

# EH2745 Computer Application in Power Systems

## Project 2

Authors; Samuel Akpobome, Matthew Gautieu

### Brief Description of the Identification and Labelling of the data set

#### Introduction

From the aims of the project, analysis is to be carried out on the 9 bus stations power system where we have the timestamps of the Voltage magnitude and angle of the system at the rate of 30mins.

As explained in the screencast, the code was developed to implement the K-Nearest neighbour algorithm which has been explained in the course. The centroids were initialized, in this project, the existing data sets were utilized to achieve this in order to get a reasonable starting point. Then the Euclidean distances were calculated, and the centroids were systematically moved until the set threshold was obtained and the movement of the same was no longer achievable. In the end we got clustering of the system in various groups.

Briefly, the clustered data were labelled into the following groups by applying concepts and knowledge of power system analysis;

1. High load rate during peak hours
2. Shut down of generator for maintenance
3. Low load rate during night
4. Disconnection of a line for maintenance

#### 1. High load rate during peak hours

From the clustering of the data set, the groups of data points that were labelled in this category were the ones with a particularly low angular values. This is because as the system experiences a high load demand especially during peak hours the angle at the corresponding buses would change accordingly.

## 2. Shut down of generator for maintenance

From the system data given, the generator buses were given as Bus 1 (Clark), Bus 2 (Amrhest), and Bus 3 (Winlock). By observing the voltage magnitudes and angles at these buses at the various time point. The information about the operational status of the generators can be gotten.

A generator that is shut down will have a bus angle that tends to be either low or negative. Hence the labelling was done by seeking out the bus location whose values closely follow this criterion.

## 3. Low load rate during night

During the low loads at night, the system frequency would tend to be high, signifying the reduction in load, similarly, the system bus voltage angle will have a value that is higher than usual which shows the reduction in demand at that particular period. We used this to guide the program in classifying such cases accordingly and the program was instructed to label values with angles greater than or equal to zero, i.e.  $\theta \geq 0$

## 4. Disconnection of a line for maintenance

For line disconnection, two factors were combined; checking if the load angle is less than zero and checking the difference between the connected bus. I.e

$$\theta \leq 0 \text{ \& Difference between connected buses}$$