

REGRESSION THEORY SUMMARY

Linear Regression (Ordinary Least Squares)

- Models relationship between features and target
- Minimizes sum of squared residuals
- Prone to overfitting with many features

Ridge Regression (L2 Regularization)

- Adds L2 penalty term (squared coefficients)
- Shrinks coefficients but never to exactly zero
- Reduces model variance, helps prevent overfitting

Lasso Regression (L1 Regularization)

- Adds L1 penalty term (absolute coefficients)
- Can force coefficients to exactly zero
- Performs automatic feature selection

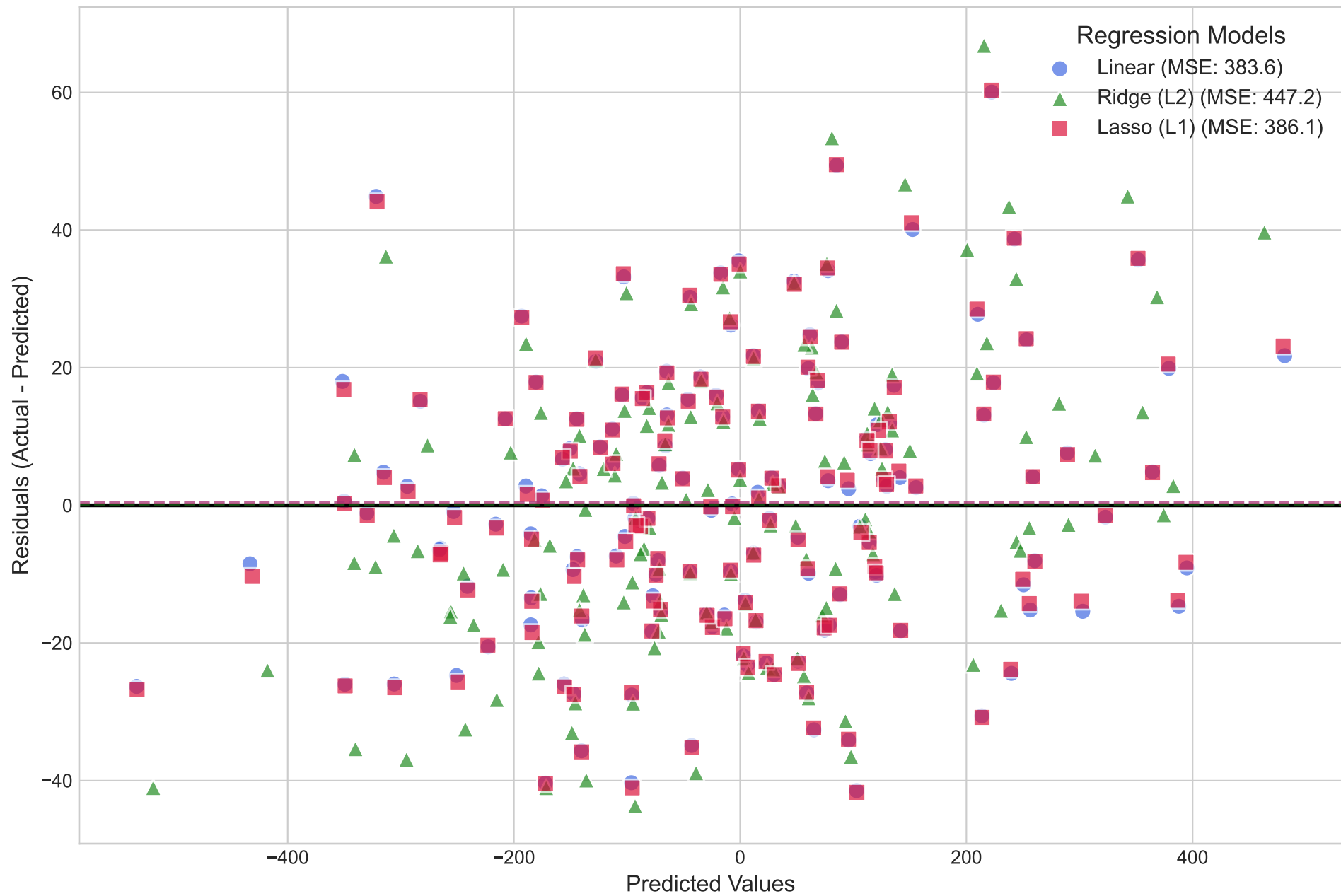
MSE INTERPRETATION

- Mean Squared Error measures prediction accuracy
- Lower values indicate better performance
- Residual plots show error distribution patterns

