تمرین ۱

قرار است برای دو متغیر تصادفی X و Y ثابت شود:

$$\mathrm{Var}(X+Y)=\mathrm{Var}(X)+\mathrm{Var}(Y)+2\ \mathrm{Cov}(X,Y)$$

definition: the from start We

$$\mathrm{Var}(X)=\mathbb{E}[X^2]-(\mathbb{E}[X])^2$$

find: to want We

$$\mathrm{Var}(X+Y)$$

definition، By

$$\mathrm{Var}(X+Y)=\mathbb{E}[(X+Y)^2]-(\mathbb{E}[X+Y])^2$$

expectation: of linearity Using

$$\mathbb{E}[X+Y]=\mathbb{E}[X]+\mathbb{E}[Y]$$

square: the expanding and

$$(X+Y)^2=X^2+2XY+Y^2$$

So،

$$\mathbb{E}[(X+Y)^2]=\mathbb{E}[X^2+2XY+Y^2]=\mathbb{E}[X^2]+2\mathbb{E}[XY]+\mathbb{E}[Y^2]$$

Also،

$$(\mathbb{E}[X+Y])^2=(\mathbb{E}[X]+\mathbb{E}[Y])^2=(\mathbb{E}[X])^2+2\mathbb{E}[X]\mathbb{E}[Y]+(\mathbb{E}[Y])^2$$

back: Substituting

$$\begin{aligned}\mathrm{Var}(X+Y)&=\big(\mathbb{E}[X^2]+2\mathbb{E}[XY]+\mathbb{E}[Y^2]\big)-\big((\mathbb{E}[X])^2+2\mathbb{E}[X]\mathbb{E}[Y]+(\mathbb{E}[Y])^2\big)\\&=\underbrace{\big(\mathbb{E}[X^2]-(\mathbb{E}[X])^2\big)}_{\mathrm{Var}(X)}+\underbrace{\big(\mathbb{E}[Y^2]-(\mathbb{E}[Y])^2\big)}_{\mathrm{Var}(Y)}+2\underbrace{\big(\mathbb{E}[XY]-\mathbb{E}[X]\mathbb{E}[Y]\big)}_{\mathrm{Cov}(X,Y)}\end{aligned}$$

$$\mathrm{Var}(X+Y)=\mathrm{Var}(X)+\mathrm{Var}(Y)+2\ \mathrm{Cov}(X,Y)$$

$$\sum_{n=1}^{8}\alpha_1^8\cap\cup \tag{۱}$$

model	MSE	MAE
regression	۱۱	۱۲
ridge	۱۳	۱۴
lasso	۱۵	۱۵

Table :۱ Caption

Caption :۱ شکل