Ridge vs. Lasso Regression

- Both ridge and lasso are convex optimization
- The ridge solution exists in closed form
- Lasso does not have closed form solution, but very efficient optimization algorithms exist

When to choose which?

- When the actual data-generating mechanism is **sparse** lasso has the advantage
- When the actual data-generating mechanism is **dense** ridge has the advantage

Sparse mechanisms: Few predictors are relevant to the response → good setting for lasso regression

Dense mechanisms: A lot of predictors are relevant to the response → good setting for ridge regression

- Also depends on:
  - Signal strength (the magnitude of the effects of the relevant variables)
  - The correlation structure among predictors
  - Sample size n vs. number of predictors p

Ridge vs. Lasso Regression

Ridge

+ Reduces Multicollinearity
+ Continuous Shrinking
+ Stable Solutions
+ Computationally Efficient

- No variable selection
- Interpretability
- Sensitive to scale

Lasso

+ Variable selection
+ Sparse models
+ Improves interpretability
+ Particularly useful for when $p > n$

- Collinearity issues
- Bias in coefficients (ℓ_1 penalty is harsher)
- Computationally intensive