

SENSITIVITY ANALYSIS REPORT

Optimal Control Model

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DATASET INFORMATION:

- Number of samples: 500
- Number of parameters: 5
- Parameters: tcre, cost_mitig_unit, cost_remov_unit, econ_dam_pct, disc_rate
- Target variable: Y
- Target range: 1470.6 to 51363.2
- Target std deviation: 10192.2

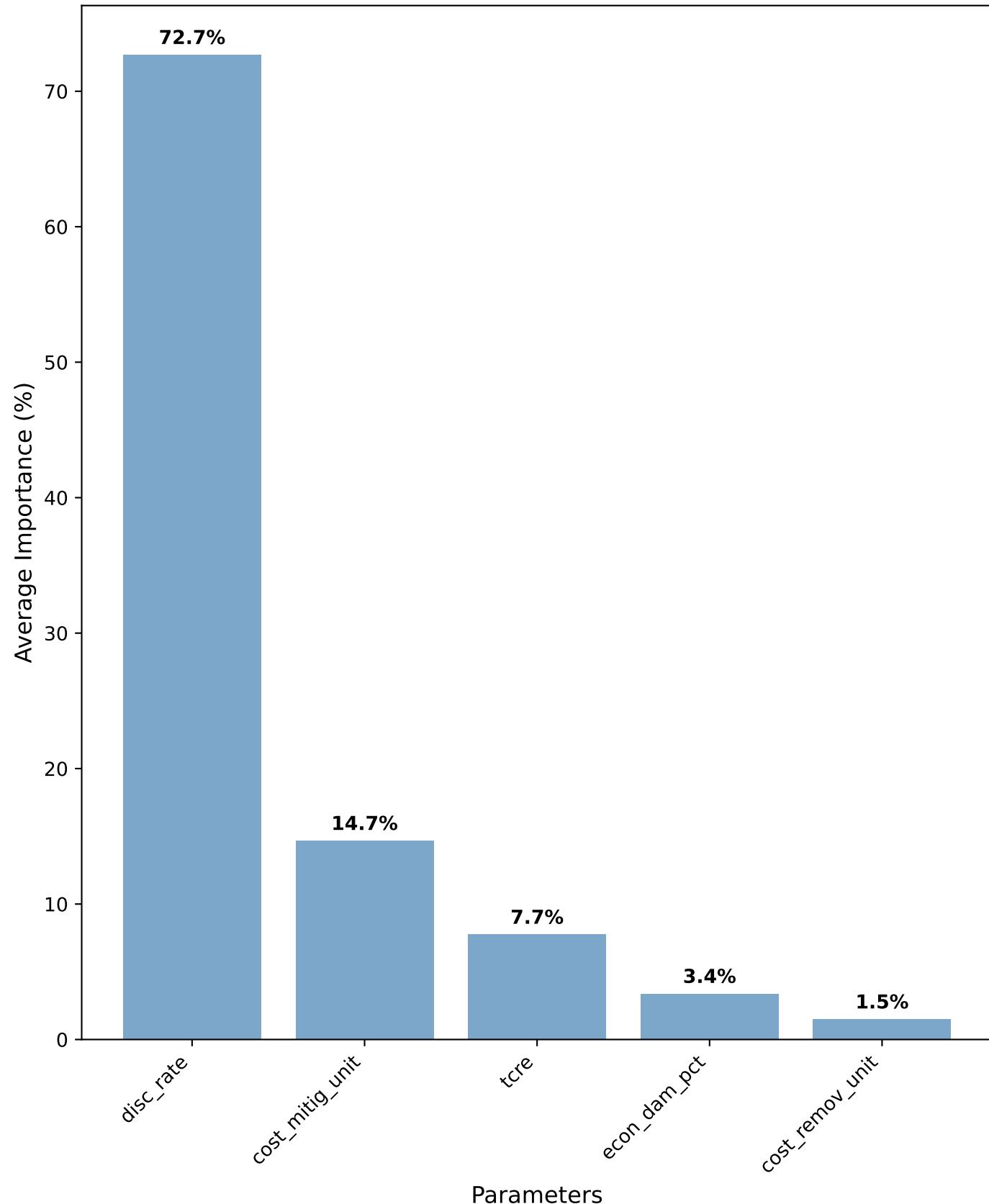
KEY FINDINGS:

