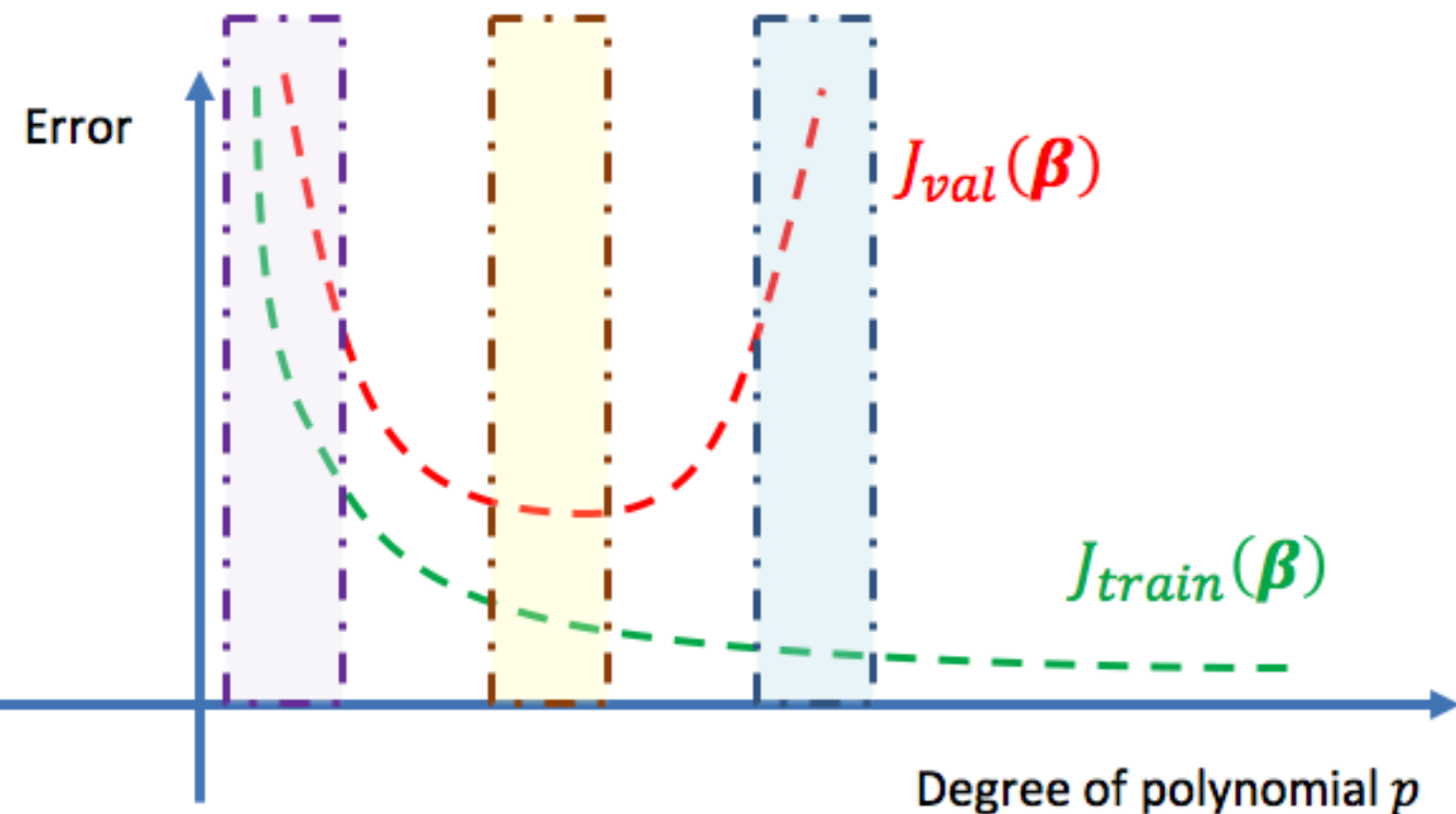


- Training error: $J_{train}(\boldsymbol{\beta}) = \frac{1}{2} \|\mathbf{y}_{train} - \hat{\mathbf{y}}_{train}\|_2^2 = \frac{1}{2} \|\mathbf{y}_{train} - \mathbf{X}_{train}\boldsymbol{\beta}\|_2^2$
- Validation error: $J_{val}(\boldsymbol{\beta}) = \frac{1}{2} \|\mathbf{y}_{val} - \hat{\mathbf{y}}_{val}\|_2^2 = \frac{1}{2} \|\mathbf{y}_{val} - \mathbf{X}_{val}\boldsymbol{\beta}\|_2^2$



Region 1

- Underfitting, $J_{train}(\boldsymbol{\beta})$ and $J_{val}(\boldsymbol{\beta})$ high
- Model is simplistic

Region 2

- Overfitting, $J_{train}(\boldsymbol{\beta})$ low and $J_{val}(\boldsymbol{\beta})$ high
- The model follows the training set very accurately but fails to follow new examples

Region 3

- Desired, $J_{train}(\boldsymbol{\beta})$ and $J_{val}(\boldsymbol{\beta})$ low