

### 3. Adding inductive bias

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### § 2.3 Prevent overfitting by adding some inductive bias

The classic way is to modify naive ERM by restricting  $h$  to live in a hypothesis class  $\mathcal{H}$ , so

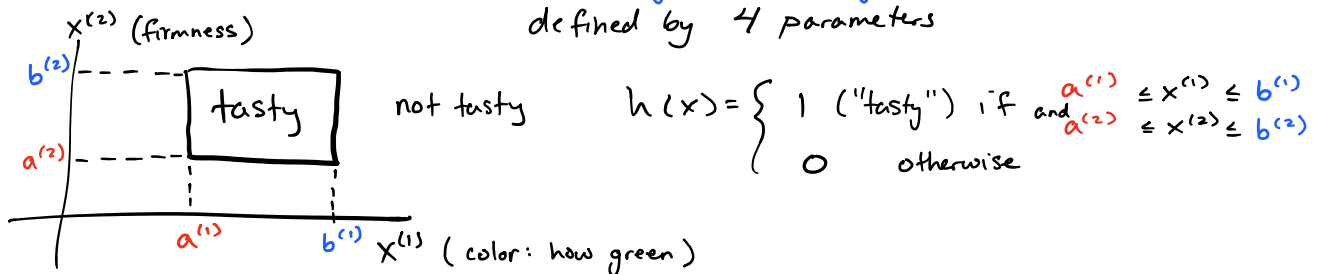
Def  $ERM_H(S) \in \operatorname{argmin}_{h \in H} \hat{L}_S(h)$  } Is this tractable?  
 may not be unique  
 For now, choose one. Don't worry about that yet.

⚠ Careful: if you choose  $\mathcal{H}$  *after* seeing data  $S$ ,  
our theory won't apply

back to Papaya ex.

Prior knowledge added so far: **tastiness** is a function of **color** and **firmness** (only!)

Let's add more: let  $\mathcal{H}$  = axis-aligned rectangles  
(2) (firmness) defined by 4 parameters



There's a tradeoff + By being this restrictive, we're less likely to overfit

- We've introduced a lot of bias. The real world isn't as simple.

we're going to quantitatively analyze some of these tradeoffs