机器学习作业

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第一题

样本特征矩阵

$$X=\begin{bmatrix}5.1 & 3.5 & 1\\ 4.9 & 3 & 1\\ 4.7 & 3.2 & 1\\ 4.6 & 3.1 & 1\\ 5 & 3.6 & 1\\ 5.4 & 3.9 & 1\\ 4.6 & 3.4 & 1\\ 5 & 3.4 & 1\\ 4.4 & 2.9 & 1\\ 4.9 & 3.1 & 1\end{bmatrix}$$

样本标签向量

$$\boldsymbol{y}=\begin{bmatrix}1.4\\ 1.4\\ 1.3\\ 1.5\\ 1.4\\ 1.7\\ 1.4\\ 1.5\\ 1.4\\ 1.5\end{bmatrix}$$

自相关矩阵 R_x

$$R_x=\boldsymbol{X^T X}=\begin{bmatrix}236.96 & 161.5 & 48.6\\ 161.5 & 110.41 & 33.1\\ 48.6 & 33.1 & 10\end{bmatrix}$$

互相关向量

$$\boldsymbol{X^T y}=\begin{bmatrix}70.64\\ 48.15\\ 14.5\end{bmatrix}$$

线性回归模型的封闭解 w

$$\widehat{\boldsymbol{w}} = (\boldsymbol{X}^T\boldsymbol{X})^{-1}\boldsymbol{X}^T\boldsymbol{y} = \begin{bmatrix} 0.1867 \\ 0.0431 \\ 0.3998 \end{bmatrix}$$

第二题

样本特征矩阵

[[5.1 3.5 1.]

[5.1 3.5 1.]

[4.9 3. 1.]

[4.7 3.2 1.]

[4.6 3.1 1.]

[5. 3.6 1.]

[5.4 3.9 1.]

[4.6 3.4 1.]

[5. 3.4 1.]

[4.4 2.9 1.]

[4.9 3.1 1.]

[5.4 3.7 1.]

[4.8 3.4 1.]

[4.8 3. 1.]

[4.3 3. 1.]

[5.8 4. 1.]

[5.7 4.4 1.]

[5.4 3.9 1.]

[5.1 3.5 1.]

[5.7 3.8 1.]

[5.1 3.8 1.]

[5.4 3.4 1.]

[5.1 3.7 1.]

[4.6 3.6 1.]

[5.1 3.3 1.]

[4.8 3.4 1.]

[5. 3. 1.]

[5. 3.4 1.]

[5.2 3.5 1.]

[5.2 3.4 1.]

[4.7 3.2 1.]

[4.8 3.1 1.]

[5.4 3.4 1.]

[5.2 4.1 1.]

[5.5 4.2 1.]

[4.9 3.1 1.]

[5. 3.2 1.]

[5.5 3.5 1.]

[4.9 3.6 1.]

[4.4 3. 1.]

[5.1 3.4 1.]

[5. 3.5 1.]

[4.5 2.3 1.]

[4.4 3.2 1.]

[5. 3.5 1.]

[5.1 3.8 1.]

[4.8 3. 1.]

[5.1 3.8 1.]

[4.6 3.2 1.]

[5.3 3.7 1.]

[5. 3.3 1.]]

样本标签向量

[[1.4]

[1.4]

[1.4]

[1.3]

[1.5]

[1.4]

[1.7]

[1.4]

[1.5]

[1.4]

[1.5]

[1.5]

[1.6]

[1.4]

[1.1]

[1.2]

[1.5]

[1.3]

[1.4]

[1.7]

[1.5]

[1.7]

[1.5]

[1.]

[1.7]

[1.9]

[1.6]

[1.6]

[1.5]

[1.4]

[1.6]

[1.6]

[1.5]

[1.5]

[1.4]

[1.5]

[1.2]

[1.3]

[1.4]

[1.3]

[1.5]

[1.3]

[1.3]

[1.3]

[1.6]

[1.9]

[1.4]

[1.6]

[1.4]

[1.5]

[1.4]]

自相关矩阵

[[1285.1   880.74 255.4]

 [880.74 606.85 174.9]

 [255.4   174.9   51.]]

互相关向量

[[373.88]

 [256.06]

[74.5]]

最小二乘解

[[0.14732246]

[-0.02105866]

[0.79523538]]