

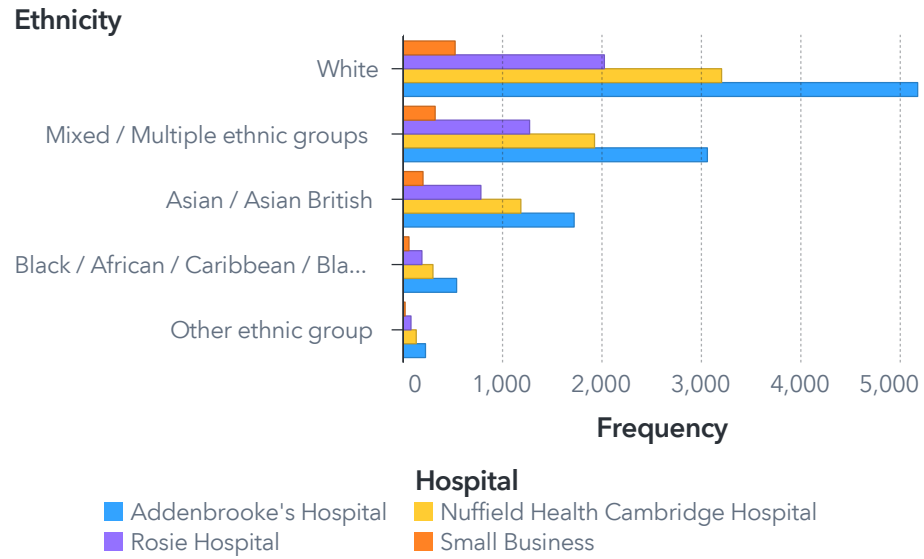
Stent Failure Prediction with ML

Creation Date: Friday, June 23, 2023 09:20:26 AM

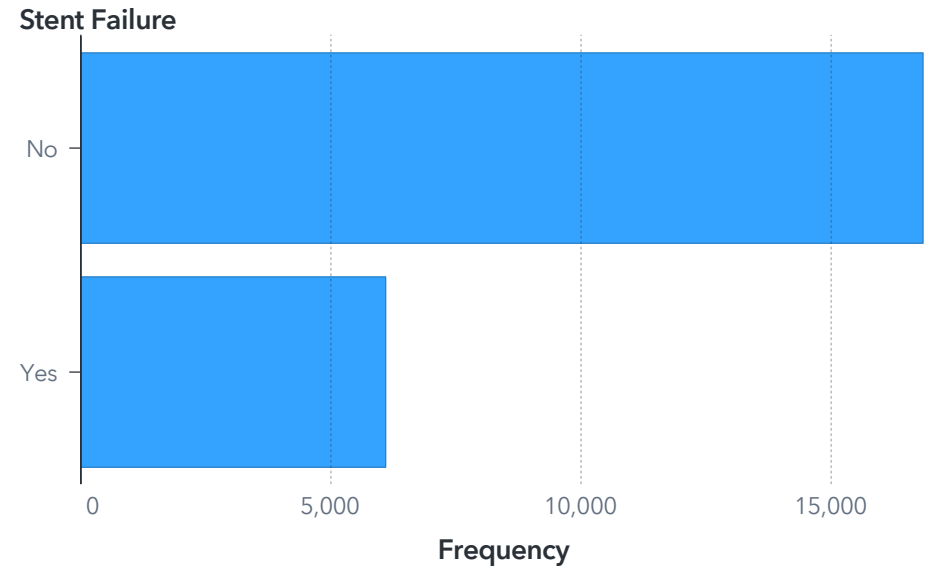
Author: etay386@wgu.edu

Exploratory Analysis

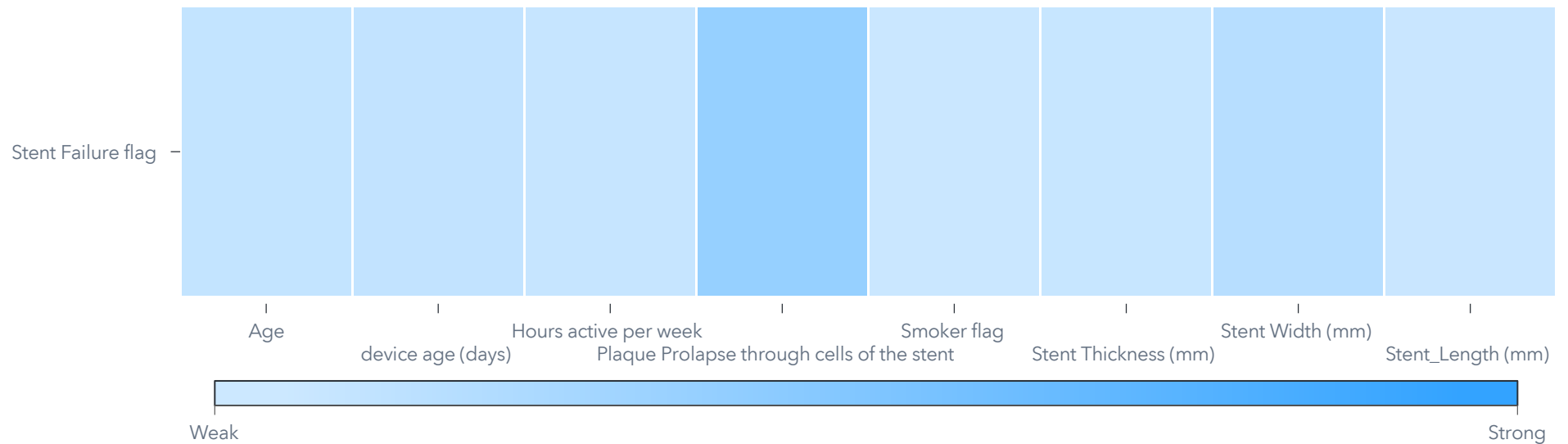
Frequency of Ethnicity grouped by Hospital



Frequency of Stent Failure



Correlation of Selected Measures



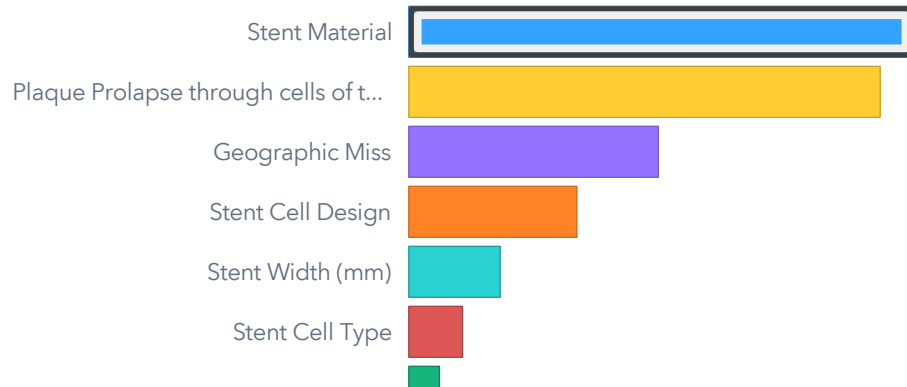
Feature Importance

What are the characteristics of Stent Failure?

Stent Failure has a 73.42% chance (17K of 23K) of being No. It's the most common Stent Failure value.