- Most influential parameter: disc_rate
- Average importance: 72.7%
- Model performance (Random Forest R²): 0.995
- Model performance (Linear Regression R²): 0.849

PARAMETER RANKING:

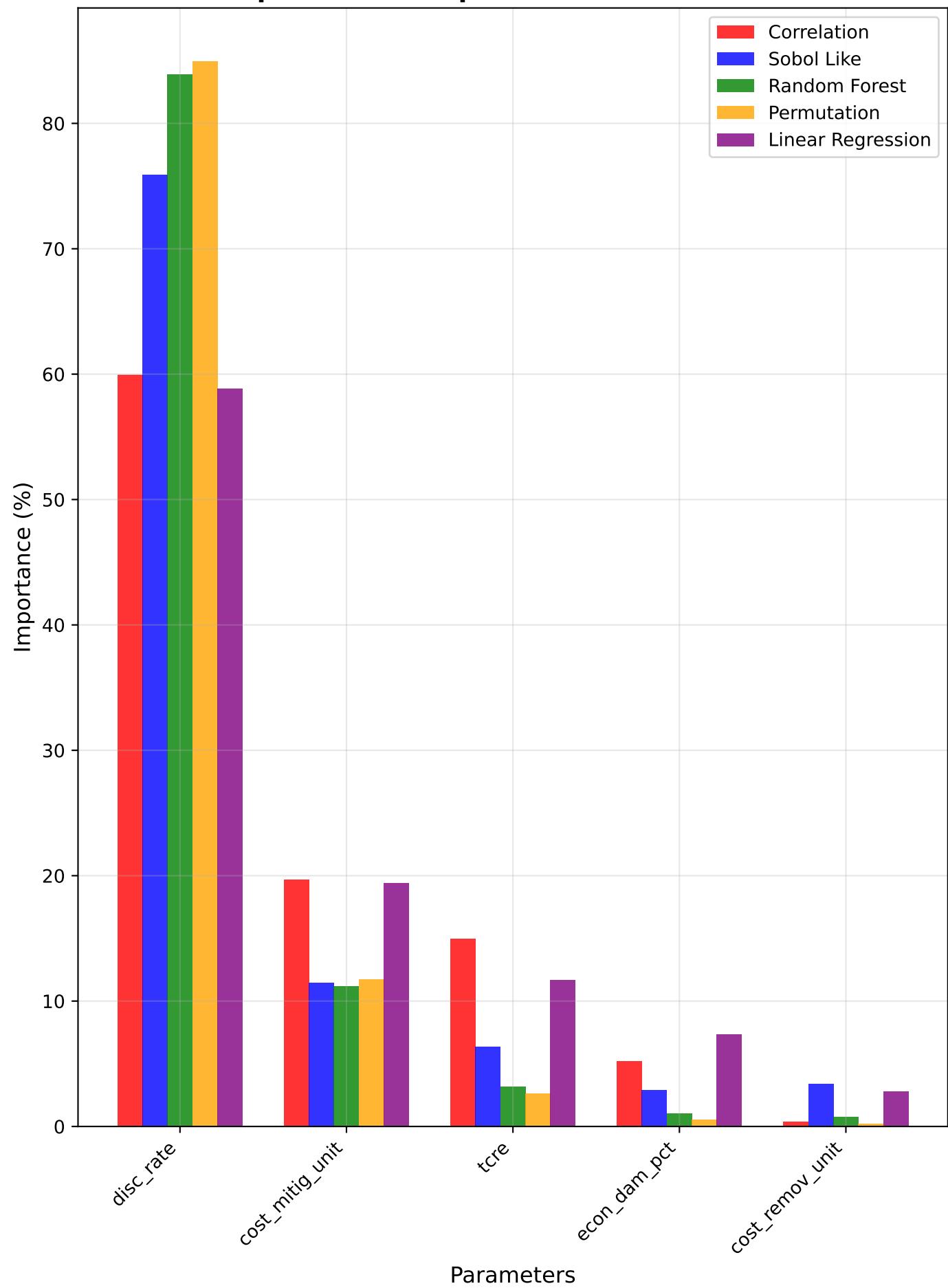
1. disc_rate: 72.7% ± 12.7%
2. cost_mitig_unit: 14.7% ± 4.4%
3. tcre: 7.7% ± 5.4%
4. econ_dam_pct: 3.4% ± 2.9%
5. cost_remov_unit: 1.5% ± 1.5%

