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Quiz 3 Cheat Sheet

$y = \ell(x) = ax + b$ $\forall x \in \mathbb{R}$, we can predict a value $\hat{y} = \ell(x)$

$r_i = y_i - \hat{y}_i = y_i - \ell(x_i)$

$SSE((X,y),\ell) = \sum_{i=1}^{n} r_i^2$

$\hat{y}_i = M_\alpha(X_i) = \alpha_0 + \sum_{j=1}^{d} \alpha_j x_{ij}$

Polynomial: $\hat{y} = M_p(x) = \alpha_0 + \alpha_1 x + \alpha_2 x^2 + \dots + \alpha_p x^p$

Cross-Validation: $\alpha = (X_{train}^T X_{train})^{-1} X_{train}^T y_{train}$

Solution: $\ell : X \to \tilde{X} \in \mathbb{R}^{n\times(d+1)}$
Solution 2: $\alpha = (\tilde{X}^T\tilde{X})^{-1}\tilde{X}^T y$
Goal: $\alpha^* = \underset{\alpha\in\mathbb{R}^{d+1}}{\operatorname{argmin}} \|\tilde{X}\alpha - y\|^2$

PSD matrix has real non-negative eigenvalues.

Soln: $\tilde{X} \in \mathbb{R}^{n\times(p+1)}$