

$$\mathbf{M}_{3 \times 3} = \mathbf{X}^T \mathbf{X} = \begin{pmatrix} 18 & 42 & 60 & 31 \\ 22 & 27 & 25 & 29 \\ 108 & 125 & 117 & 132 \end{pmatrix} \begin{pmatrix} 6649 & 3929 & 18306 \\ 3929 & & \end{pmatrix}$$

Diagram illustrating the calculation of the matrix $\mathbf{M}_{3 \times 3} = \mathbf{X}^T \mathbf{X}$ using the dot product of rows of \mathbf{X} .

The matrix \mathbf{X} is represented by the following rows:

- Row 1: 18, 22, 108
- Row 2: 42, 27, 125
- Row 3: 60, 25, 117
- Row 4: 31, 29, 132

The diagram shows the calculation of the dot products between the rows of \mathbf{X} to form the elements of $\mathbf{M}_{3 \times 3}$:

- Row 1 dot Row 1: $18 \times 18 + 22 \times 22 + 108 \times 108 = 6649$
- Row 1 dot Row 2: $18 \times 42 + 22 \times 27 + 108 \times 125 = 3929$
- Row 1 dot Row 3: $18 \times 60 + 22 \times 25 + 108 \times 117 = 18306$
- Row 1 dot Row 4: $18 \times 31 + 22 \times 29 + 108 \times 132 = 14149$
- Row 2 dot Row 2: $42 \times 42 + 27 \times 27 + 125 \times 125 = 16909$
- Row 2 dot Row 3: $42 \times 60 + 27 \times 25 + 125 \times 117 = 15429$
- Row 2 dot Row 4: $42 \times 31 + 27 \times 29 + 125 \times 132 = 17029$
- Row 3 dot Row 3: $60 \times 60 + 25 \times 25 + 117 \times 117 = 13849$
- Row 3 dot Row 4: $60 \times 31 + 25 \times 29 + 117 \times 132 = 15829$
- Row 4 dot Row 4: $31 \times 31 + 29 \times 29 + 132 \times 132 = 17549$