Classification

Training:

$$P(\theta|X_{\mathrm{tr}}, y_{\mathrm{tr}}) = \frac{P(y_{\mathrm{tr}}|X_{\mathrm{tr}}, \theta)P(\theta)}{P(y_{\mathrm{tr}}|X_{\mathrm{tr}})}$$

Prediction:

$$P(y_{\mathrm{ts}}|X_{\mathrm{ts}}, X_{\mathrm{tr}}, y_{\mathrm{tr}}) = \int P(y_{\mathrm{ts}}|X_{\mathrm{ts}}, \theta)P(\theta|X_{\mathrm{tr}}, y_{\mathrm{tr}})d\theta$$