Reparameterization Trick

Reparameterization expresses the new GP mean with the included x^{n+1} data point $\mu_y^{n+1}(x)$ using the old GP mean $\mu_y^n(x)$

$$\mu_y^{n+1}(x) = \mu_y^n(x) \; + \; \tilde{\sigma}_y^n(x, x^{n+1})\, Z_y, \qquad Z_y \sim \mathcal{N}(0,1),$$

Reparameterized covariance coefficient of x, x^{n+1}

$$\tilde{\sigma}_y^n(x, x^{n+1}) = \frac{k_y^n(x, x^{n+1})}{\sqrt{k_y^n(x^{n+1}, x^{n+1}) + \sigma_\epsilon^2}}$$

Intoducess randomness to GP posterior sampling

Notice the new posterior mean is a linear function of Z_y

Discretization and Linear-Envelope - 1

Scott et al 2011

The domain X is discretized into a finite set X_j $\{x_1, x_2, \ldots, x_J\}$