Parameter Importance Ranking (Average Across All Methods)

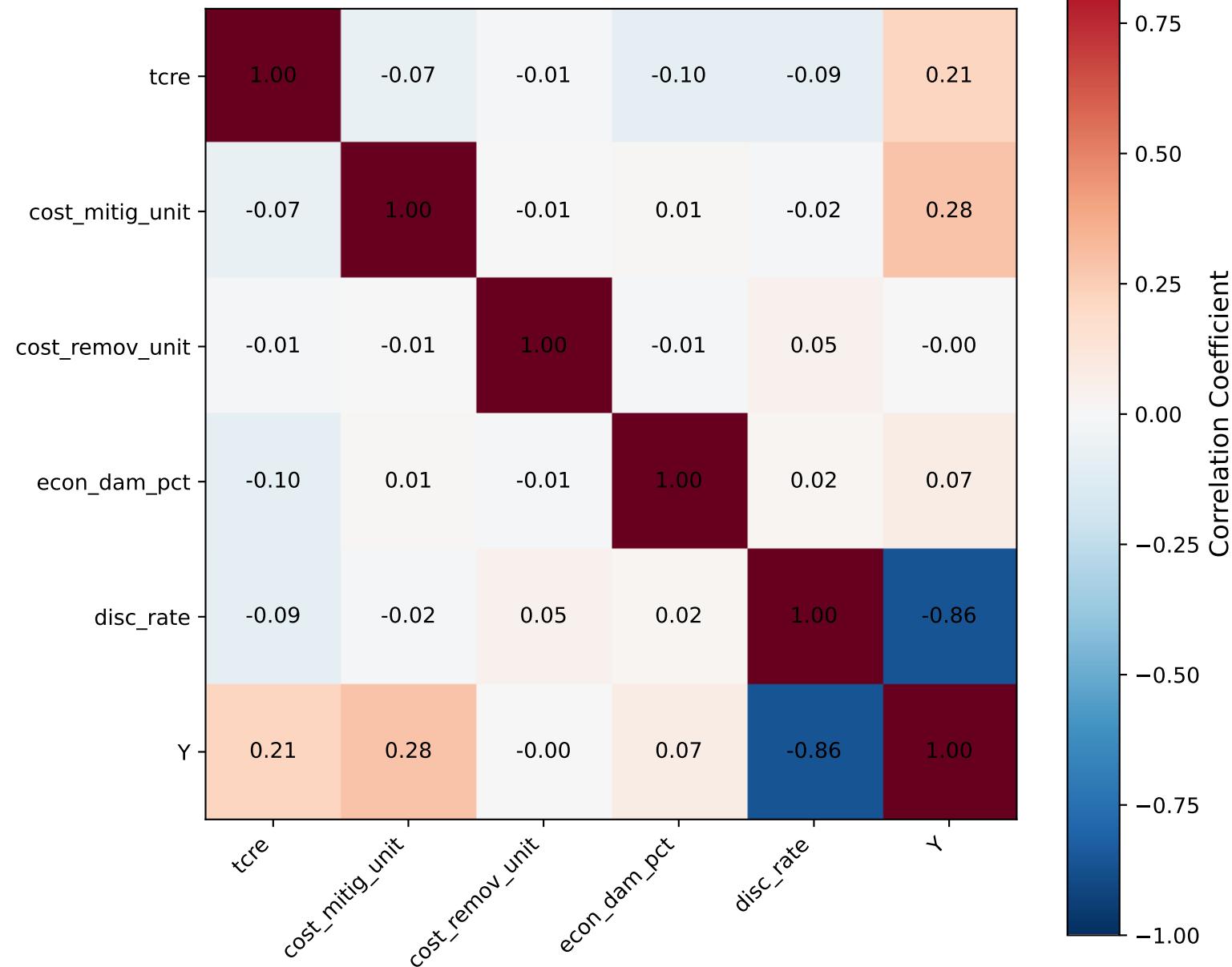


Parameter	Avg Importance	Std Dev
disc_rate	72.7%	12.7%
cost_mitig_unit	14.7%	4.4%
tcre	7.7%	5.4%
econ_dam_pct	3.4%	2.9%
cost_remov_unit	1.5%	1.5%