No	Yes
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What factors are most related to Stent Failure?



What are the groups based on Stent Material by the chance of Stent Failure being No?

89.48%

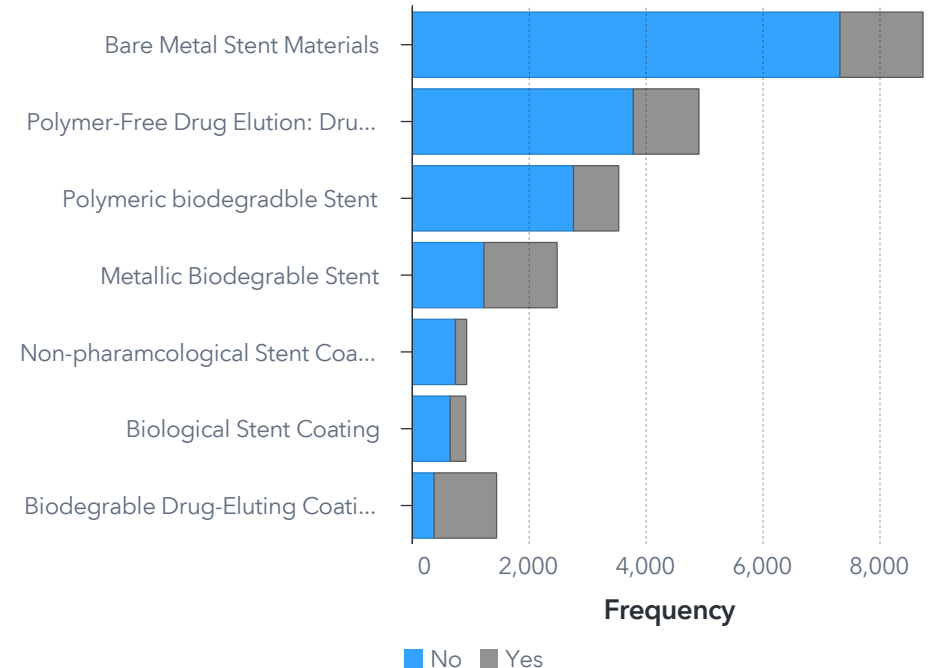
If Plaque Prolapse through cells of the stent is 0, Stent Material is Bare Metal Stent Materials, Biological Stent Coating, Non-pharamcological Stent Coating, Polymer-Free Drug Elution: Drug-Filled Reservoirs, or Polymeric biodegradable Stent, then Stent Failure has a 89.48% chance (11K out of 12K cases) of being No.

