DS 501: STATISTICAL AND MATHEMATICAL METHODS FOR DATA SCIENCE
QUIZ 3

Problem
Given the following Matrix *A*. Orthogonally diagonlize A.

$$A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$$

Solution
(You need to do the working for computing eigen values and eigen vectors)

$$A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} \frac{1}{\sqrt{(2)}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{(2)}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{(2)}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{(2)}} & \frac{-1}{\sqrt{2}} \end{bmatrix}^T$$

Or

$$A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} \frac{1}{\sqrt{(2)}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{(2)}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{(2)}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{(2)}} & \frac{-1}{\sqrt{2}} \end{bmatrix}$$