Machine Learning Applied to Hepatocellular Carcinoma

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Section 1

Background HCC

HepatoCellular Carcinoma (HCC)

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- Data mining approach to tailor evaluation and treatment for HCC are limited in the literature.
- Using the HCC dataset, we undertook the data mining approach to evaluate the patient level factors to identify those who are at risk of one year mortality.

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- The target variable is the survival at 1 year, coded as 0 (dies) and 1 (lives).

Section 2

Random Forest Model

Description

Estimated Performance

Calibration Plots

Variable Importance

Partial Dependence

Section 3

XGBoost Model

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Section 4

Support Vector Machine Model

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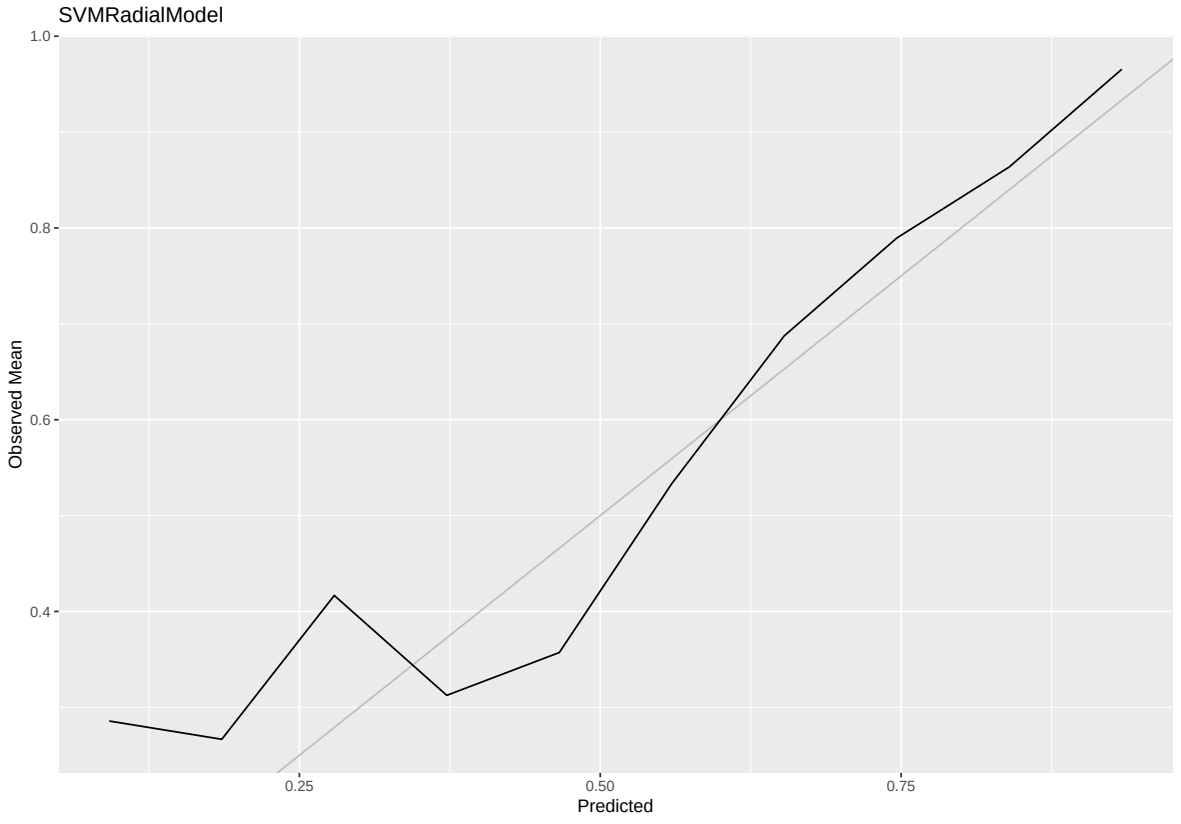
- Cost of misclassification C =0.8956493
- imputation using knn with neighbors = 4

