Untitled

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Suppose we have data X, a response variable y and a learning rate $\lambda > 0$. We will build a sequence of weak learners (small trees), $\hat{f}_b$, $b = 1...B$ as follows.

- Initialize the **residuals** $r = y$ and the **initial model** $\hat{f}(x) = \bar{y}$.
- For $b = 1, 2, \ldots, B$,
  - Fit a weak learner $\hat{f}_b(x)$ to the X and r_{i-1} (the current response).
  - Update $\hat{f}(x)$ via
  $$\hat{f}(x) \leftarrow \hat{f}(x) + \lambda \hat{f}_b(x)$$
  - Update the residuals
  $$r \leftarrow r - \lambda \hat{f}_b(X)$$
- When done, the boosted model is:

$$\hat{f}(x) = \lambda(\hat{f}_1(x) + \cdots + \hat{f}_B(x)).$$