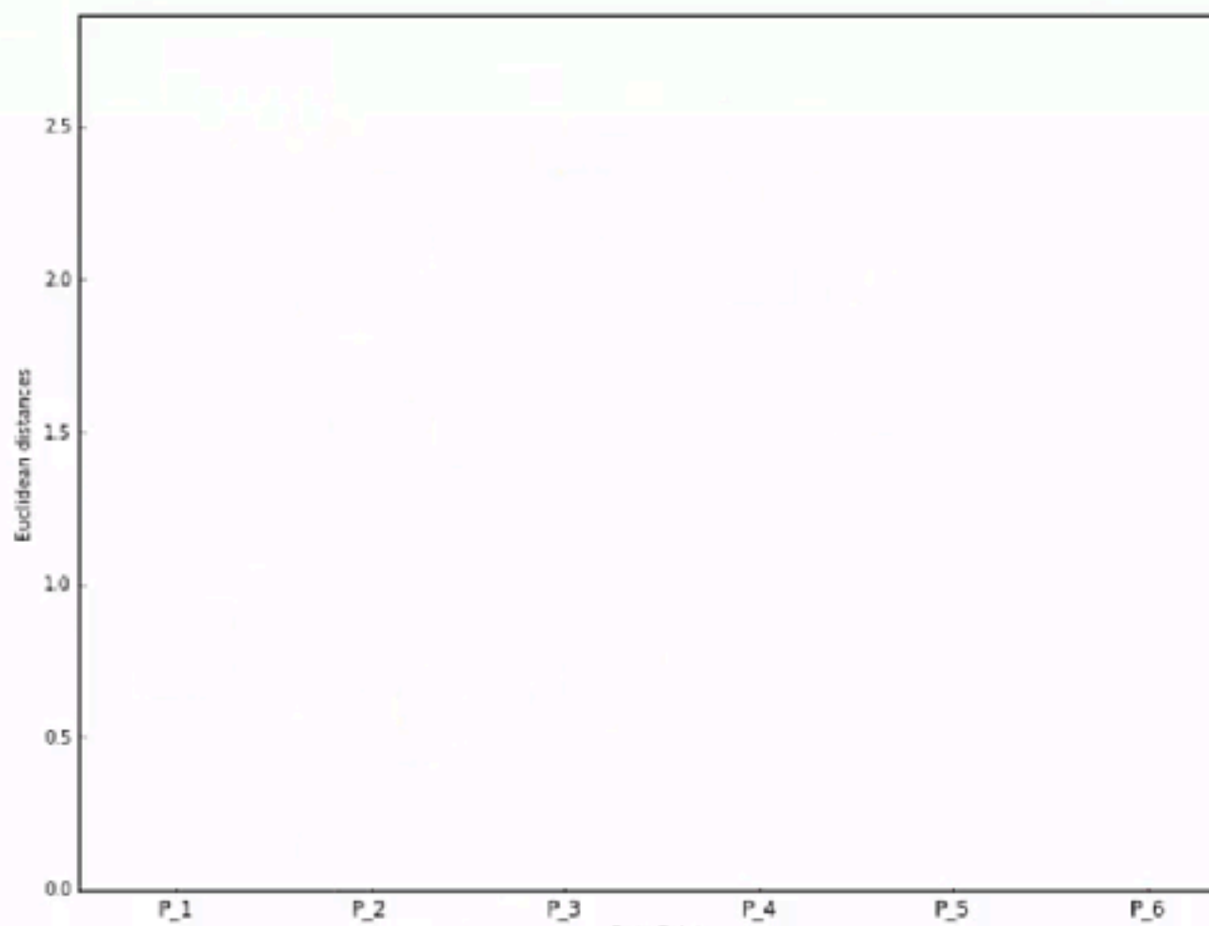

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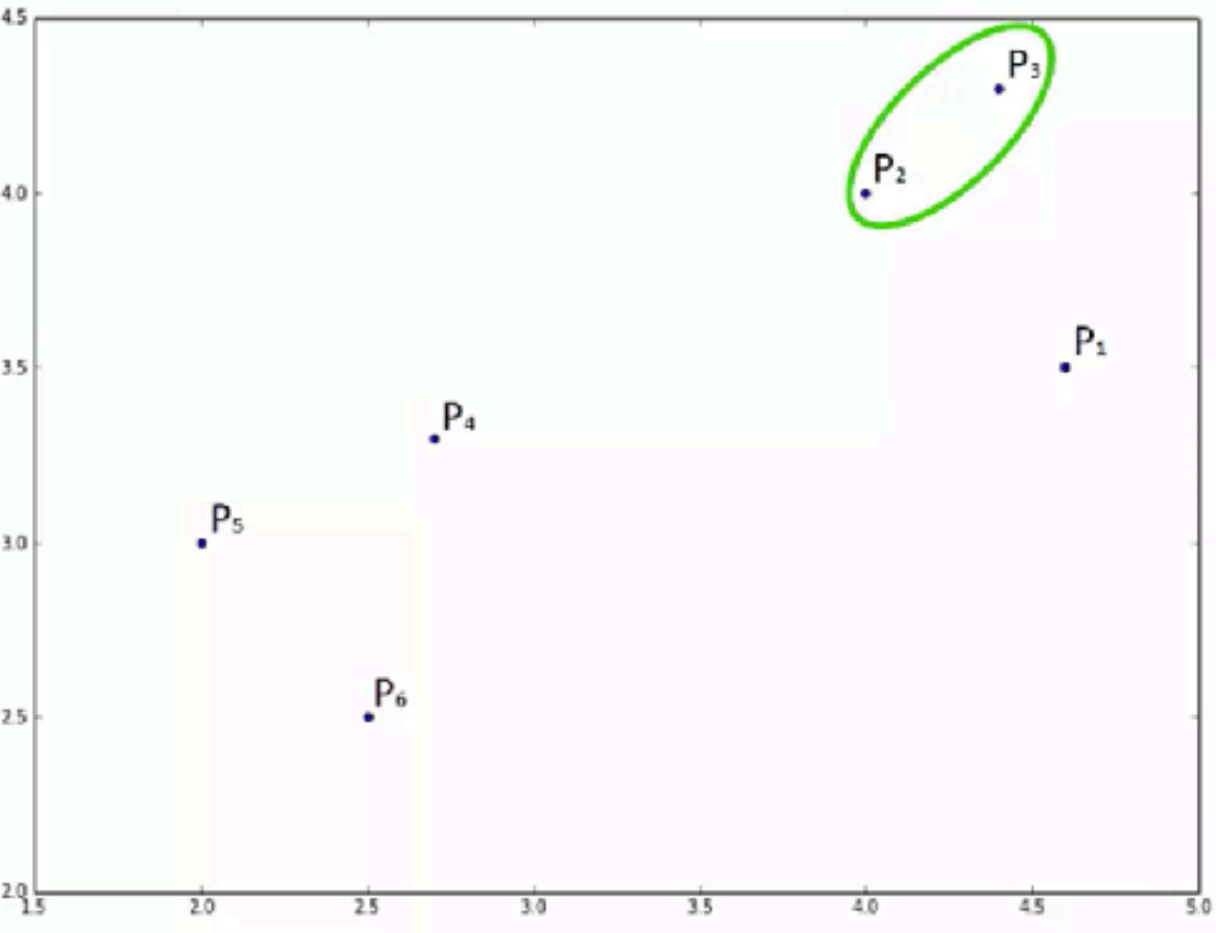

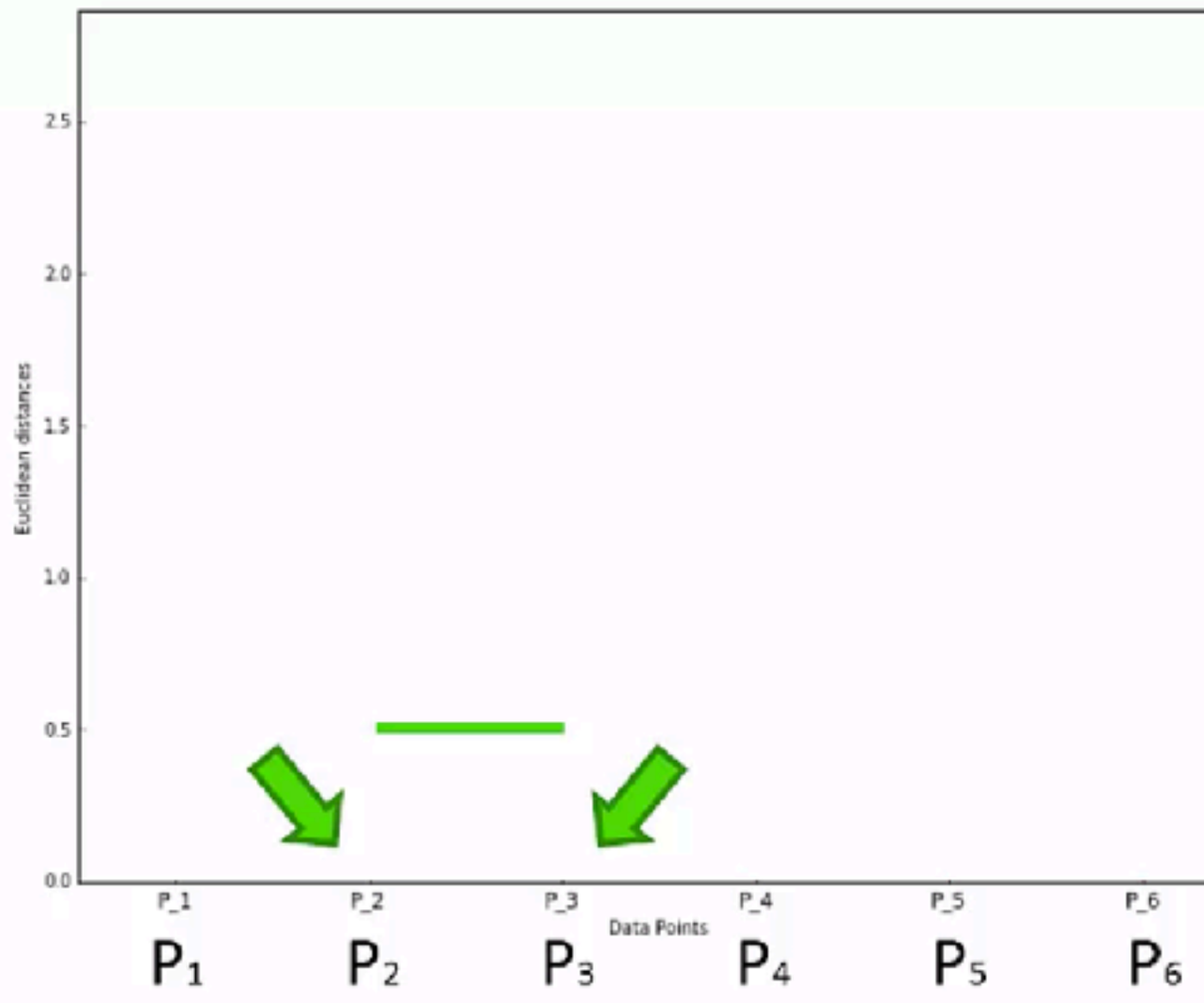

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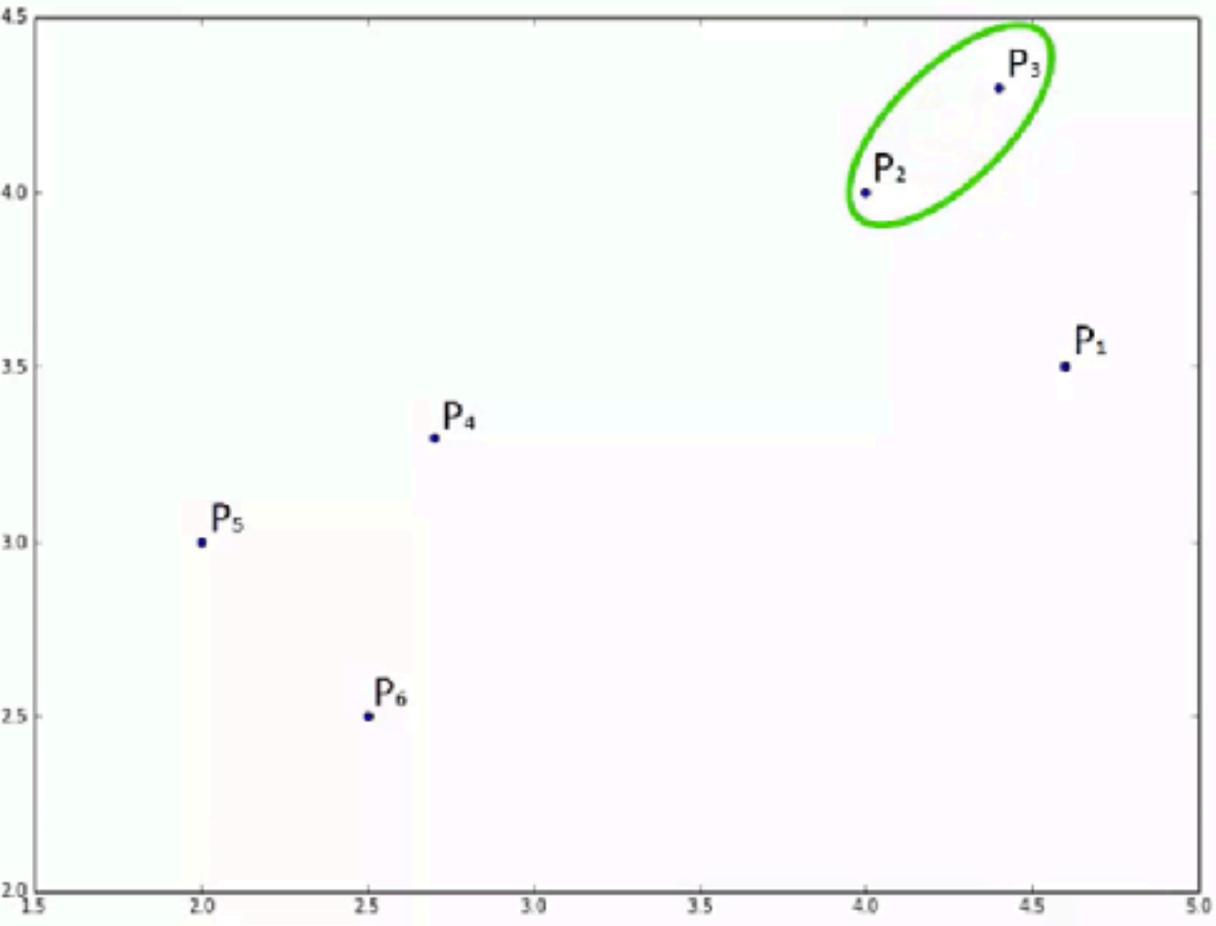

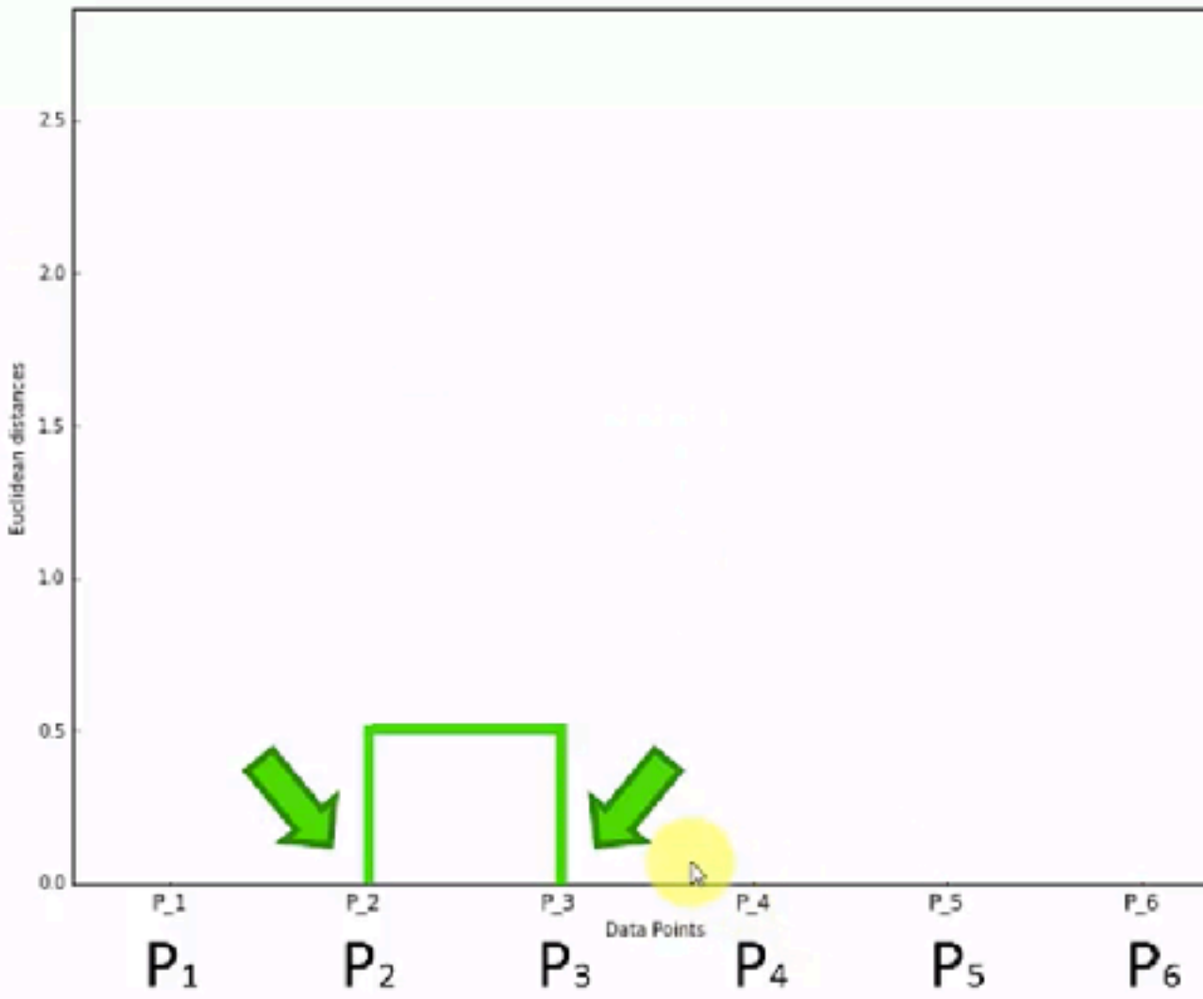

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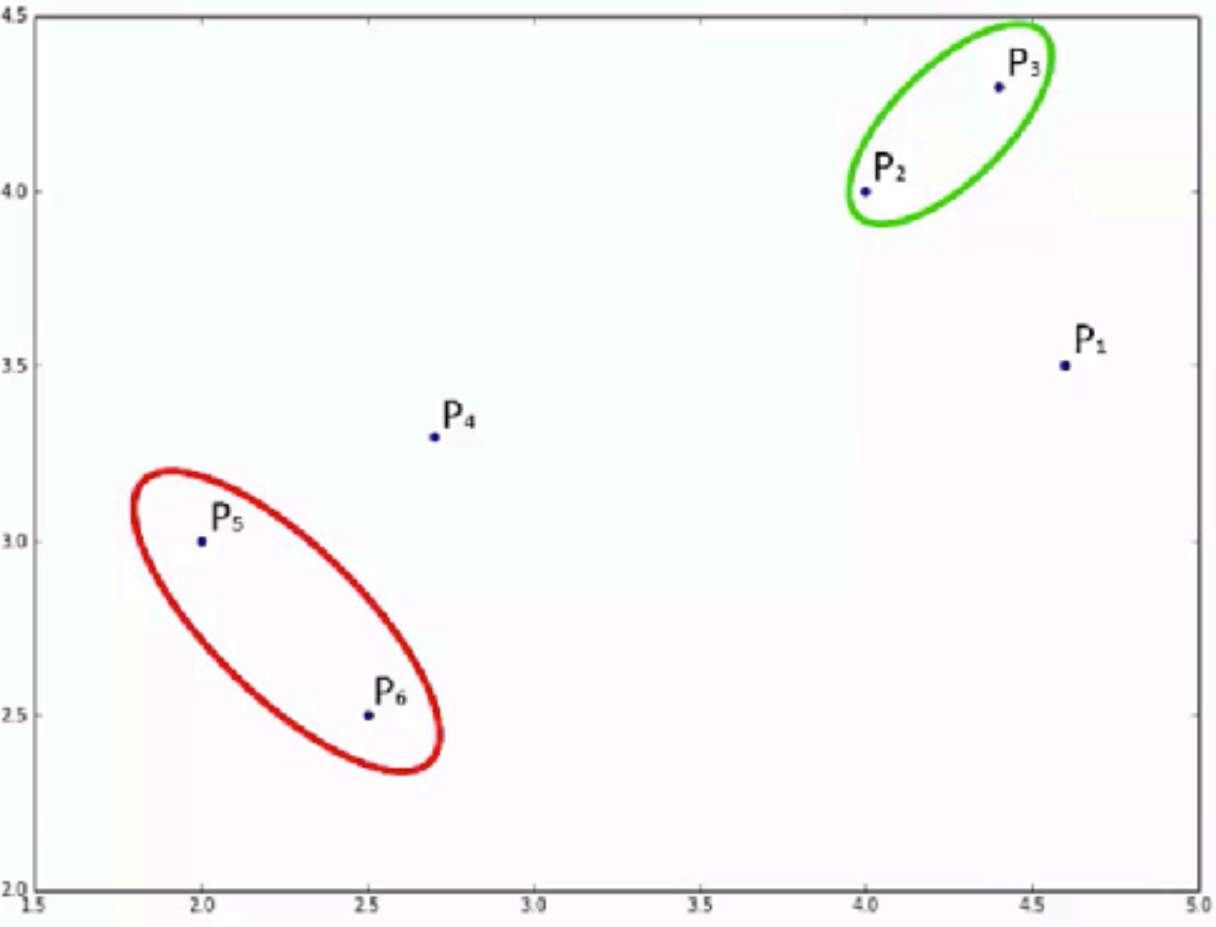

