

Error in eval(expr, envir, enclos): Argument 'x' must be a matrix or a vector.

Error in eval(expr, envir, enclos): 'x' must be numeric
 Error in eval(expr, envir, enclos): 'x' must be numeric
 Error in eval(expr, envir, enclos): object 'all.int.tests' not found
 Error in smooth\$wt.p.value: object of type 'closure' is not subsettable
 Error in smooth[, num]: object of type 'closure' is not subsettable
 Error in smooth\$variable: object of type 'closure' is not subsettable
 Error in smooth\$smooth = NULL: object of type 'closure' is not subsettable
 Error in smooth["Dice Similarity Index",]: object of type 'closure' is not subsettable

Validated Automatic Brain Extraction of Head CT Images

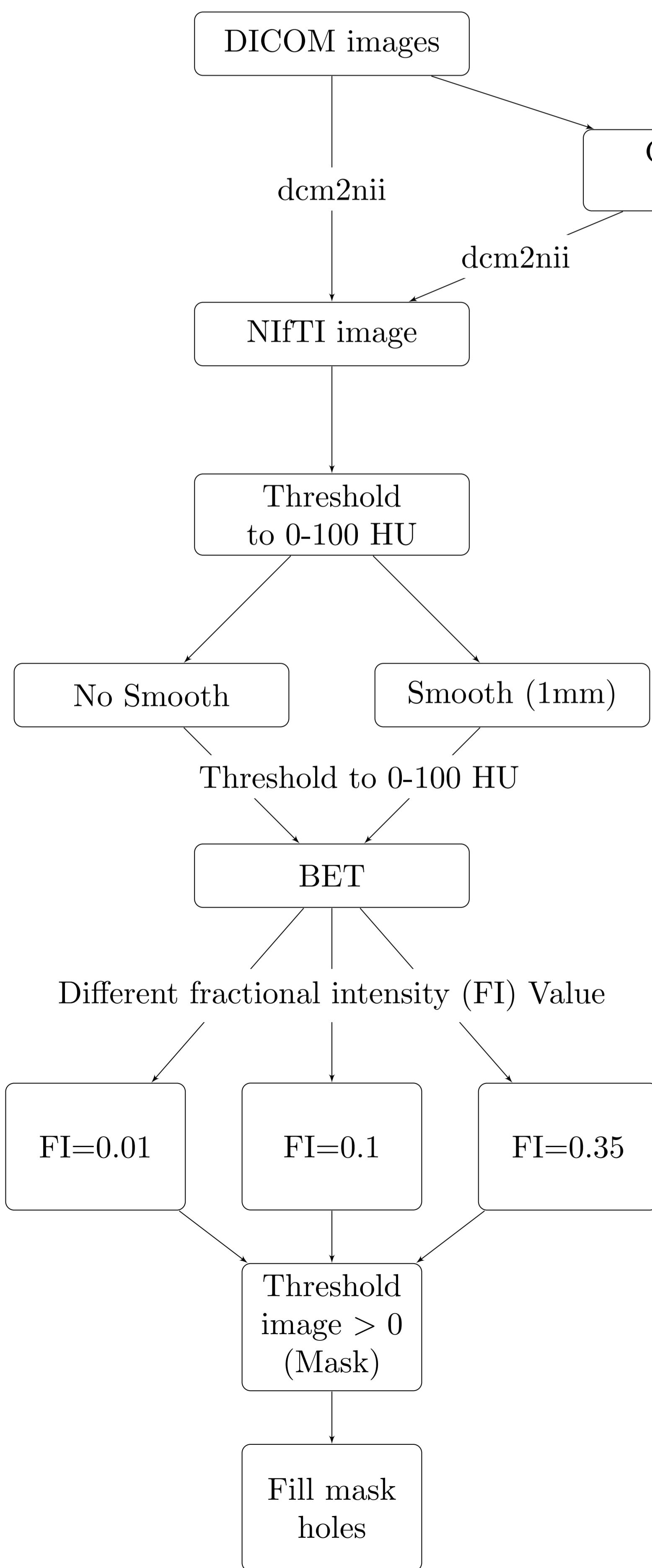
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Image Processing Pipeline



Systematically analyze the performance of the brain extraction tool (BET) [2], a function of the FMRIB software library (FSL) [1], on head CT images of patients with intracranial hemorrhage by varying parameters of BET and the use of smoothing after performing CT-specific preprocessing by:

- Quantitatively comparing the results to the manual gold standard, and
- Estimating the performance using the intraclass correlation of serial CT scans.