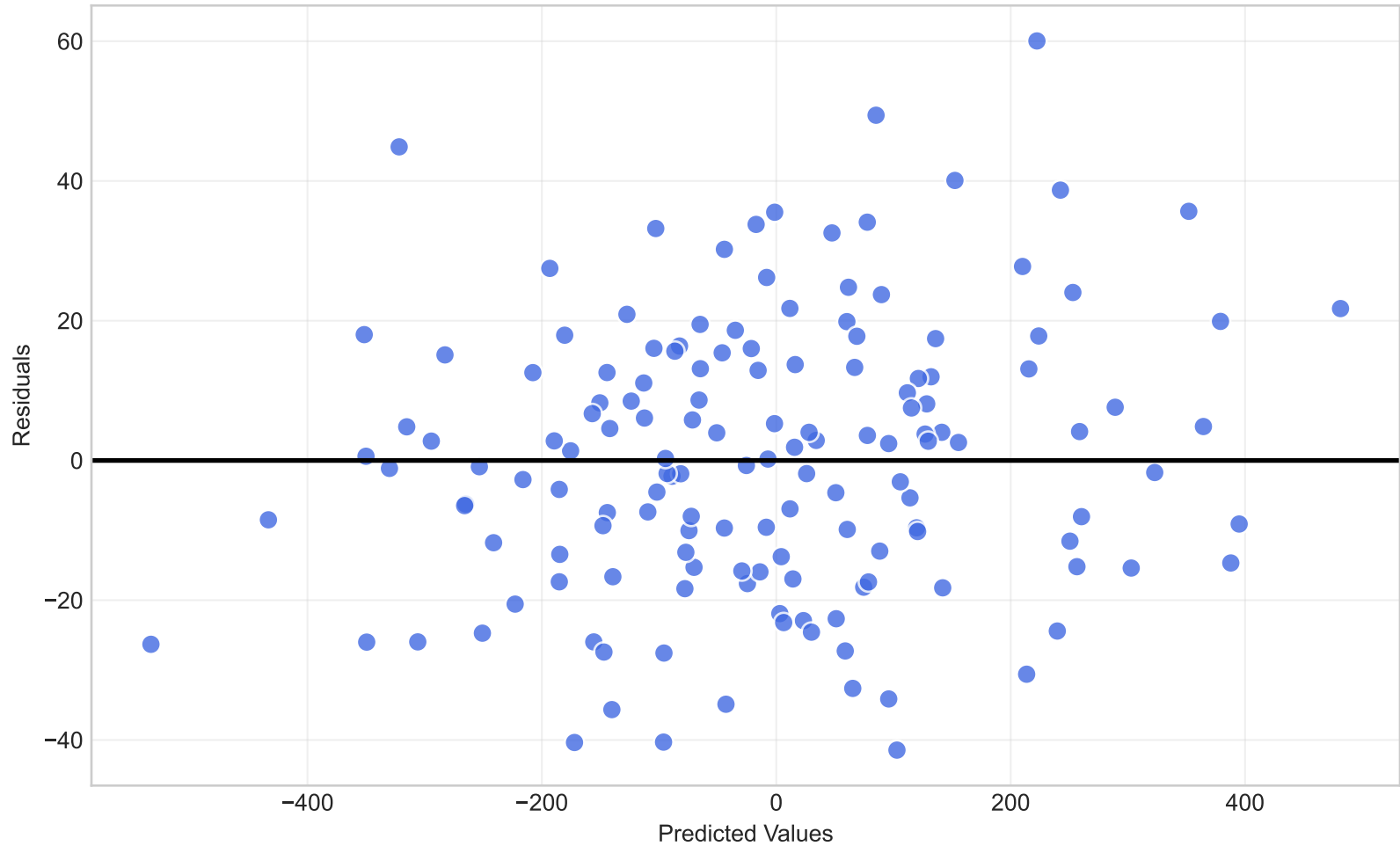
RESIDUAL PLOT DIAGNOSTICS

- Ideal: Random scatter around zero line
- Patterns indicate model deficiencies
- Clustering suggests unmodeled relationships

