

Contrast Overuse in Patients with Renal Disease: A Targeted Analysis

Team SuperLearners

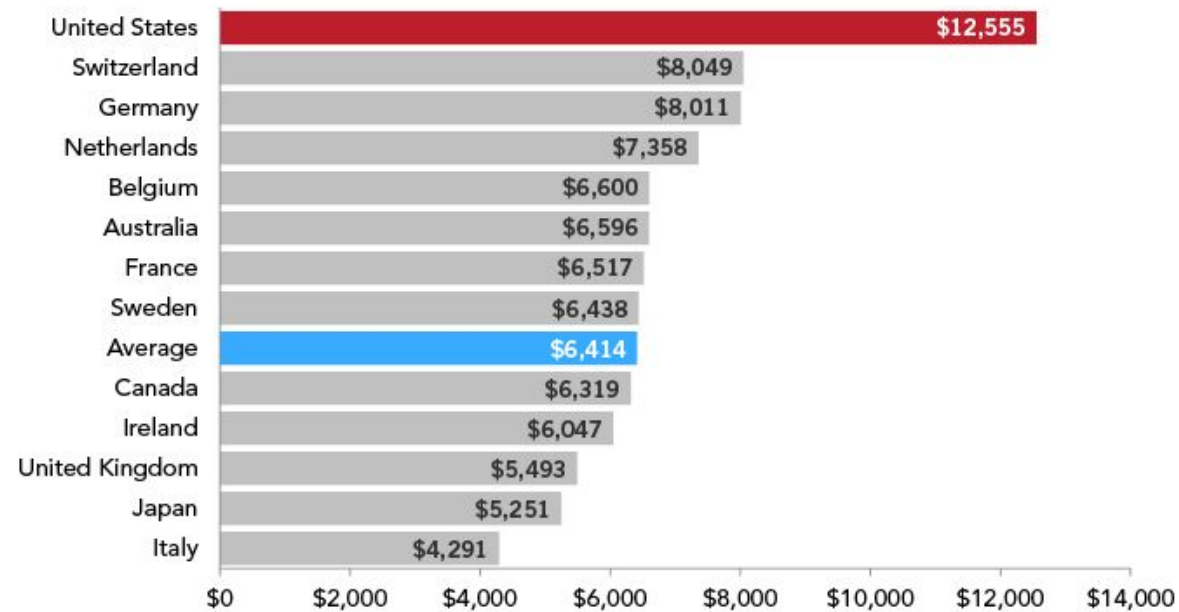


Inspiration



U.S. per capita healthcare spending is over twice the average of other wealthy countries

Healthcare Costs per Capita (Dollars)



SOURCE: Organisation for Economic Co-operation and Development, *OECD Health Statistics 2023*, July 2023.

NOTES: Data are from 2022 and include provisional values from some countries. Average does not include the United States. The five countries with the largest economies and those with both an above median GDP and GDP per capita, relative to all OECD countries, were included. Chart uses purchasing power parities to convert data into U.S. dollars.

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Inspiration



Inspiration



Inspiration



Aims

- (1) Predict CT and MRI Contrast Use
- (2) Predict Patient Mortality and Readmission
- (3) Estimate Differences in Adverse Outcomes Following Imaging with Contrast