Importance Comparison Across Methods

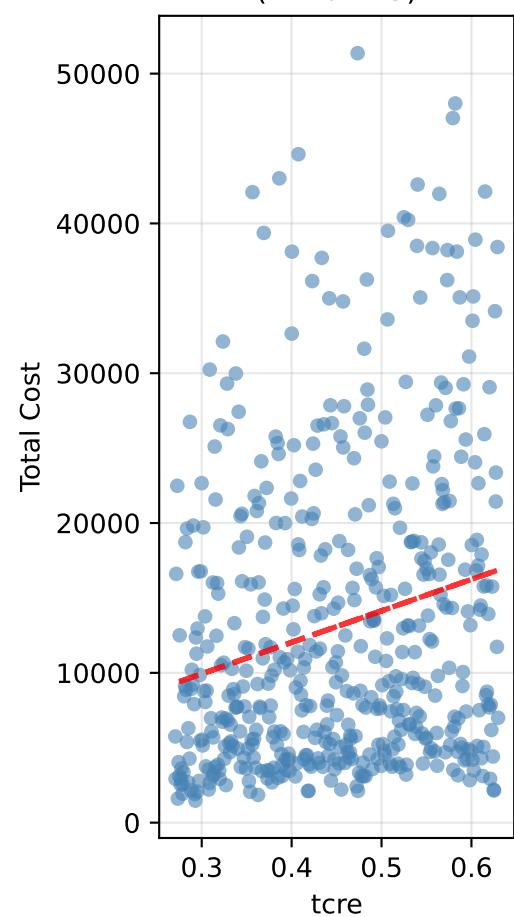


Parameter Correlation Matrix

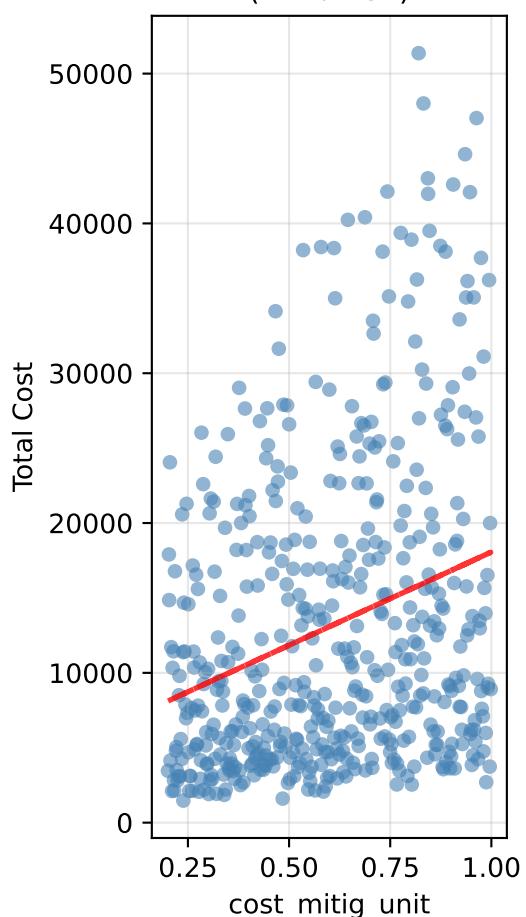


Individual Parameter Effects on Total Cost

