

Rectified Linear Unit ($\text{ReLU}(x) = \max(0, x)$) and Sigmoid ($\sigma(x) = 1/(1 + e^{-x})$) are common functions for introducing non-linearity in modeling approaches. These functions are implemented in a numerically stable way in many libraries, including JAX, which is used by hbmep. Eqns. 4.2.5-4.2.8 describe how hbmep implements the activation functions in Eqns. X-Y as composition of these functions.

$$\text{Rectified-logistic} \quad x \mapsto L - \ell + (H + \ell) \cdot \text{ReLU}(\sigma(b(x - a) - \ln(H/\ell))) \quad (4.7.1)$$

$$\text{Logistic-5} \quad x \mapsto L + H \cdot \{\sigma(b(x - a) - \ln(2^v - 1))\}^{\frac{1}{v}} \quad (4.7.1)$$

$$\text{Logistic-4} \quad x \mapsto L + H \cdot \sigma(b(x - a)) \quad (4.7.2)$$

$$\text{Rectified-linear} \quad x \mapsto L + \text{ReLU}(b(x - a)) \quad (4.7.3)$$