Principal Components

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What are Principal Components?

- **An orthogonal linear transformation that transforms the data to a new coordinate system.**
- **The greatest variance by some projection comes to lie on the first coordinate (the first principal component).**

What are Principal Components?

- **That is, the first vector satisfies:**

$$\mathbf{w}_{(1)} = \arg\max_{\|\mathbf{w}\|=1} \left\{ \sum_i (t_1)_{(i)}^2 \right\} = \arg\max_{\|\mathbf{w}\|=1} \sum_i \left(\mathbf{x}_{(i)} \cdot \mathbf{w} \right)^2$$

  - **Computed using eigenvalue decomposition or singular value decomposition.**

Use of Principal Components

- **Click to add text**

Use of Principal Components

- **Reduce dimensionality of data**
- **Reduce redundancy in data**
- **Filter noise**