Linear Algebra Review Problems

CSC311, Fall 2021

1 Commute times

1. Suppose we are trying to predict commute times based on the distance traveled and day of the week. We have the following data:

dist	day	commute time
2.7	1	25
3.4	1	31
5.2	2	45
1.0	3	16
2.8	5	22

(a) We estimate that commute times have the following relationship

$$\text{commute time} = 10 \times \text{dist} - \text{day}$$

What are our predicted commute times? How can we use matrices to compute this quickly?

(b) Suppose we want to calculate the average mean squared error between the predictions and the ground truth. How do we do this?

2 Misc problems

1. Are the following set of vectors linearly independent or dependent? Justify.

$$\left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 3 \\ 4 \end{bmatrix} \right\}$$

2. Compute the projection of the vector $\begin{bmatrix} 7 \\ 2 \end{bmatrix}$ onto the direction $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$.