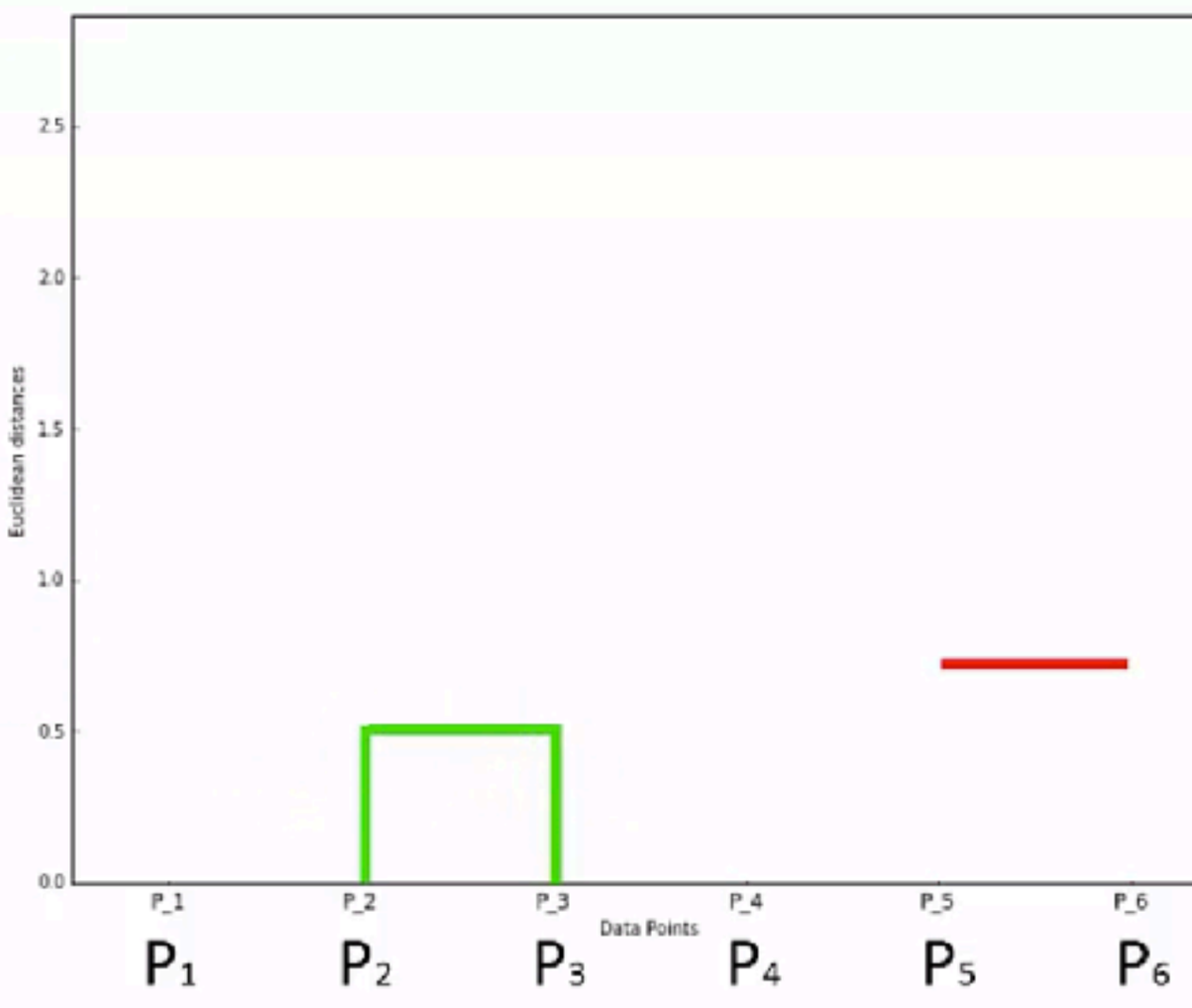

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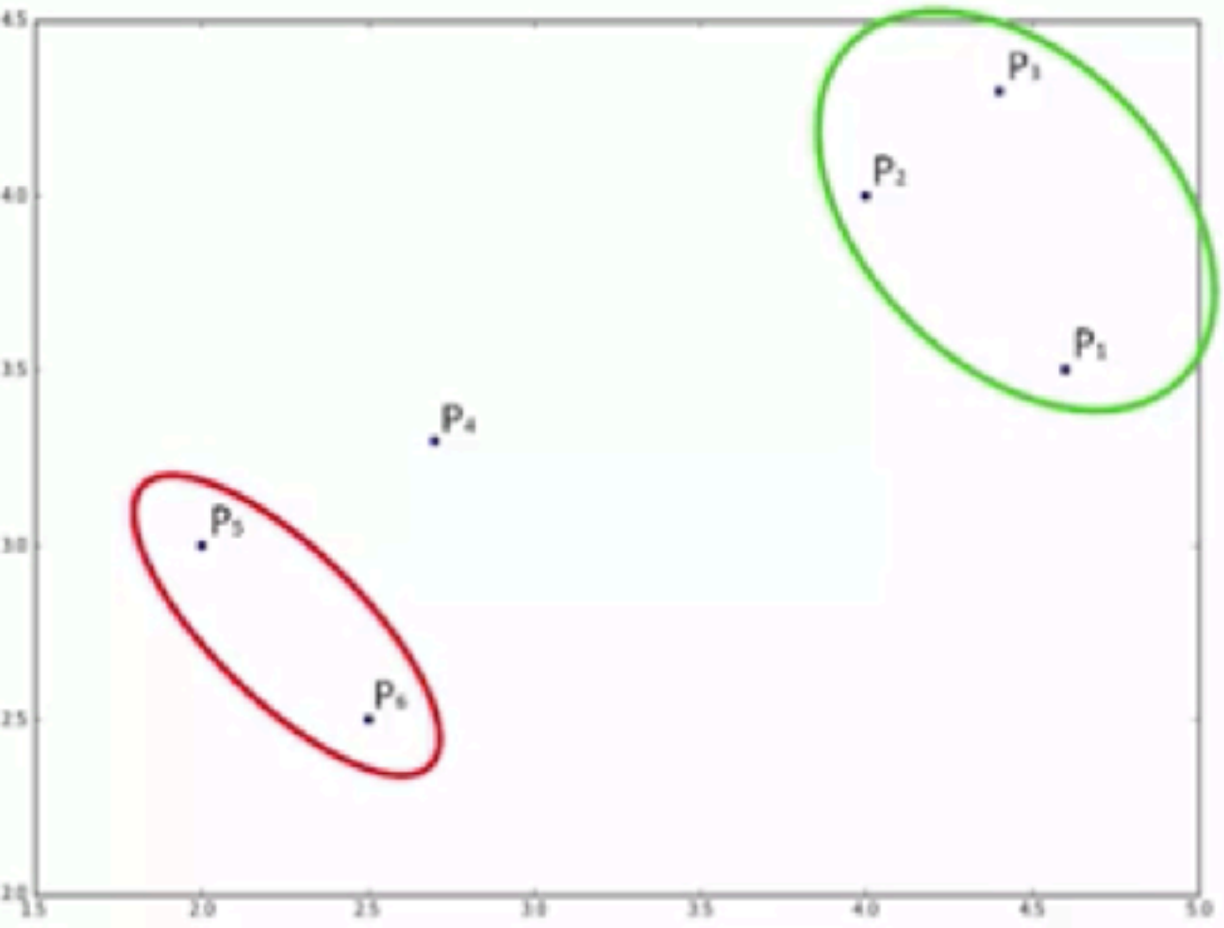

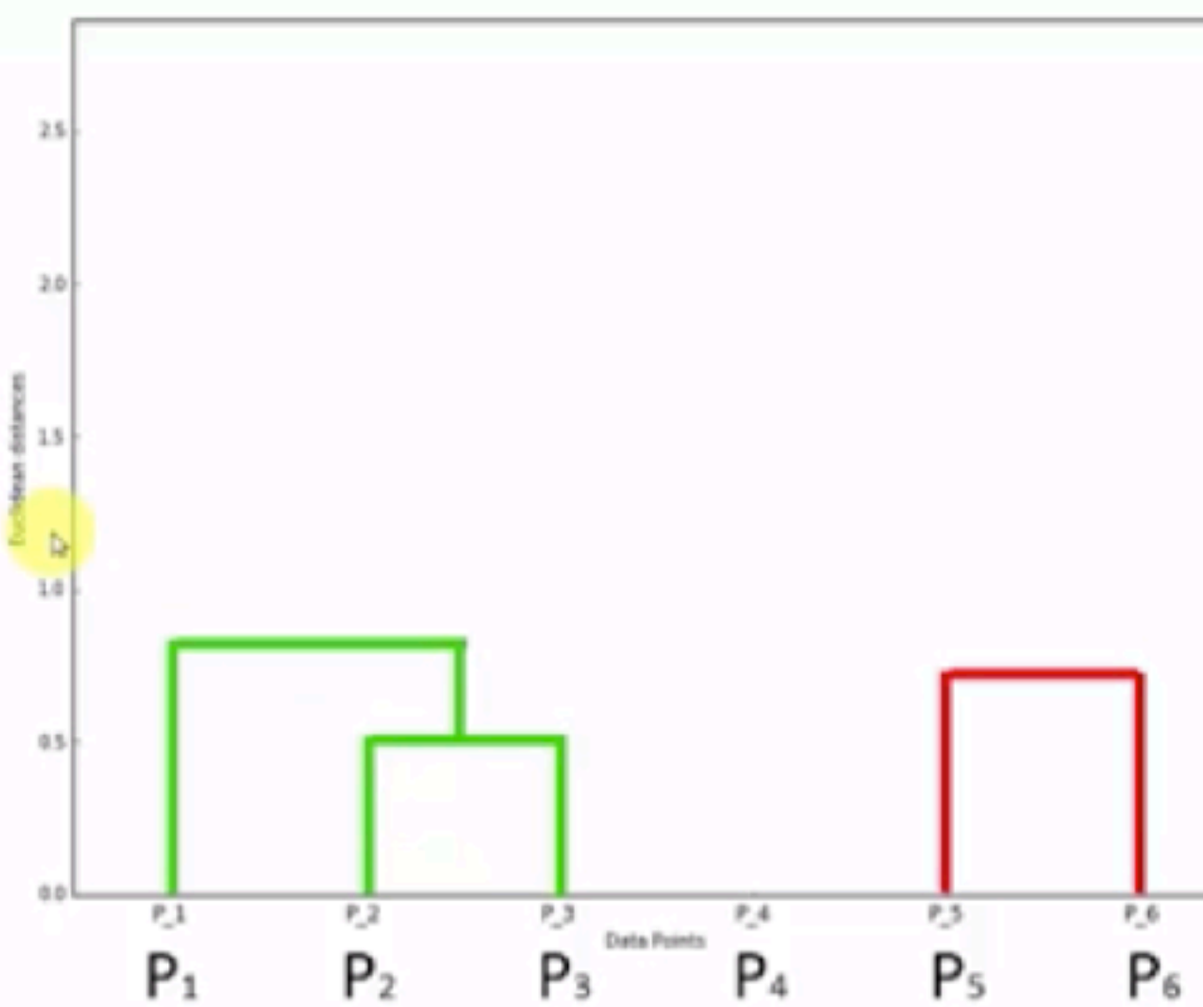

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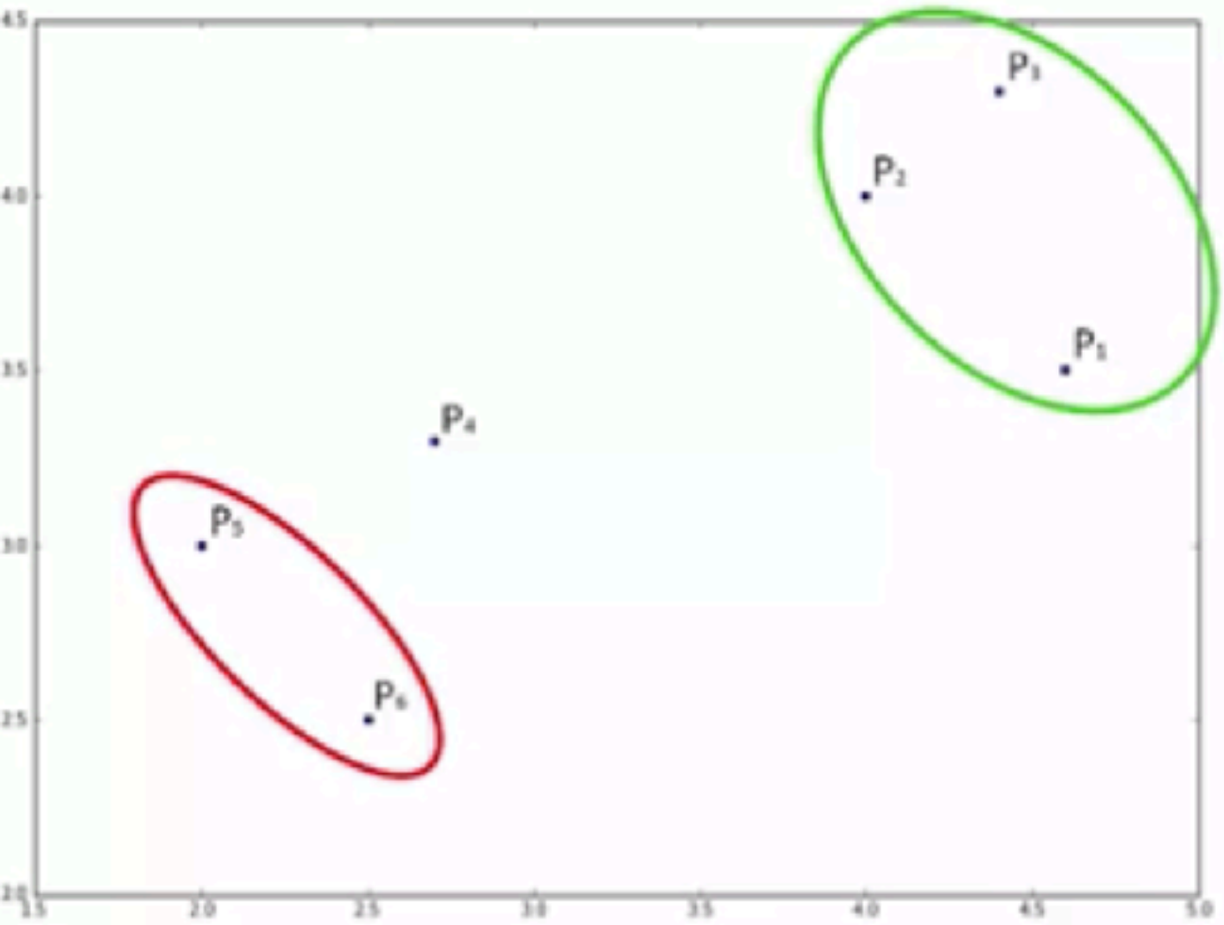

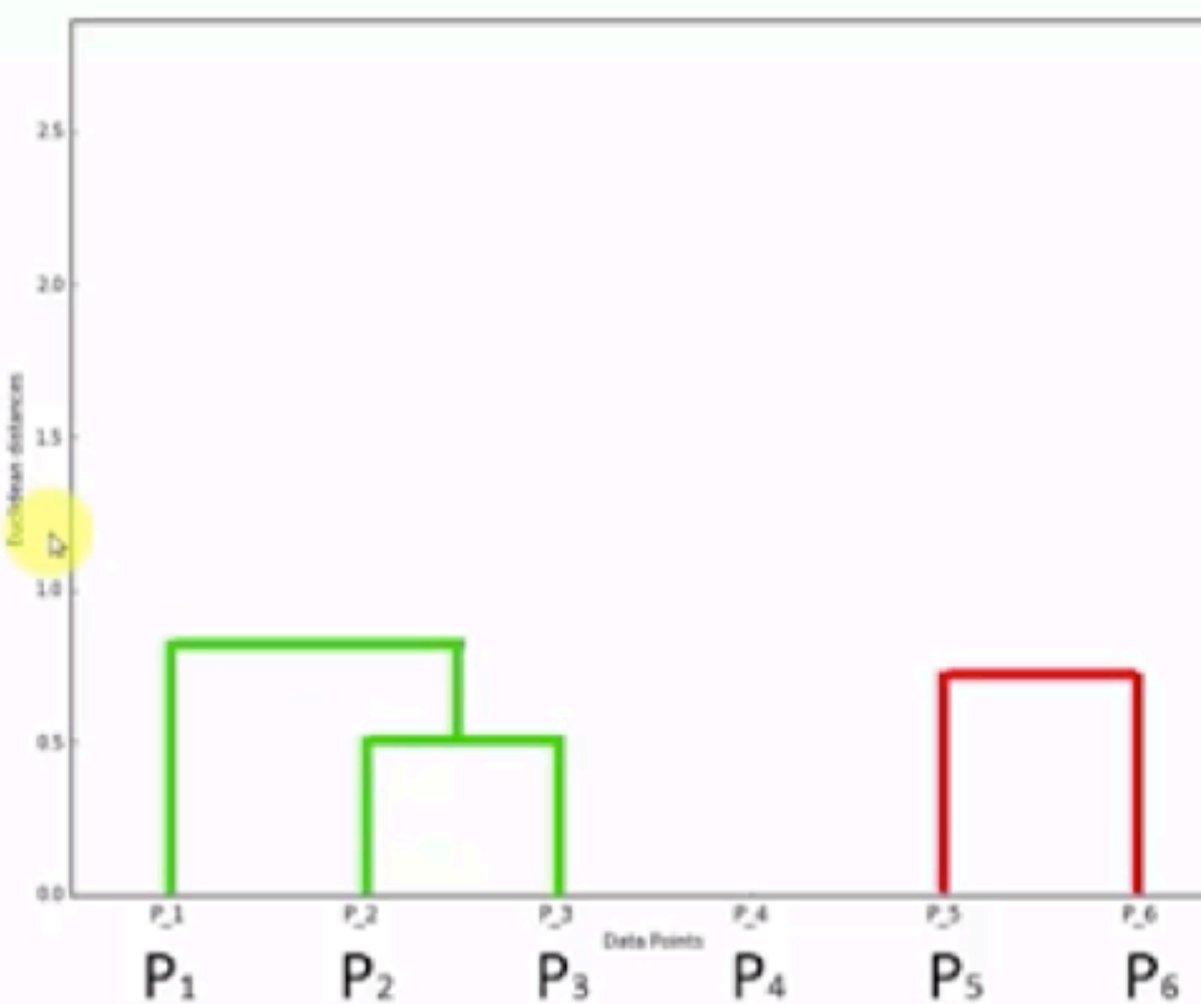

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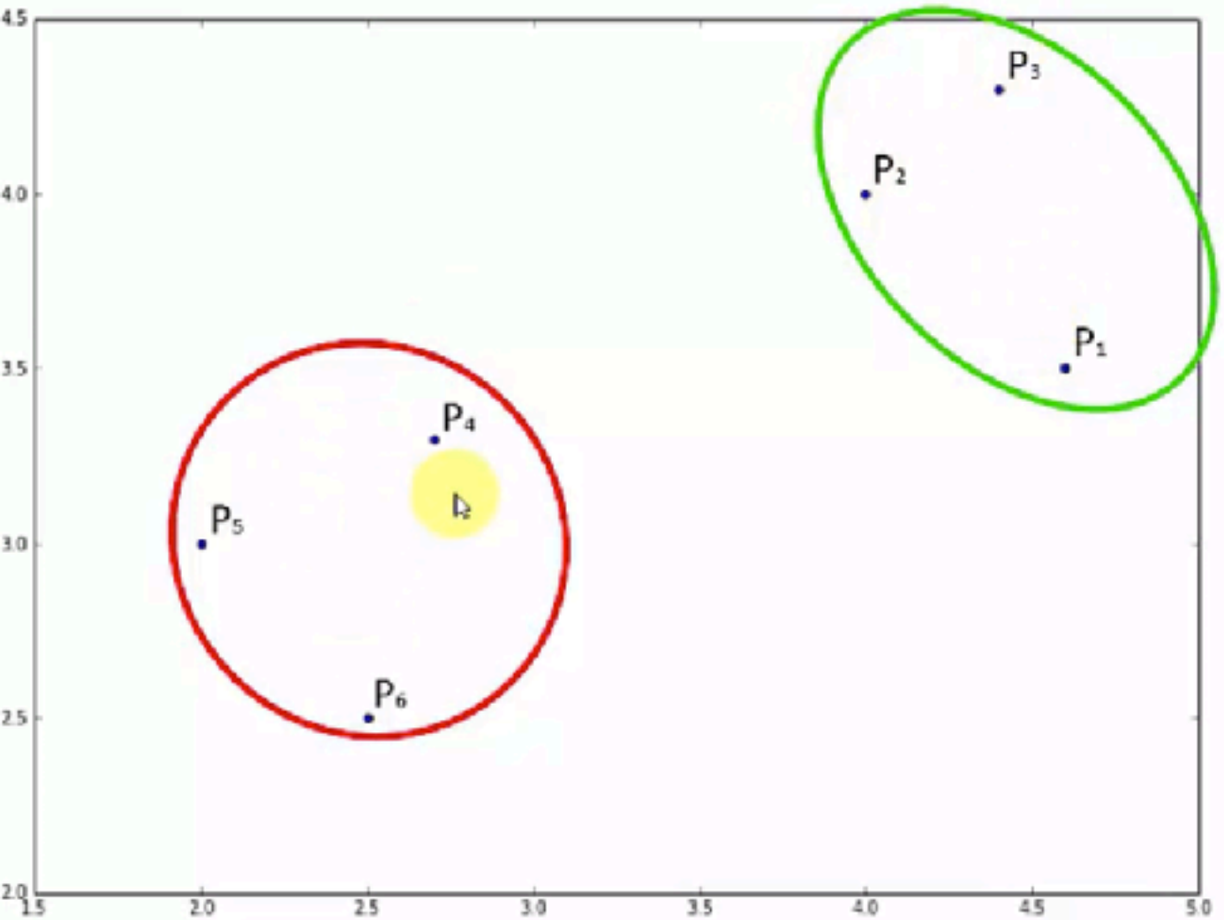