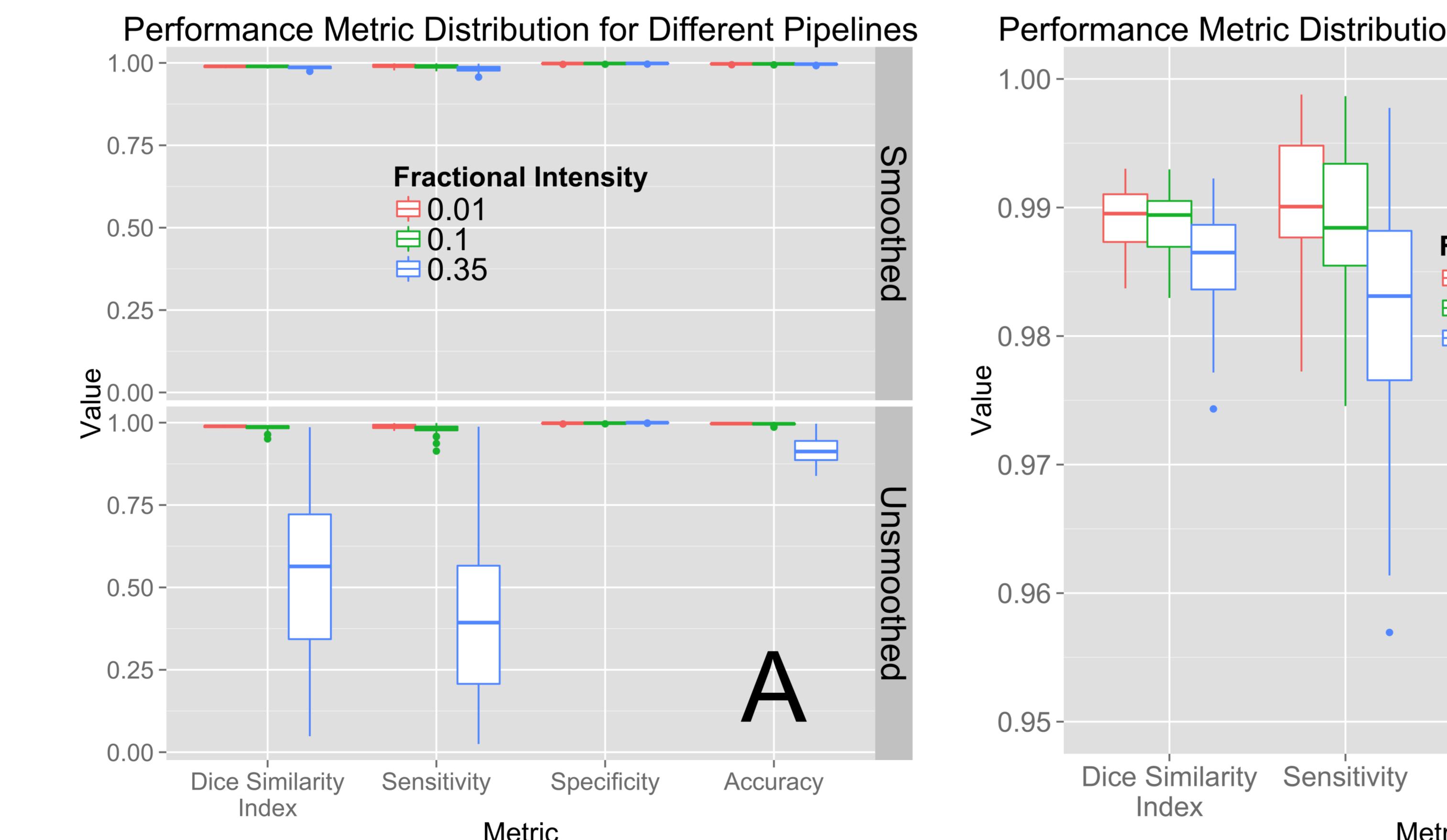
Data were from patients with intracranial hemorrhage from MISTIE (Minimally Invasive Surgery plus recombinant-tissue plasminogen activator for Intracerebral Evacuation) stroke trial centers.

- Sample compared to gold standard: Thirty Six images from 36 patients.
- Intraclass Correlation Estimate: 1062 images from 133 patients, after excluding 115 scans for craniotomy or skull stripping failure (9.8%).

