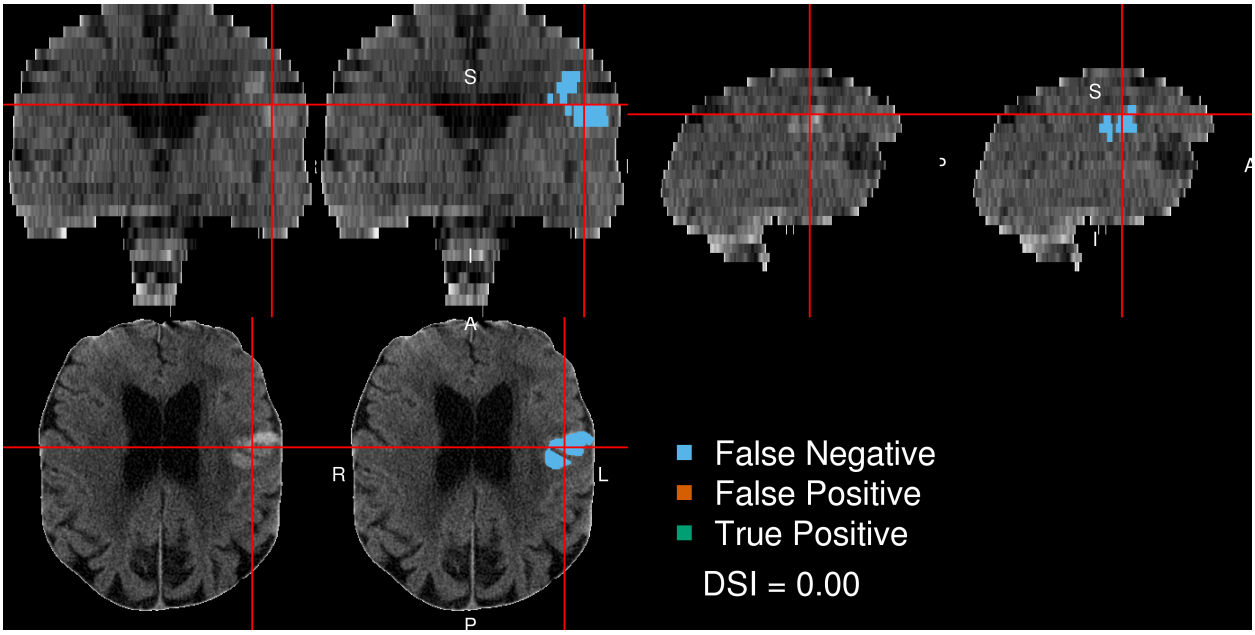

Figure S1: **Patient with Lowest Dice Similarity Index**. We present the patient with the lowest Dice Similarity Index (DSI), a measure of spatial overlap, from the chosen predictor model fit with a random forest. The lowest DSI was 0. The green indicates a correct classification of ICH from the model, blue indicates a false negative, where the manual segmentation denoted the area to be ICH but the predicted one did not, and red indicates a false positive, where the predicted segmentation denoted the area to be ICH but the manual one did not.

5. Supplemental Material

5.1. Examples of Dice Similarity Index in Test Scans

5.2. Model Specification

Let $Y_i(v)$ represent the binary hemorrhage mask indicator for voxel v, from patient i, and $x_{i,v}(k)$ represent the predictor image for image j, $j = 1, \ldots 21$.

$$\text{logit}\left(P(Y_i(v) = 1)\right) = \beta_0 + \sum_{j=1}^{21} x_{i,j}(v)\beta_j$$

The coefficients for the logistic model are (in log odds or log odds ratios):

The specification for the functional form of the model fit with the LASSO penalty, is the same, but optimizes the following criteria (`https://web.stanford.edu/~hastie/glmnet/glmnet_alpha.html#log`):

$$\min_{\beta} -\left(\frac{1}{\sum_i V_i}\sum_i Y_i(v) \times X_i(v)\beta - \log\left(1 + e^{X_i(v)\beta}\right)\right) + \lambda \sum_k |\beta_k|$$

