**Optimizing Power Consumption on Home Appliances using Machine Learning**

1. **Objective**
   1. Optimise power consumption of devices
   2. Limit power consumption to a certain number as specified in a month
   3. Notify users on devices consuming excess power
   4. Advice users on what to be done at which place, which device whether to be turned off or whether people can be clubbed together in a room
   5. Advice users on which device is to be turned off in which room
2. **Tools**
   1. Programming Language: Python
   2. Libraries: numpy, scipy, pandas, matplotlib
   3. OpenCV (cv2) for image processing
   4. Sci-kit Learn for Machine Learning
3. **Dataset generation**
   1. **Training data**
      1. Parameters: device, rooms, weather types, date, from time, to time, time of day, number of people, time stayed per min, power consumed
         1. Device: All home appliances
         2. Rooms: (any room number)
         3. Weather Types: cold, hot – low, medium, very
         4. Date – one month
         5. From/To - 1 hr frequency
         6. Time – morning, afternoon, evening, midnight
         7. Power consumption – Kilo Watt hr
      2. 7 devices, 6 weather types, 1 month of date range, data of every device for every single date range
      3. Random values are generated for number of people, time stayed in mins and weather type, rooms, devices are randomly selected
      4. Time of the day is selected as per the time
      5. Pandas dataframe is created
      6. Ranges of power consumption is created for all devices
      7. Power consumption is selected for devices from the ranges created
      8. Data is cleaned for number of people and time when they are zero
      9. A csv file is created containing the data
   2. **Unseen Data**
      1. A similar data is generated without power consumption value
      2. This data is considered as unseen data and will be used to predict power consumed by devices
4. **Visualisation**
   1. Power consumption of all devices per day is plotted
   2. Power consumption of all devices per hour is plotted
   3. Mean power consumption per device per hour is plotted
5. **Maximum Power Consumption Database**
   1. This Db contains maximum power consumption at that hour
   2. Range is the same as mentioned above
6. **Priority Database**
   1. Priorities of devices during weather type and type of day is created. Each device at each time of day and weather is given a unique priority
   2. Devices with higher priority are advised to be turned on otherwise is advised to be turned off
7. **Training**
   1. Model is trained on the training set and is saved
   2. Multiple linear regression, random forest and decision tree algorithms are used
8. **Testing**
   1. Model is evaluated on the test set (unseen data) and values are predicted
   2. This is purely run on unseen data and a new dataset with predicted values is created
9. **Message and Action**
   1. The newly predicted value is then passed onto a function along with the whole dataset
   2. It generates priorities based on the type of device
   3. This function reduces power consumption by checking on devices, their priority, and they type of weather
   4. It also gives out messages and action that has to be performed to the use
10. **Conclusion**
    1. Performance of different machine learning algorithms are measured and plotted
    2. The data is visualised and power consumption optimisation is showed
    3. Devices can be turned off or people can be moved to different room as suggest by the algorithm