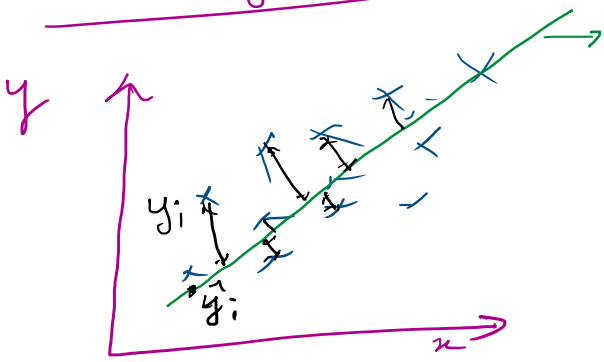
Session-28 ML

22 September 2024 07:05 PM

Ridge, Lasso & Elastic Regression

Linear regression

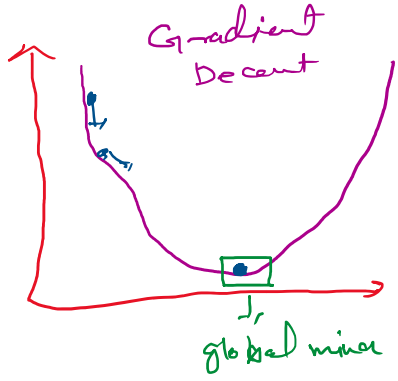


$h_\theta(x) = \theta_0 + \theta_1 x$

Independent

Intercept, slope

$h_\theta(x) \rightarrow \hat{y}_i$



$$\text{Error} = y_i - \hat{y}_i$$

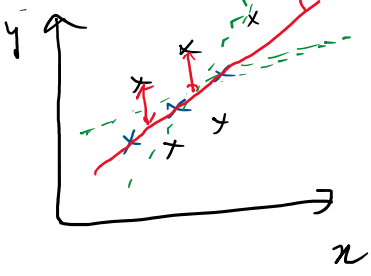
$$\text{Cost function} = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - h_\theta(x)_i\right)^2$$

y_i = actual, $\hat{y}_i$ = predicted

[Mean Squared Error] (MSE)

① Ridge Regression (L_2 Regression)

Reducing Overfitting



$y_i = \hat{y}_i$ on Train data

Error = 0

Error ↑↑ on test data

overfitting

x

on test data

$$\text{cost fn} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 + \lambda \sum_{i=1}^{n} (\text{slope})^2$$

Hyperparameter

② Lasso Regression (L_2 Regression)

→ Feature selection

$$\text{cost fn} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 + \lambda \sum_{i=1}^{n} |\text{slope}|$$

$$h_\theta(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3$$

③ ElasticNet Regression

- → Reducing overfitting → Ridge
- → Feature selection → lasso

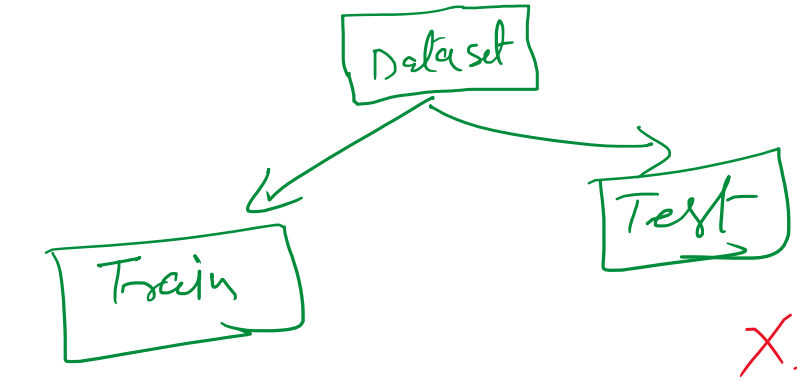
$$\text{cost fn} = \frac{1}{n}\sum^{n}(y_i - \hat{y}_i)^2 + \lambda_1 \sum_{i=1}^{n} (\text{slope})^2 + \lambda_2 \sum_{i=1}^{n} |\text{slope}|$$

$$\text{cost fun} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 + \lambda_1 \sum_{i=1} (\text{slope}) + \lambda_2 \sum_{i=1}$$

Ridge L_1

Lasso L_2

(λ_1 & λ_2 => Hyperparameter tuning)



X_test , y_test

X_train , y_train

X_train & X_test => I/P -> Independent feature

y_train & y_test => O/P -> Dependent feature