Datasets

1. MIMIC-IV-ED

- Vitals, Medication, Diagnoses

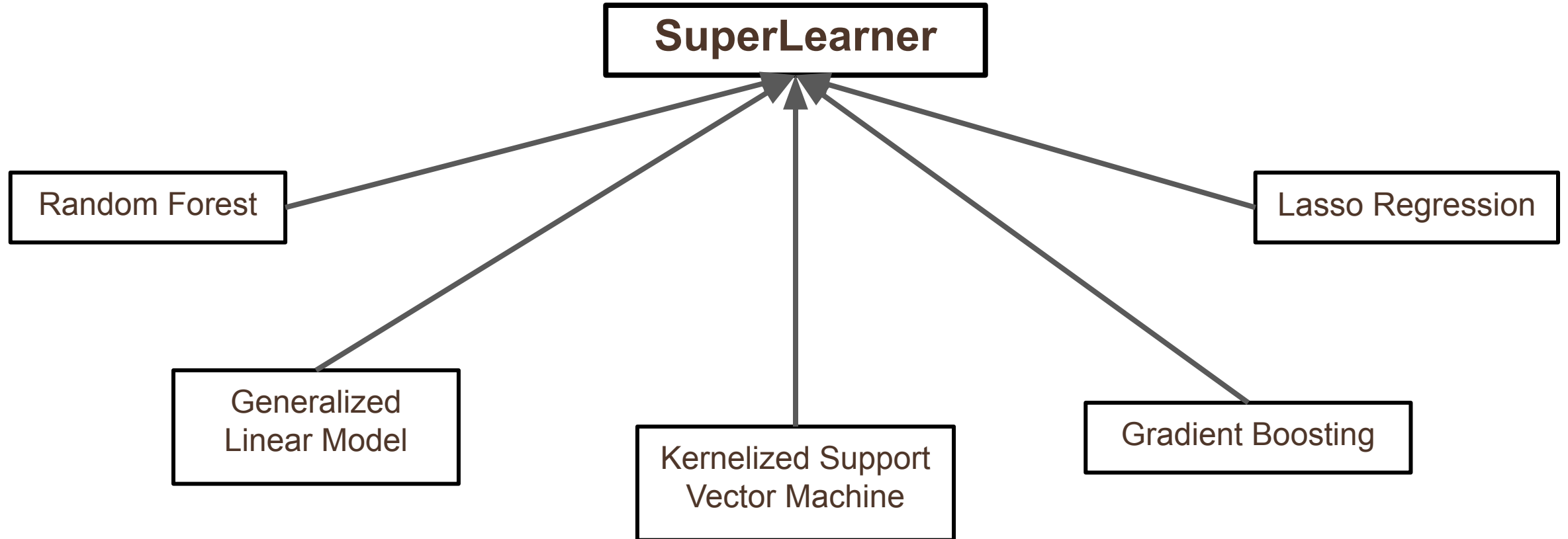
2. MIMIC-IV

- Age, Sex, Race, Insurance, Marital status, DRG

3. MIMIC-IV-Note

- CT and MRI contrast imaging

Methodology



Targeted Maximum Likelihood Estimation

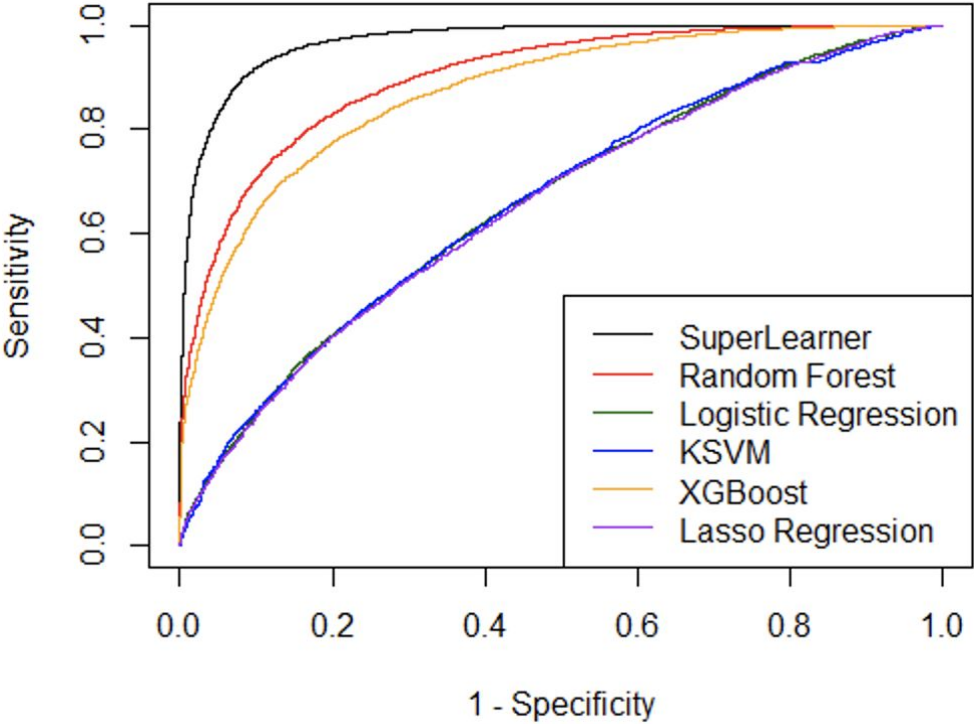
$$Q(A, W) = E[Y|A, W]$$

$$g(A, W) = P[A = 1|W]$$

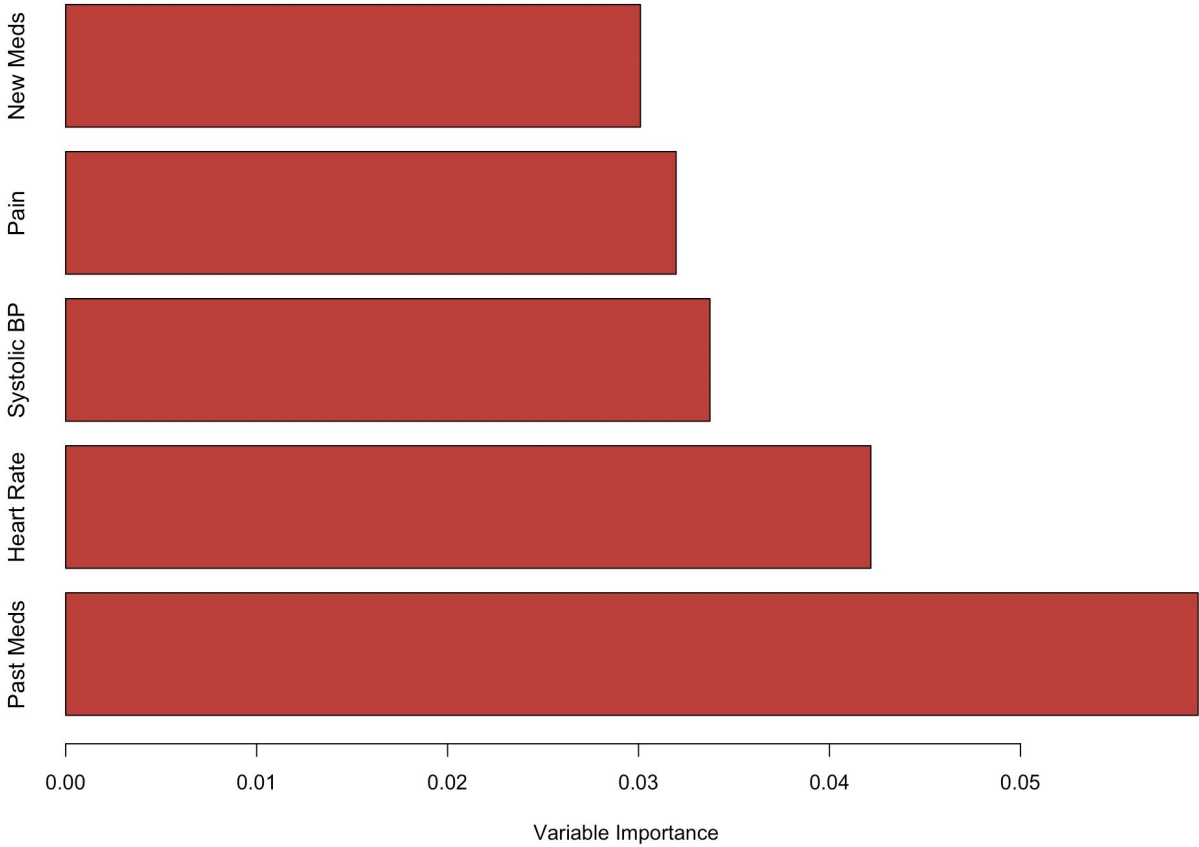
Targeted Maximum Likelihood Estimation

$$ATE = \frac{1}{n} \sum [Q(1, W) - Q(0, W)]$$

