Chairing #Definition

For a given ***Euclidean norm*** of a vector x:

$$V(\mathrm{x}) = \frac{1}{2}||\mathrm{x}||_P^2$$

Here, $||\mathrm{x}||_P^2$ representes the **quadratic** form associated with the matrix P. We can rewrite this expression in the following ways:

Matrix Notation:

$$V(\mathrm{x}) = \frac{1}{2}\mathrm{x}^T P\mathrm{x}$$

Component Form:

$$V(\mathrm{x}) = \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} P_{ij}\mathrm{x}_i\mathrm{x}_j$$

Diagonal Form: If P is diagonal with elements p_i on the diagonal, the **quadratic** norm simplifies to:

$$V(\mathrm{x}) = \frac{1}{2}\sum_{i=1}^{n} p_i x_i^2$$