Open Source Radiomics

IBSI Compliant Octave Code

Kate Sweetland

Radiomics

Growing field, concerned with high throughput extraction of image features in medical imaging

Huge increase in computational power

Challenges

- Standardization
- Reconstruction variations
- Filters
- Contrast
- Slice thickness
- Field strength
- Type of algorithm used (FBP, IR, AI-aided)

International Biomarker Standardization Initiative

- Started in 2020
- Sought to clearly define the calculation of each image
- Prior to this, most radiomic calculations were in-house, and varied institution to institution
- Variation in mathematical definition and built-in functions
- Clarify nomenclature obfuscation
- Harmonize post-reconstruction proceedings

Implementation

IBSI metrics calculated by either MATLAB or Octave code

Check for accuracy with given IBSI digital phantom

Tested with two data sets: Brodatz textures and CT scan

Exploring Textural Implications

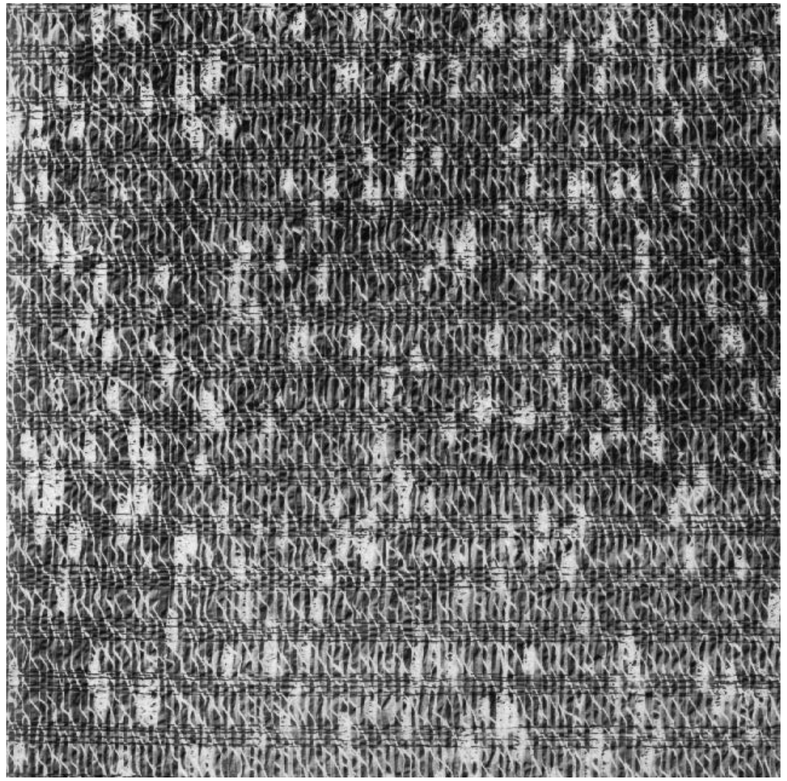
Brodatz Texture Paper

Set of 112 textures used for validating image classification algorithms for decades

