

## EWS Blatt 10

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June 17, 2021

$$\frac{\mathbb{E} \left[ \left( \hat{h}(x) - \mathbb{E} [\hat{h}(x)] \right)^2 \right]}{\lambda \left( \|\tilde{I}\theta\|^2 \right)} \tilde{X} = [1 \quad X], \quad \tilde{y}^T = [1 \quad y^T] \quad \theta^* = \operatorname{argmin}_{\theta} \|\tilde{y} - \tilde{X}\theta\| +$$

$$\tilde{I} = \begin{bmatrix} 0 & & & \\ & 1 & & \\ & & \ddots & \\ & & & 1 \end{bmatrix} = I - \begin{bmatrix} 1 & & & \\ & 0 & & \\ & & \ddots & \\ & & & 0 \end{bmatrix}$$

$$\begin{aligned}\hat{\theta} &= \operatorname{argmin}_{\theta} R(\theta) \\ &= \operatorname{argmin}_{\theta} \|\tilde{y} - \tilde{X}\theta\|^2 + \lambda \|\tilde{I}\theta\|^2 \\ &= \langle \tilde{y} - \tilde{X}\theta, \tilde{y} - \tilde{X}\theta \rangle + \lambda \langle \tilde{I}\theta, \tilde{I}\theta \rangle \\ &= \tilde{y}^T \tilde{y} + \theta^T \tilde{X}^T \tilde{X} \theta - 2\theta^T \tilde{X}^T \tilde{y} + \lambda \theta^T \tilde{I}^T \tilde{I} \theta\end{aligned}$$

$$\left(\tilde{X}^T \tilde{X} + \tilde{I}^T \tilde{I}\right) \hat{\theta} = \tilde{X}^T \tilde{y} \quad \tilde{X}^T \tilde{X} \stackrel{(4.2)}{\underset{(5.6)}}{\nabla} f(x) = \frac{x-b}{\|x-b\|} x - \nabla f(x) \sum_{k=0}^{\infty} (5/6)^k$$

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