Estimated Performance

Table 1: SVMRad results with knn imputation

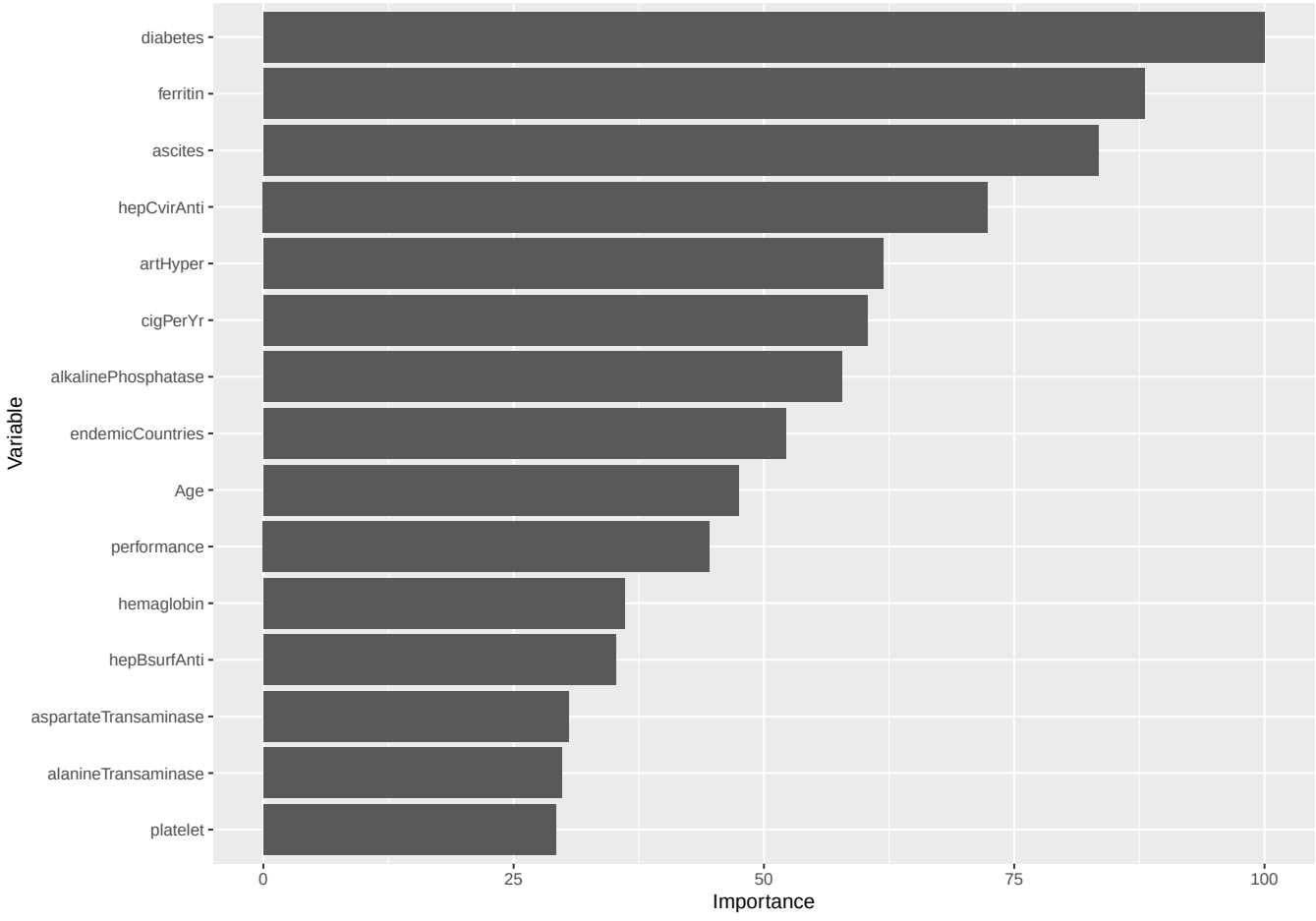
Metric	Mean	Median	SD	Min	Max	NA
Brier	0.176	0.166	0.057	0.101	0.287	0
Accuracy	0.756	0.764	0.119	0.562	0.938	0
Kappa	0.482	0.503	0.254	0.097	0.871	0
ROC AUC	0.818	0.829	0.101	0.600	0.967	0
Sensitivity	0.803	0.809	0.107	0.600	0.909	0
Specificity	0.681	0.643	0.190	0.500	1.000	0

Calibration Plots



- Decently calibrated. Low probabilities have many false negatives.

