



## Why

We are given an element of some set, and want to find an element (in some subset) which is most similar to it.

## Definition

Consider a non-empty set, one of its subsets, and a similarity function on it. An *approximator* of an element of the set is any element of the subset. So we call the subset the set of *approximators*. One approximator may be more similar than another. An *optimal* approximator is a minimizer of the similarity function over the set of approximators.

## Notation

Let  $B$  be a non-empty set. Let  $A \subset B$ . Let  $d : B \times B \rightarrow \mathbf{R}$  be a similarity function. For  $b \in B$ , every  $a \in A$  is an approximator of  $b$ . An optimal  $b$  is a solution of

$$\begin{array}{ll} \text{minimize} & d(b, a) \\ \text{subject to} & a \in A. \end{array}$$

## $\varepsilon$ approximations

Let  $a, b \in B$ . For  $\varepsilon > 0$ , we say that an element  $b$   $\varepsilon$ -approximates  $a \in A$  if  $d(a, b) \leq \varepsilon$ .