5.3. Variable Importance Plot

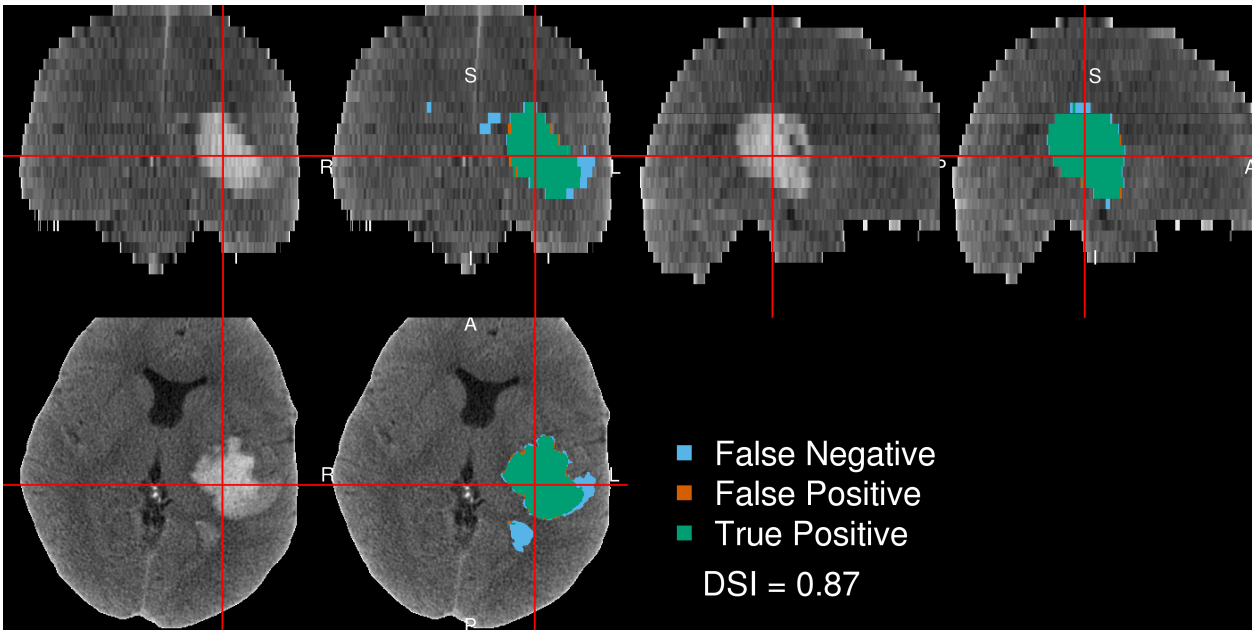

Figure S2: **Patient with 25$^{\text{th}}$ Quantile Dice Similarity Index**. We present the patient with the 25$^{\text{th}}$ quantile Dice Similarity Index (DSI), a measure of spatial overlap, from the chosen predictor model fit with a random forest. The 25$^{\text{th}}$ quantile DSI was 0.87. The green indicates a correct classification of ICH from the model, blue indicates a false negative, where the manual segmentation denoted the area to be ICH but the predicted one did not, and red indicates a false positive, where the predicted segmentation denoted the area to be ICH but the manual one did not.