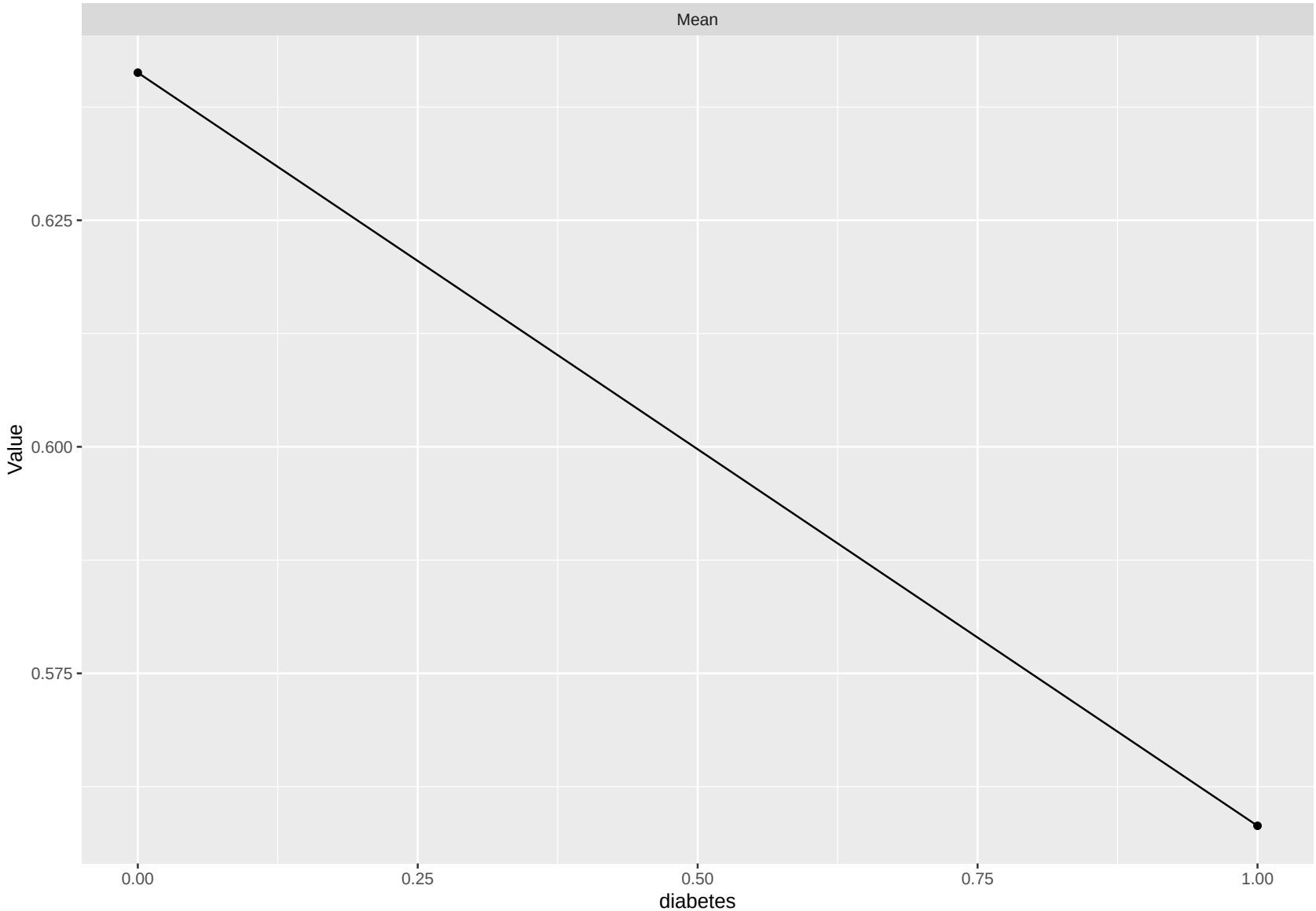
Variable Importance



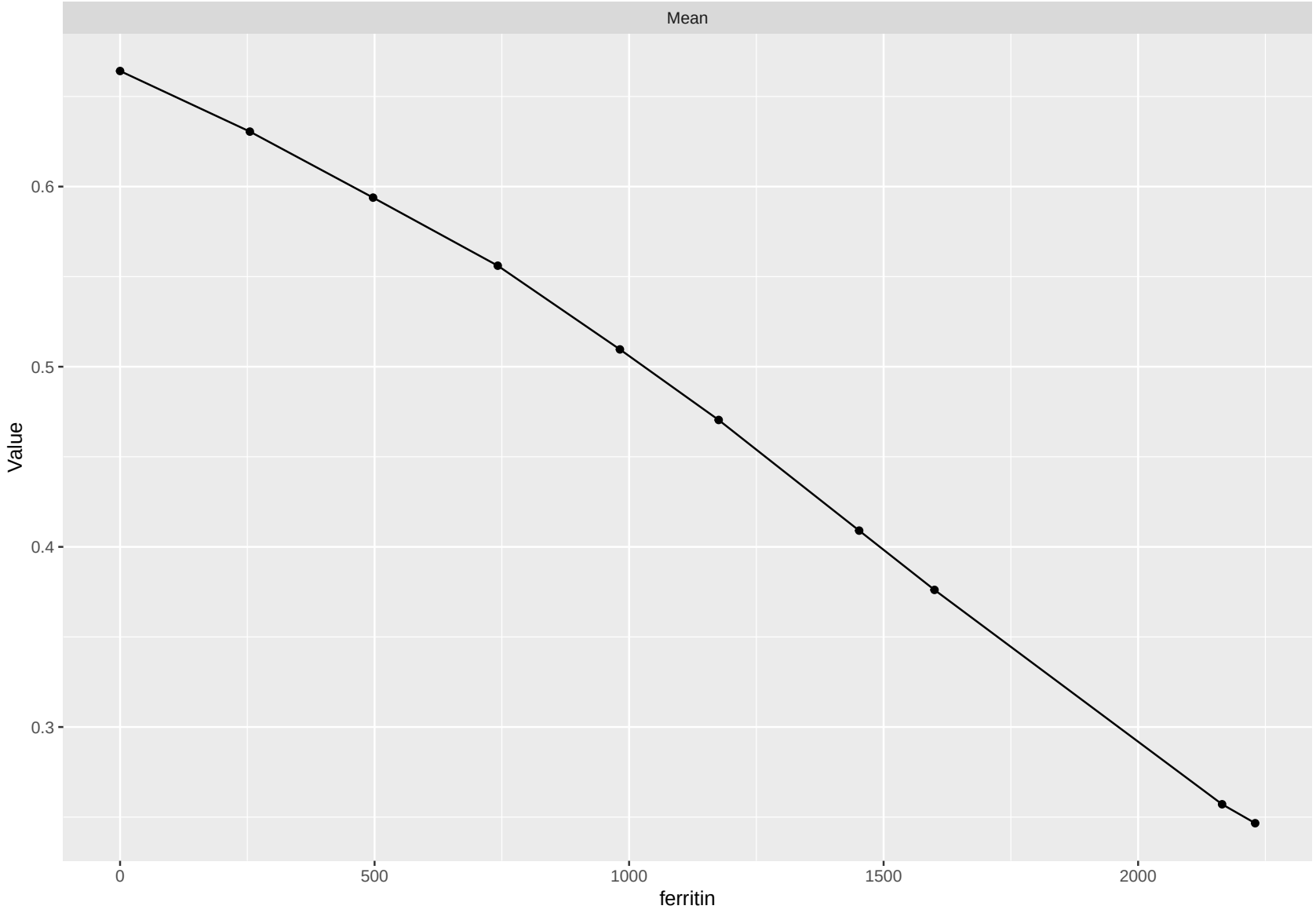
Variable Importance

- Symptoms (performance)
- Indicators of liver injury/disease/infection (hepBsurfAnti, hepCvirAnti,aspartateTransaminase, alkalinePhosphatase, ferritin, totalProteins, ascites, hemoglobin)
- Biological Characteristics (age, portalVeinThromb)
- Risk factors (diabetes, artHyper)
- behavioral/demographic (endemicCountries, cigPerYr)

