

## Introduction of Project:

The purpose of this project is to  
Analyse the data observed from the boiler  
to understand the factors by which  
its efficiency can be predicted and the normal  
functioning of the sensor  
could be verified.

## Problem Statement:

### **In Case of Efficiency:**

To predict the efficiency of the boiler using the given input parameters.  
To find the factors that affect the efficiency significantly.

### **• In Case of Sensor Failure:**

- The predicted values of the reading that would be shown on the sensor that would help us to determine if the sensors are working correctly.

## Algorithms And Methods Used:

PCA and Multiple ML algorithms.

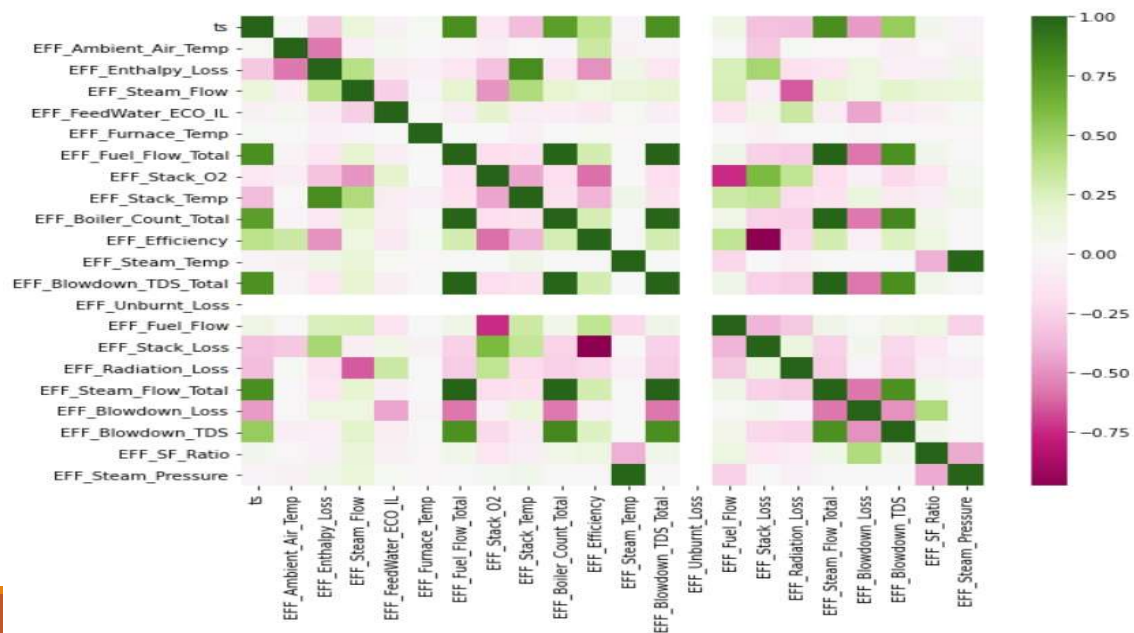
### About The Dataset:

- Input rows: 26500 & Input columns: 22
- All columns are in numeric format except the Time Stamp column which is in date and time format.
- Boiler ON column is also modified. Records are removed when boiler status is off.

## Procedure:

- ❖ Data Pre-processing.
- ❖ Normalization And Standardization.
- ❖ Feature Selection.
- ❖ ML Algorithms.
- ❖ Prediction.

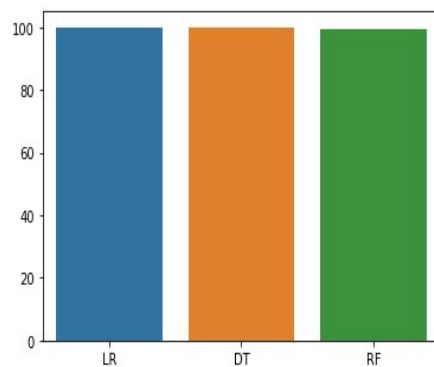
## Heat Map:



## Result of Efficiency:

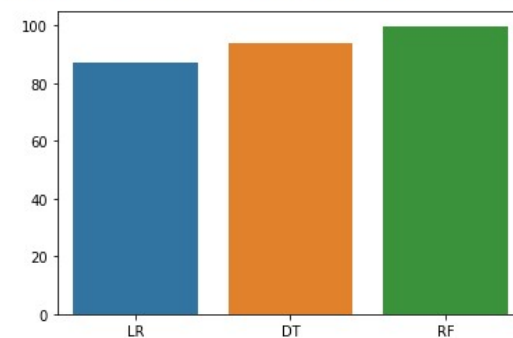
Train R2

<matplotlib.axes.\_subplots.AxesSubplot at 0x7fd597c67ad0>



Test R2

<matplotlib.axes.\_subplots.AxesSubplot at 0x7fd597eb26d0>



LR: Linear regression.  
DT: Decision Tree.  
RF: Random forest.

**Steam Pressure:**

Dependant Features for Steam Pressure
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- |                       |                            |
|-----------------------|----------------------------|
| 1. Blowdown TDS Total | 6. Efficiency              |
| 2. Stack O2           | 7. Furnace Temperature .   |
| 3. Stack Loss         | 8. Ambient Air Temperature |
| 4. SF Ratio           | 9. Blowdown TDS            |
| 5. Feed Water ECO IL  | 10. Fuel Flow              |
|                       | 11. Steam Flow             |

**Accuracy %**

Parameters	Linear Regression		Random Forest		Decision Tree	
	Scaled	unscaled	Scaled data	Unscaled	scaled	unscaled
Efficiency	Train: 99.924343 Test: 86.971729	Train: 95.77 Test: 99.7531	Train: 99.955827 Test: 94.141992	Train: 99.70 Test: 99.8758	Train: 100.00 Test: 94.00067	Train: 100.00 Test: 99.7415
Steam pressure	Train: 99.988878 Test: 99.989252	Train: 98.36 Test: 98.44	Train: 99.988780 Test: 99.989	Train: 99.99 Test: 99.94	Train: 100.00 Test: 99.963476	Train: 99.94 Test: 99.92
Stack Temperature	Train: 99.075316 Test: 99.670357	Train: 99.73 Test: 99.74	Train: 99.898209 Test: 99.641986	Train: 99.94 Test: 99.64	Train: 100.00 Test: 99.394780	Train: 100.00 Test: 99.37
Furnace Temperature	Train: 0.3257 Test: 0.4396	Train: Test:	Train: 51.35 Test: 50.069	Train: Test:	Train: 99.999 Test: -111.52	Train: Test: