



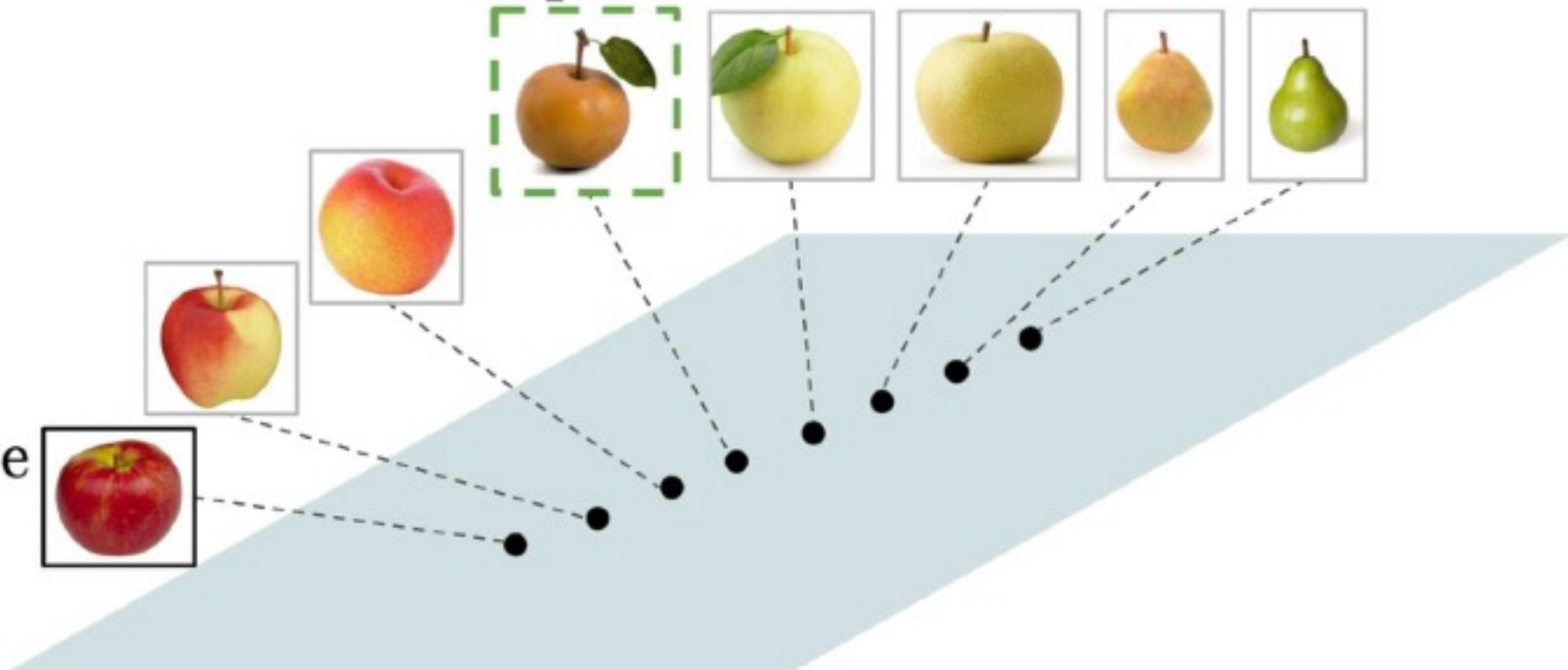
**FAQs for metric learning**

- Reference object  $\mathbf{x}$ , *query vector*  $\mathbf{a}$ ,  
continuous path of points  
 $\{\mathbf{x} + \ell \mathbf{a} : \ell \in [0, \ell^\uparrow]\}$

- Ask user to select the *first item along the path that is dissimilar to the reference*
  - I.e., the item  $\mathbf{x} + \ell \mathbf{a}$  such that

PAQ  
response

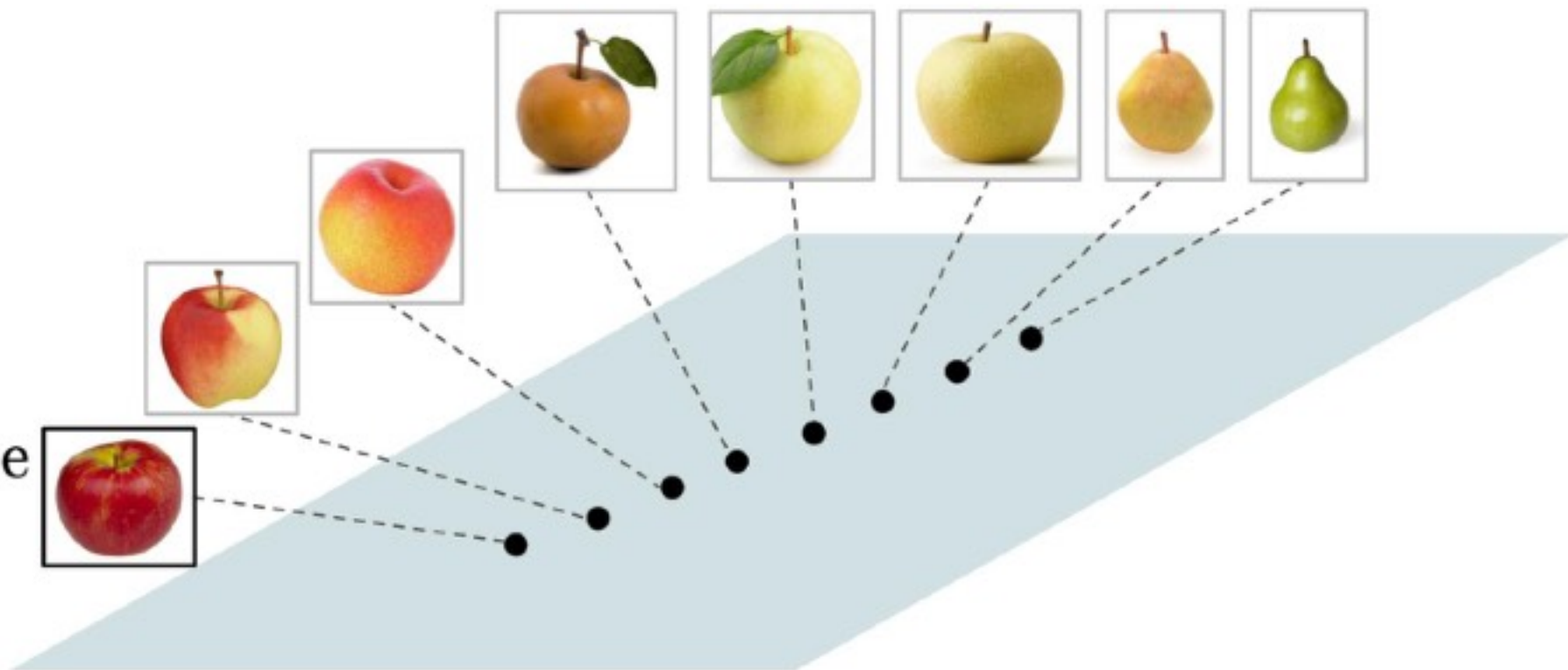
Reference  
item





$$\| \mathbf{x} - (\mathbf{x} + \ell \mathbf{a}) \|_M^2 = \ell^2 \mathbf{a}^\top M \mathbf{a} = y$$