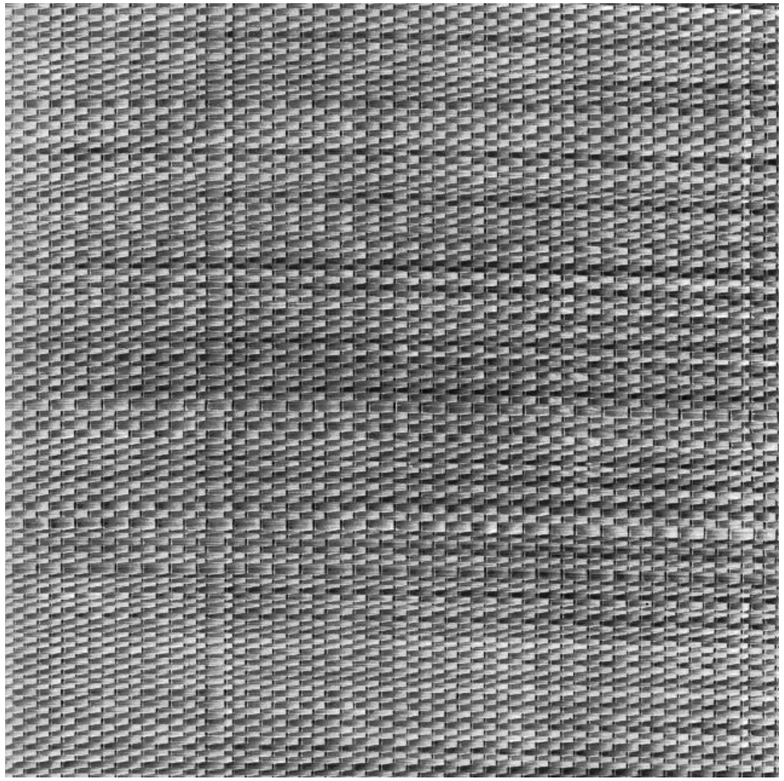
Sorted into broader categories by past work using both subject input and three different mathematical approaches