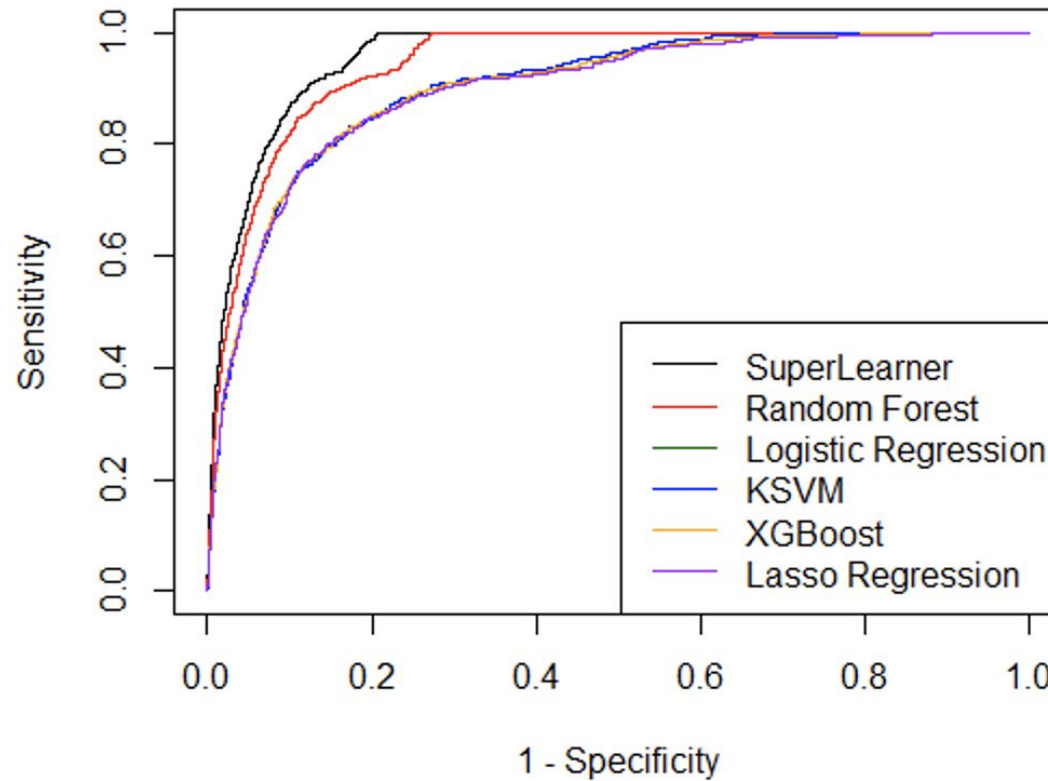
CT with Contrast Prediction Results (Aim 1)



AUC: 0.9701
Accuracy: 90.2%



Mortality Prediction Results (Aim 2)

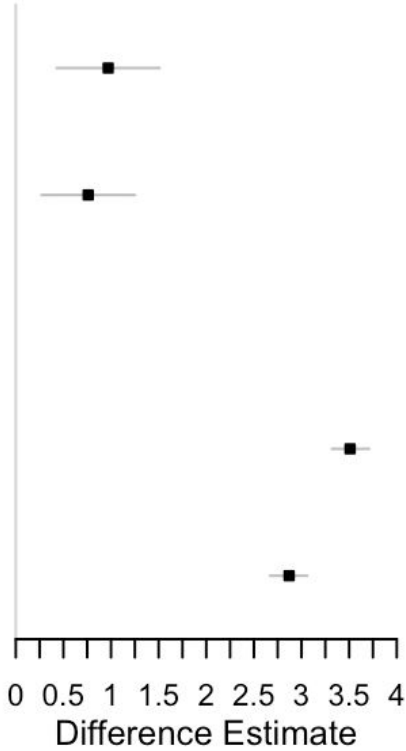


AUC: 0.9752

Accuracy: 98%

TMLE Results (Aim 3)

	Difference Estimate	95% CI
Risk of Mortality		
CT with Contrast Use	0.97%	(0.43%, 1.51%)
MRI with Contrast Use	0.76%	(0.27%, 1.25%)
Number of Readmissions		
CT with Contrast Use	3.51	(3.32, 3.71)
MRI with Contrast Use	2.87	(2.67, 3.06)



Conclusions

- Imaging with contrast associated with increases in mortality risk and number of readmissions
 - CT with contrast > MRI with contrast
- Imaging with contrast decreases value of care
 - Increased costs
 - Worse overall outcomes
- Increased push against contrast use in patients with underlying renal disease
 - Hospital policies
 - EHR warnings when ordering
 - Lowering insurance payments for low-value care

Thank You