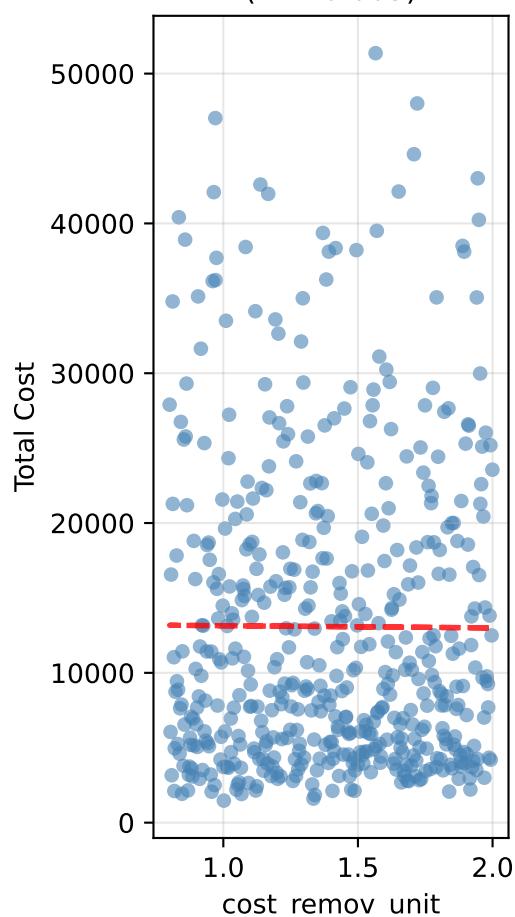
tcre
($r = 0.215$)



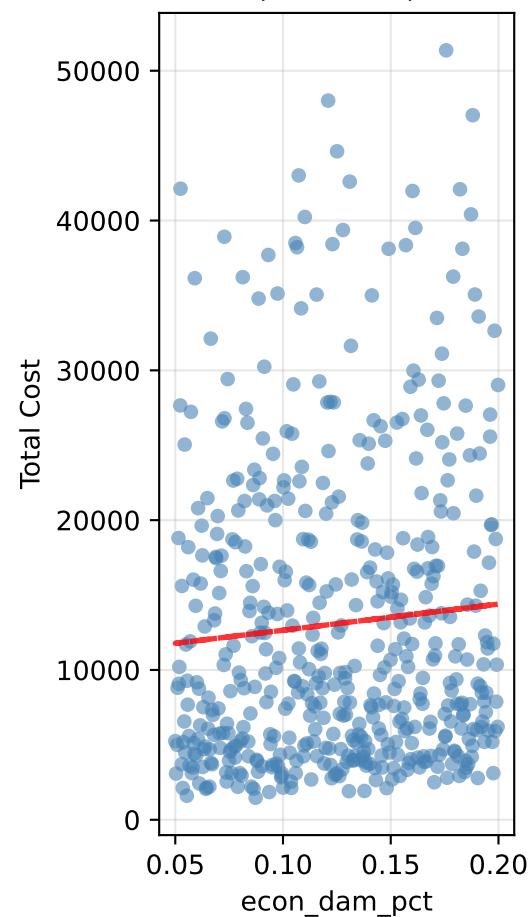
cost_mitig_unit
($r = 0.282$)



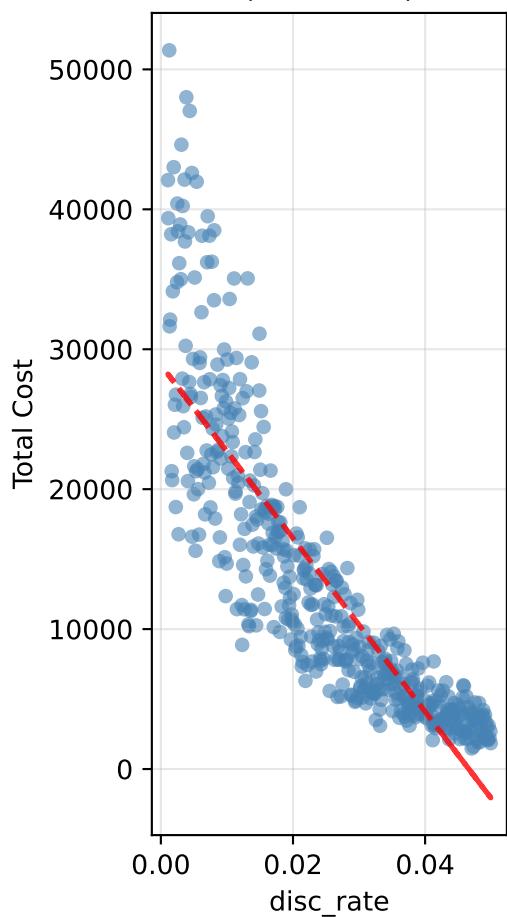
cost_remov_unit
($r = -0.005$)



