

$$f(x) = \alpha + \sum_{j=1}^p f_j(x_j)$$

$$= \alpha + f_1(x_1) + f_2(x_2) + \dots + f_p(x_p)$$

Let $f_j(x_j) = \beta_j x_j$, then $(\alpha = \beta_0)$

$$f(x) = \alpha + \sum_{j=1}^p \beta_j x_j = \beta_0 + \sum_{j=1}^p \beta_j x_j$$

$$y = f(x) + \varepsilon,$$

$$EPE(f) = E[h(y, f(x))]$$

$$\text{If } h(y, f(x)) = (y - f(x))^2$$

$$\Rightarrow \hat{f}(x) = E[y | x] = \mu(x)$$

Regression trees:

$$f(x) = \sum_{m=1}^M c_m \mathbb{1}(x \in R_m)$$

$$RSS = \sum_{i=1}^N (y_i - f(x_i))^2$$

$$= \sum_{i=1}^N \left(y_i - \sum_{m=1}^M c_m \mathbb{1}(x_i \in R_m) \right)^2$$

This is only 1
for 1 of the
terms in the
sum

$$= \sum_{m=1}^M \sum_{i: x_i \in R_m} (y_i - c_m)^2$$