RandMaxVar

The randomized maximum variance acquisition method

- The next evaluation point is drawn randomly from the density corresponding to the variance of the posterior

$$\theta_{t+1} \sim q(\theta), \text{ where } q(\theta) \propto \text{Var}(p(\theta) \cdot p_a(\theta))$$

$$p_a(\theta) = \Phi\left(\frac{\epsilon - \mu_{1:t}(\theta)}{\sqrt{v_{1:t}(\theta) + \sigma_n^2}}\right)$$

- ϵ is the ABC threshold, $\mu_{1:t}$ and $v_{1:t}$ are determined by the GP surrogate, σ_n^2 is the noise.

ExpIntVar

The Expected Integrated Variance

- Loss function measures the overall uncertainty in the unnormalised ABC posterior over the parameter space.

- The value of the loss function depends on the next simulation so the next evaluation location θ^* is chosen to minimise the expected loss

$$\theta_{t+1} = \arg\min_{\theta^*} L_{1:t}(\theta^*)$$

- The expected loss $L(\,\cdot\,)$ approximated as:

$$L_{1:t}(\theta^*) \approx 2 \cdot \sum_{i=1}^{s} \omega^i \cdot p^2(\theta^i) \cdot w_{1:t+1}(\theta^i, \theta^*)$$

- ω^i is an importance weight, $p^2(\theta^i)$ is the prior squared, and $w_{1:t+1}(\theta^i, \theta^*)$ is the expected variance of the unnormalised ABC posterior at θ^i after running the simulation model with parameter θ^*