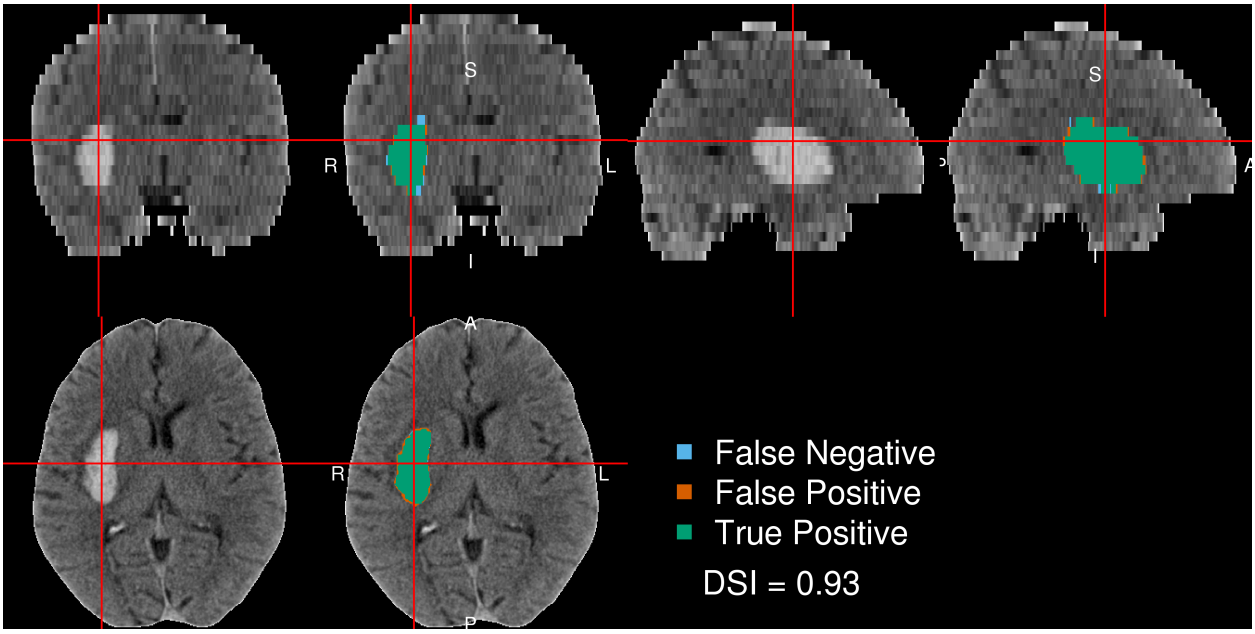

Figure S3: **Patient with 75$^{\text{th}}$ Quantile Dice Similarity Index**. We present the patient with the 75$^{\text{th}}$ quantile Dice Similarity Index (DSI), a measure of spatial overlap, from the chosen predictor model fit with a random forest. The 75$^{\text{th}}$ quantile DSI was 0.93. The green indicates a correct classification of ICH from the model, blue indicates a false negative, where the manual segmentation denoted the area to be ICH but the predicted one did not, and red indicates a false positive, where the predicted segmentation denoted the area to be ICH but the manual one did not.

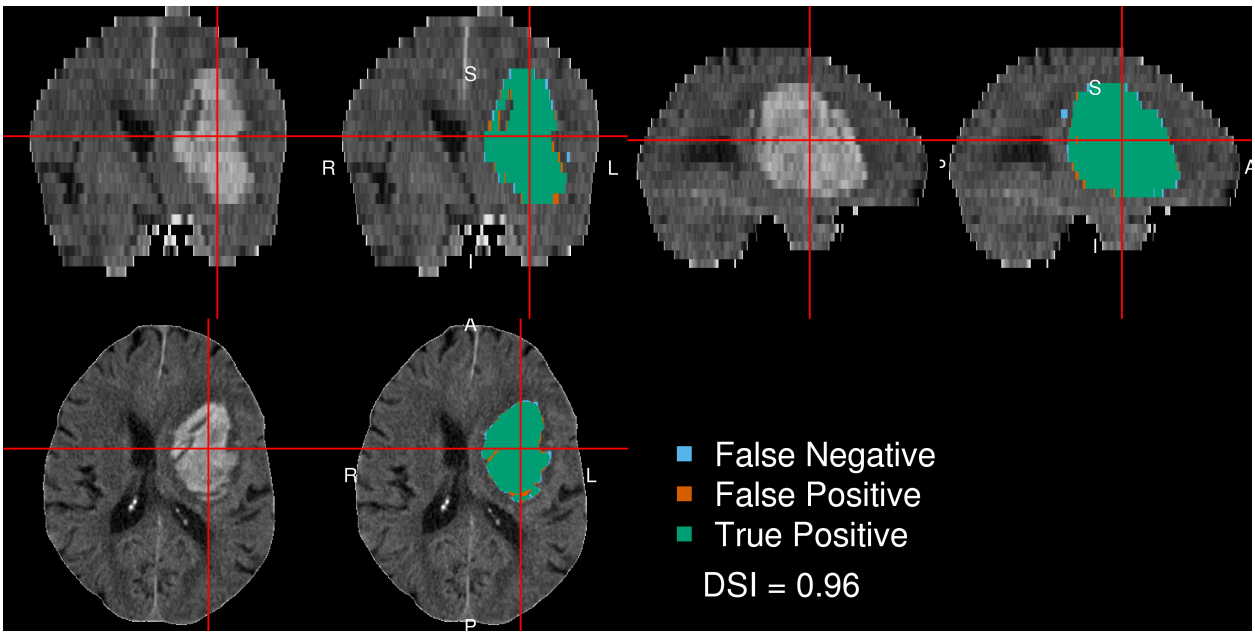

Figure S4: **Patient with Highest Dice Similarity Index**. We present the patient with the highest Dice Similarity Index (DSI), a measure of spatial overlap, from the chosen predictor model fit with a random forest. The highest DSI was 0.96. The green indicates a correct classification of ICH from the model, blue indicates a false negative, where the manual segmentation denoted the area to be ICH but the predicted one did not, and red indicates a false positive, where the predicted segmentation denoted the area to be ICH but the manual one did not.