Goals and Methods

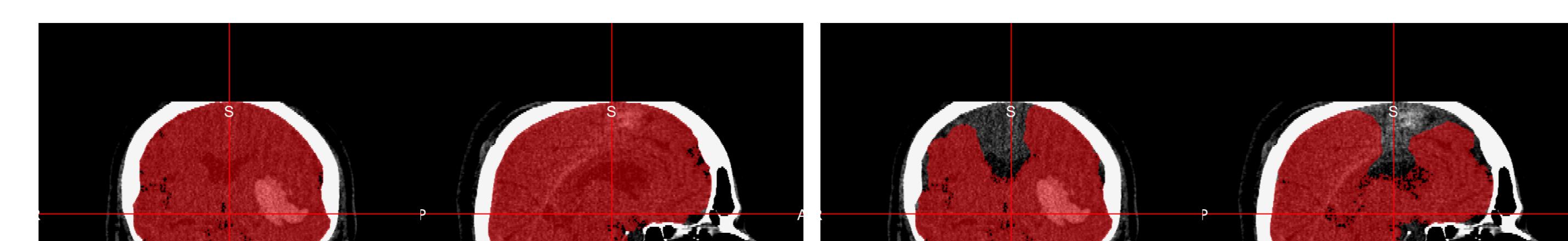
Measuring and Testing Brain Extraction Performance

Error in stopifnot(all(all.smooth.tests\$wt.p.value < 0.01)): object 'all.smooth.tests' not found