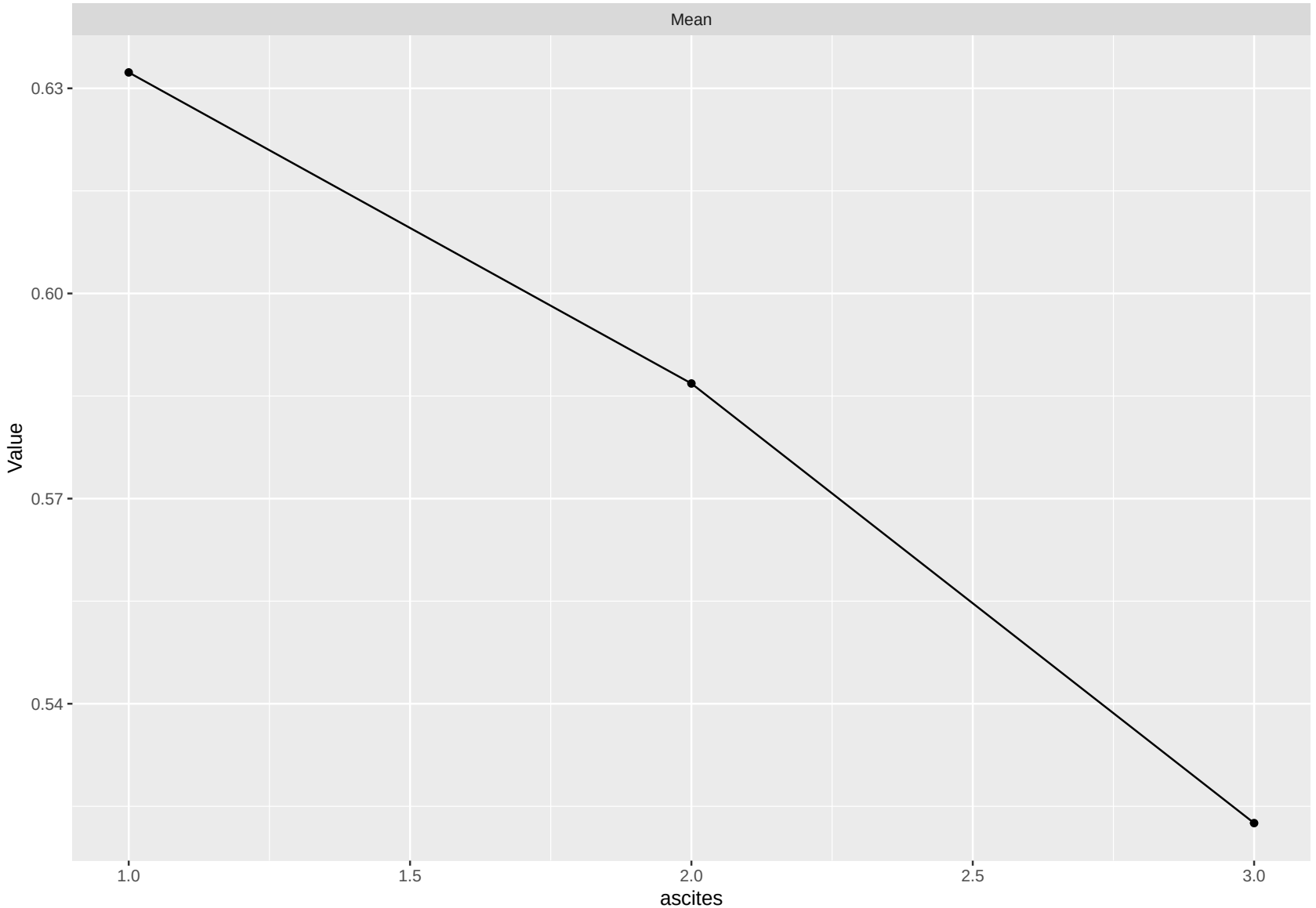
Partial Dependence: diabetes



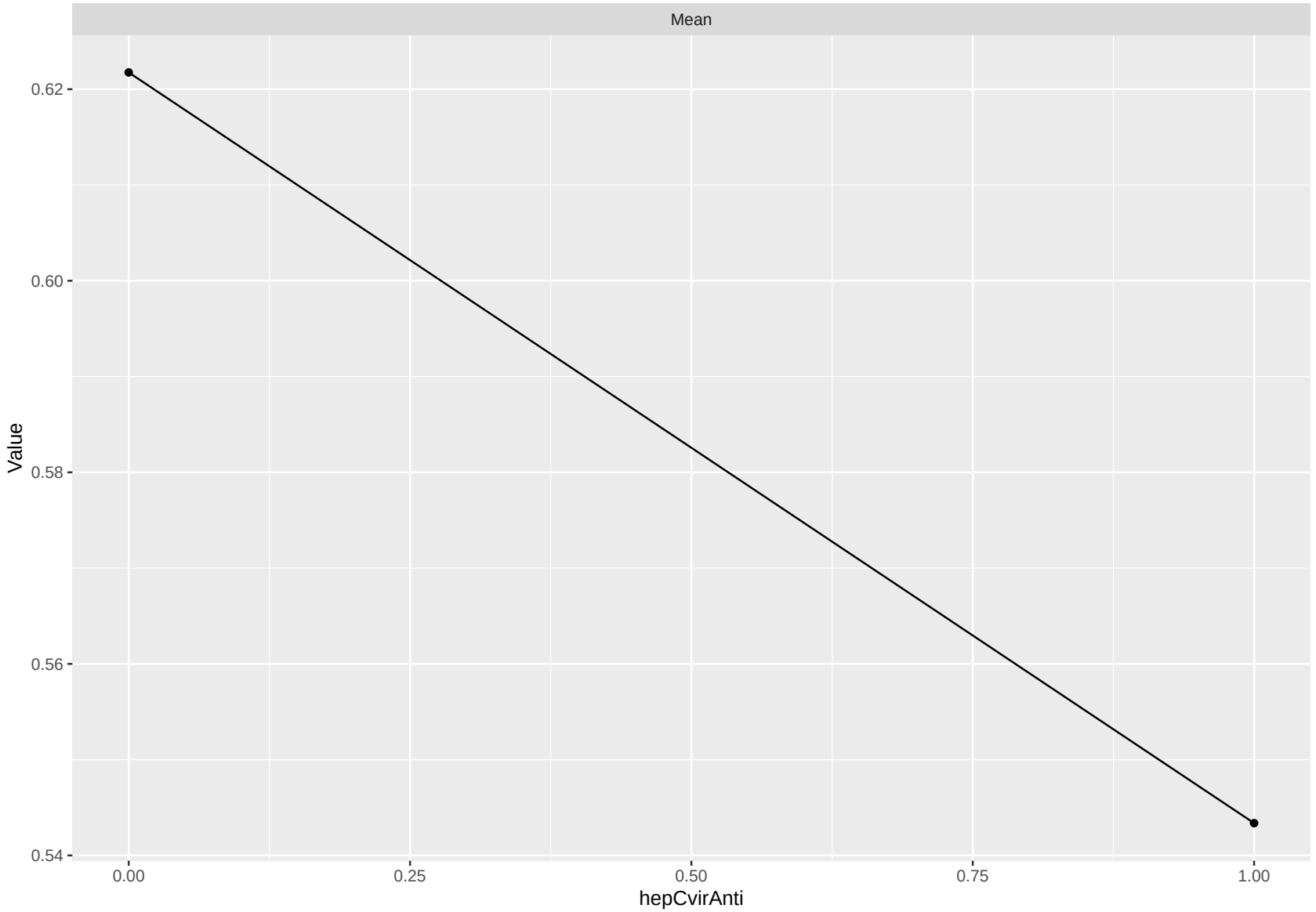
Partial Dependence: ferritin