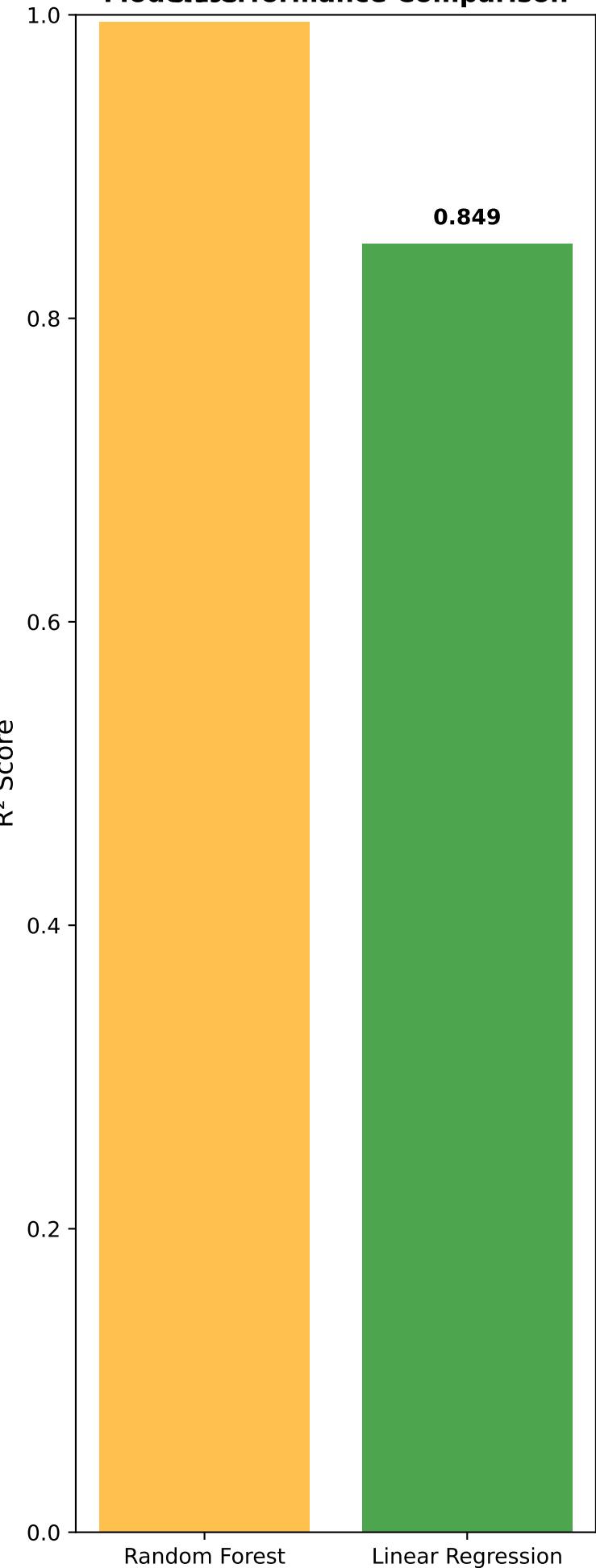
econ_dam_pct
($r = 0.074$)