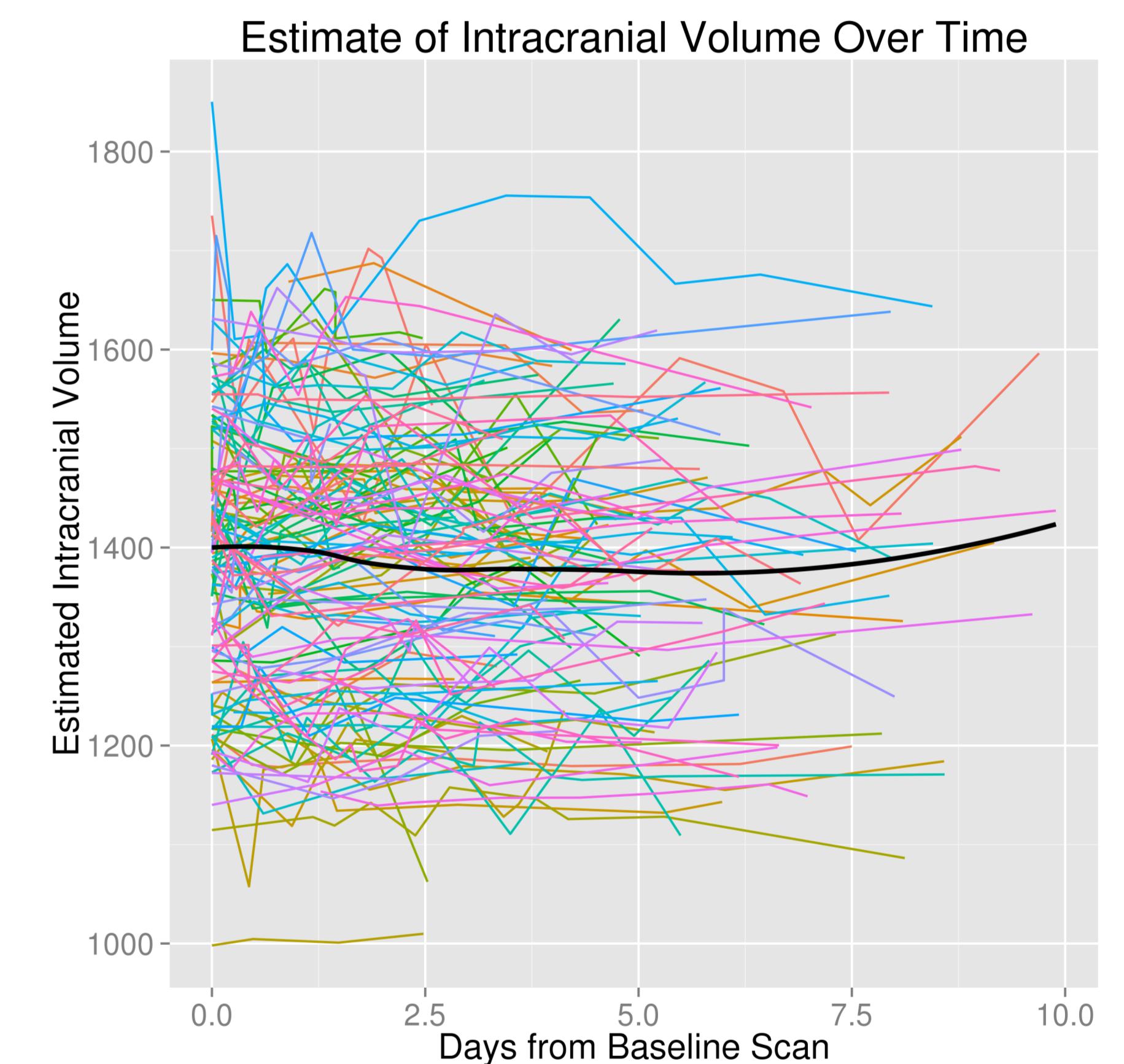
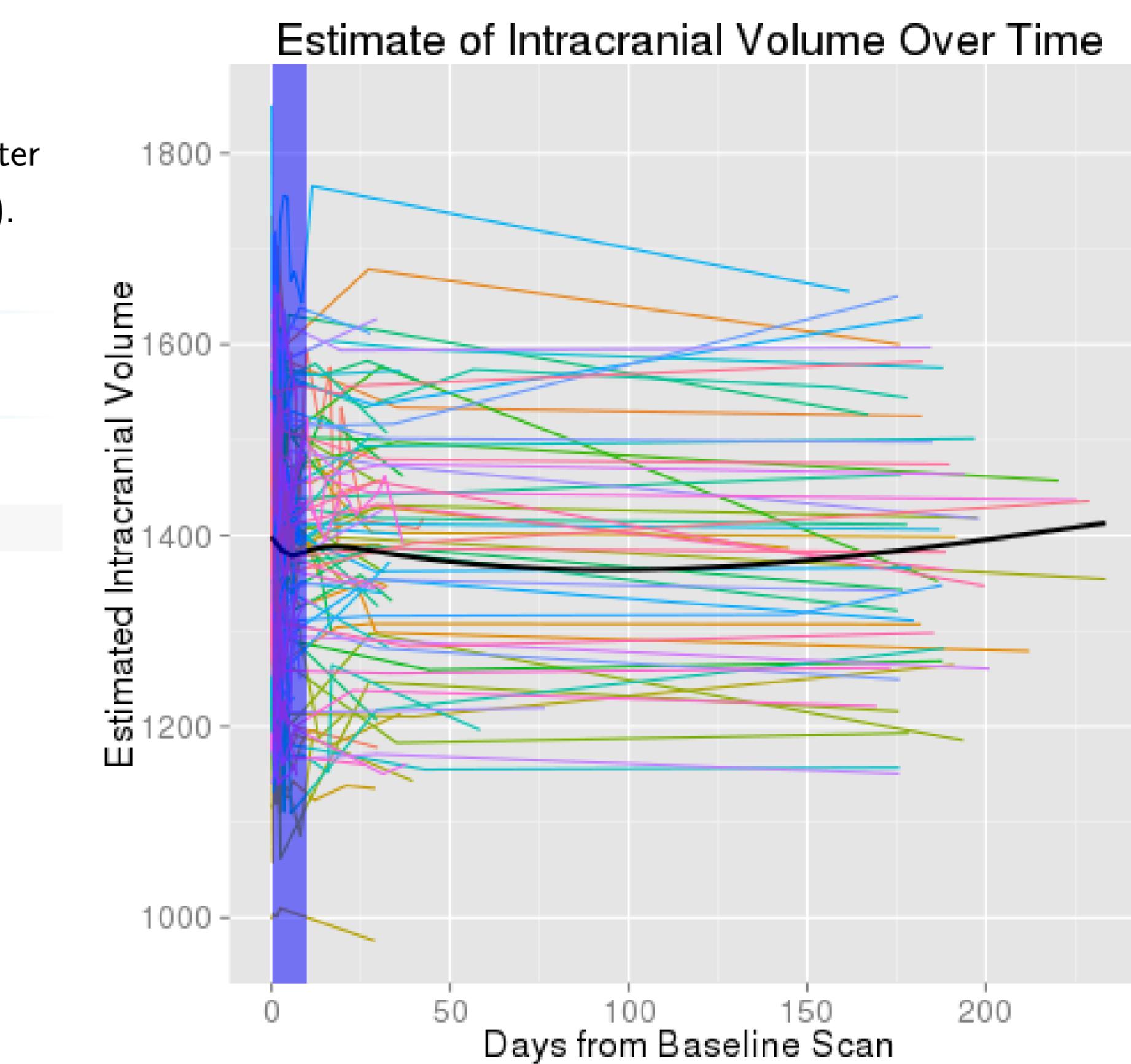