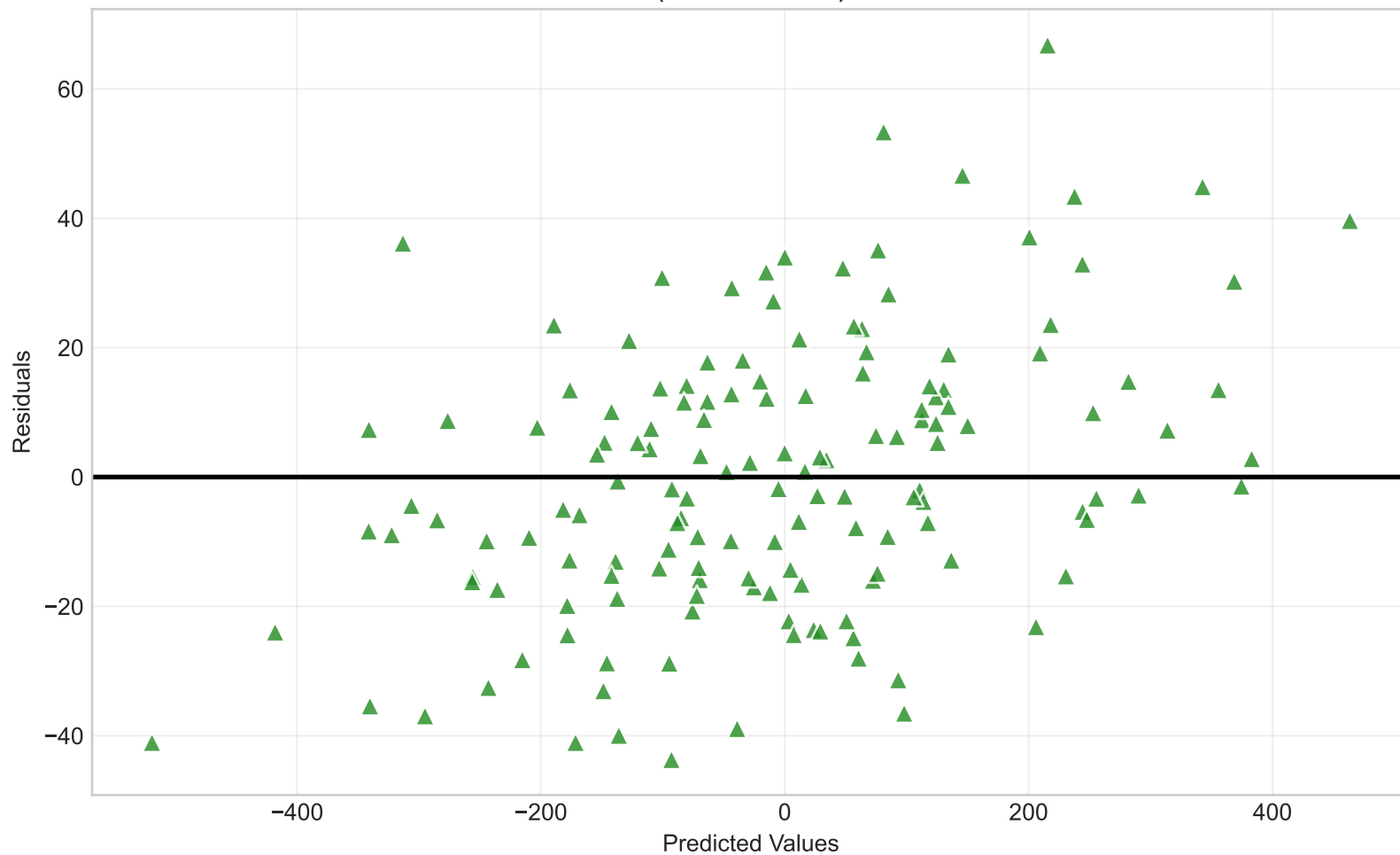
Regression Residual Analysis



Linear Regression Residuals (MSE: 383.6)



Ridge (L2) Regression Residuals
(MSE: 447.2)



Lasso (L1) Regression Residuals
(MSE: 386.1)