89.15%

If Stent Material is Metallic Biodegradable Stent, Multiple Stent is Yes, then Stent Failure has a 89.15% chance of being No.

What is the relationship between Stent Failure and Stent Material?

Stent Material

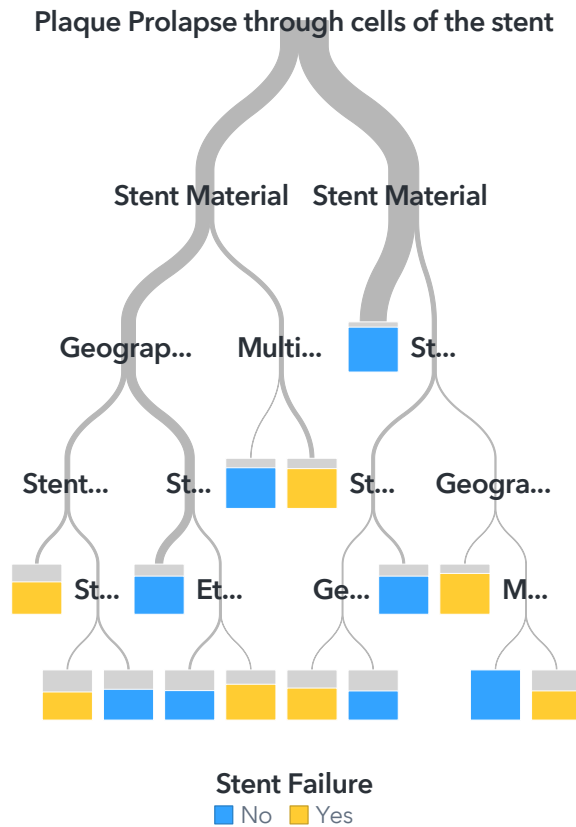


When Stent Material is Bare Metal Stent Materials, the total count of No is a high value; when Stent Material is Metallic Biodegradable Stent, Non-pharamcological Stent Coating, Biological Stent Coating or Biodegradable Drug-Eluting Coating, the total count of No is a low value. The most common Stent Material value is Bare Metal Stent Materials.

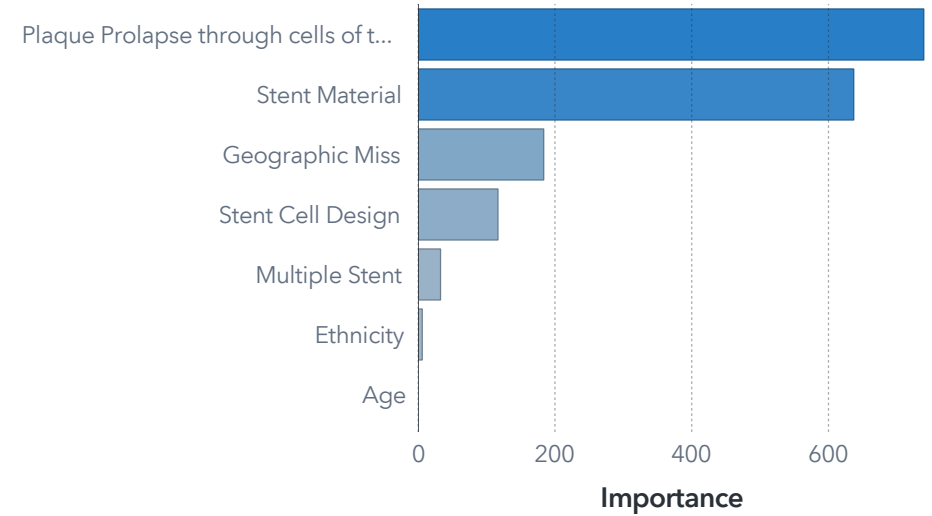
Decision Tree

Decision Tree **Stent Failure** (event=Yes) Validation Cumulative Lift **2.922** Observations Used **22,932**

