

# Monte Carlo

Why do we need to estimate expected values?

- Full Bayesian inference (see Week 1)

$$\begin{aligned} p(y \mid x, Y_{\text{train}}, X_{\text{train}}) \\ &= \int p(y \mid x, w) p(w \mid Y_{\text{train}}, X_{\text{train}}) dw \\ &= \mathbb{E}_{p(w \mid Y_{\text{train}}, X_{\text{train}})} p(y \mid x, w) \end{aligned}$$

$$p(w \mid Y_{\text{train}}, X_{\text{train}}) = \frac{p(Y_{\text{train}} \mid X_{\text{train}}, w) p(w)}{Z}$$