Problem Statement 1:

Have you ever thought that there is a scientific way to determine the age of your mobile battery? We want you to build a model from scratch to estimate the battery life in terms of *Cycle Life* elapsed, based on the battery usage data collected from various smartphones.

Task:
Modern day smartphone batteries usually last for a *Cycle Life* in the range of 600-750 charging cycles before the battery reaches its end of life (when the remaining capacity of the battery falls down to 70-80% of the original capacity).

A *Charging Cycle* is equivalent to a complete discharge of a battery from a full to an empty state. As the battery ages due to the repetitive usage over time, its capacity degrades resulting in elapsing of the charging cycles till battery can no longer be used.

Battery Capacity basically represents the total charge that a battery can store during charging or the total current that is capable of supplying during discharging. For instance, a brand new 3300mAh battery will discharge a current equivalent to 3300mA for 1 hour and can store a total energy of 3300mAh when charged with 3300mA current for 1 hour.

To get an estimate of how old is the battery it is important to estimate the number of Charging Cycles that could have been elapsed by the battery in problem, which can be done on the basis of remaining capacity of the battery at any given point in time:

The given problem requires the following tasks to be completed:

1. Write a logic which will be used to predict the remaining capacity of the battery based on the energy stored in the battery during charging periods for any given charging cycle
2. Using the remaining capacity calculated and other factors given in the data, build a model that will estimate the current age of battery in terms of how many charging cycles have been elapsed by the battery in question
3. Give a final list of the variable importance of all the predictors used while estimating the current age of the battery

List down all the assumptions that you will be making while building this model. For instance, you should be assuming different numbers of the total cycle life of the battery as well as the criteria for defining end of life capacity of the battery to get the final optimal model.

Data Provided:
The data collected is in the CSV format for multiple smartphones running on various capacities of different technologies of the batteries. The CSV file contains information about impact factors such as charging/discharging current, battery voltage, battery temperature, screen on/off, network connected etc for multiple charging and discharging periods.

Assessment:
The model should run on the testing data from different phones for which we will have the rough age of the battery. The error rate of the predicted age to the actual age will be used to rank the candidates.