Table 1

Model Metrics Summary (Final Models)				
Model	Key Hyperparameters	Performance (Test Set)	Notes	
Linear Reg.	No regularization (OLS)	R ² ≈ 0.9756; RMSE ≈ 1,445 psi; MAE ≈ 937 psi1	Baseline model. Accurate; errors balanced (no bias).	
Ridge Reg.	α = 0.001 (optimal)	R ² ≈ 0.9756; RMSE ≈ 1,445 psi; MAE ≈ 937 psi1	Same performance as Linear (minimal regularization effect).	
Lasso Reg.	α = 0.001 (optimal)	R ² ≈ 0.9756; RMSE ≈ 1,445 psi; MAE ≈ 937 psi1	Same performance as Linear (coefficients ~unchanged).	
Random Forest	150 trees; max_depth ~30; min_leaf = 21	R ² ≈ 0.9775; RMSE ≈ 1,387 psi; MAE ≈ 903 psi1	Best mean predictor. Captures ~98% variance.	
LightGBM 99%	300 trees; max_depth = 10; α = 0.991	~99% coverage (actual ≤ pred); RMSE ≈ 4,882 psi; MAE ≈ 3,837 psi1	Conservative high- bound model (overshoots by ~3.8 ksi on avg).	