Tree



Variable Importance



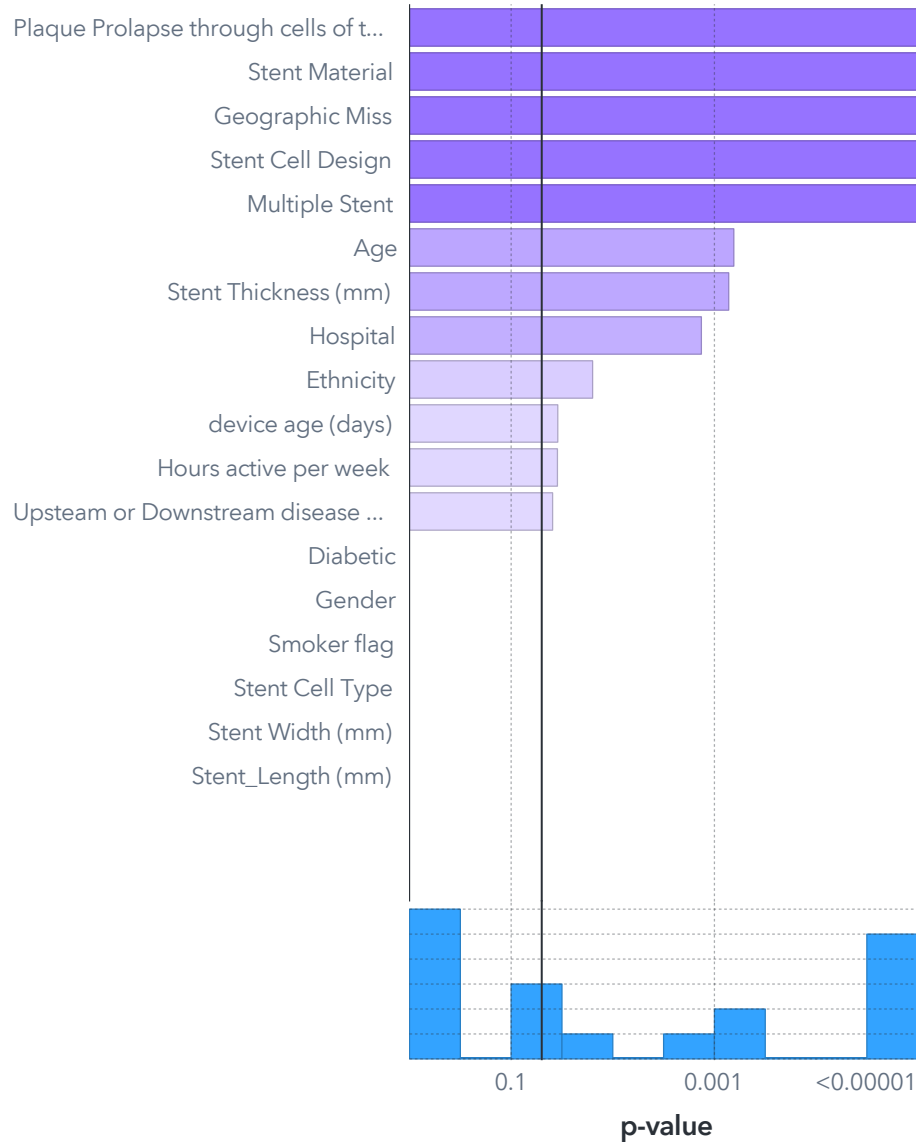
Confusion Matrix

		Observed			
		No		Yes	
Predicted	No	10,921	860	4,685	371
	Yes	2,171	2,100	914	910
		Training		Validation	
		No	Yes	No	Yes

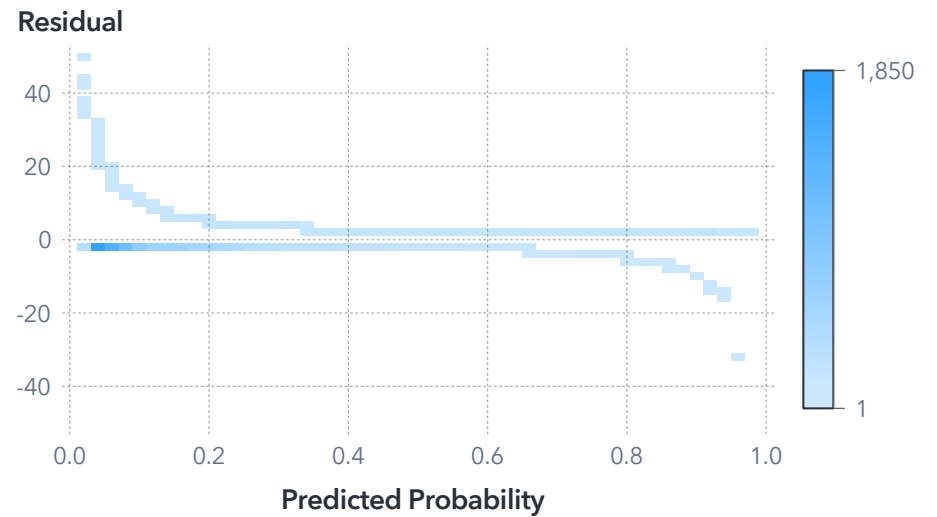
Logistic Regression

Logistic Regression **Stent Failure** (event=Yes) Validation KS (Youden) **0.4933** Observations Used **22,337** Unused **595**