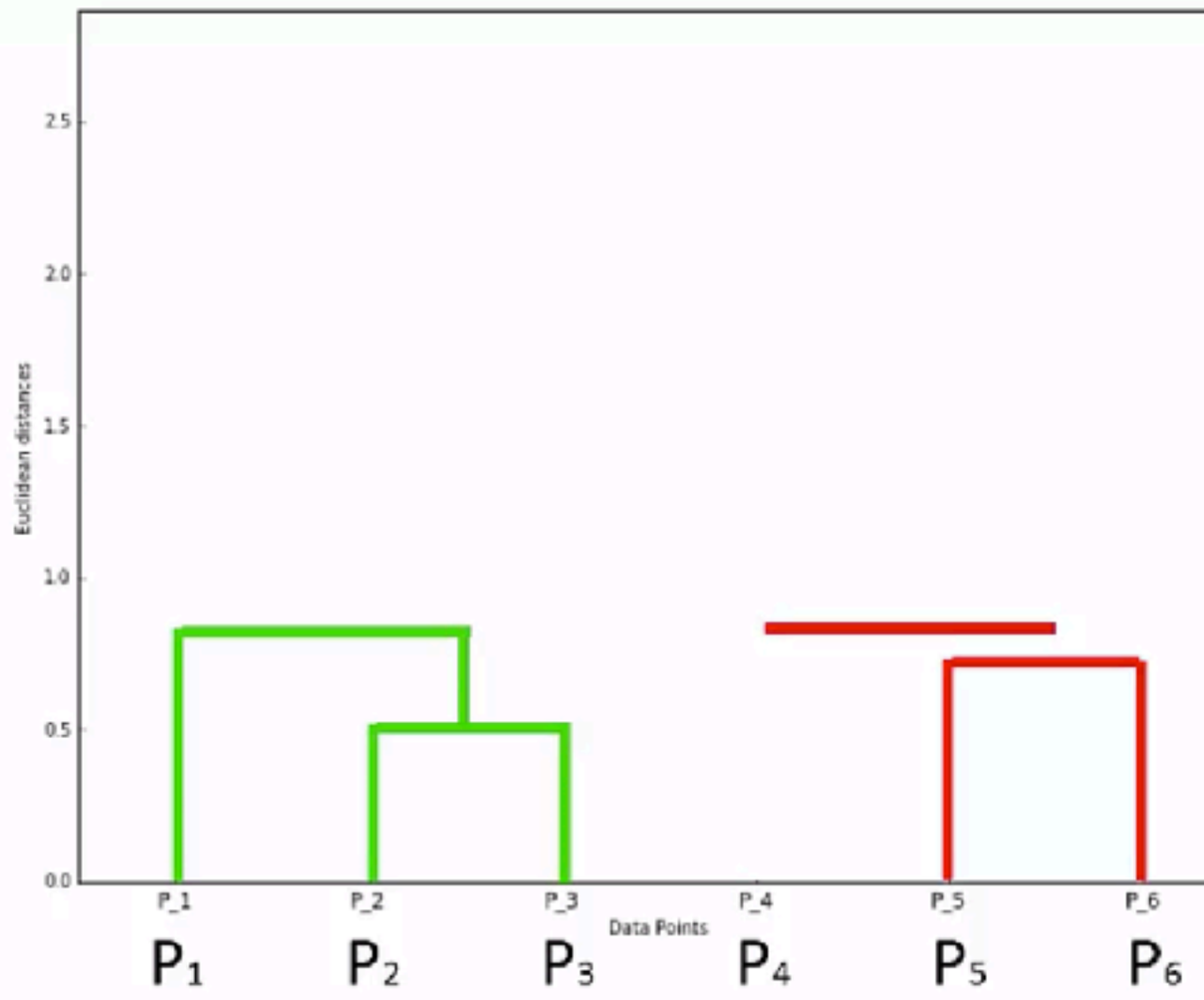

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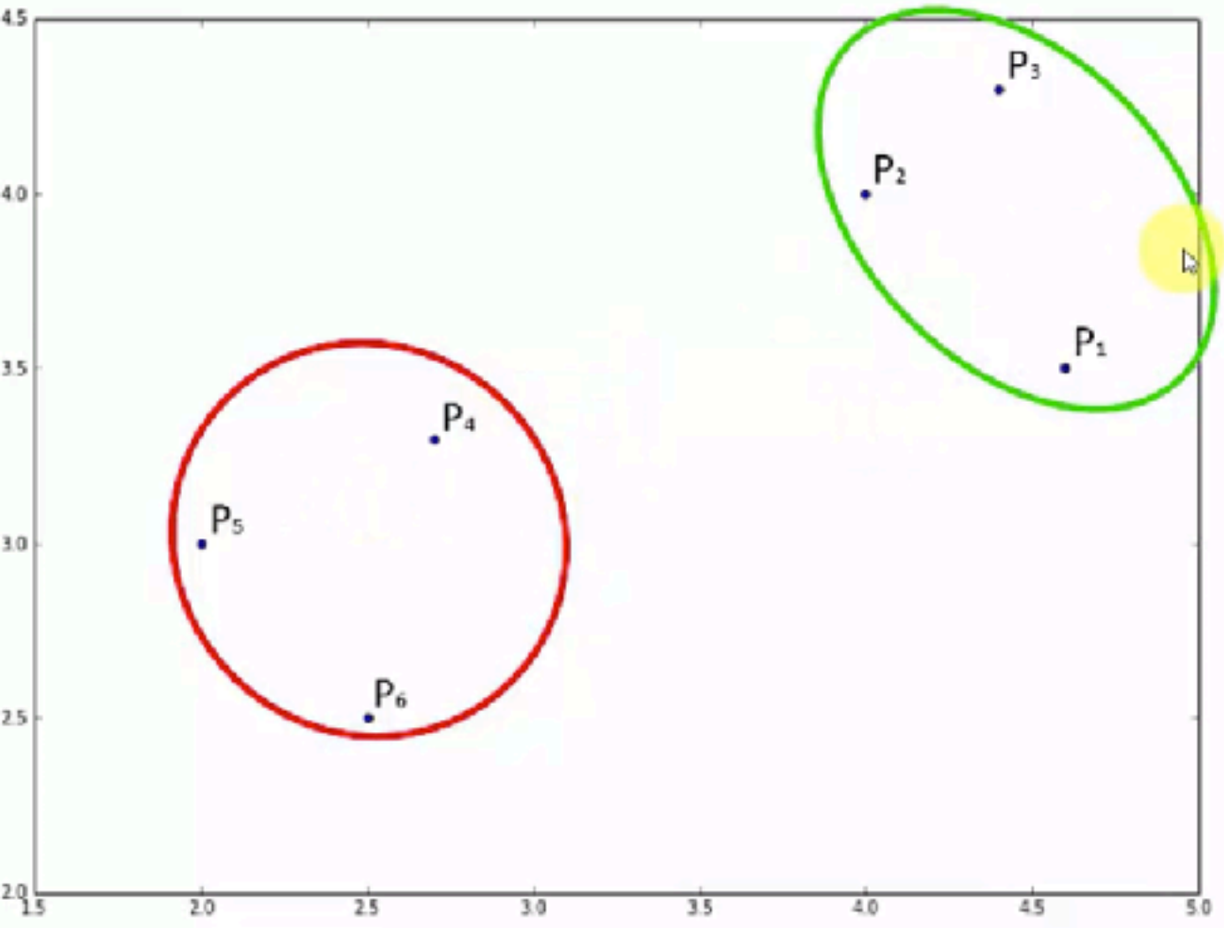

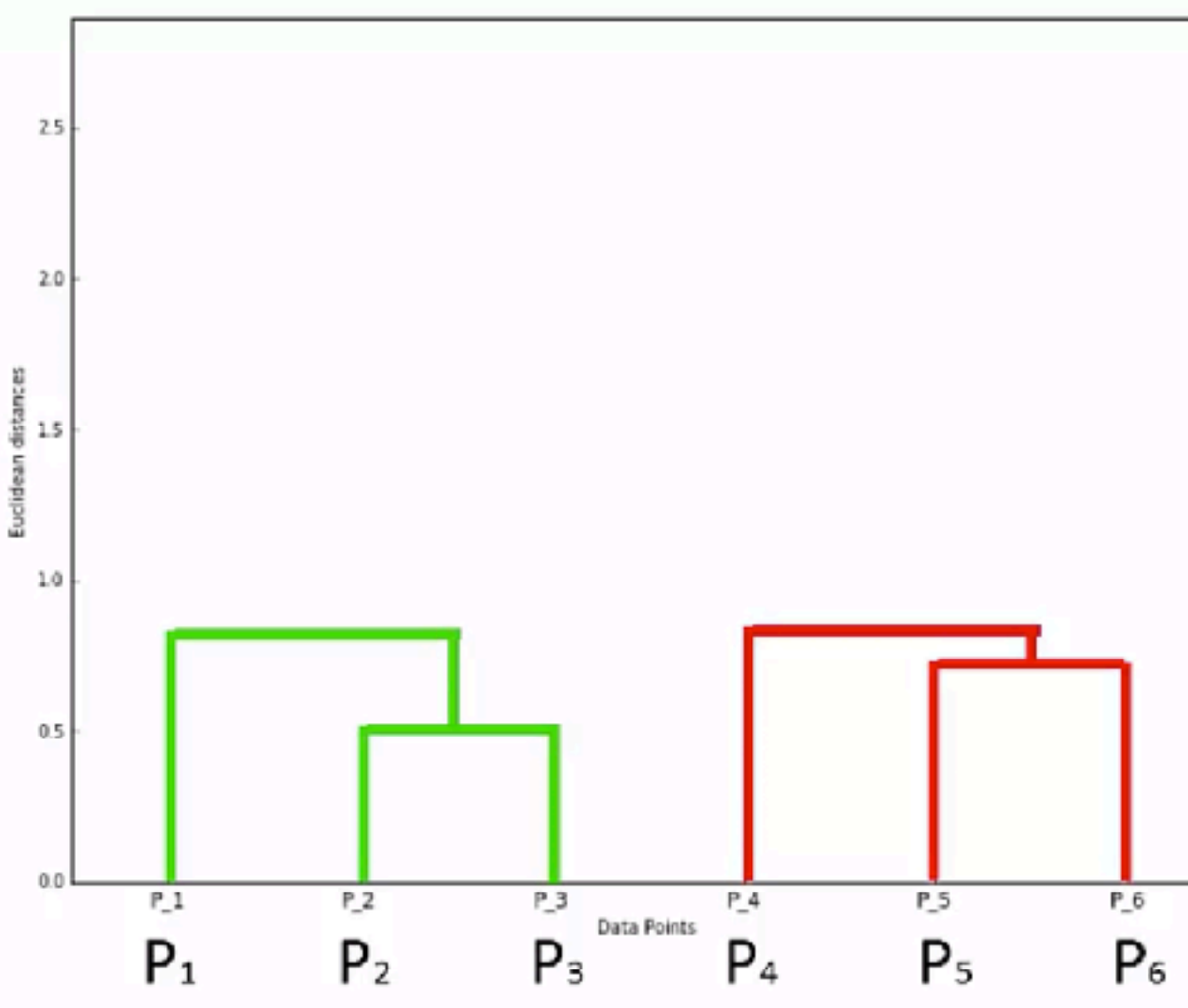

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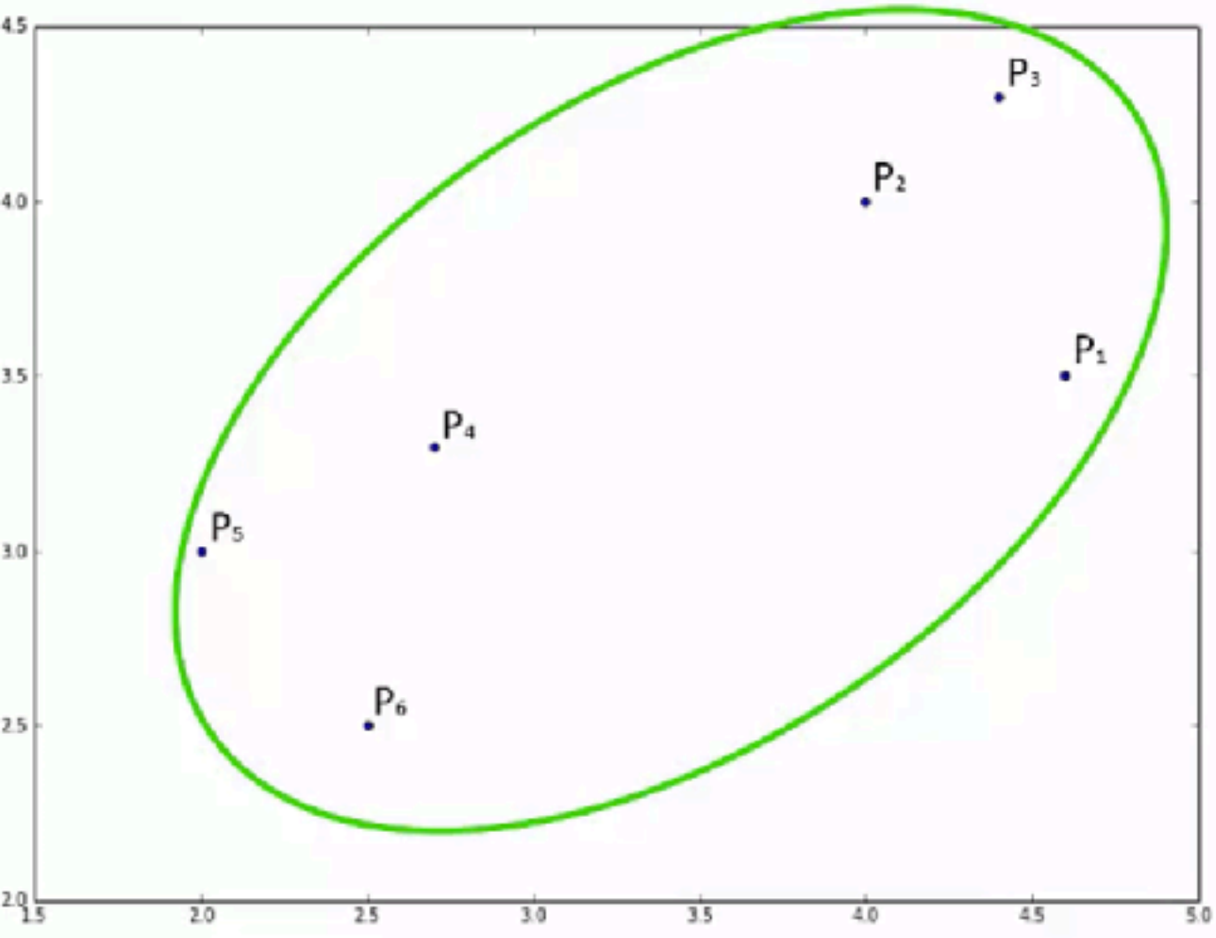