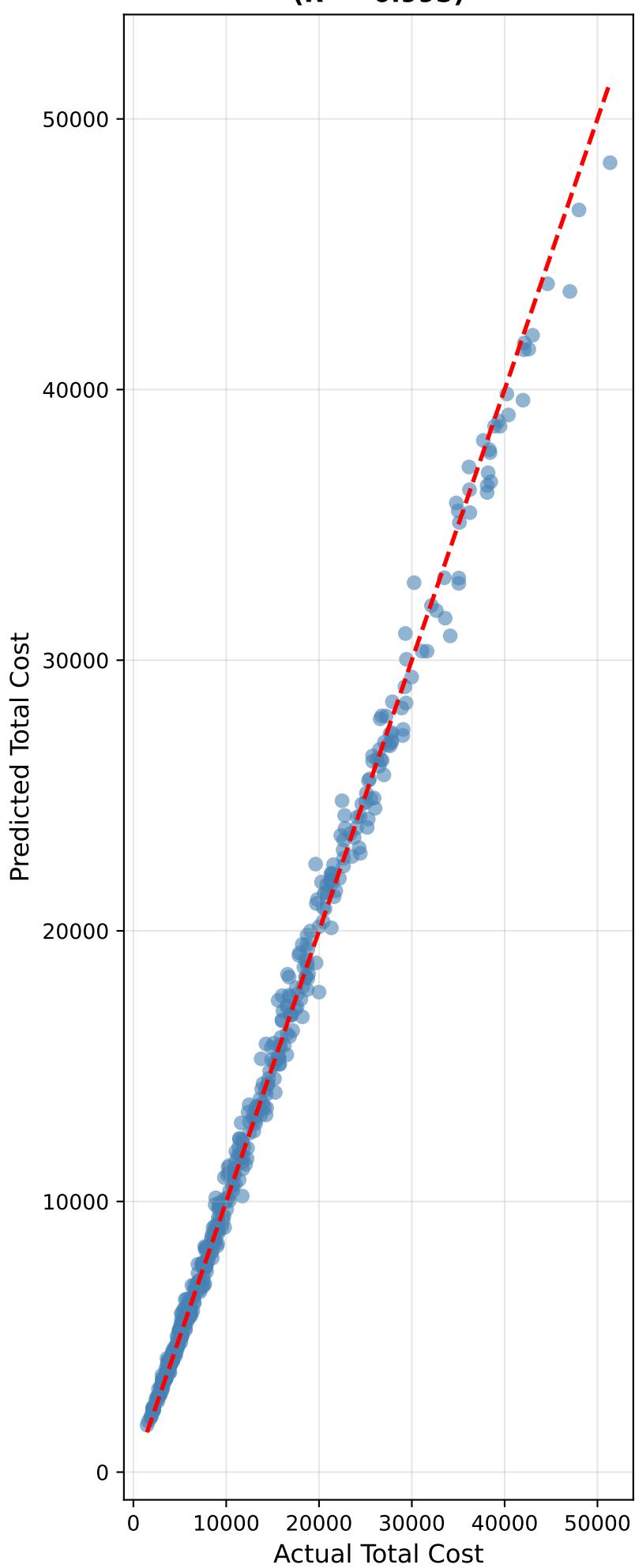
disc_rate
($r = -0.861$)



Model Performance Comparison



Actual vs Predicted
($R^2 = 0.995$)



DETAILED RESULTS TABLES

SUMMARY TABLE (All Methods):

	Parameter	Correlation	Sobol_Like	Random_Forest	Permutation	Linear_Regression	Average_Importance	Std_Importance
4	disc_rate	59.91	75.89	83.88	84.96	58.82	72.69	12.67
1	cost_mitig_unit	19.65	11.45	11.15	11.72	19.42	14.68	4.44
0	tcre	14.93	6.35	3.18	2.61	11.68	7.75	5.39
3	econ_dam_pct	5.17	2.91	1.01	0.51	7.32	3.38	2.86
2	cost_remov_unit	0.34	3.40	0.77	0.21	2.76	1.50	1.48

MODEL PERFORMANCE DETAILS:

Random Forest:

- R² Score: 0.9954
- Number of trees: 100
- Feature importance method: Gini impurity

Linear Regression:

- R² Score: 0.8489
- Features: Standardized
- Method: Ordinary Least Squares

Permutation Importance:

- Baseline R²: 0.9954
- Method: Feature permutation with Random Forest