Fit Summary



Residual Plot



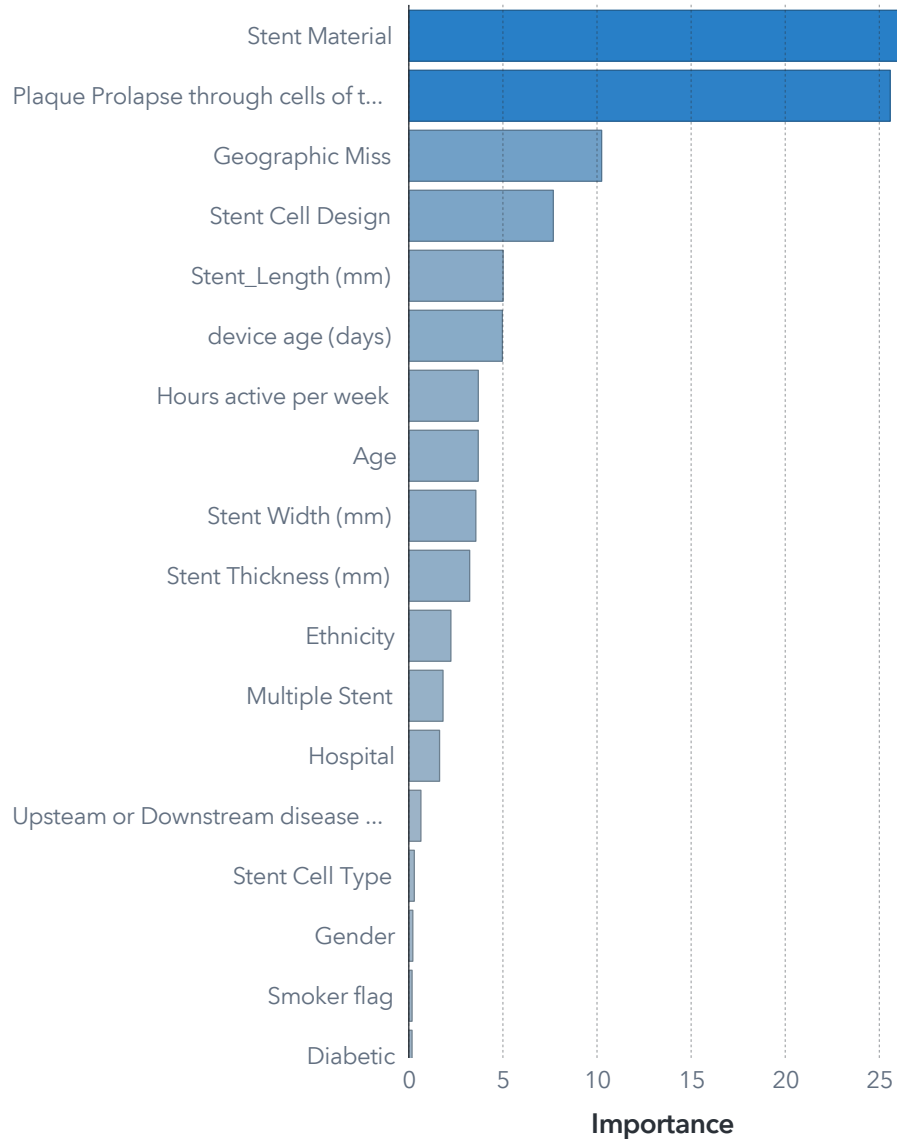
Confusion Matrix

		Observed			
		Training		Validation	
Predicted	No	10,749	777	4,626	330
	Yes	2,175	1,927	932	821
Partition		Training		Validation	