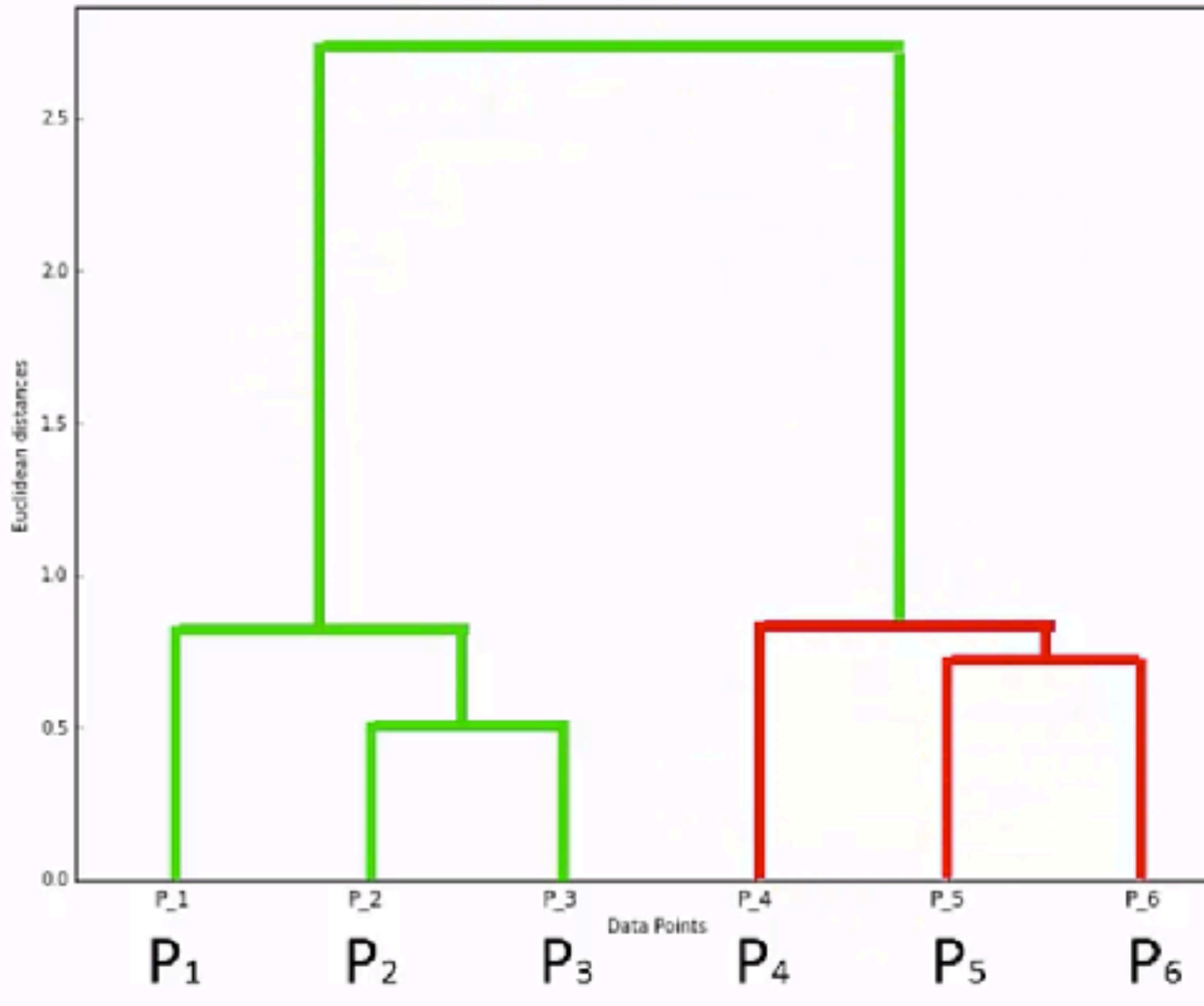

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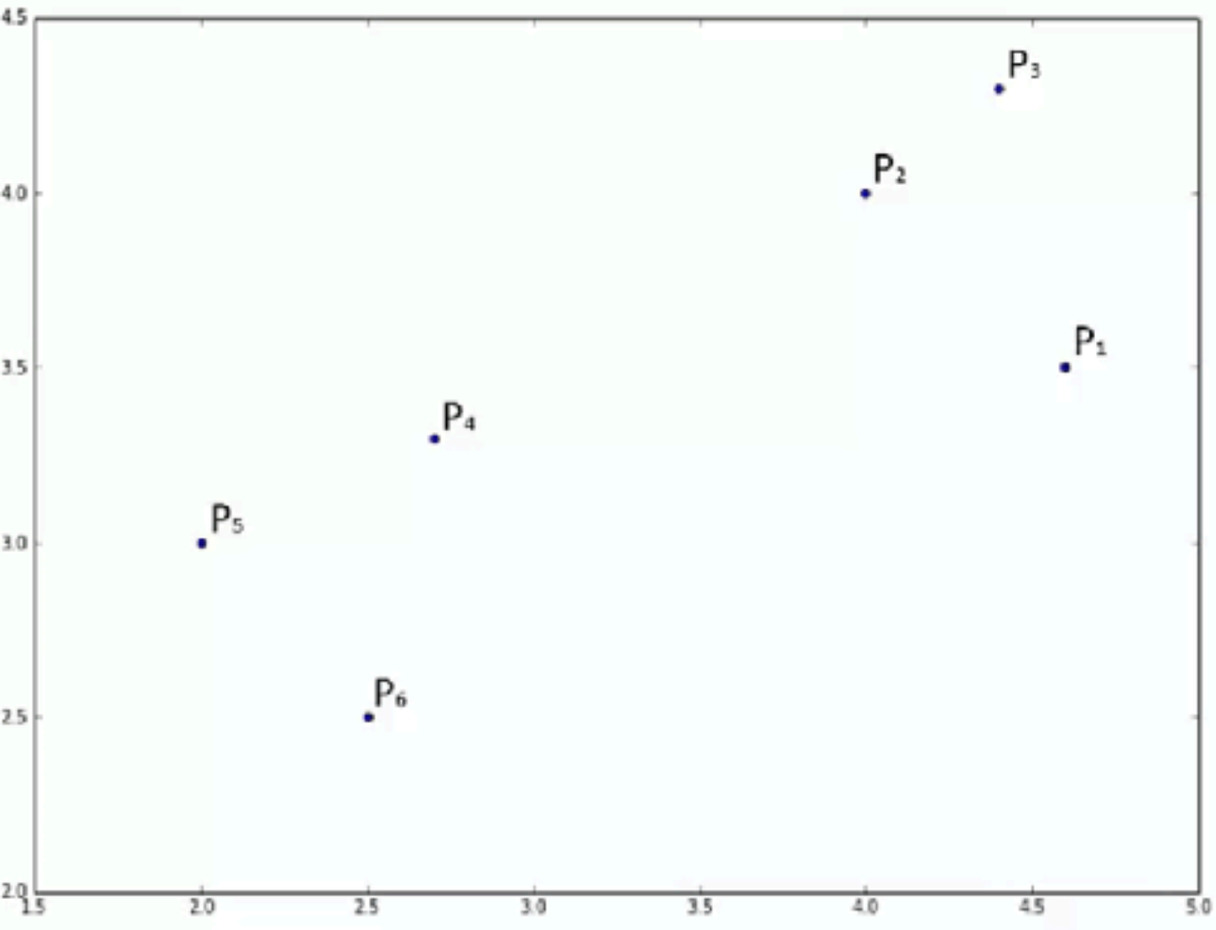
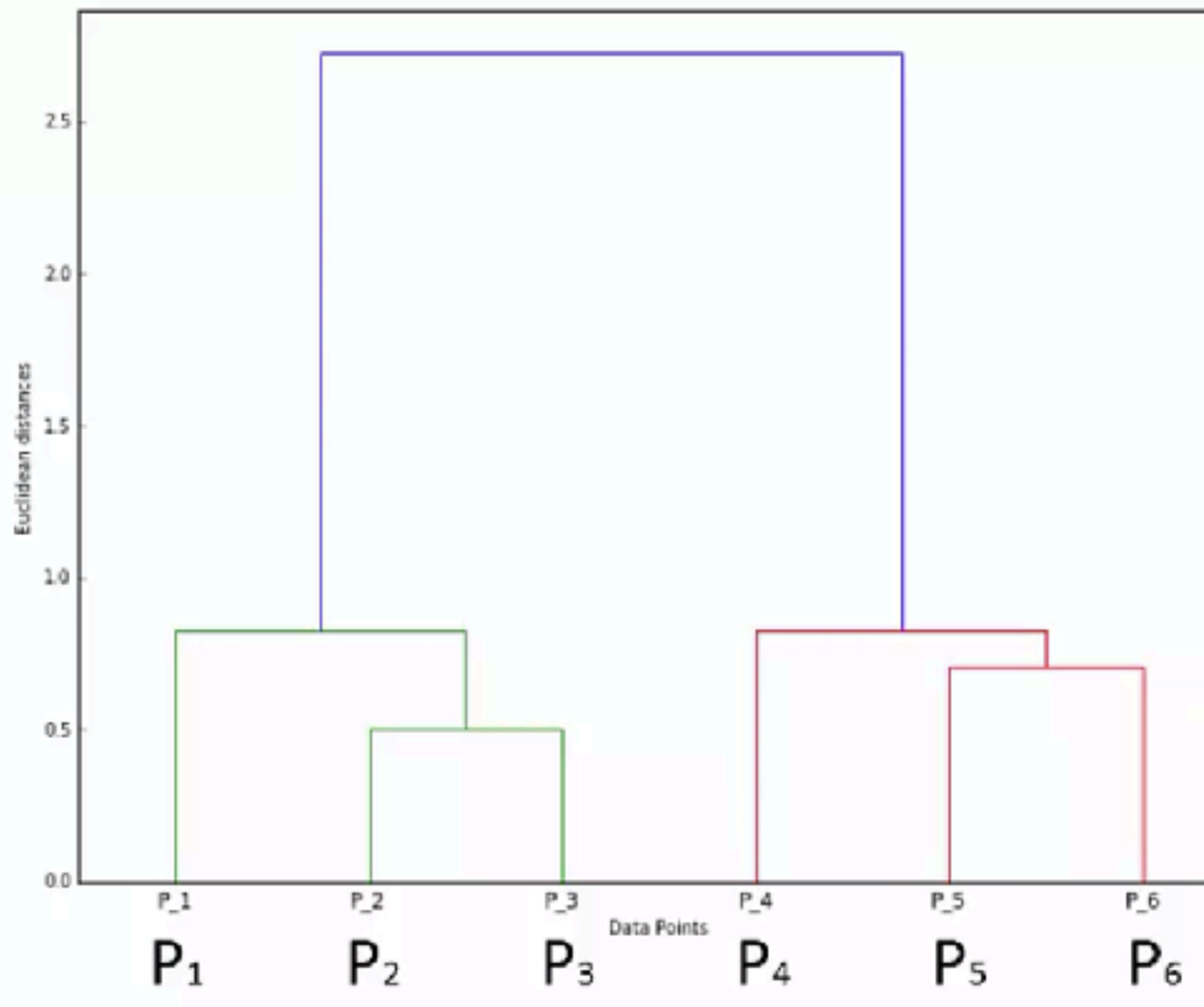
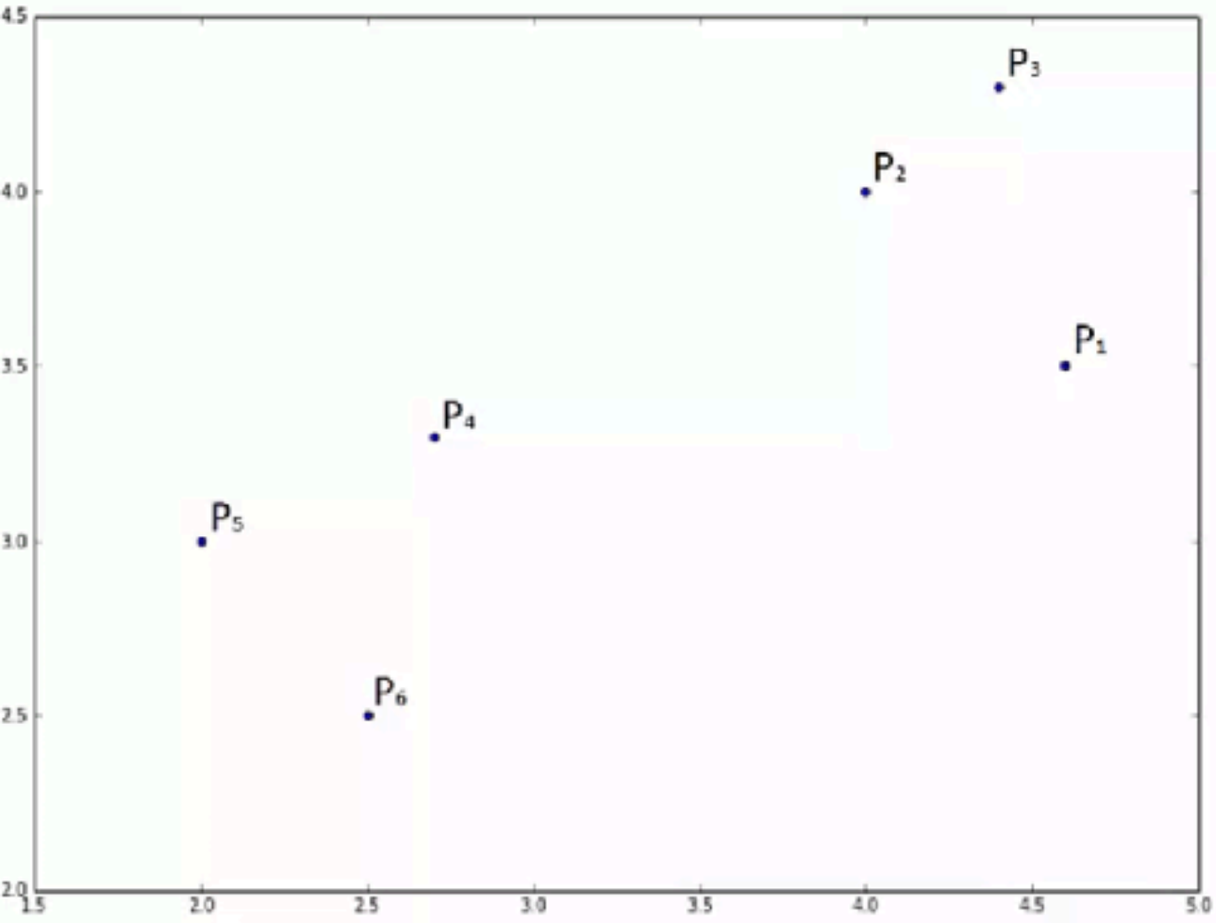
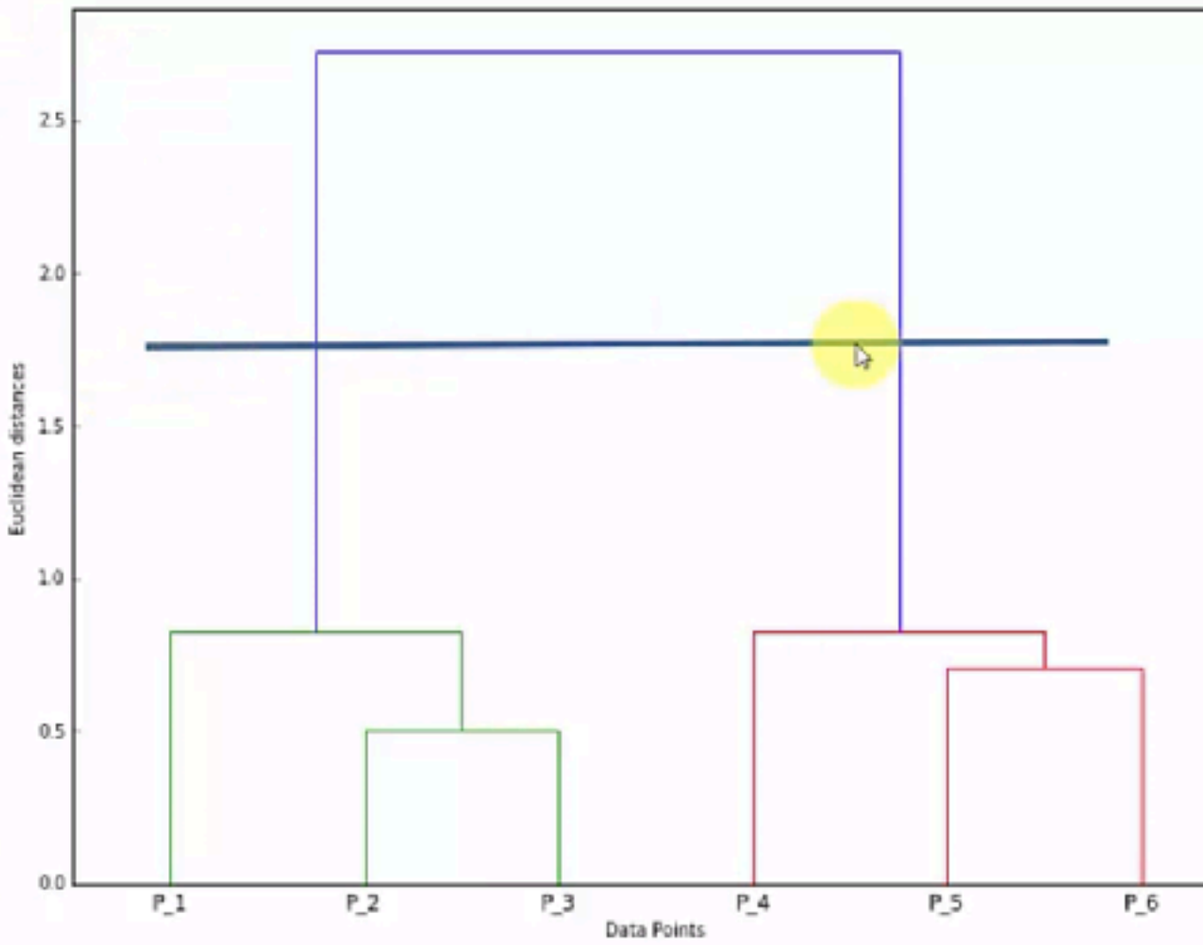




