**EH2745 Computer Applications for Power Systems**

**Assignment II**

**K-Nearest Neighbour algorithm**



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In order to label the 4 different power system states we went on and calculated the voltage difference over the system lines. To do that, we assumed that our system architecture remains the same in every case.

Cluster 1 (High load rate during peak hours): We know that when the load is high the corresponding bus voltage is low. Our system has 3 load buses (buses 5, 7 and 9). We calculated the average voltage value for those 3 buses in every case. If the voltage was below a set value (0.9 in our case) then the system observation was defined to belong in this cluster.

Cluster 2 (Low load rate during night): On the contrary to the earlier case, should the average voltage value of the 3 load buses exceed the preset limit, the measurement was set to belong to cluster 2.

Cluster 3 (Disconnection of a line for maintenance): The voltage drop over each line of the system was calculated. In case this voltage drop exceeded a preset value (0.28 in our case), we assumed that the line over which the voltage drop was calculated, was disconnected. That is assumed due to the fact that power should find an alternate way with increasing loses.

Cluster 4 (Shut down of a generator for maintenance): We know that our system includes three generators in buses 1, 2 and 3. We also know that these buses are connected to the system through lines 1-4, 2-8 and 3-6 respectively. To identify the cases when a generator was shut down, we went on and calculated the voltage drop over those three lines. Should any of these 3 voltage drops was too small (less than 10-3 in our case) we clustered the respective measurement in this cluster.

*Comment:* The clustering was performed in the following order:

1. Case 4. If this is the case then we do not care whether the conditions for the other 3 clusters are fulfilled. The measurement is clustered in cluster 4.
2. Case 3. If the measurement does not belong to cluster 4 then we go on and check for cluster 3. Again, should the conditions for this cluster are fulfilled we classify the measurement in cluster 3 and stop searching further.
3. In case the conditions for both clusters 3 and 4 are not fulfilled, the measurement will either belong to cluster 1 or 2. At this point we check the conditions for these cases and classify the measurement accordingly.