Gradient Boosting

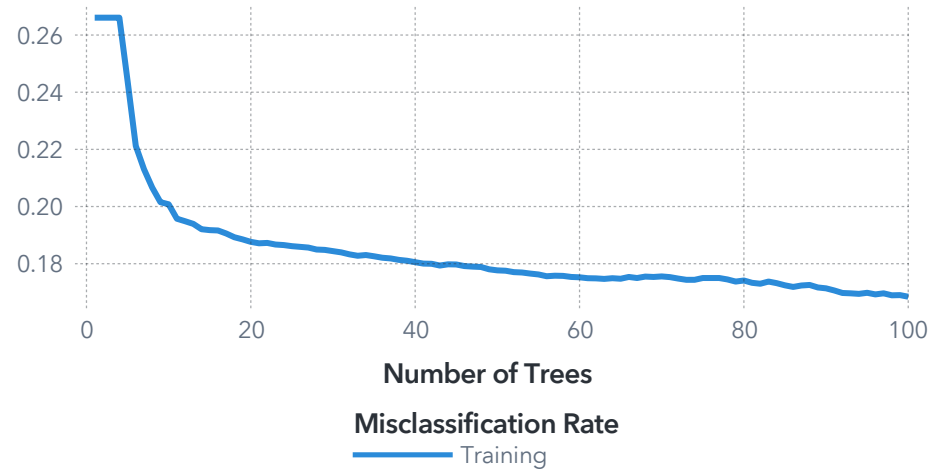
Gradient Boosting **Stent Failure** (event=Yes) Validation KS (Youden) **0.5060** Observations Used **22,932**

Variable Importance



Iteration Plot

Misclassification Rate



Confusion Matrix

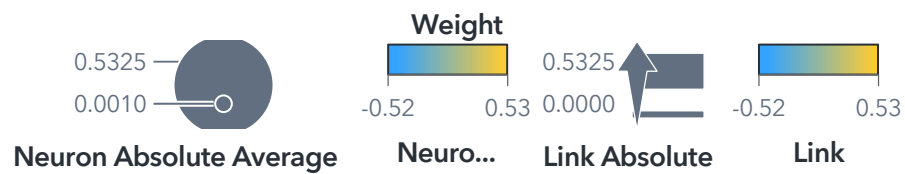
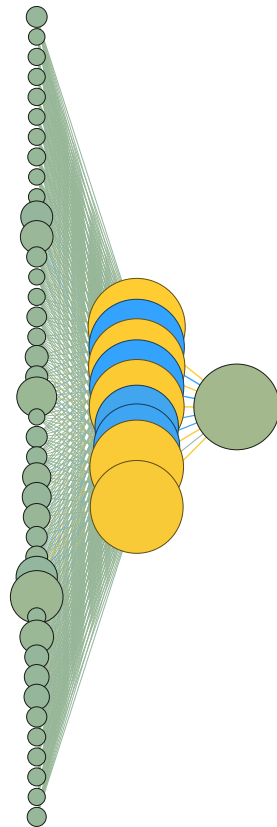
		Observed	
		No	Yes
Predicted	No	11,057	1,980
	Yes	724	2,291
		Validation	
Partition	Training	4,678	908
	Validation	378	916

Neural Network

Neural Network **Stent Failure** (event=Yes) Validation KS (Youden) **0.4916** Observations Used **22,337** Unused **595**