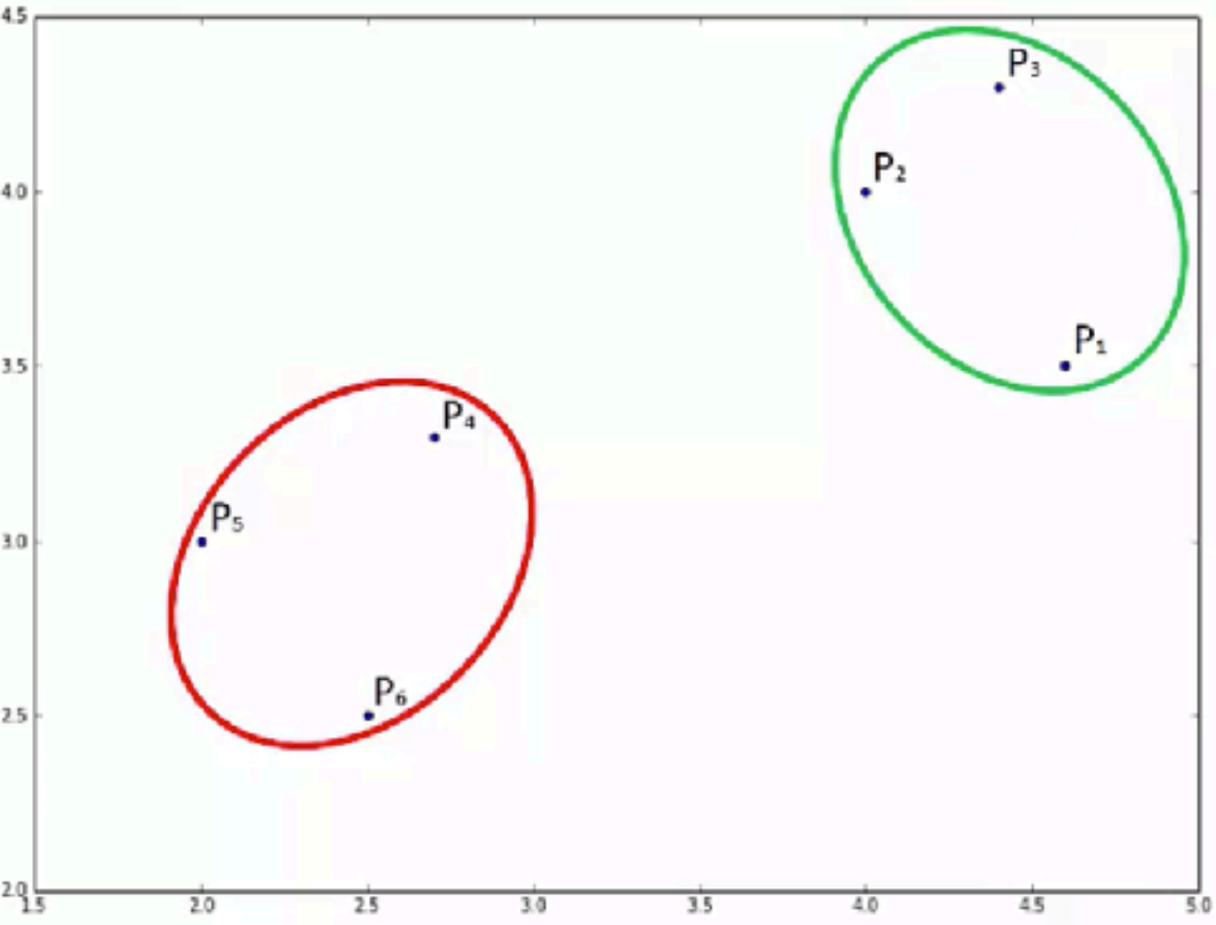
HC Intuition: Using Dendrograms

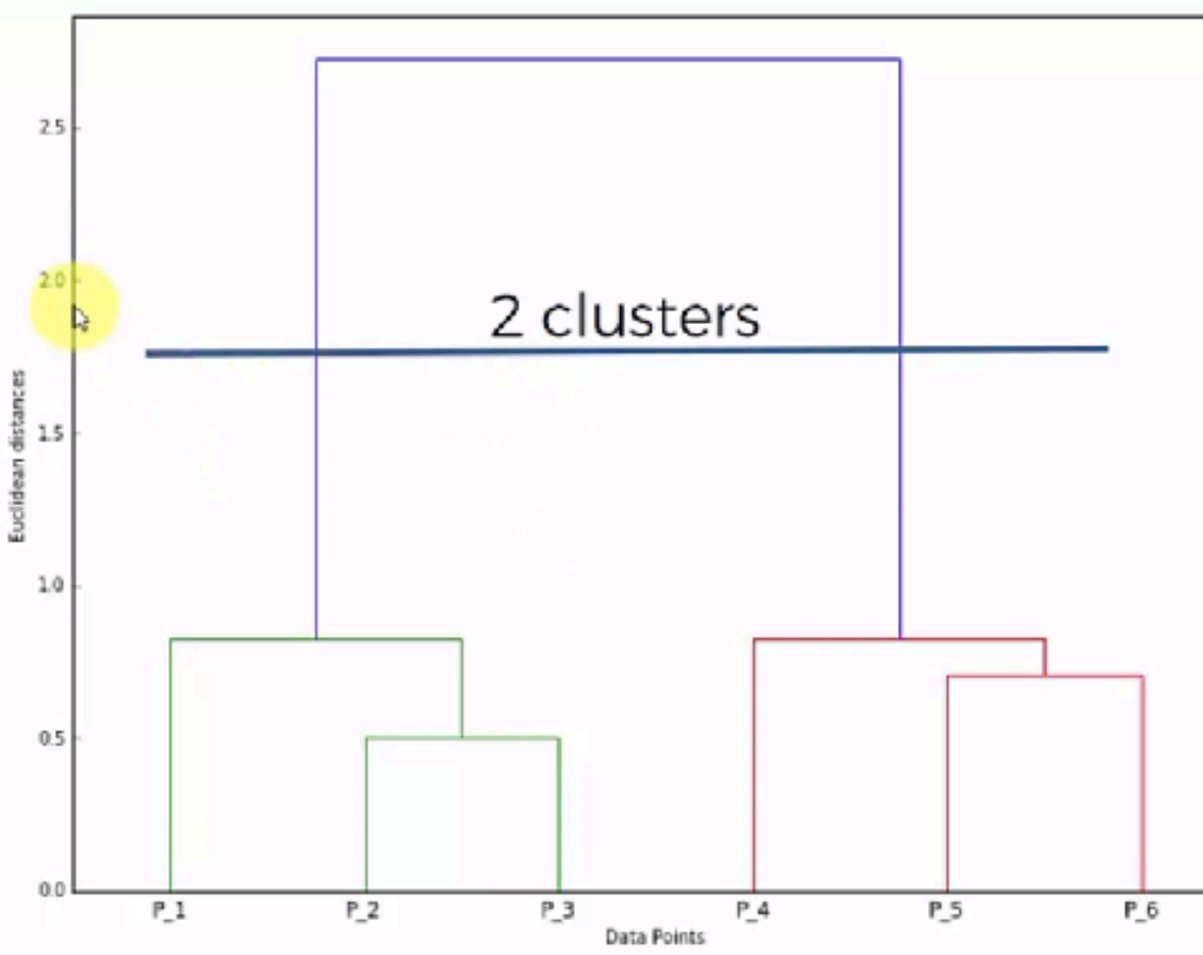
Dendrograms – Two Clusters



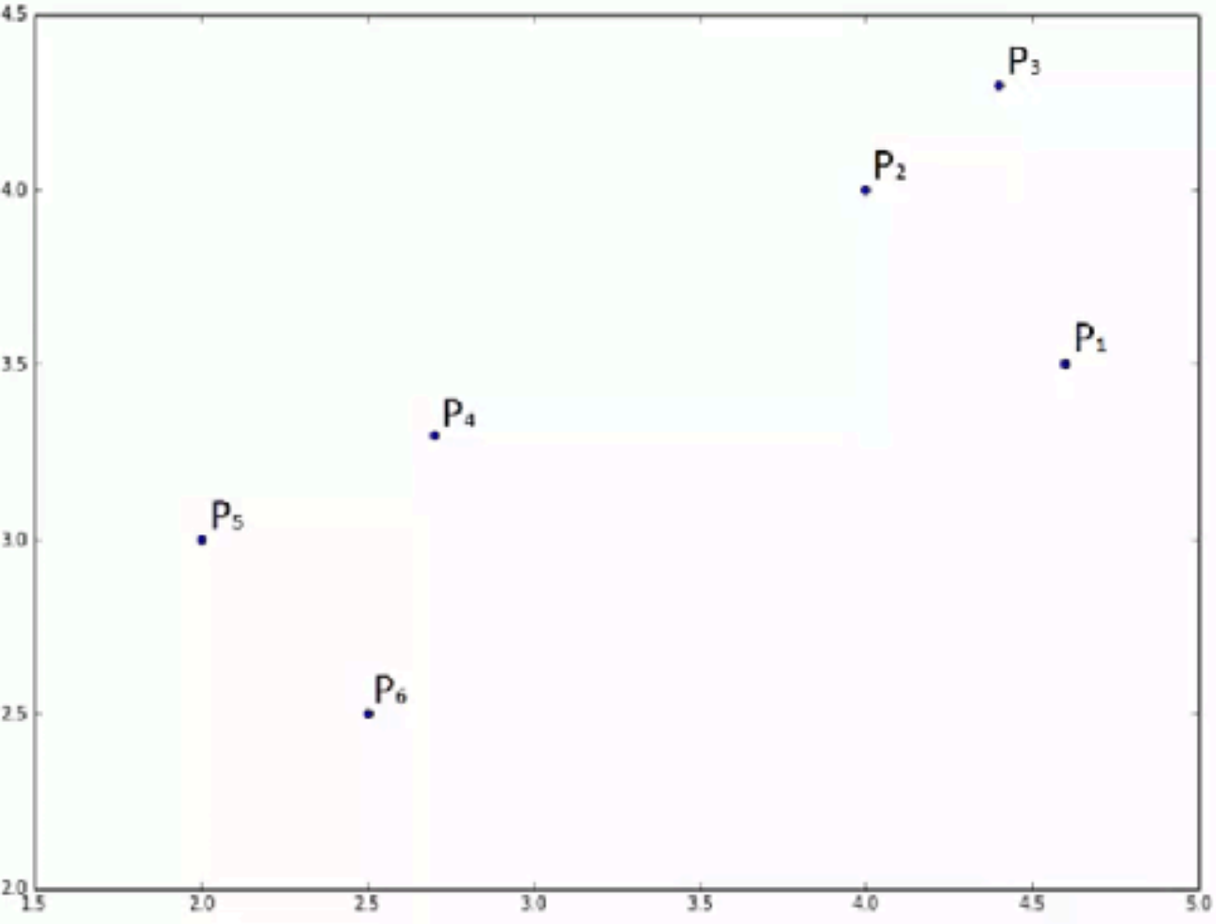


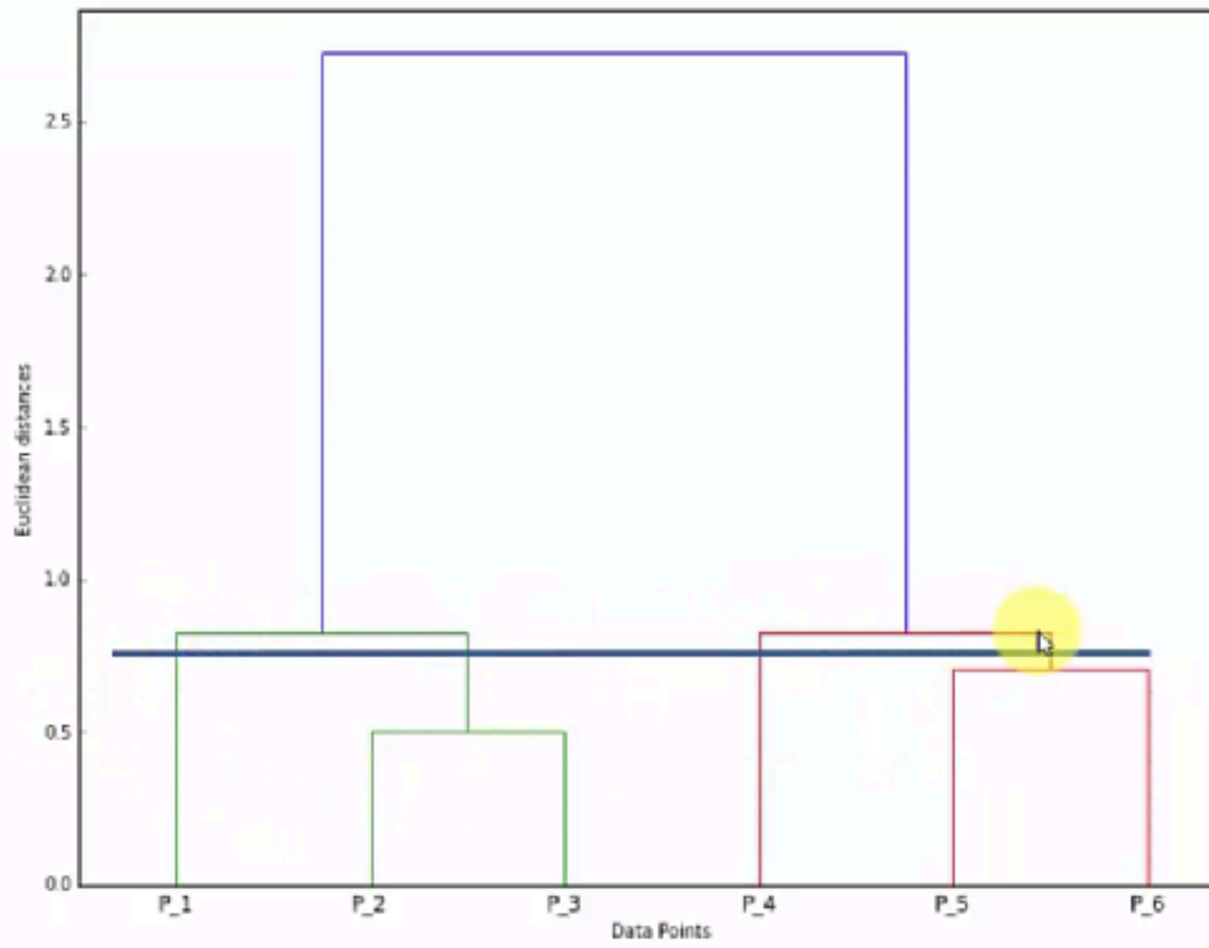
Dendrograms – Two Clusters



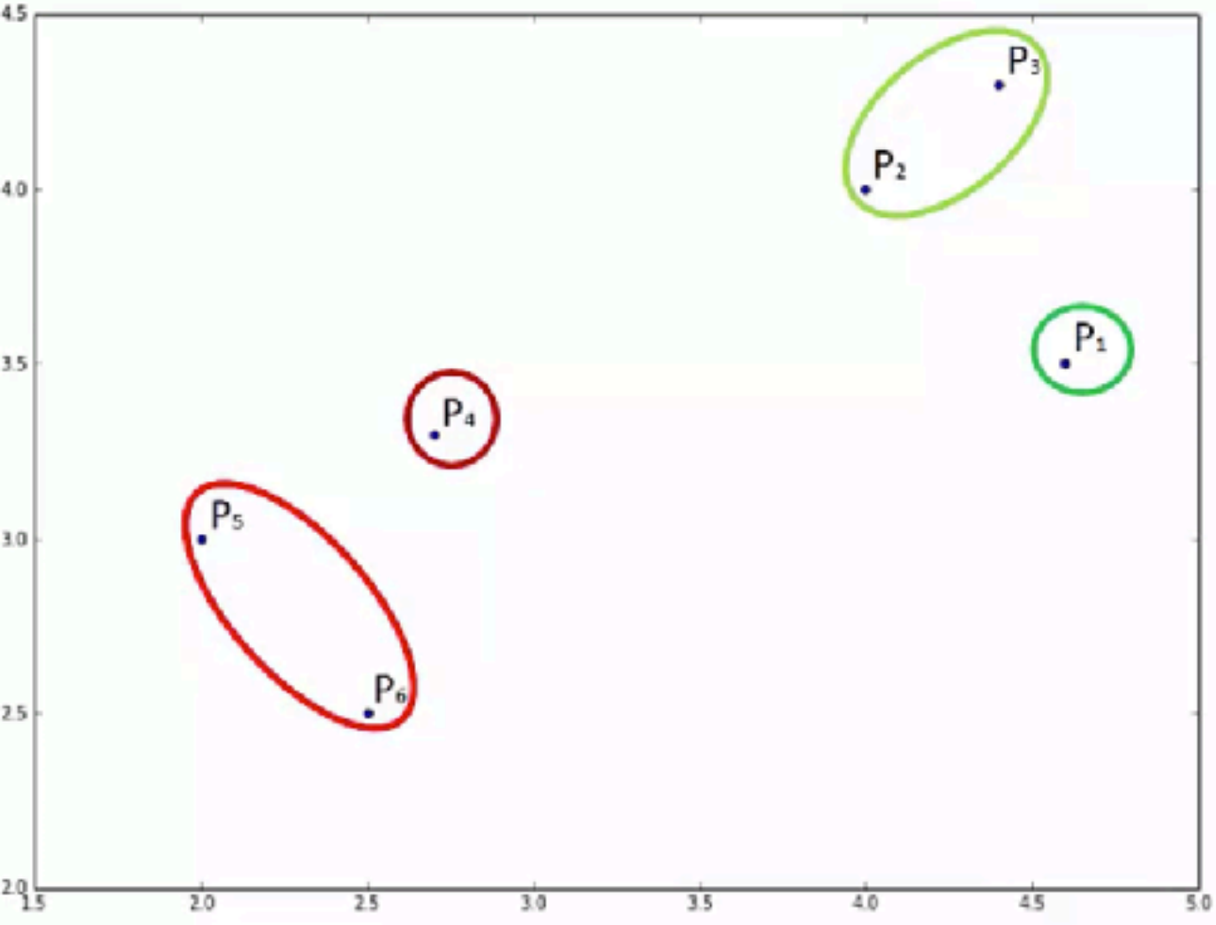


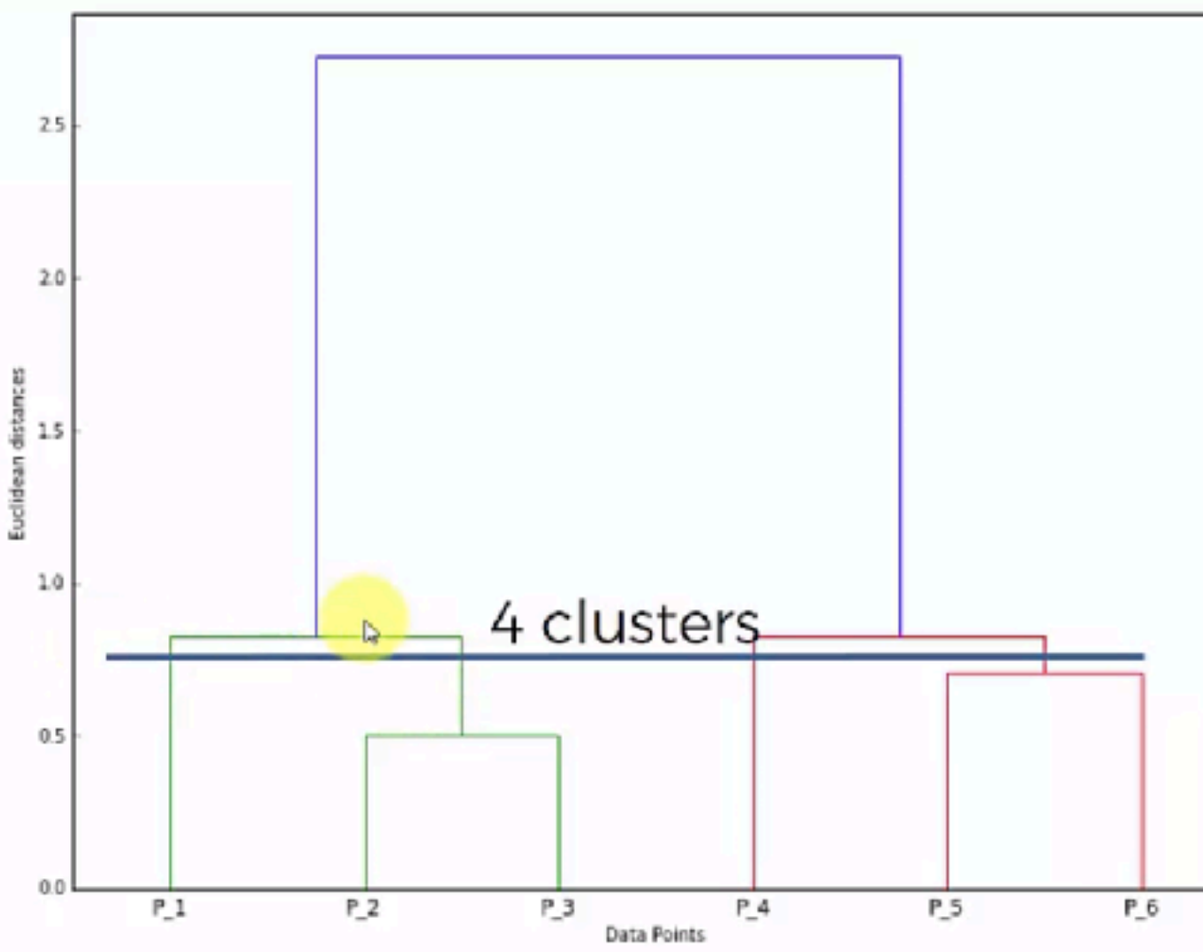
Dendrograms – Four Clusters



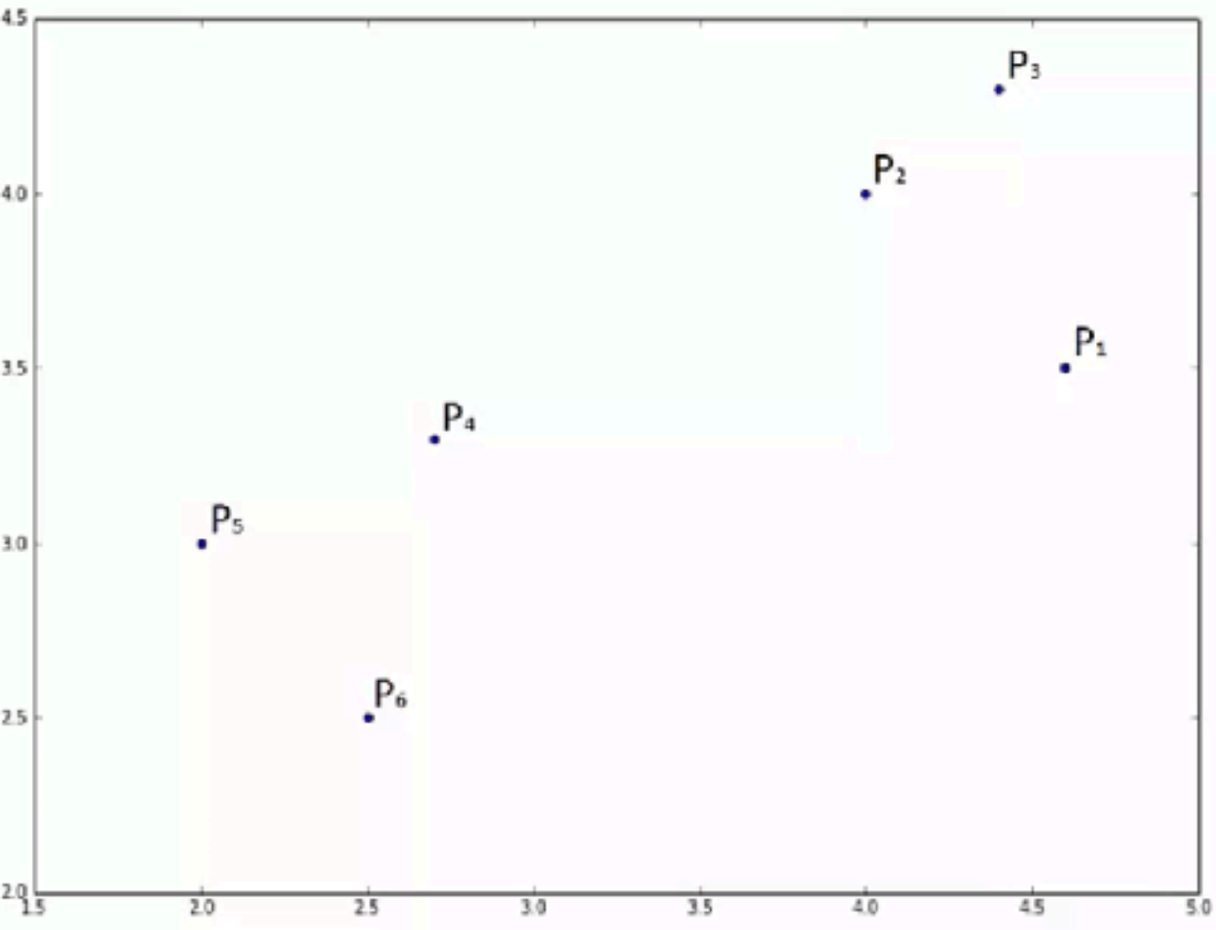


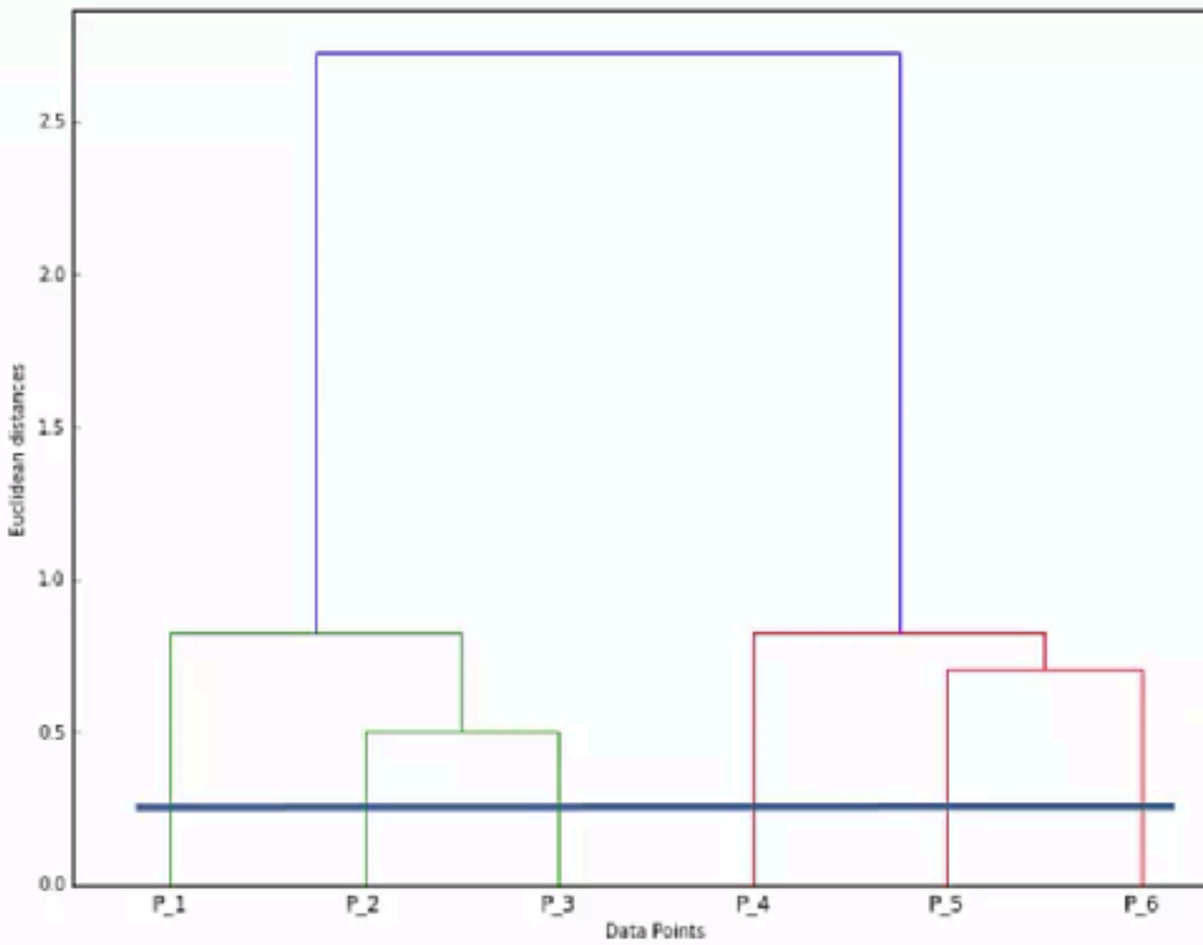
Dendrograms – Four Clusters