Exploring Textural Implications

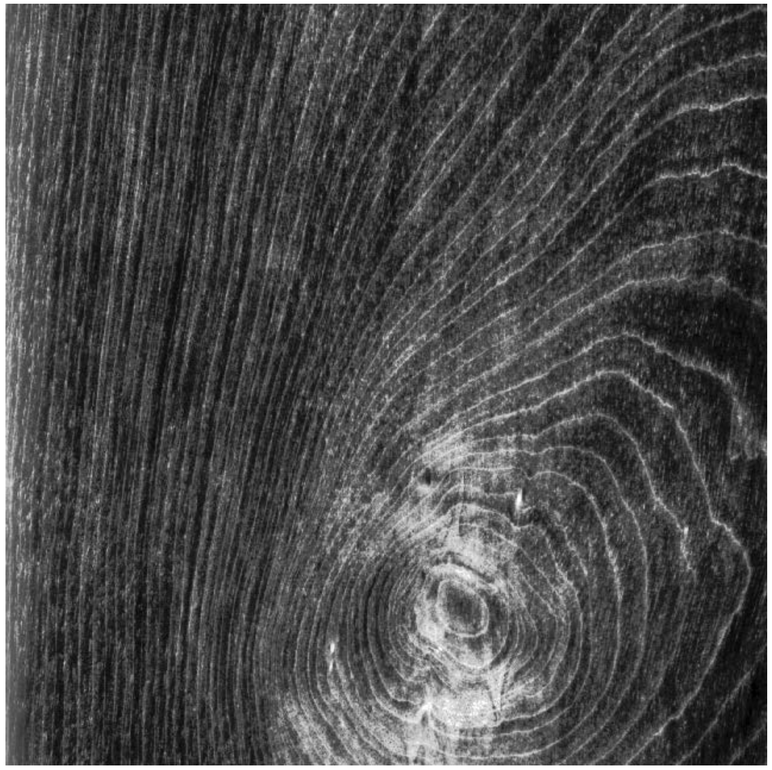
Brodatz Texture Paper



Cluster 1



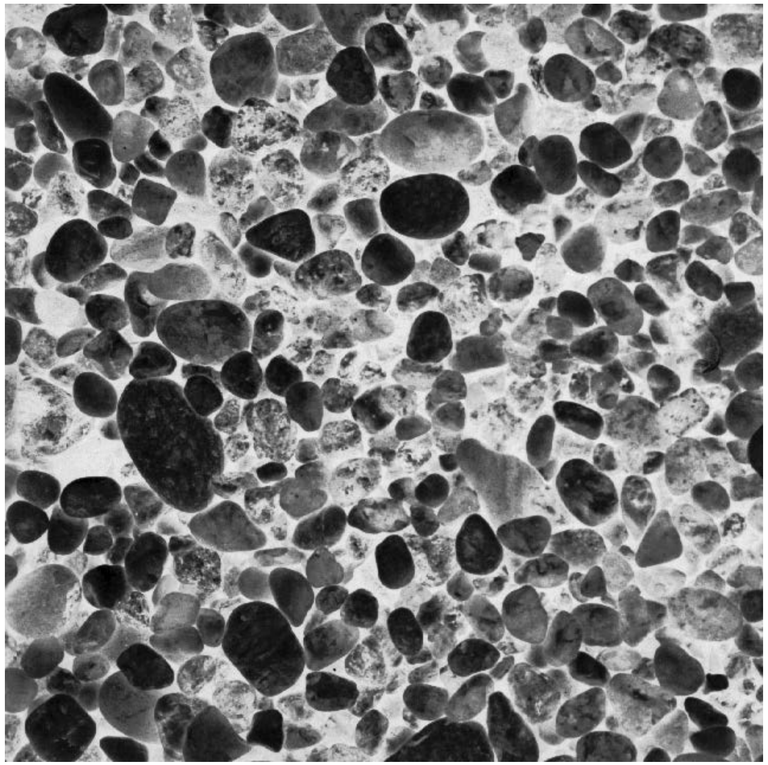
Cluster 2



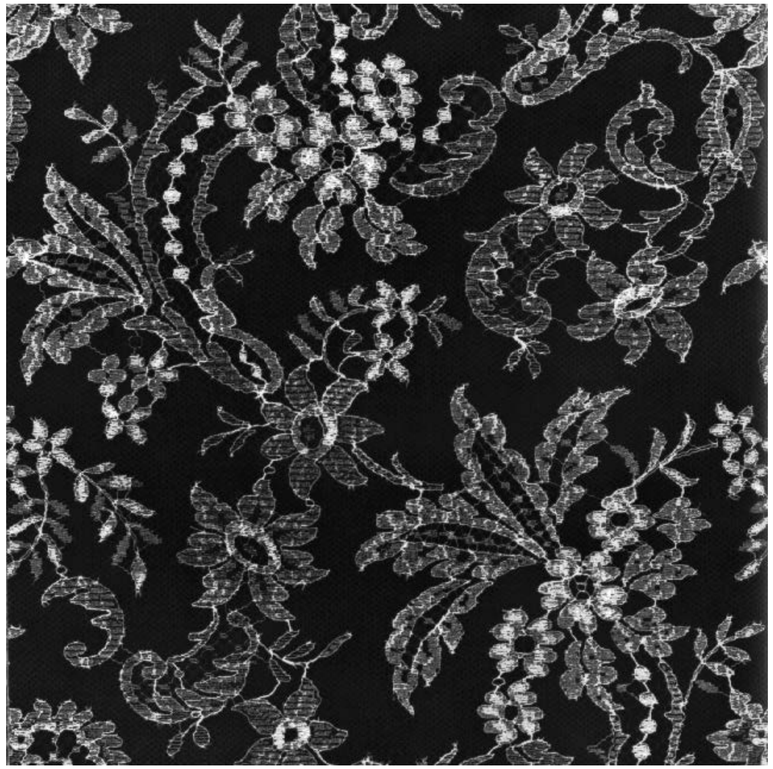
Cluster 3

