# Cubic vs. Natural vs. Smoothing Splines
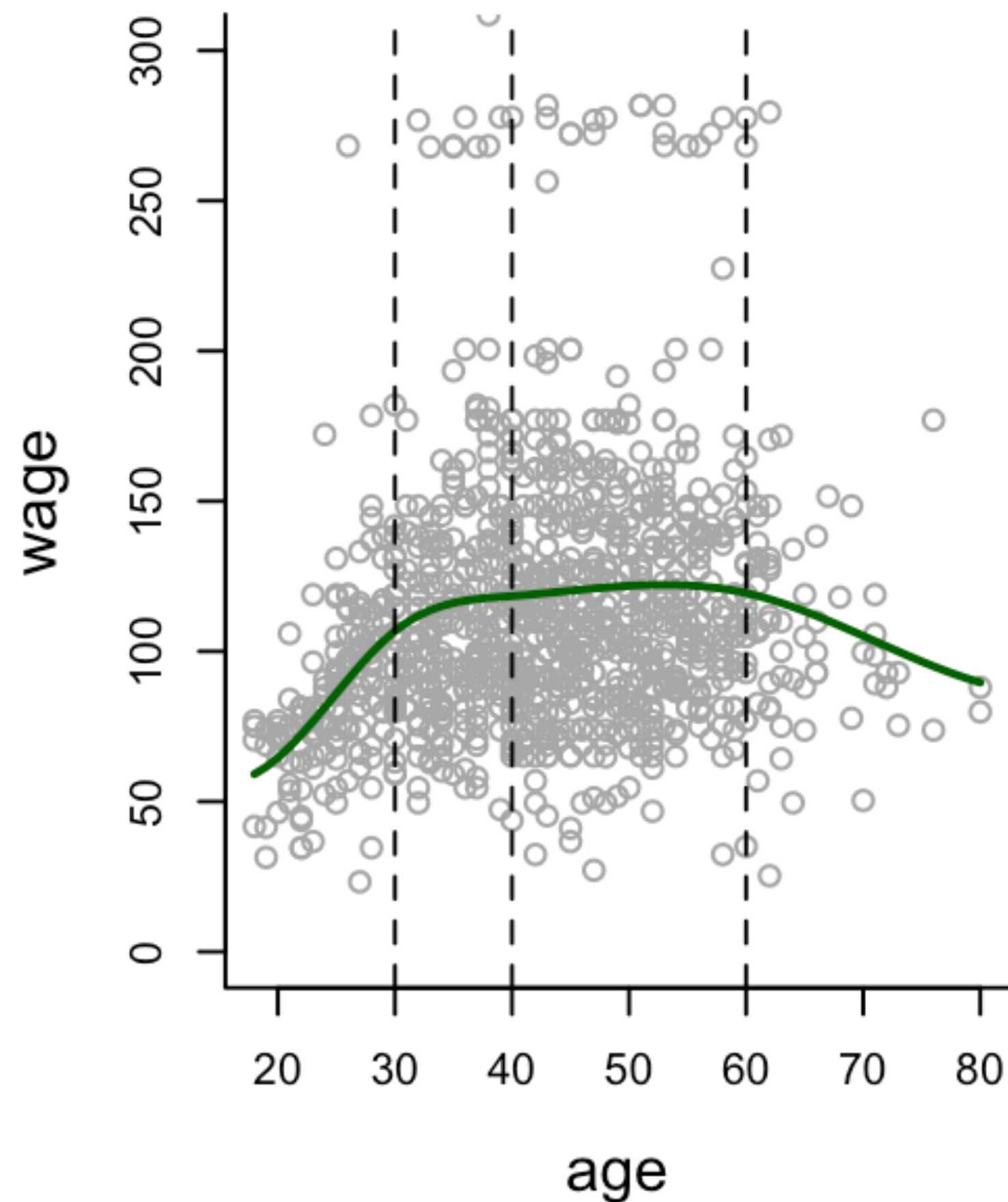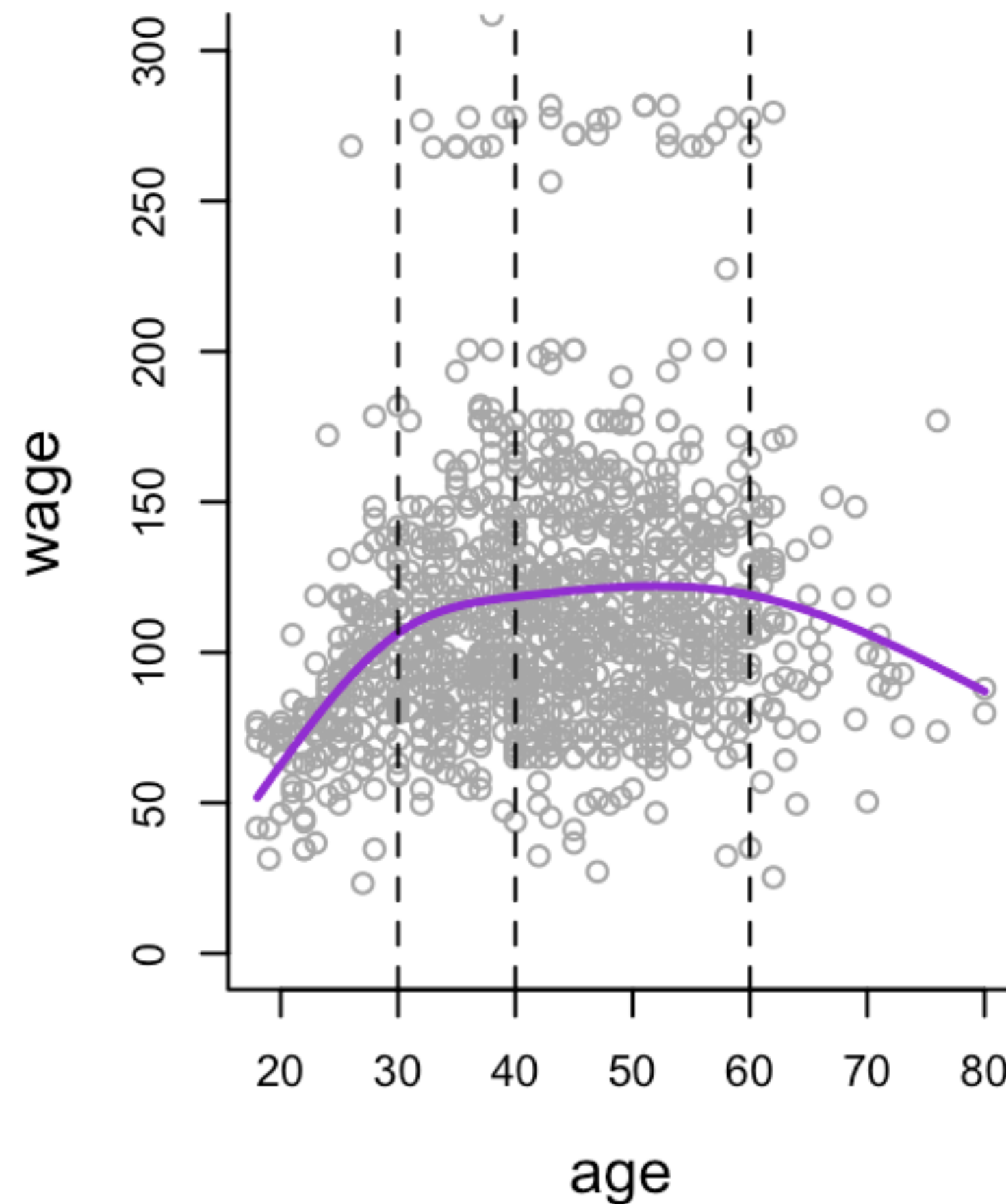
**Example: Wage (ISLR2)**

Training data = 1000
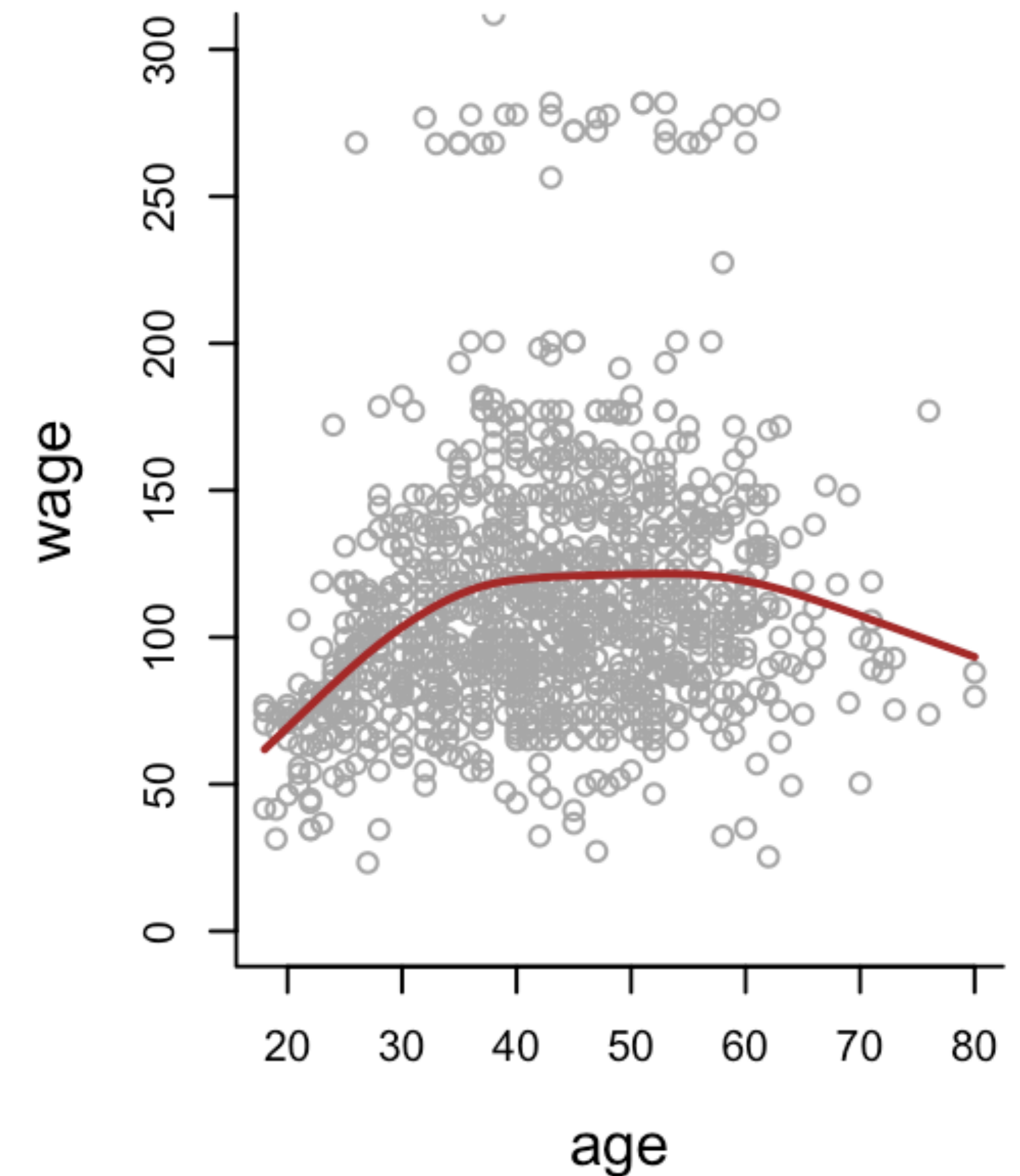
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| Criterion | Polynomial Splines | Natural Splines | Smoothing Splines |
|---|---|---|---|
| **Flexibility** | High with more knots | Moderate | High, controlled by $\lambda$ |
| **Boundary Behavior** | May behave erratically | Linear at boundaries | Smooth, but depends on $\lambda$ |
| **Noise Handling** | Poor, sensitive to noise | Moderate | Excellent, balances fit and smoothness |
| **Interpretability** | Good for low degree | Good | Moderate, influenced by $\lambda$ |
| **Knot Selection** | User-defined | User-defined | Not required |
| **Computation** | Fast | Fast | Slower for large data |