Network

Iteration Plot



⚠ A1.1

Confusion Matrix

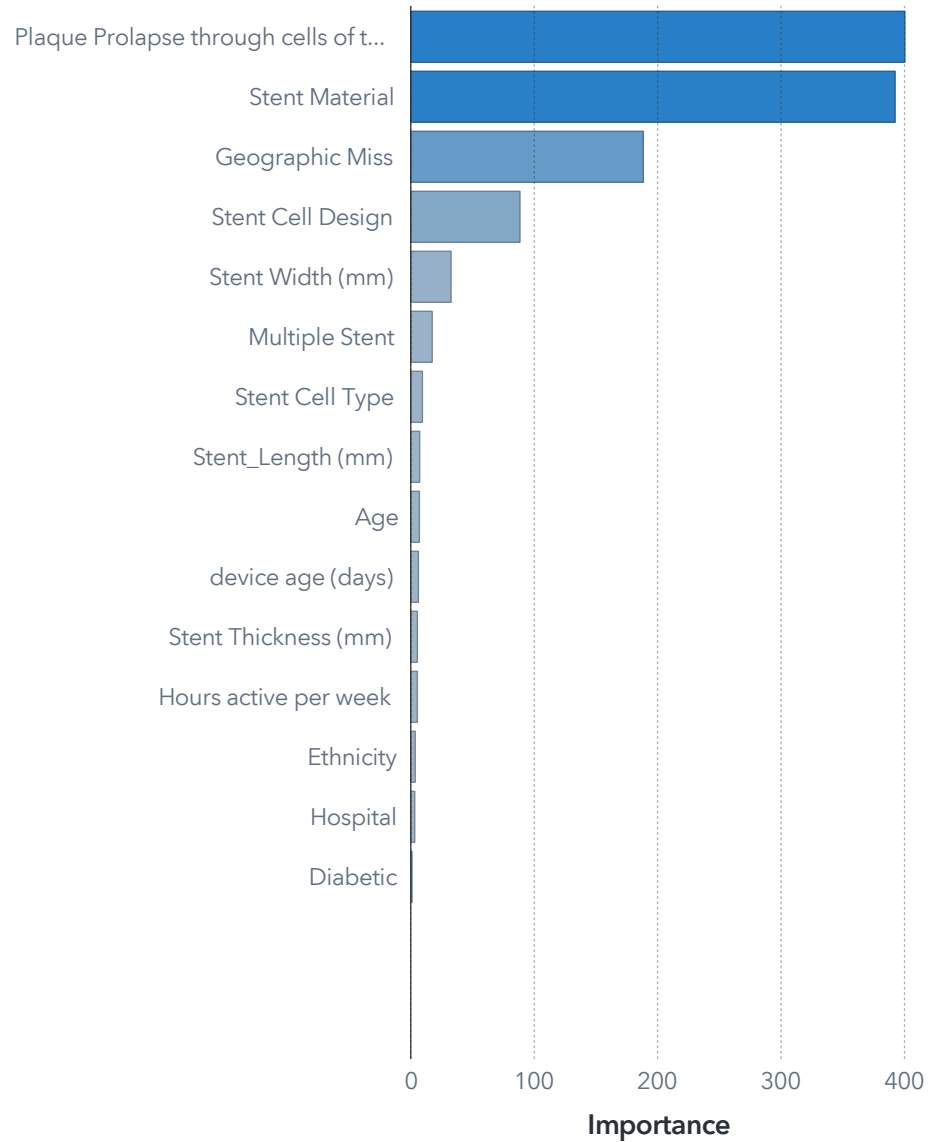
Observed

	Training		Validation	
	No	Yes	No	Yes
No	10,810	716	4,654	302
Yes	2,256	1,846	969	784
Predicted	Training		Validation	

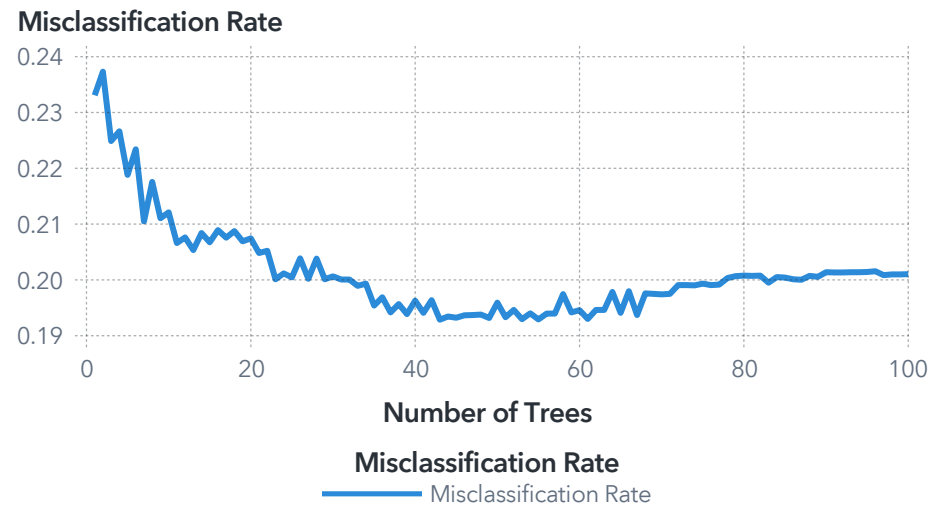
Forest

Forest **Stent Failure** (event=Yes) KS (Youden) **0.4932** Observations Used **22,932**

