

CMSC 197 Lec1

Introduction to Numerical Computing Using Python

Goal of the Assignment

- Implement regression loss functions using python
- Test how well you can apply the lessons

Mean Squared Error:

Mostly commonly used in linear regression models. The mean squared error, sometimes called residual sum of squares is:

$$L = \frac{1}{N} \sum_{i=1}^N (\hat{y}_i - y_i)^2$$

Mean Absolute Error (MAE)

- Similar to MSE, mean absolute error is as shown below:

$$L = \frac{1}{n} \sum_{i=1}^n | \hat{y}_i - y_i |$$

Mean Squared Logarithmic Error:

- Similar to MSE, but calculated on a logarithmic scale. Target variable should be non-negative, but can be equal to zero. If the target is never zero, the addition of 1 in the logarithm can be dropped.

$$L = \frac{1}{n} \sum_{i=1}^n (\log(\hat{y}_i + 1) - \log(y_i + 1))^2$$

Mean Absolute Percentage Error:

- Similar to mean absolute error, mean absolute percentage error is as shown below:

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$$L = \frac{100\%}{n} \sum_{i=1}^n \left| \frac{\hat{y}_i - y_i}{y_i} \right|$$

Preliminaries

- Create a jupyter notebook, with filename, `quiz1-numpy.ipynb`
- Make sure that your answers are properly labeled (with descriptions included using html markdown)
- Also make sure that when you submit the jupyter notebook, the codes have all been executed

Part 1.

- Create 2 2D arrays, `y_hat` and `y`
 - `y_hat` --- \hat{y}_i
 - `y` --- (y_i)
- Initialize `y_hat` with 20 linearly spaced numbers between -1 and 1
- Initialize `y` with 20 linearly spaced numbers between 0 and 1
- Compute for the shape and dimension of `y_hat` and `y`.
- Create individual functions for each of the loss functions with `y` and `y_hat` as parameters
- Each function should return the loss value (L)

Part 2.

1. Create a 1d array M {1, 2, ...16} using the arange function
2. Reshape M into 4x4 array and store it to N
3. Get the 2nd row of N
4. Get the minimum values for each column of N
5. Get the locations of the minimum values for each column of N
6. Get the average of the whole matrix
7. Create a vector V with 4 elements, each element is 1
8. Take the dot product of N and V

Instructions for Submission

- Submit a github link containing the jupyter notebook in LMS
- Make sure that you have used the required filename, otherwise you will get 5 points deduction