Implicit assumptions of Euclidean distance

Features considered in isolation

Price vs. Price
Color vs. Color
Weight vs. Weight
.
.
.

Feature importance equally weighted

Price and shoelace length are equally important to me

A more expressive preference model

- A *Mahalanobis metric* $\mathbf{M} \succ \mathbf{0} \in \mathbb{R}^{D \times D}$ overcomes these drawbacks:

$$\|\mathbf{x}_i - \mathbf{u}\|_{\mathbf{M}}^2 = (\mathbf{x}_i - \mathbf{u})^\top \mathbf{M} (\mathbf{x}_i - \mathbf{u})$$

- ***New goal:*** Estimate ideal item $\mathbf{u}$ and metric $\mathbf{M}$