Point-predictive distribution

$p(y|x, x_{1:N}, y_{1:N}, \alpha, \sigma^2) = ?$

$p(\underline{w}|x_{1:N}, y_{1:N}, \alpha, \sigma^2) = \checkmark$; $p(y|x, \underline{w}, \sigma^2) = \checkmark$

Sum Rule : $p(A|I) = \sum_i p(A|B_i, I)\, p(B_i|I)$

$p(B_1 \text{ or } B_2 \text{ or } \dots) = 1, \quad p(B_i, B_j) = 0$

$$\underbrace{p}_{A}(y|\underbrace{x, x_{1:N}, y_{1:N}, \alpha, \sigma^2}_{I}) = \sum_i p(y|B_i, I)\, p(B_i|I)$$

$$= \int p(y|\underline{w}, I)\, p(\underline{w}|I)\, d\underline{w}$$

$p(\underline{w}|x_{1:N}, y_{1:N}, \alpha, \sigma^2)$

$p(y|\underline{w}, x, \cancel{x_{1:N}, y_{1:N}}, \cancel{\alpha}, \sigma^2) = p(y|x, \underline{w}, \sigma^2)$

$$= \int p(y|x, \underline{w}, \sigma^2)\, p(\underline{w}|x_{1:N}, y_{1:N}, \alpha, \sigma^2)\, d\underline{w}$$

$$= N(y|\underline{\varphi}^T(x)\underline{m}, \underbrace{\underline{\varphi}^T(x)\underline{\underline{S}}\,\underline{\varphi}(x)}_{\text{epistemic}} + \sigma^2)$$

post. mean of weights

post. cov. of weights

noise variance

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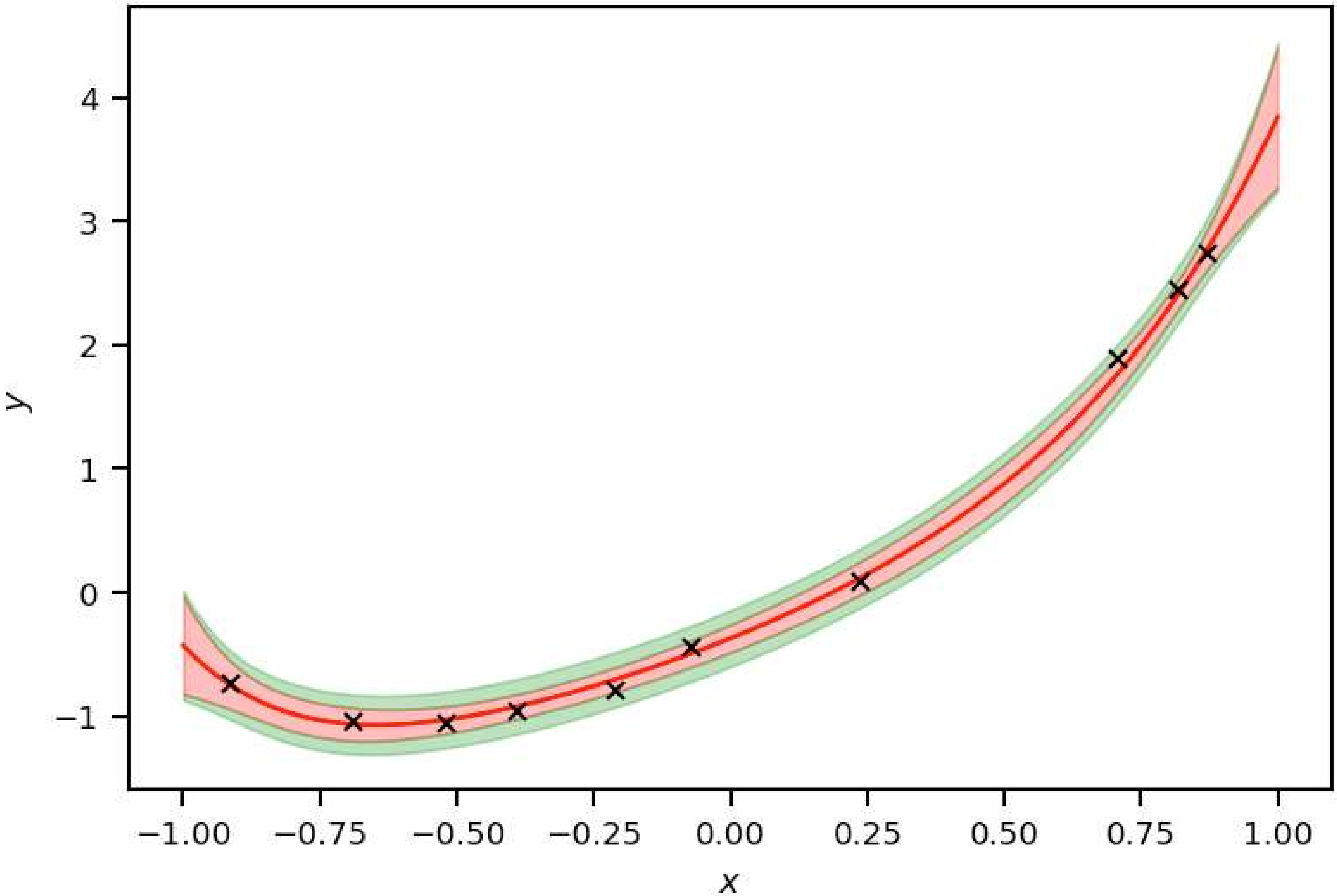
Example: Separating epistemic and aleatory uncertainties



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