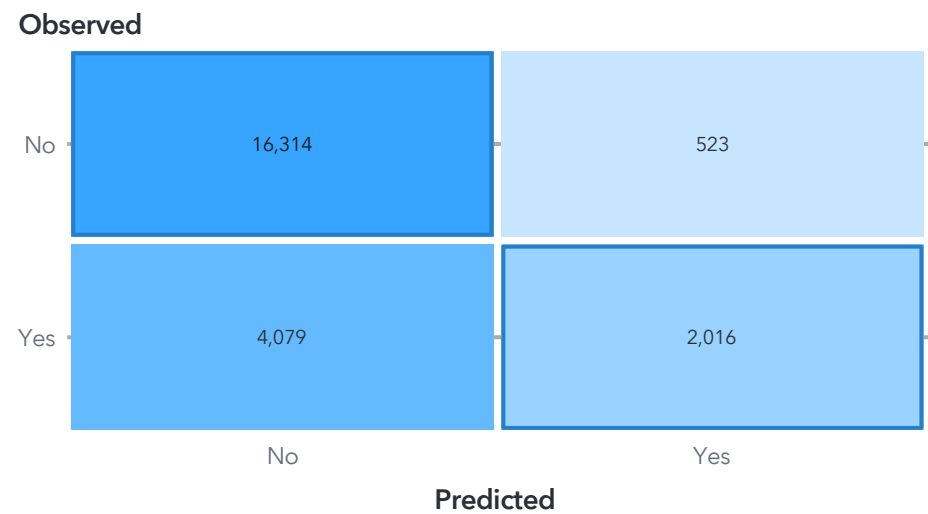
Variable Importance



Error Plot



Confusion Matrix

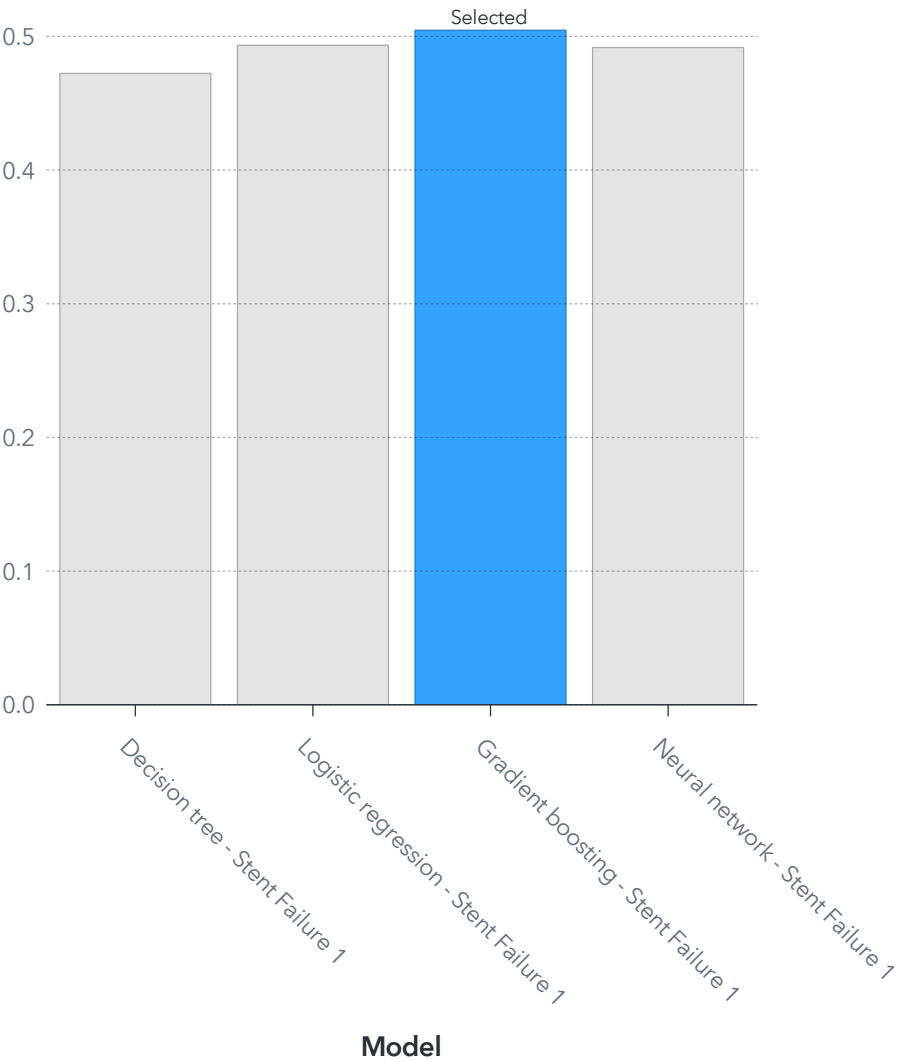


Assessment

Model Comparison **Stent Failure** (event=Yes)

Fit Statistic

Validation: KS (Youden)



Confusion Matrix

Training: Observed

	Decision tree - Stent Failure 1		Logistic regression - Stent Failure 1		Gradient boosting - Stent Failure 1		Neural network - Stent Failure 1	
	Yes	No	Yes	No	Yes	No	Yes	No
Yes	2,599	1,672	2,839	1,263	3,088	1,183	2,829	1,273
No	1,597	10,184	2,245	9,281	1,998	9,783	2,280	9,246

Training: Pre...

Model Decision tree - Stent Failure 1 Logistic regression - Stent Failure 1 Gradient boosting - Stent Failure 1 Neural network - Stent Failure 1

A2.1

Appendix

A1.1 Iteration Plot

Warnings: The graph object refers to an invalid result.

A2.1 Fit Statistic

Warnings: Number of observations for all models do not match.