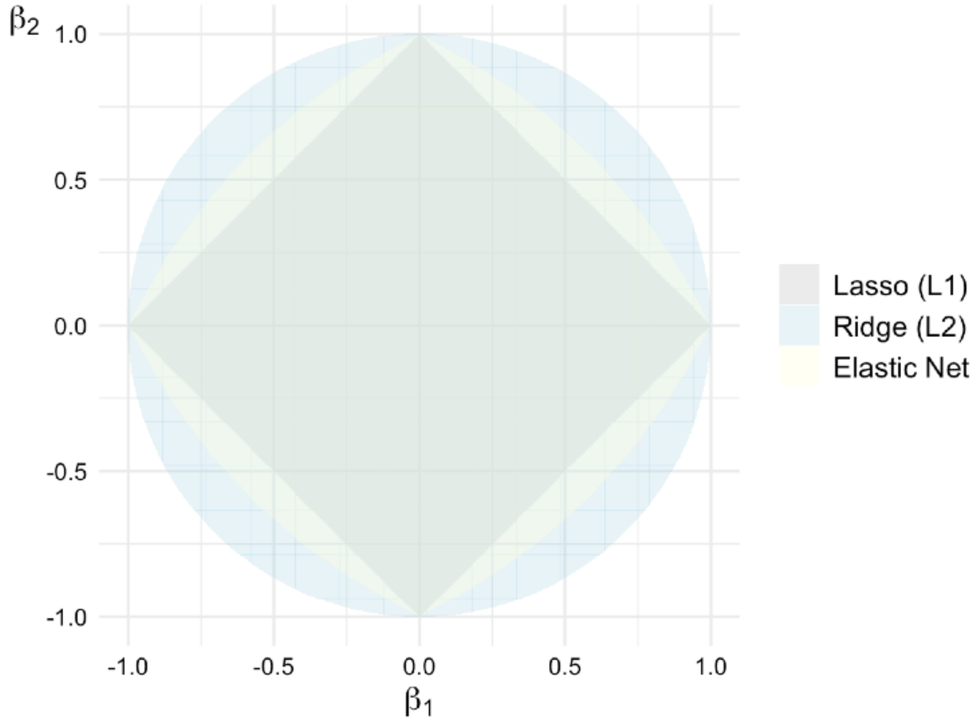
λ Tuning

- *K*-fold Cross Validation
    1. Choose the number of folds *K*
    2. Split the data accordingly into training and testing sets.
    3. Define a grid of values for λ
    4. For each λ, calculate the validation MSE within each fold
    5. For each λ, calculate the overall cross-validation MSE
    6. Locate under which λ cross-validation MSE is minimized, i.e. minimum_cv λ
- Packages such as will `glmnet` do this automatically

Hybrid Approach: Elastic Nets

$$\text{RSS} + \underbrace{\lambda_1 \sum_{j=1}^{p} \beta_j^2}_{\text{“ridge”}} + \underbrace{\lambda_2 \sum_{j=1}^{p} |\beta_j|}_{\text{“lasso”}}$$



λ_1 and λ_2 are regularization parameters controlling the strength of the penalties

- Helps stabilize the solution when predictors are correlated
- Shrinks some coefficients to zero, enabling feature selection
- Particularly useful for high-dimensional datasets with correlated predictors