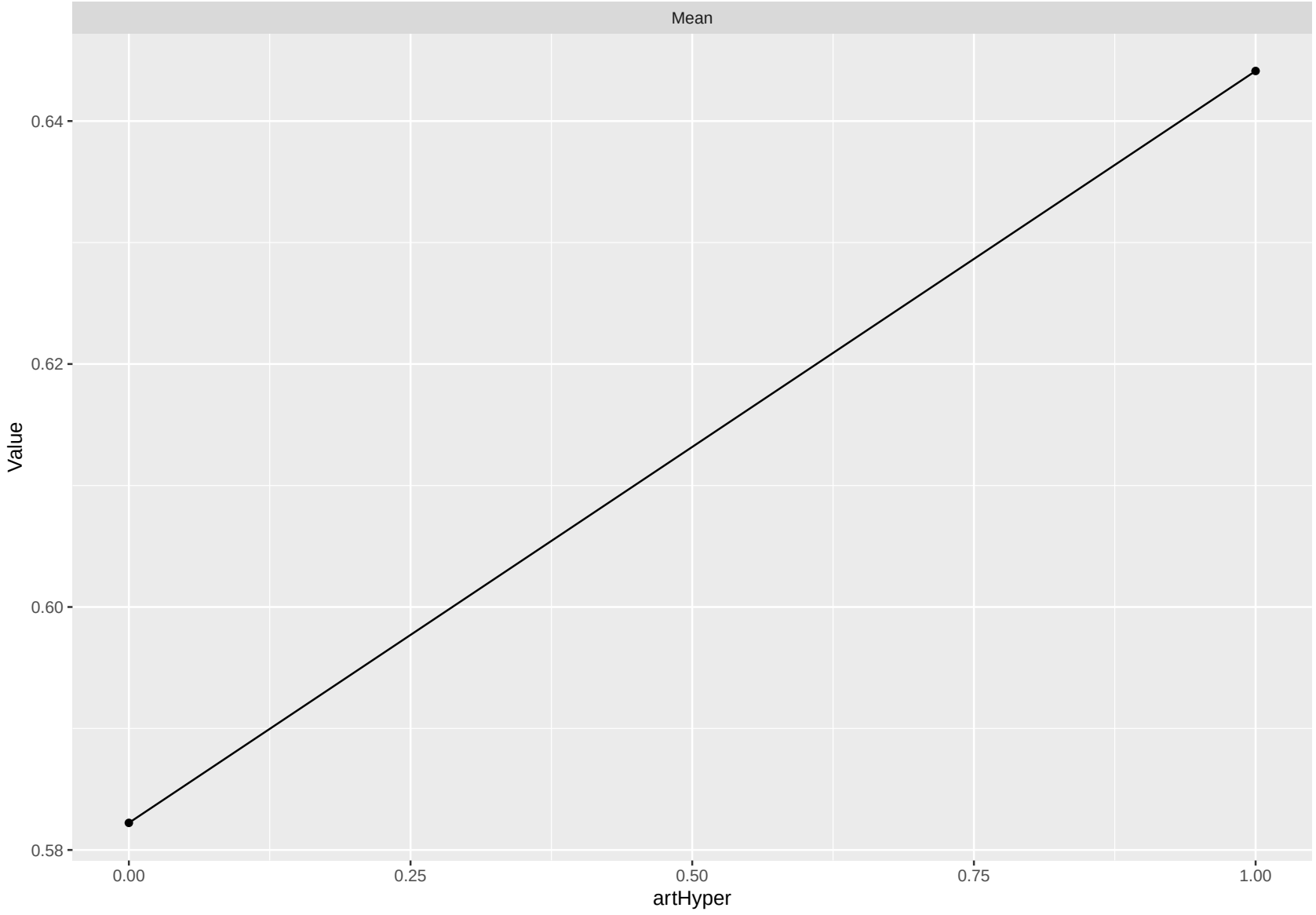
Partial Dependence ascites



Partial Dependence: artHyper



Partial Dependence: symptom



Section 5

Final Model

Final Model

- Final model was chosen by the model with the highest Sensitivity - 2SD

Section 6

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