



Question: Let D be a diagonal $R \times R$ matrix whose diagonal

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Let D be a diagonal $R \times R$ matrix whose diagonal elements are positive. Show that the maximizer $\hat{\beta}$ to

$$\underset{\beta \in \mathbb{R}^R}{\text{maximize}} \quad \|D\beta\|_2^2 \quad \text{subject to} \quad \|\beta\|_2 = 1$$

has a 1 in the entry corresponding to the largest diagonal element of D , and is 0 elsewhere.

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Expert Answer



Anonymous
answered this

Let D be a diagonal $n \times n$ matrix whose diagonal elements are positive. A diagonal matrix is a matrix in which the entries outside the main diagonal are all zero.

A diagonal matrix is a type of square matrix that contains zero at non-diagonal elements starting from left upper to right bottom.

$$D = \begin{pmatrix} d_1 & 0 & 0 & \dots & 0 \\ 0 & d_2 & 0 & \dots & 0 \\ 0 & 0 & d_3 & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & d_n \end{pmatrix}$$

The maximizer $\hat{\beta}$ to

$$\text{minimize } \|D\beta\|_2^2 \text{ subject to } \|\beta\|_2 = 1$$

has 1 in the entry corresponding to the largest diagonal element of D and zero elsewhere.

$$D = \begin{pmatrix} d_1 & 0 & \dots & 0 \\ 0 & d_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & d_n \end{pmatrix}$$

D is symmetric

D is positive definite

$$d_1 > 0, d_2 > 0, \dots, d_n > 0$$

(1, 1) entry is called the diagonal of the matrix

$$\text{minimize } \|D\beta\|_2^2 \text{ subject to } \|\beta\|_2 = 1$$

please thumbs up dear 🙏

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[See answer](#)

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