Predictor	Beta	SE	Z
Intercept	1.008	0.331	3.046
Neighborhood mean	0.051	0.010	4.964
Neighborhood sd	0.000	0.000	0.304
Neighborhood skew	0.065	0.046	1.415
Neighborhood kurtosis	-0.352	0.026	-13.357
Image intensity (HU)	-0.172	0.012	-14.741
Threshold ($\geq$ 40 and $\leq$ 80)	-0.151	0.072	-2.090
Within-plane coronal	-0.632	0.050	-12.537
Within-plane sagittal	-0.249	0.057	-4.381
Within-plane axial	1.037	0.056	18.354
Winsorized standardized (20% trim)	0.547	0.041	13.518
Percentage thresholded neighbors	2.061	0.172	11.955
Atropos probability image	0.150	0.092	1.635
Percent of zero neighbors	-9.180	1.437	-6.387
Indicator of any zero neighbors	0.071	0.345	0.205
Distance to image centroid	-0.087	0.002	-45.265
Gaussian smooth ($\sigma = 5\text{mm}^3$)	-0.051	0.014	-3.591
Gaussian smooth ($\sigma = 10\text{mm}^3$)	0.550	0.022	25.416
Gaussian smooth ($\sigma = 20\text{mm}^3$)	-0.390	0.020	-19.757
Standardized-to-template intensity	1.460	0.034	43.100
Contralateral difference	0.033	0.002	17.530

Table 1: Beta coefficients (log odds ratio) for the logistic regression model for all coefficients. Combining these for each voxel value and using the inverse logit transformation yields the probability that voxel is ICH. After smoothing by 1 voxel in all 3 directions, the probability cutoff for thresholding was 0.5481. We note the standardized-to-template intensity and the neighborhood mean appear to be the strongest predictors.

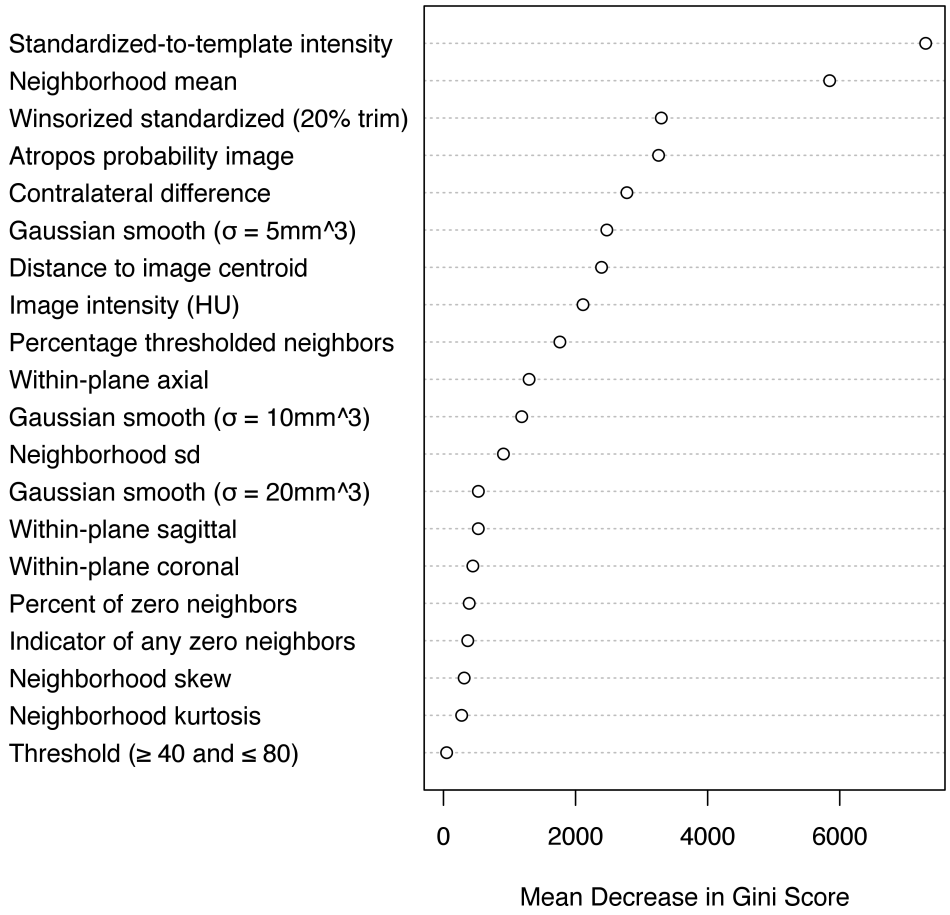

Figure S5: **Variable Importance Plot of Random Forest Classifier**. These numbers represent the mean decrease in the Gini coefficient in the random forest classifier for all coefficients. After smoothing by 1 voxel in all 3 directions, the probability cutoff for thresholding with this classifier was 0.509.