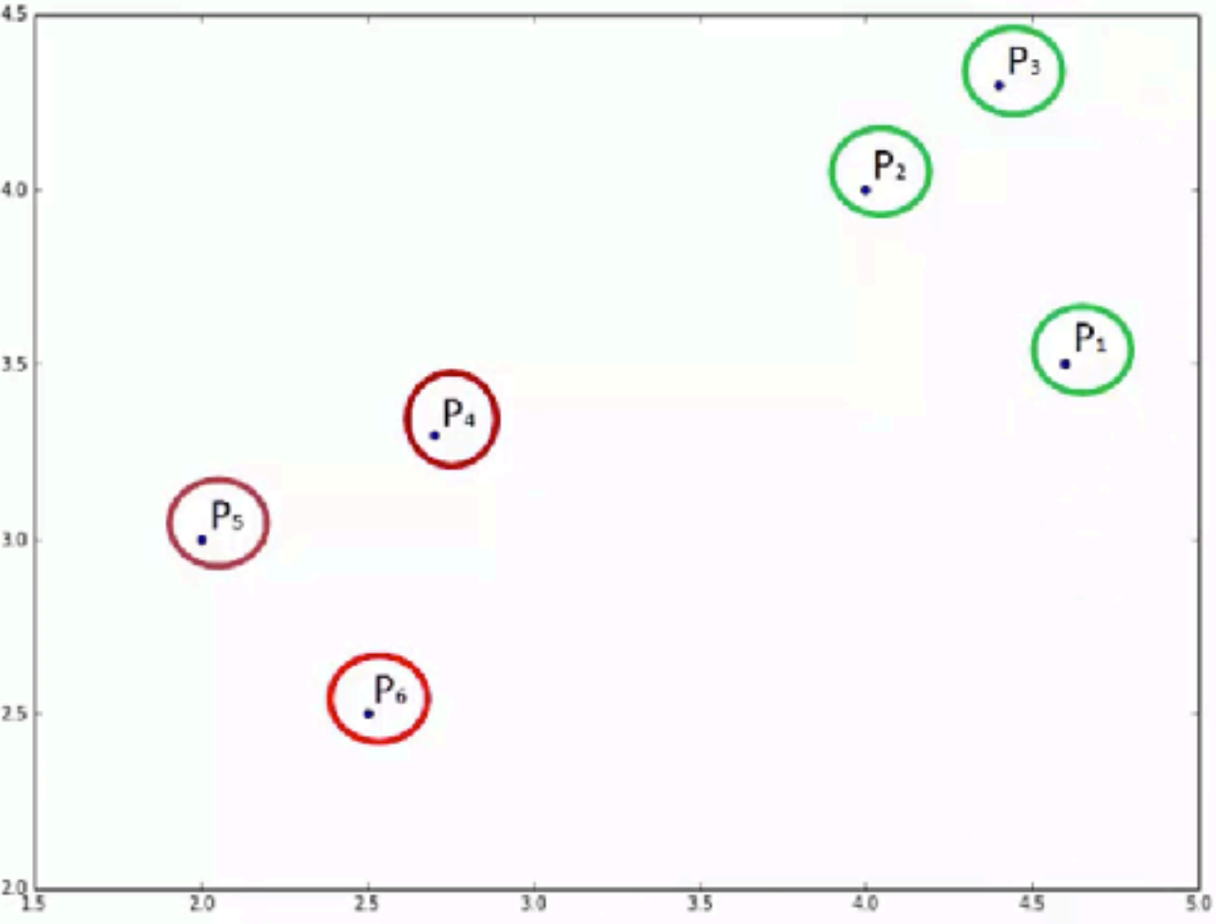


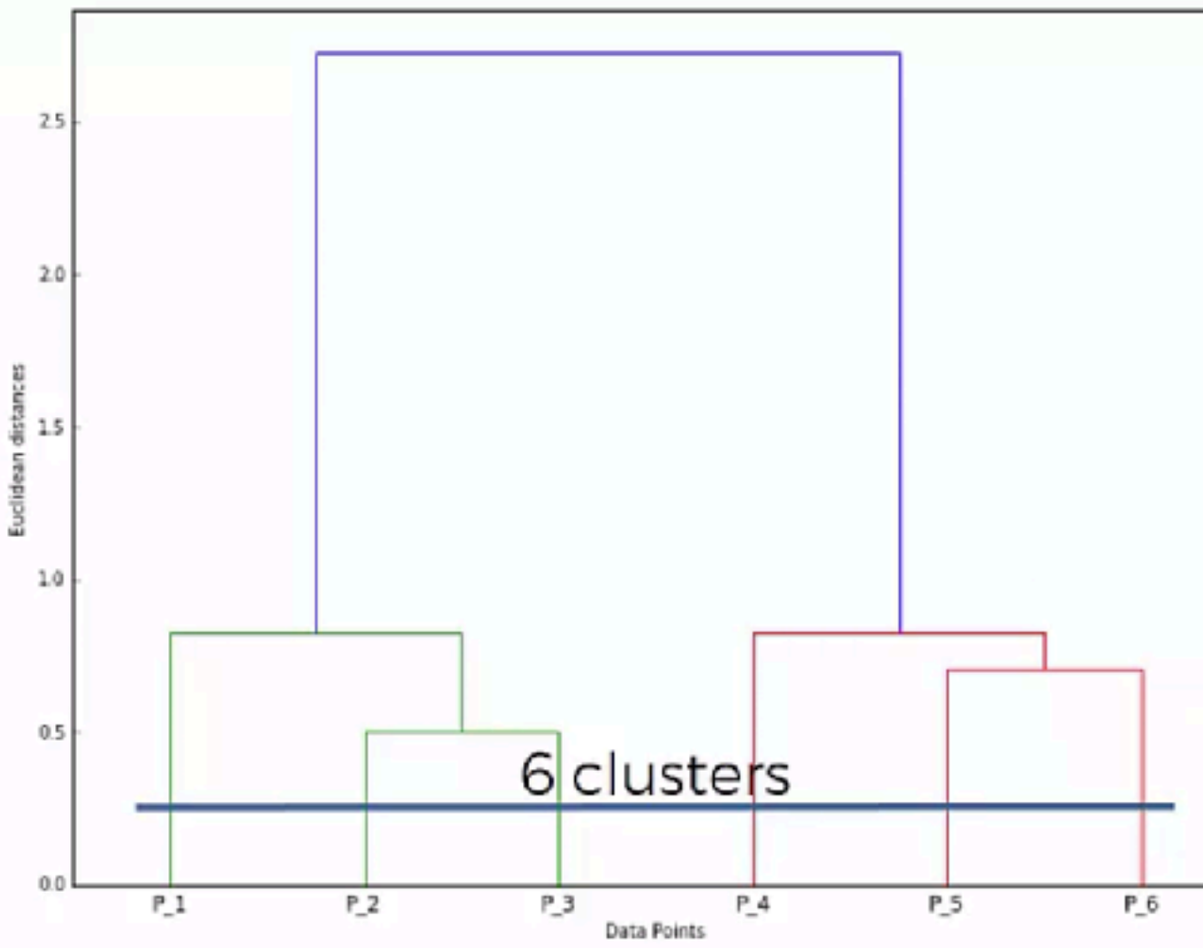
Dendrograms – Six Clusters



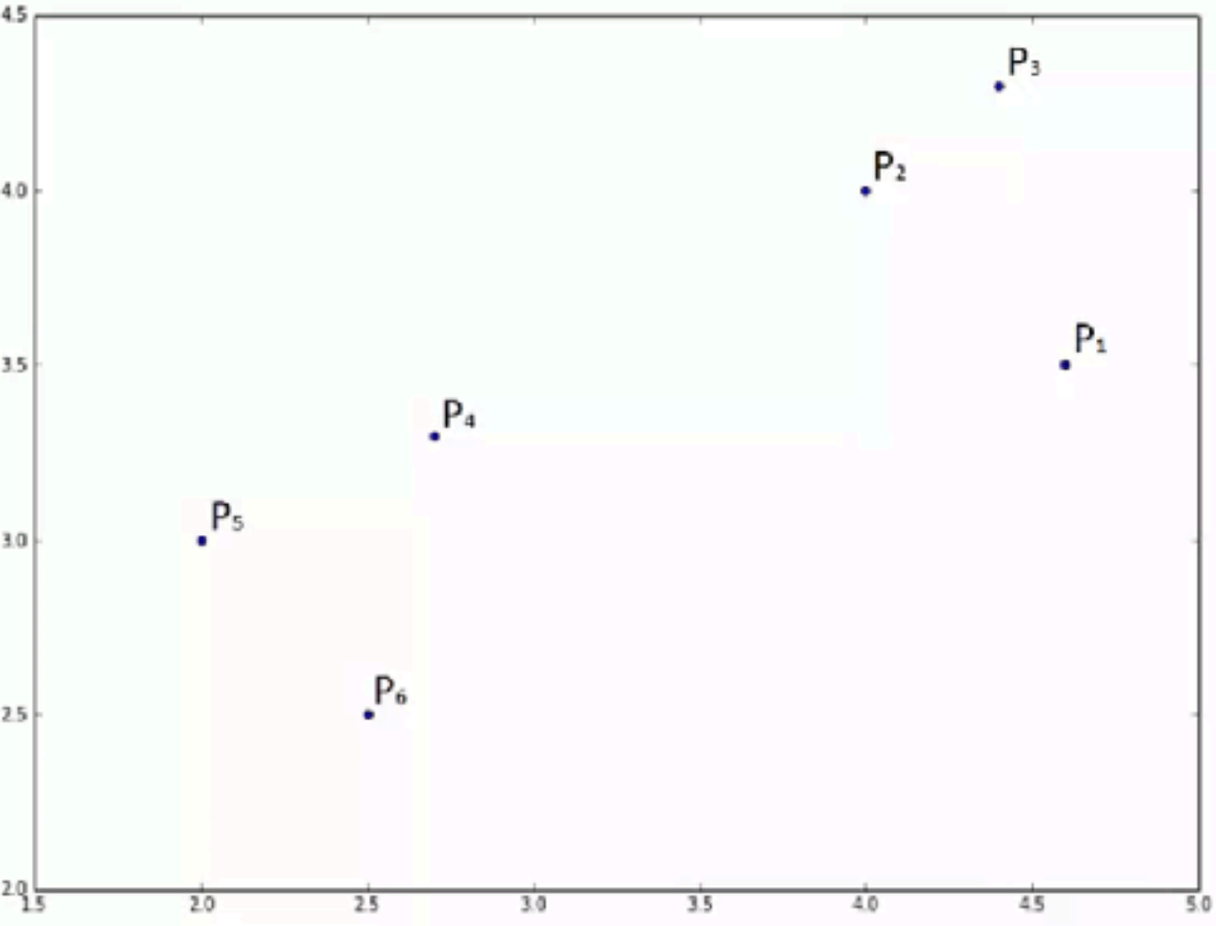


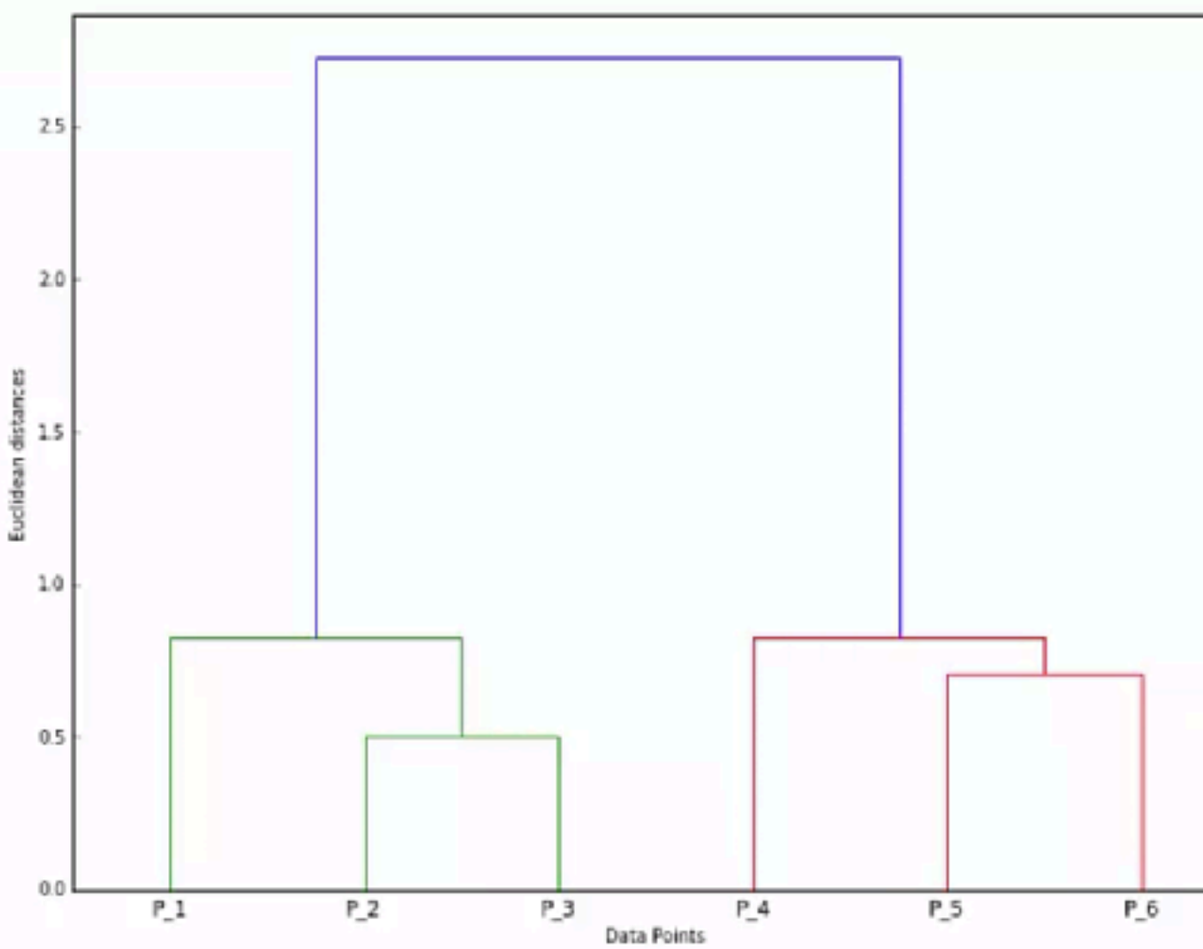
Dendrograms – Six Clusters



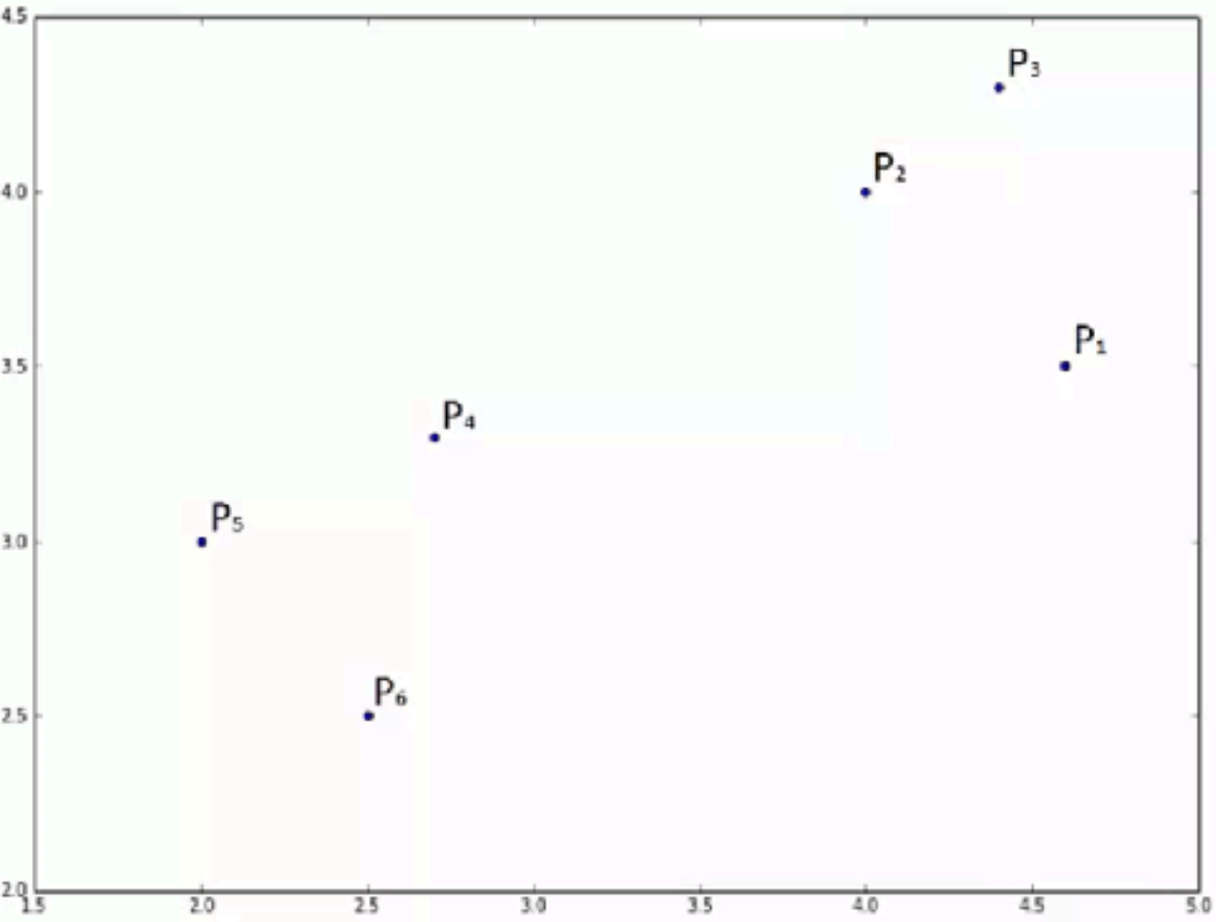


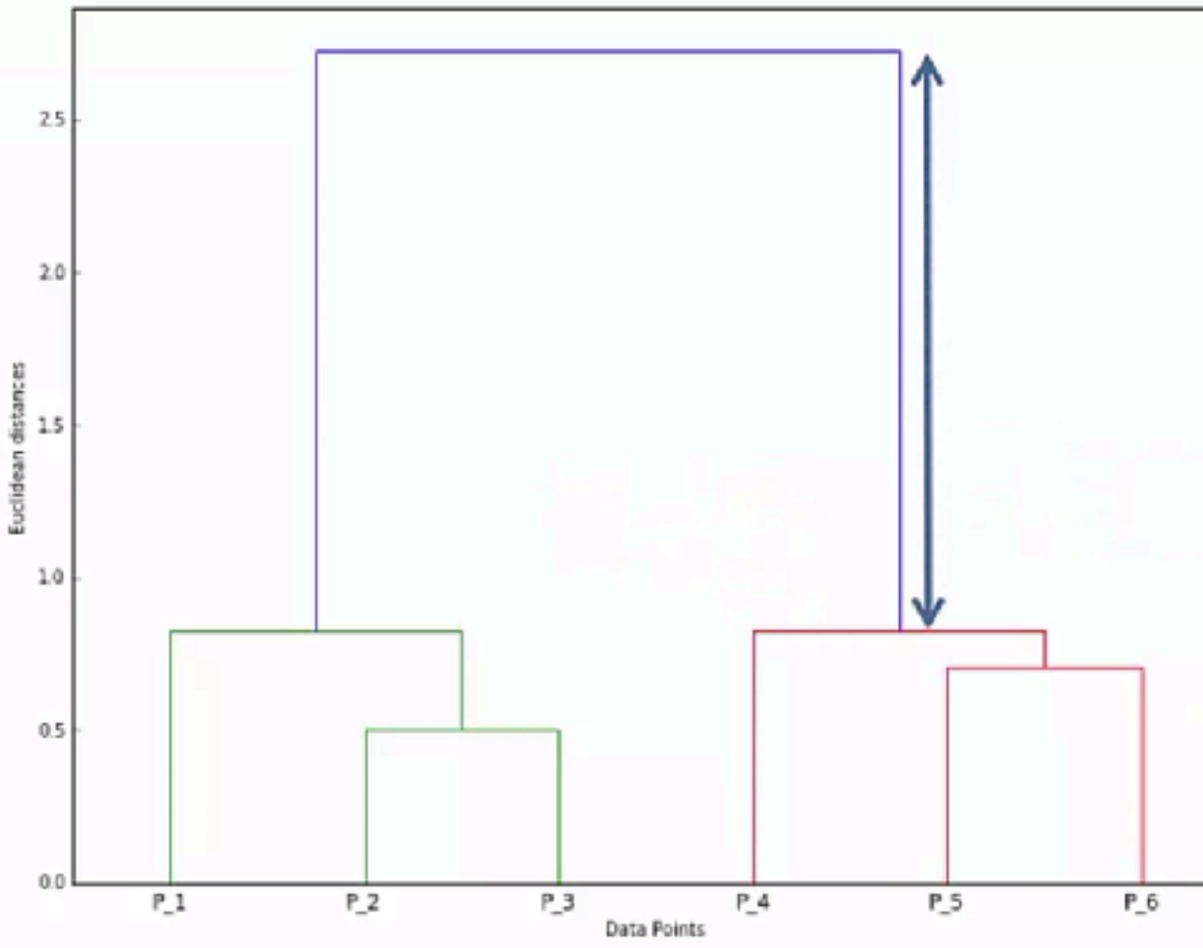
Dendrograms – Optimal # of Clusters



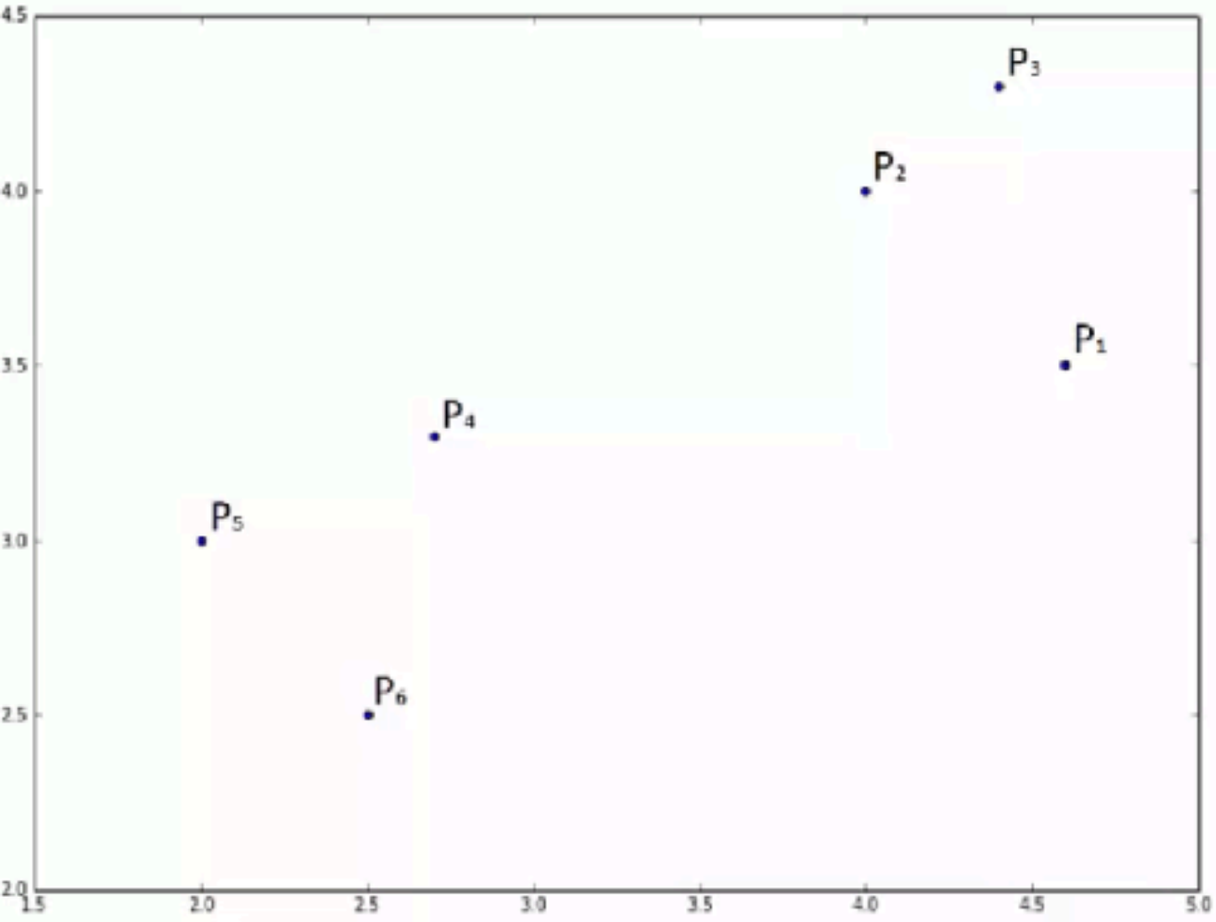


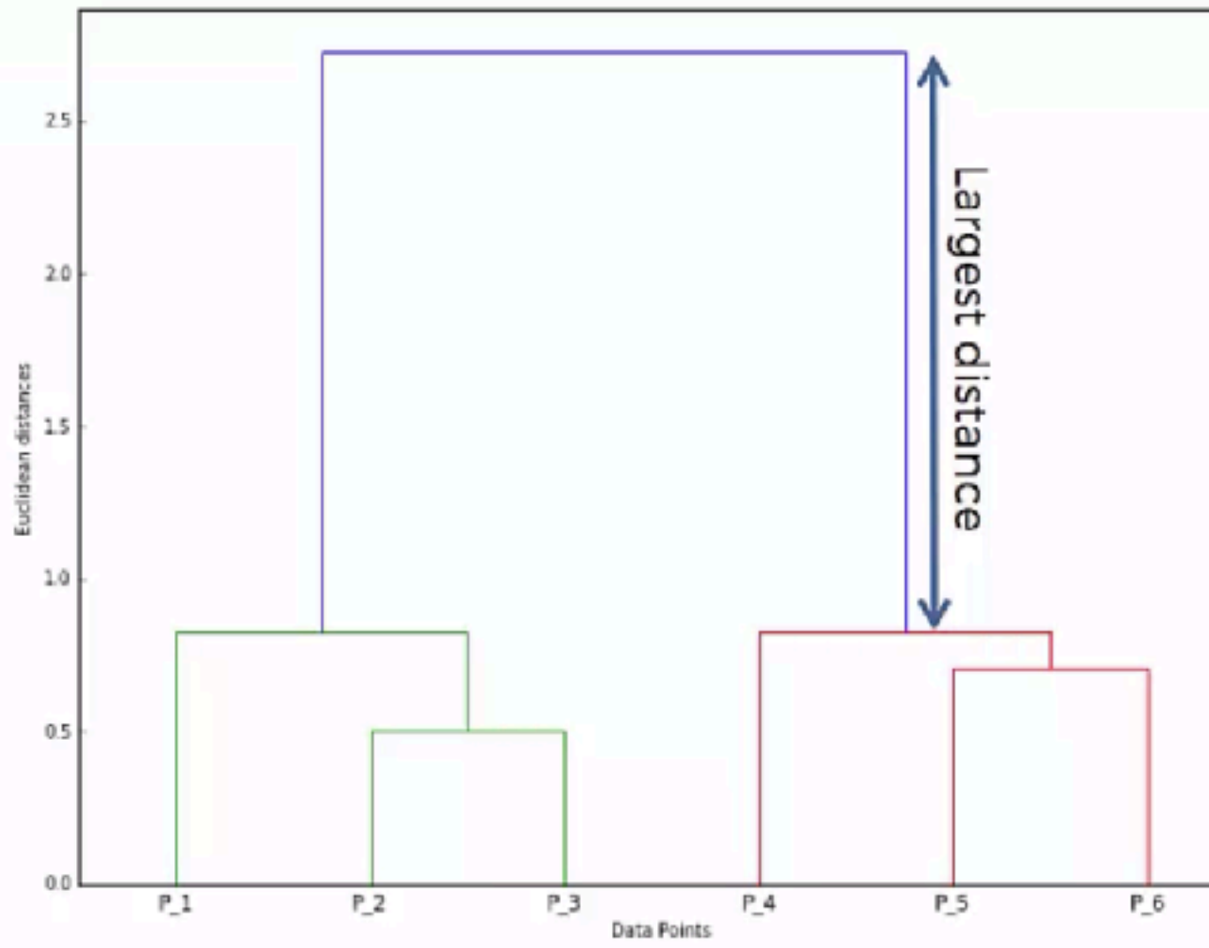
Dendrograms – Optimal # of Clusters



