

# Calculation of the gradient

- Gamma filter equations ( $x_0(n)=x(n)$ )

$$y(n) = \sum_{k=0}^K w_k x_k(n)$$

$$x_k(n) = (1 - \mu)x_k(n-1) + \mu x_{k-1}(n-1)$$

- Gradients are

$$\Delta w_k = -\frac{\partial J}{\partial w_k} = \eta_1 \sum_{n=0}^T e(n) x_k(n)$$

$$\Delta \mu = -\frac{\partial J}{\partial \mu} = \eta_2 \sum_{n=0}^T e(n) \sum_{k=0}^K w_k \alpha_k(n)$$

- And the gradient variable is computed as ( $\alpha_0(n)=0$ )

$$\alpha_k(n) = (1 - \mu)\alpha_k(n-1) + \mu\alpha_{k-1}(n-1) + x_{k-1}(n-1) - x_k(n-1)$$