



















































**Ridge Regression**  
F(B)  
• New objective:  

$$\beta^{ridge} = \arg \min_{\beta} \sum_{i=1}^{n} (y_i - (\beta_0 + \beta^T x_i))^2 + \lambda ||\beta||_2^2$$
• Reformulate:  

$$F(\delta) = \int_{\alpha} \beta^T (x^T X) \beta - \beta^T X^T Y + const$$

$$f(\delta) = \int_{\alpha} \beta^T (x^T X) \beta - \beta^T X^T Y + const$$
• Set gradient = 0  

$$\beta^{ridge} = (X^T X + \lambda I) \beta - \beta^T X^T Y + const$$
• Linear smoother!!  

$$f(\delta) = \int_{\alpha} \beta^{ridge} = \int_{\alpha} \int_{\alpha} \beta^{ridge} = \int_{\alpha} \int_{\alpha} f(x^T X + \lambda I) f(X^T X) f(X) + \lambda I = \chi f(X^T X + \lambda I) f(X) + \chi I = \chi f(X) + \chi f(X) + \chi I = \chi f(X) + \chi f(X) + \chi f(X) = \chi f(X) + \chi f(X) + \chi f(X) + \chi f(X) = \chi f(X) + \chi f(X) + \chi f$$

















