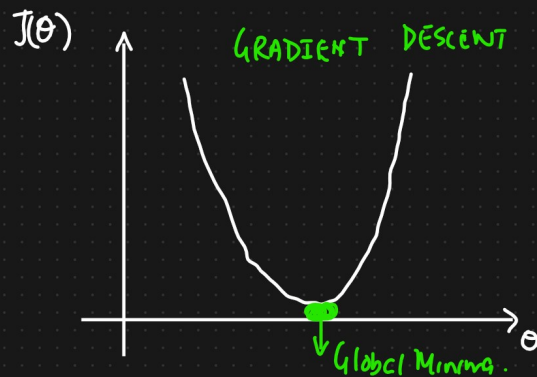
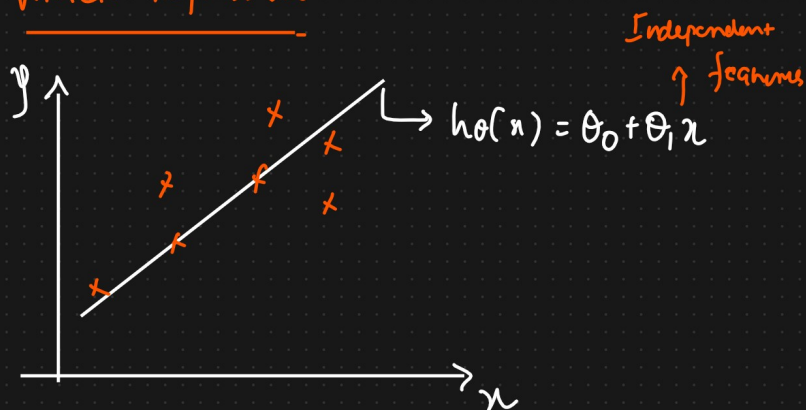


Ridge Regression, Lasso Regression, Elasticnet Regression

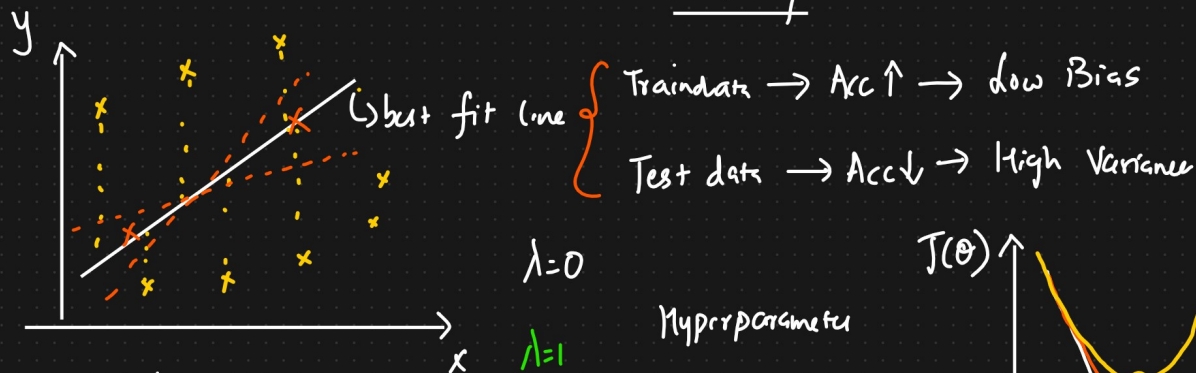
Linear Regression



$$\text{Cost fn} = \frac{1}{2m} \sum_{i=1}^m (h_0(x^{(i)}) - y^{(i)})^2$$

↓
Mean Squared Error

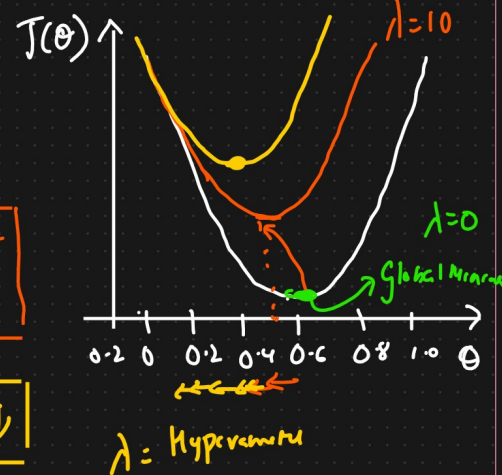
① Ridge Regression (L2 Regularization) → Reduce Overfitting



$$\text{Cost fn} = \frac{1}{2m} \sum_{i=1}^m (h_0(x^{(i)}) - y^{(i)})^2 + \lambda \sum_{i=1}^m (\theta_i)^2$$

↓
0 + (1) $[(\theta_1)^2]$

λ ↑ slope ↓



$$\lambda = 1$$

$$> 0$$

$$h_0(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3$$

$$= 0.34 + \underbrace{0.52}_{\downarrow} x_1 + \underbrace{0.48}_{\downarrow} x_2 + \underbrace{0.24}_{\downarrow} x_3$$



$$= 0.34 + 0.40x_1 + 0.38x_2 + \boxed{0.14x_3}$$

↑↑↑

② Lasso Regression (L_1 Regularization) \rightarrow Feature Selection

$$\text{Cost fn} = \frac{1}{2m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)})^2 + \lambda \sum_{i=1}^n |\text{slope}|$$

↑↑

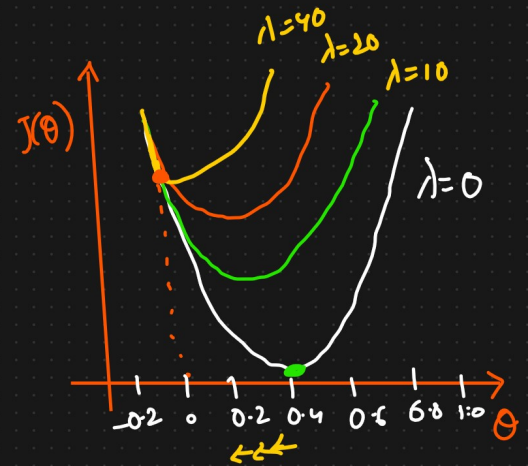
$$h_{\theta}(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \theta_4 x_4$$

$$h_{\theta}(x) = 0.52 + 0.65x_1 + 0.72x_2 + 0.34x_3 + \boxed{0.12x_4}$$

\Downarrow
Lasso Regression

$$= 0.52 + 0.51x_1 + 0.60x_2 + 0.14x_3 + \boxed{0x_4}$$

$\nearrow \neq 0$



③ ElasticNet Regression

- \rightarrow ① Reduce Overfitting
- \rightarrow ② Feature Selection

$$\text{Cost fn} = \frac{1}{2m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)})^2 + \lambda_1 \sum_{i=1}^m (\text{slope})^2 + \lambda_2 \sum_{i=1}^m |\text{slope}|$$

\Downarrow Reduce Overfitting \Downarrow Feature Selection

{ Hyperparameter Tuning the
Linear Regression }