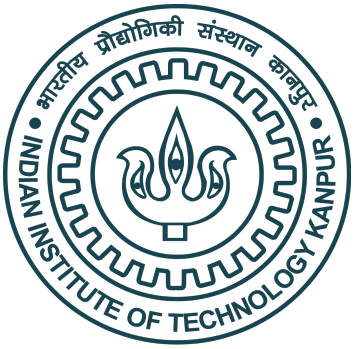

CS771A Assignment 3

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April 5, 2023

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Contents

1 Question 1

1.1 Solution

This problem is restricted to make use of linear models to predict the ozone and no2 levels in the atmosphere using only the voltage values.

We used various models with varying hyperparameters to find out the best model in terms of MAE.

Observations:

1. Time taken was more or less similar using different linear models, some changes was visible by changing the hyperparamters like alpha and loss functions whereever they were applied.
2. MAE of Ozone was comparatively lower than that of NO2.
3. MAE values were lower for L1 regularization compared to L2 regularization.
4. MAE values did not changed much by changing the loss function.

Name	Roll	Time (in sec)	MAE (Ozone)	MAE (NO2)
Lasso	Alpha = 1	0.10	5.68	6.62
	Alpha = 10	0.12	5.85	6.70
Linear Regression	Default	0.12	5.62	6.54
Elastic-Net Regression	Alpha = 100	0.11	5.67	6.61
	Alpha = 10	0.10	5.92	6.63
	Alpha = 0.01	0.11	5.62	6.53
Ridge Regression	Alpha = 1	0.11	5.62	6.54
	Alpha = 100	0.12	5.62	6.53

Result:

We used the following model and MAE values

- Model used : Ridge Regression

- Regularization : L2
- Time taken : 0.1224 s
- MAE(Ozone) : 5.62
- MAE(NO2) : 6.53

2 Question 2

2.1 Solution

This problem was open to make use of any model of our choice using all the features including temperature and moisture. We used different class of models like Support Vector, Deep Learning, Random Forests, Decision Tree, etc and varied the parameters to find the best model in terms of size, time and MAEs.

Observations:

- Time taken was varying considerably using different non-linear models.
- MAE of Ozone was comparatively higher than that of NO2.
- MAE values did not changed much by changing the loss function, however we tried to find the best one by tuning this.
- We decied to use Decision tree model and then checked upon various loss functions to choose the best one which turned out to be squared error.

Model	Hyperparameter	Time	MAE (Ozone)	MAE (NO2)
Random Forest Regression	Default	0.18	1.41	0.96
MLP Regression (Deep Learning)	Default	0.04	5.28	4.17
Support Vector Regression	Kernel = polynomial	6.90	5.86	5.48
	Kernel = rbf	6.39	6.19	5.74
Decision Tree Regression	Criterion = Squared_error	0.01	0.03	0.02
	Criterion = Absolute_error	0.08	0.03	0.02
	Criterion = Poisson	0.07	0.03	0.02

Result:

We used the following model and its output are shown below:

- Model used : Decision Tree Regression
- Loss function: Squared Loss
- Time taken : 0.008 sec
- MAE(Ozone) : 0.029
- MAE(NO2) : 0.021

However the size of Decision Tree model is little large(2.8 mb), it performs very significantly in terms of time and MAE, some models which has smaller size as compared to DT, they have high MAEs in range of 2 - 5.