Foundations of Data Science & Machine Learning

Tutotial 09

May 6, 2021

Question 1. Manually determine the best fit line through the origin for each of the following sets of points. Is the best fit line unique? Justify your answers in each case.

1. $\{(0,1),(1,0)\}$
2. $\{(0,1),(2,0)\}$

Question 2. Let

$$C_{p\times r} = A_{p\times q}B_{q\times r}.$$

Prove that

$$C = \sum_{i=1}^{q} A[:,i]B[i,:],$$

where $A[:,i]$ denotes the i-th column of A and $B[i,:]$ denotes the i-th row of B. (Hence $A[:,i]B[i,:]$ is an outer product.)

Question 3. Let A be a square $n \times n$ matrix whose rows are orthonormal. Prove that the columns of A are orthonormal. *Hint.* Projection operator.