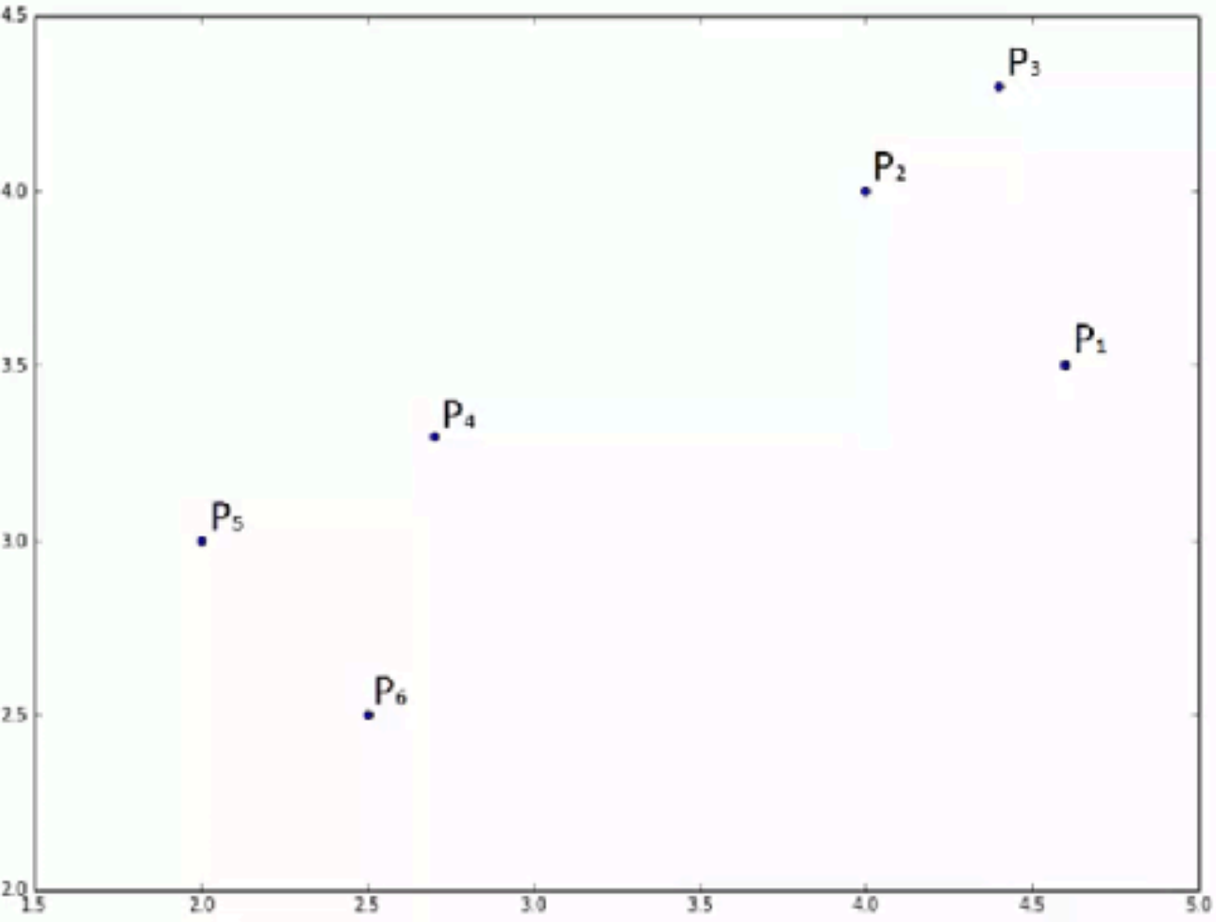


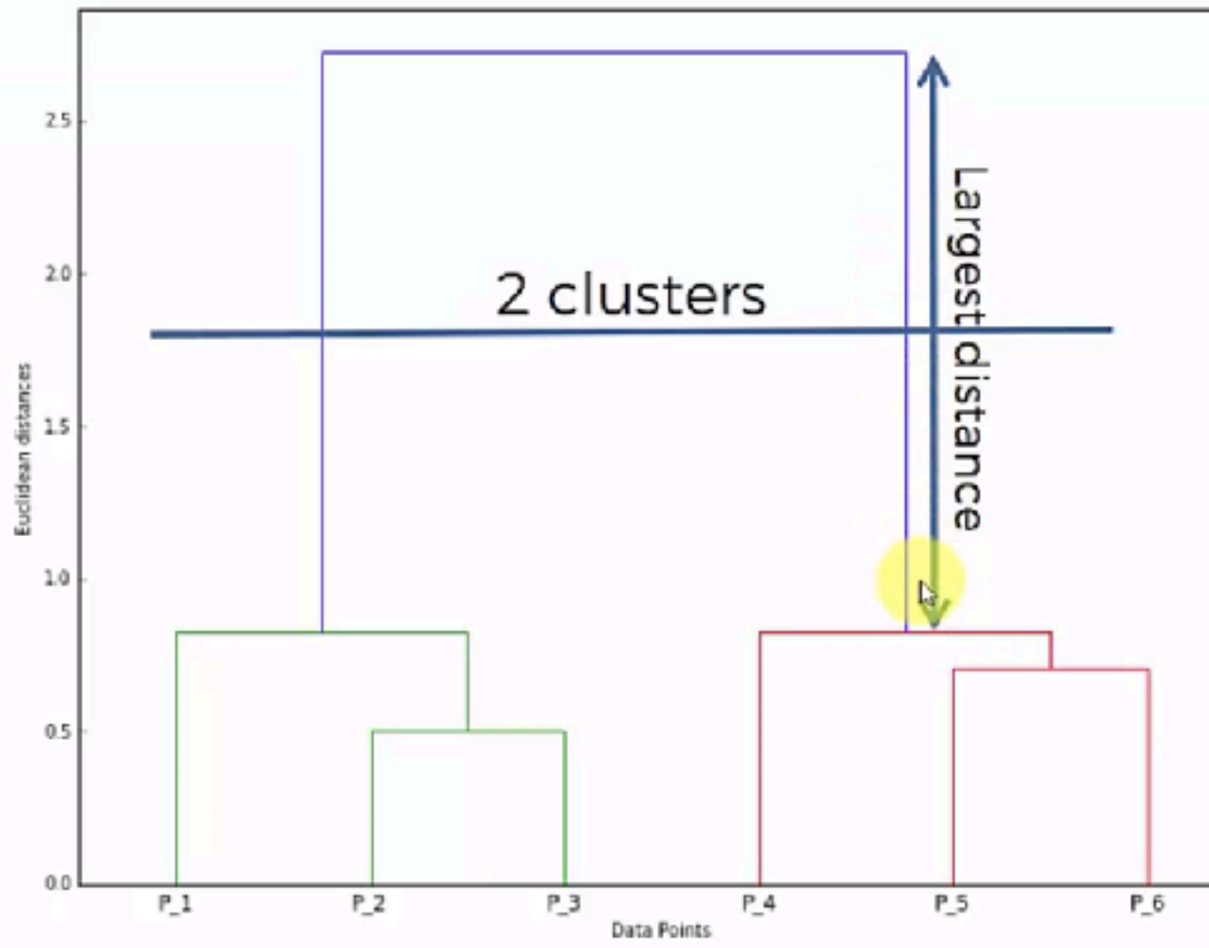
Dendrograms – Optimal # of Clusters



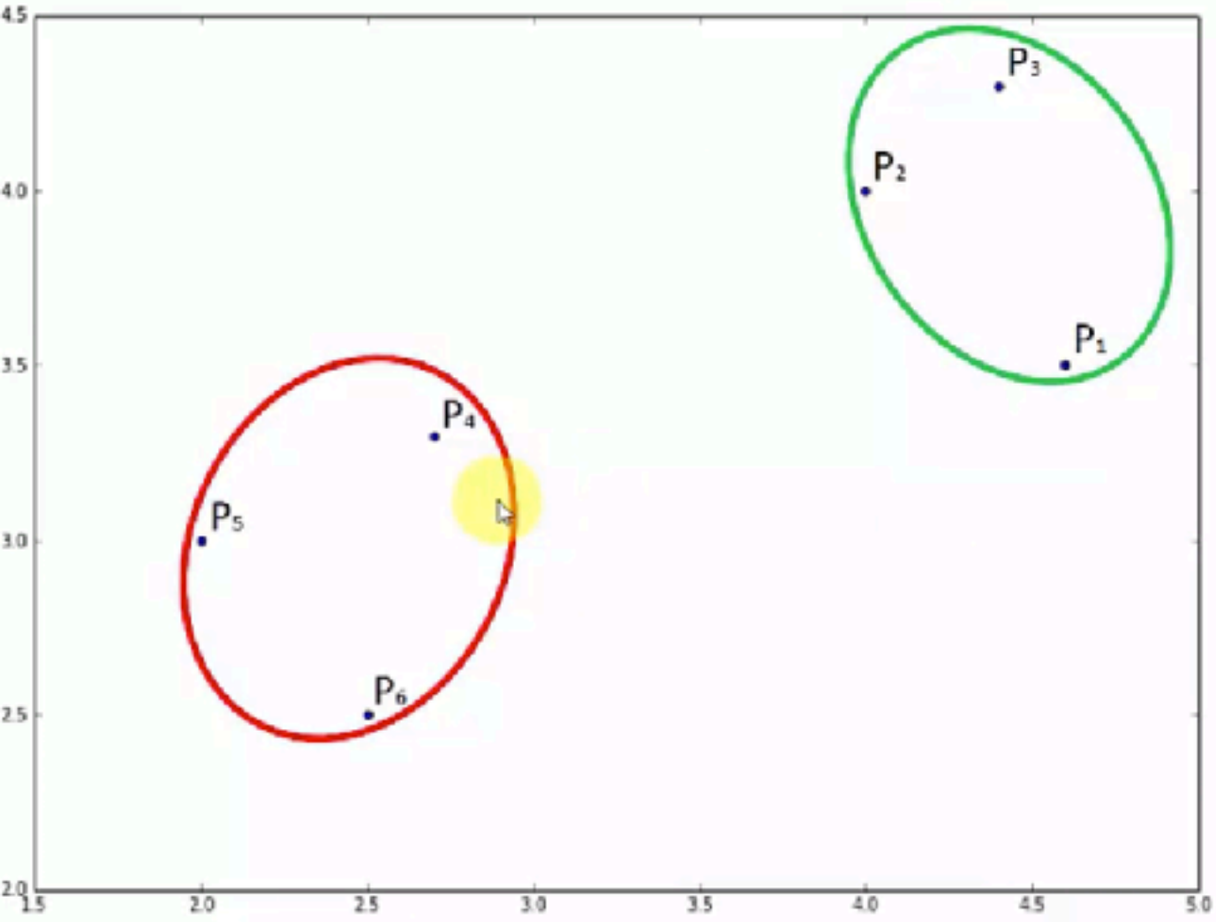


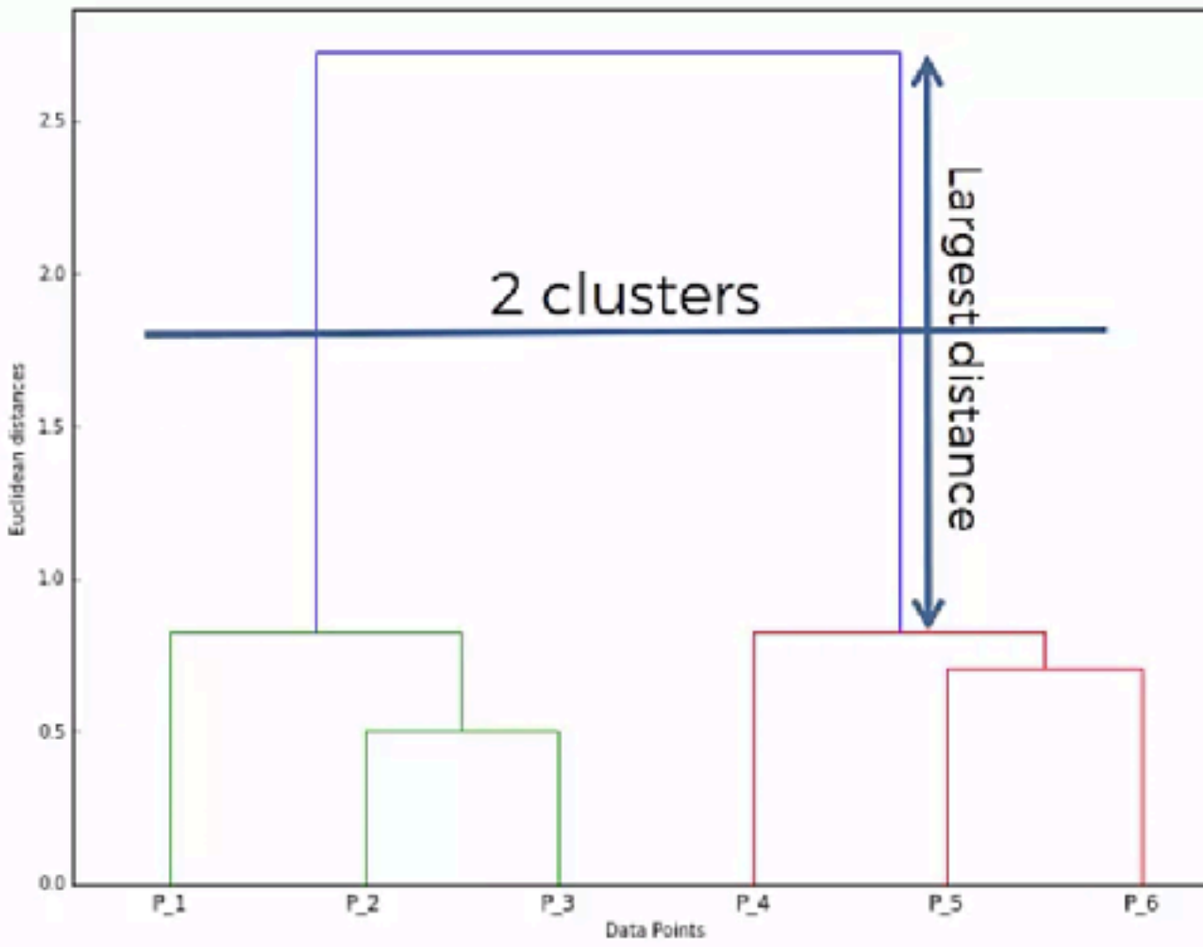
Dendrograms – Optimal # of Clusters





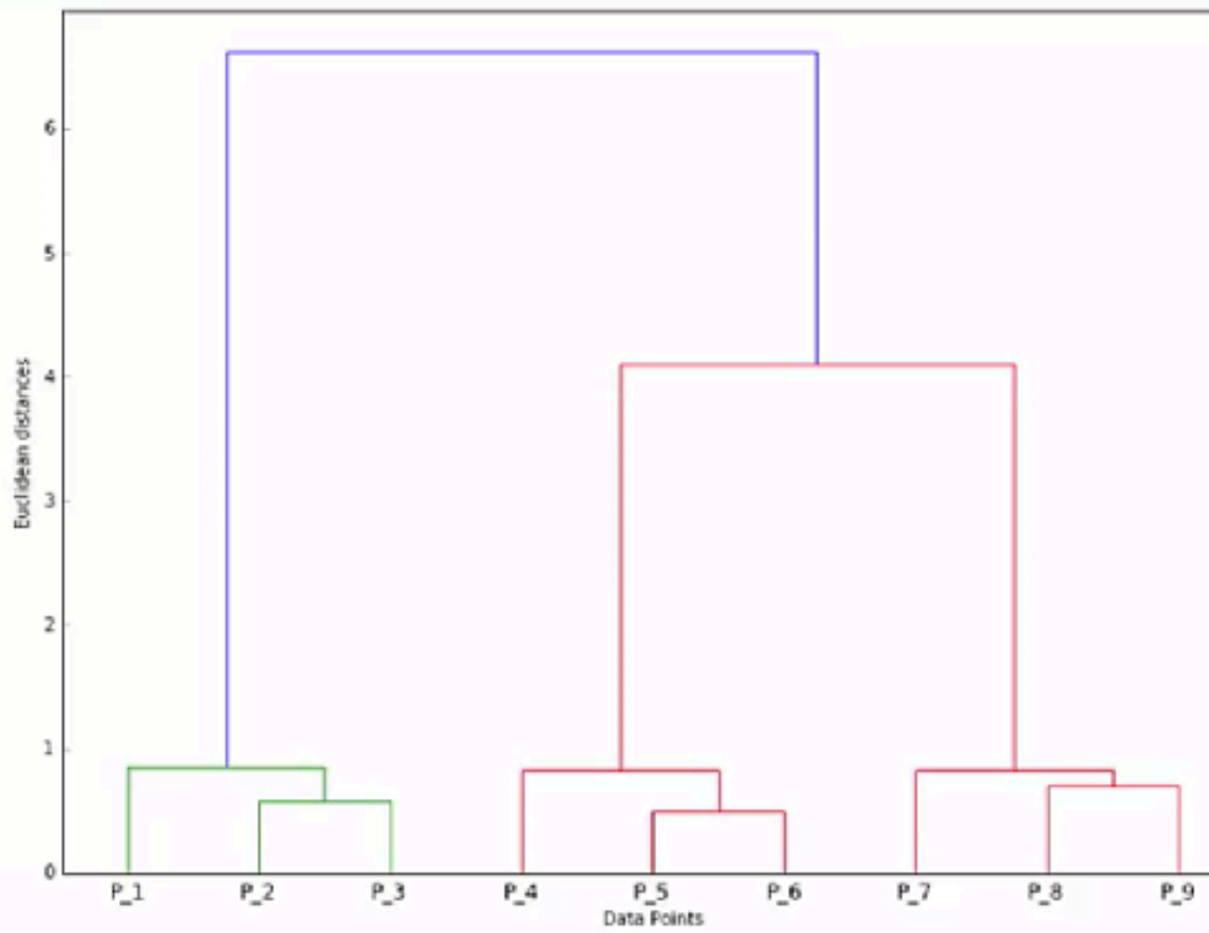
Dendrograms – Optimal # of Clusters



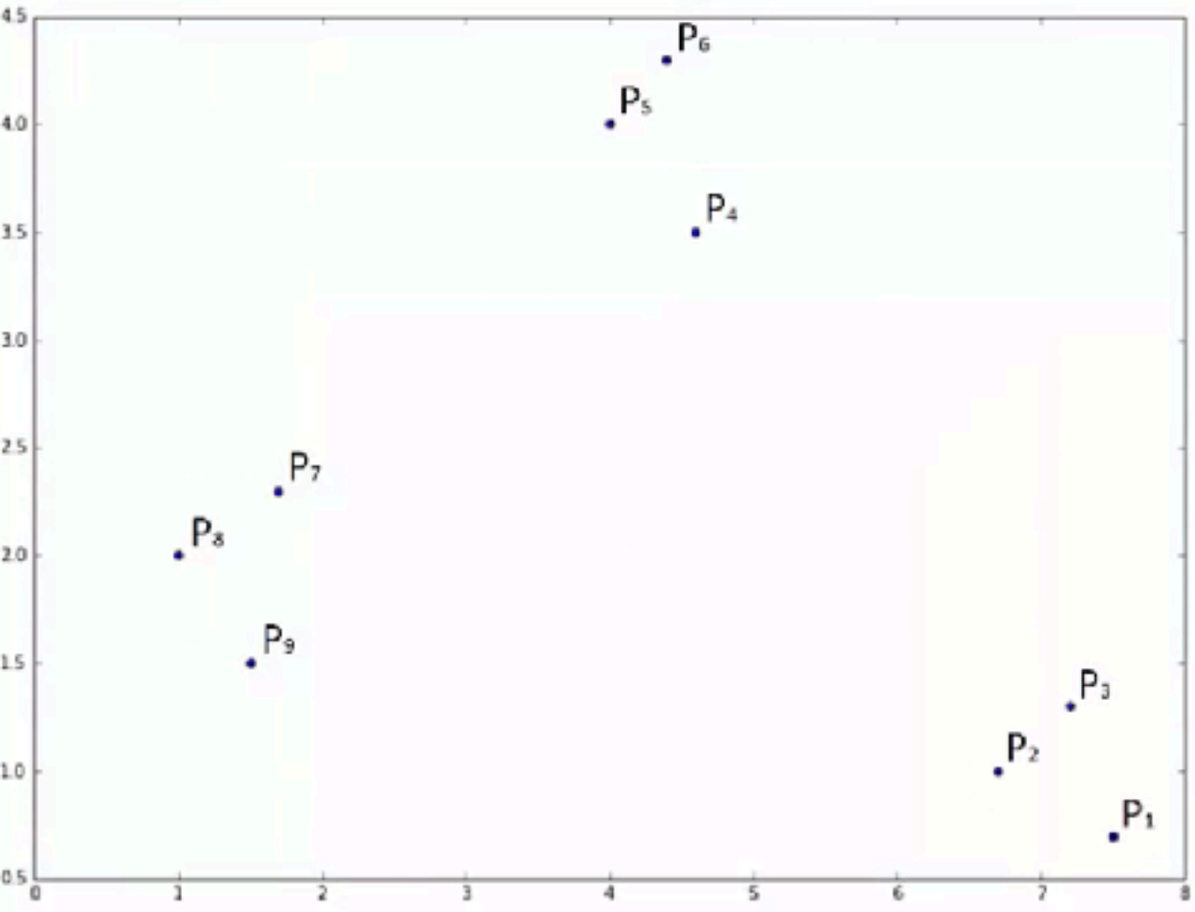


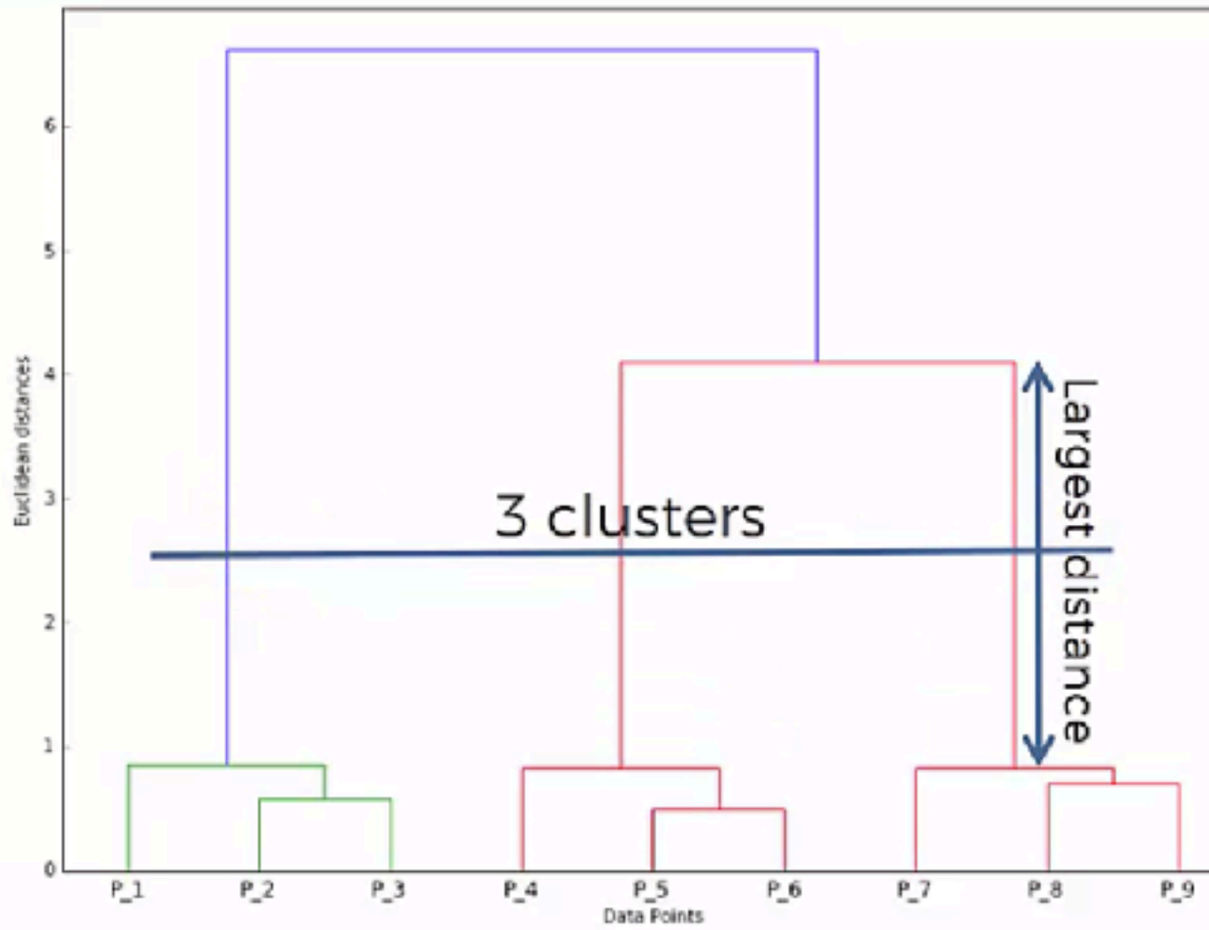
Dendrograms – Knowledge Test

Dendrograms – Knowledge Test

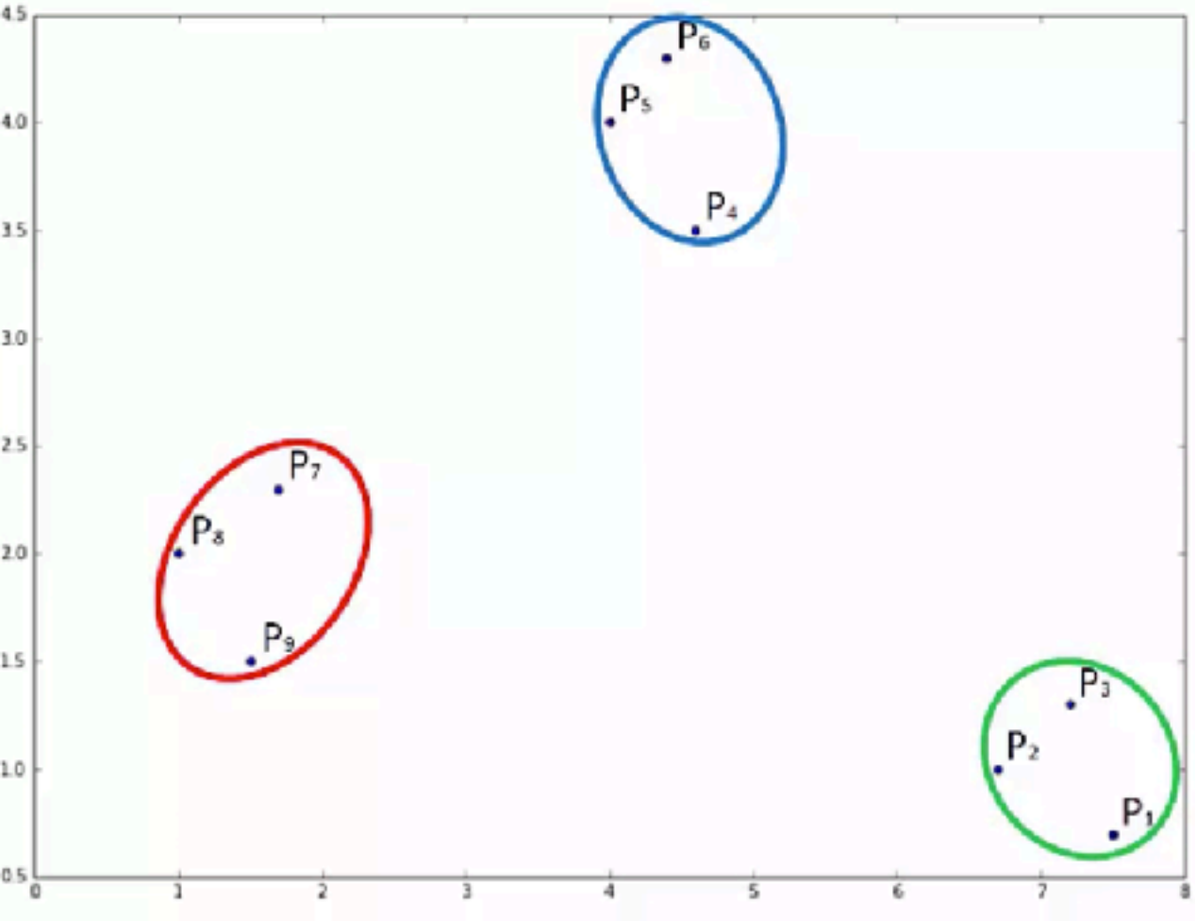