Performance Metric Distribution for Different Pipelines. Panel A displays the performance for brain extraction for the pipelines, panel B focuses on only those using smoothed images. Using an FI of 0.01 or 0.1 performed better than 0.35. Using an FI of 0.01 had a higher median sensitivity (0.9902) than an FI of 0.1 (0.9891, $p < 0.001$), lower specificity (0.998 vs. 0.998; $p < 0.001$), and no difference in accuracy (0.9971 vs. 0.9971; $p = 0.039$) or DSI (0.9892 vs. 0.9895).

Smoothing Images can Dramatically Increase Performance

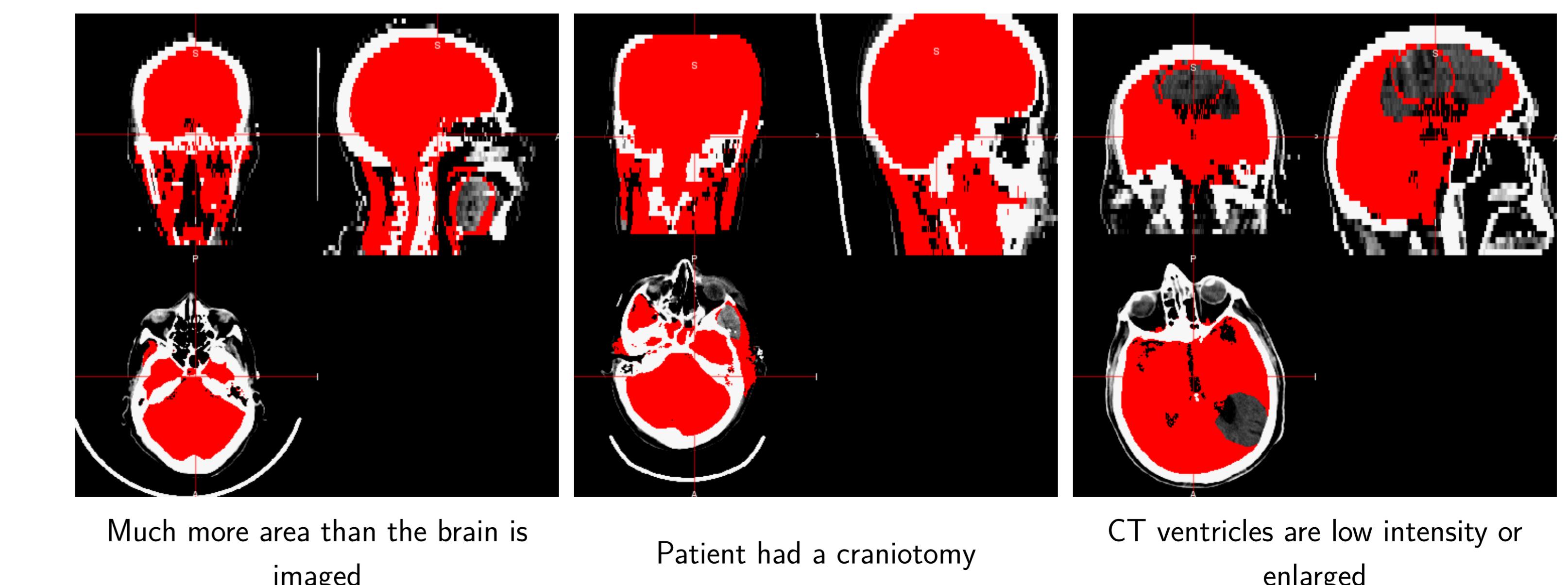


CT Skull Stripping Leads to Consistent Intracranial Volume Estimates



Intracranial Volume (ICV) Estimate over Time. Each line represents an individual patient's ICV estimate over time. The data presented used an FI = 0.01 and smoothed data. The left panel shows all data used to estimate the intraclass correlation coefficient (ICC) of 0.93, (95%CI : 0.91, 0.95).

Where does it fail?



We have code to do this!

• R code: http://bit.ly/CTBET_RCODE

• bash code: http://bit.ly/CTBET_BASH