Reference  
item





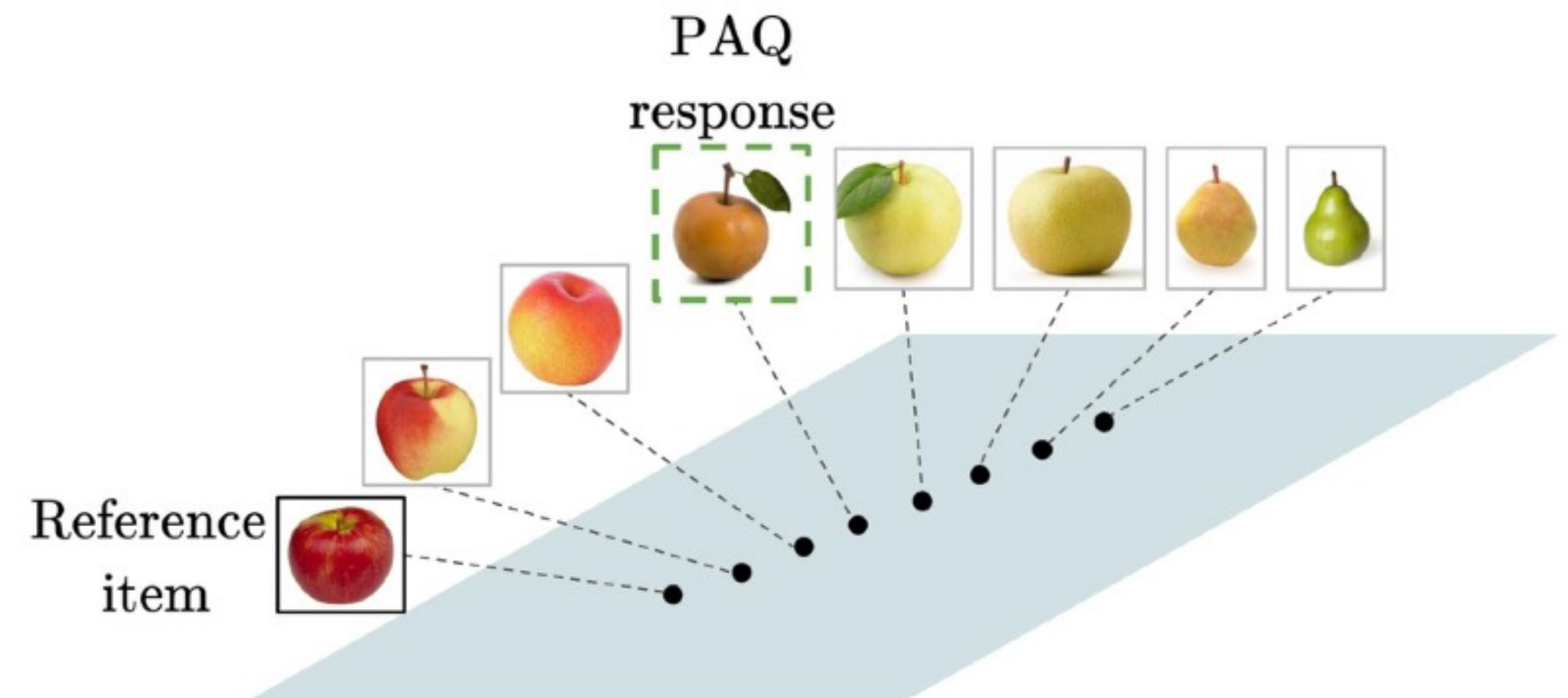


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# PAQs for metric learning

- Reference object  $\mathbf{x}$ , *query vector*  $\mathbf{a}$ , continuous path of points  $\{\mathbf{x} + \ell \mathbf{a} : \ell \in [0, \ell^\uparrow]\}$
- Ask user to select the first item along the path that is dissimilar to the reference
- I.e., the item  $\mathbf{x} + \ell \mathbf{a}$  such that

$$\|\mathbf{x} - (\mathbf{x} + \ell \mathbf{a})\|_{\mathbf{M}}^2 = \ell^2 \mathbf{a}^\top \mathbf{M} \mathbf{a} = y$$



# Noisy PAQ responses → trace measurements