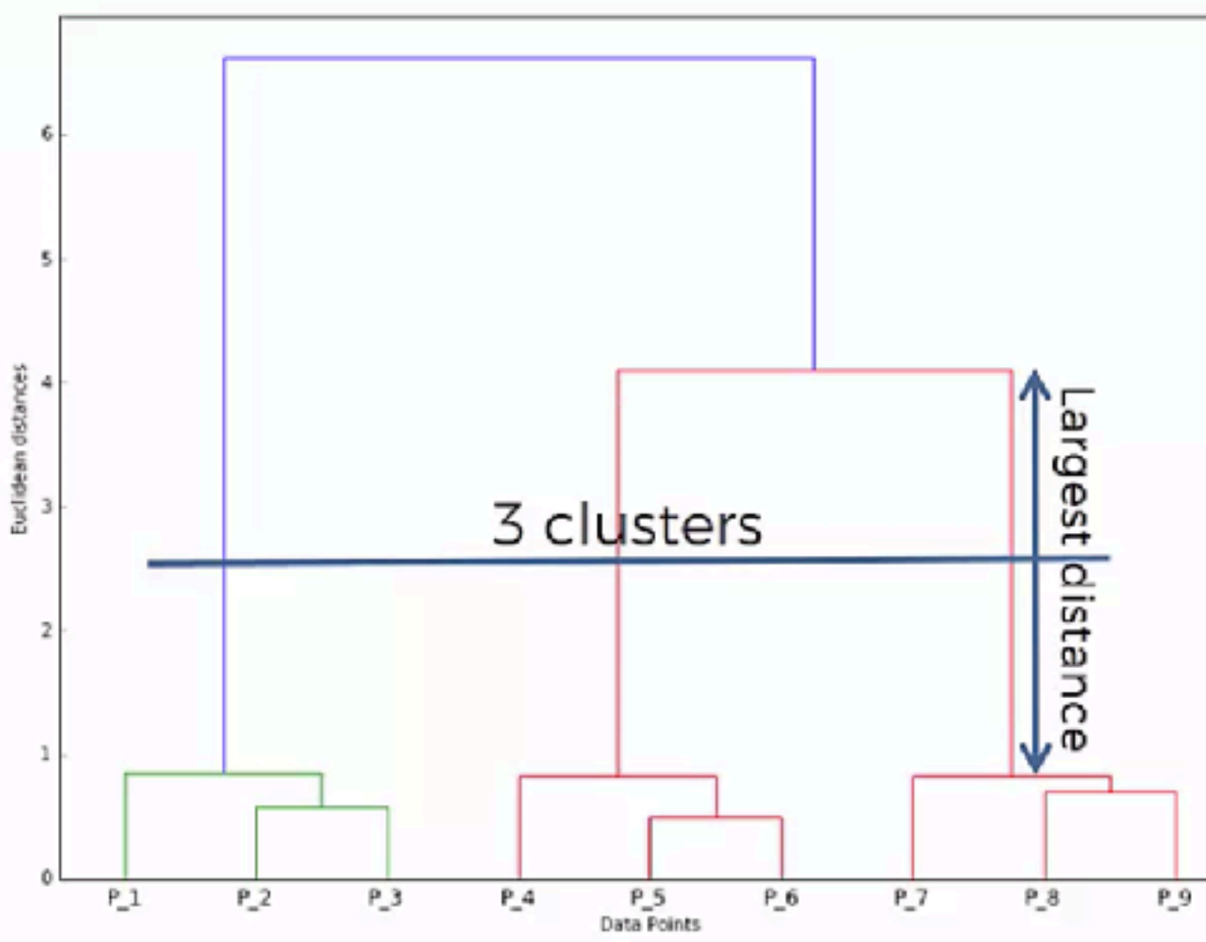
Dendrograms – Knowledge Test





Dendrograms – Knowledge Test





Clustering

Clustering Model	Pros	Cons
K-Means	Simple to understand, easily adaptable, works well on small or large datasets, fast, efficient and performant	Need to choose the number of clusters
Hierarchical Clustering	The optimal number of clusters can be obtained by the model itself, practical visualisation with the dendrogram	Not appropriate for large datasets