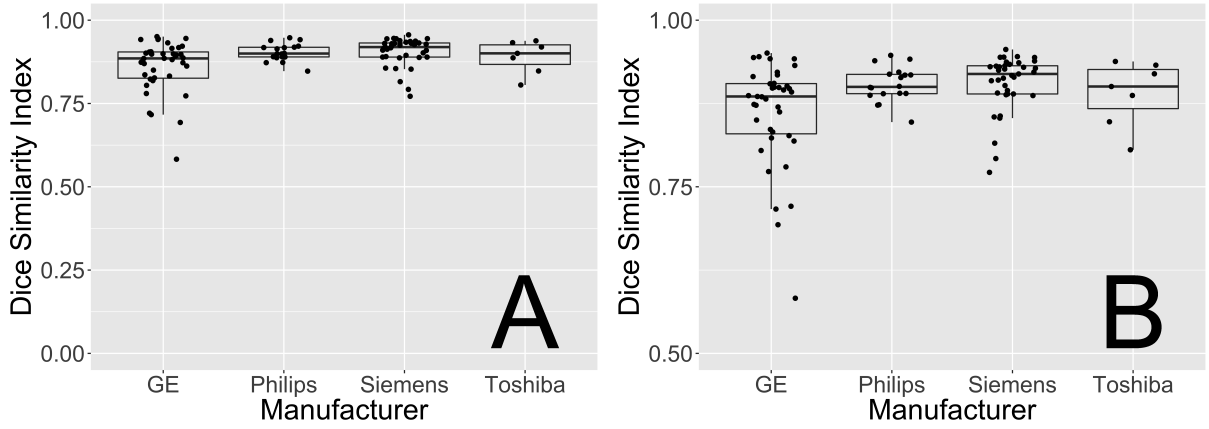

Figure S6: **Dice Similarity Index (DSI) by CT Scanner Manufacturer**. Here we present the DSI for all patients in the test set for the different scanner manufacturers (panel A). We note that the failed segmentation was a patient scanned with a GE scanner. We present the same data in panel B without that patient to illustrate the distributions of the DSI by scanner (note the y-axis begins at 0.5 DSI). All median DSI is relatively high. We see the lowest median DSI for patients scanned in GE scanners, comparable median DSI for Toshiba and Philips, slightly higher DSI for those scanned in a Siemens machine.

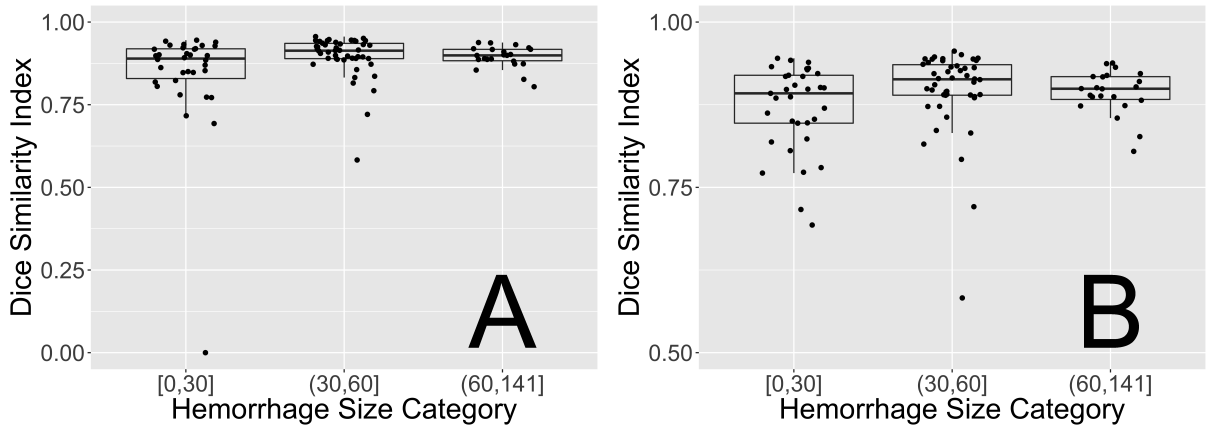

Figure S7: **Dice Similarity Index (DSI) by Hemorrhage Volume Category**. Here we present the DSI for all patients in the test set for the different hemorrhage voxel categories, described above (panel A). We will denote the categories as small, medium and large. We note that the failed segmentation was in the small category. We present the same data in panel B without that patient to illustrate the distributions of the DSI by category (note the y-axis begins at 0.5 DSI). All median DSI is relatively high. We see the lowest median DSI for patients with small hemorrhages, followed by large hemorrhages, and the highest median DSI is in the medium hemorrhages.