Exploring Textural Implications

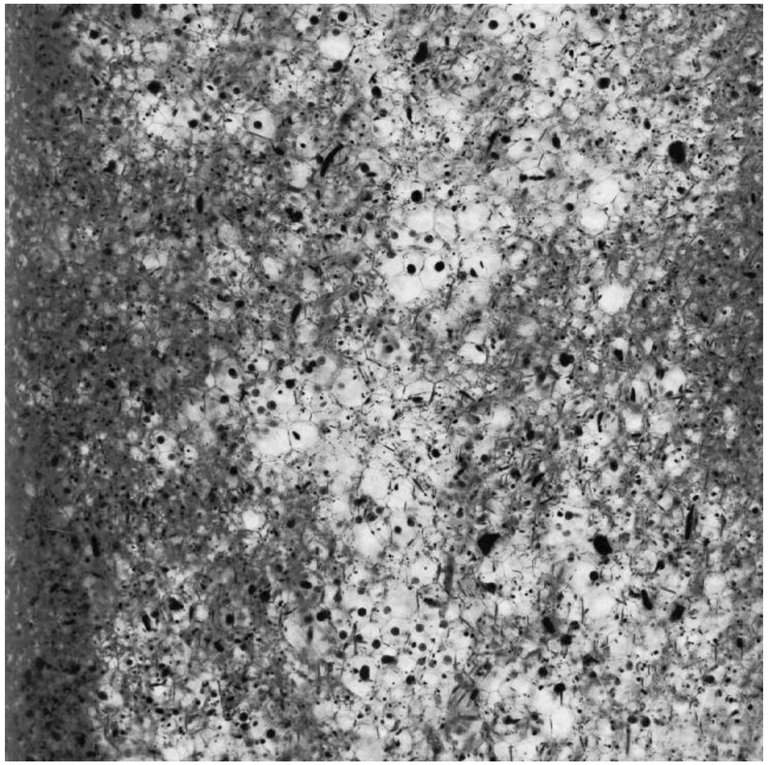
Brodatz Texture Paper



Cluster 4



Cluster 5



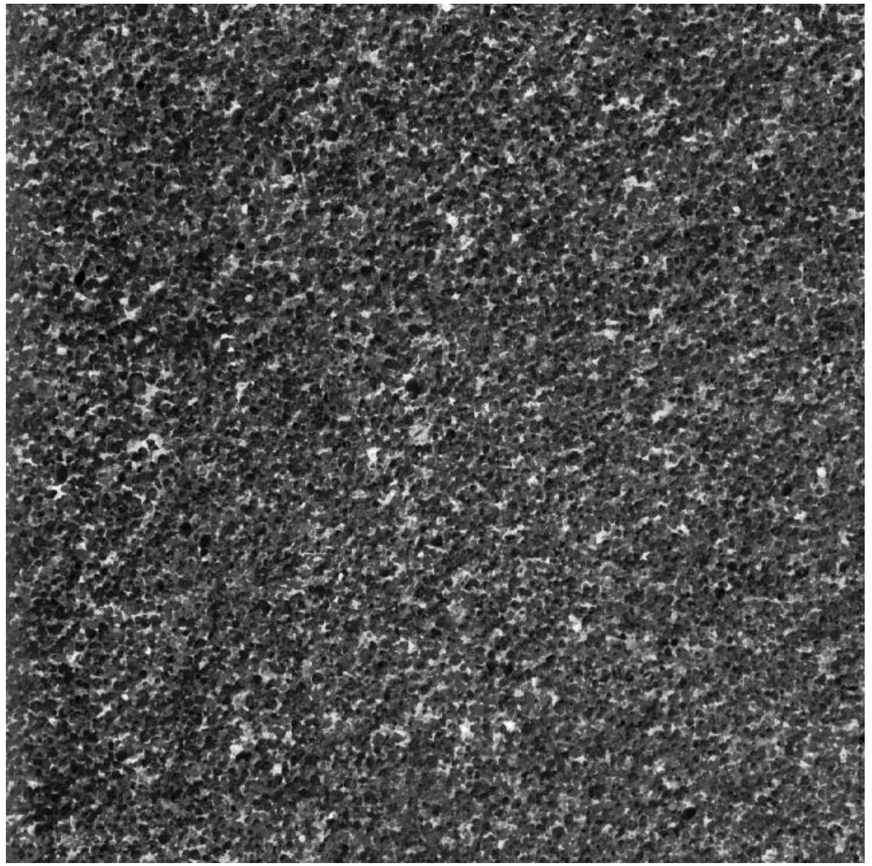
Cluster 6

Exploring Textural Implications

Brodatz Texture Paper

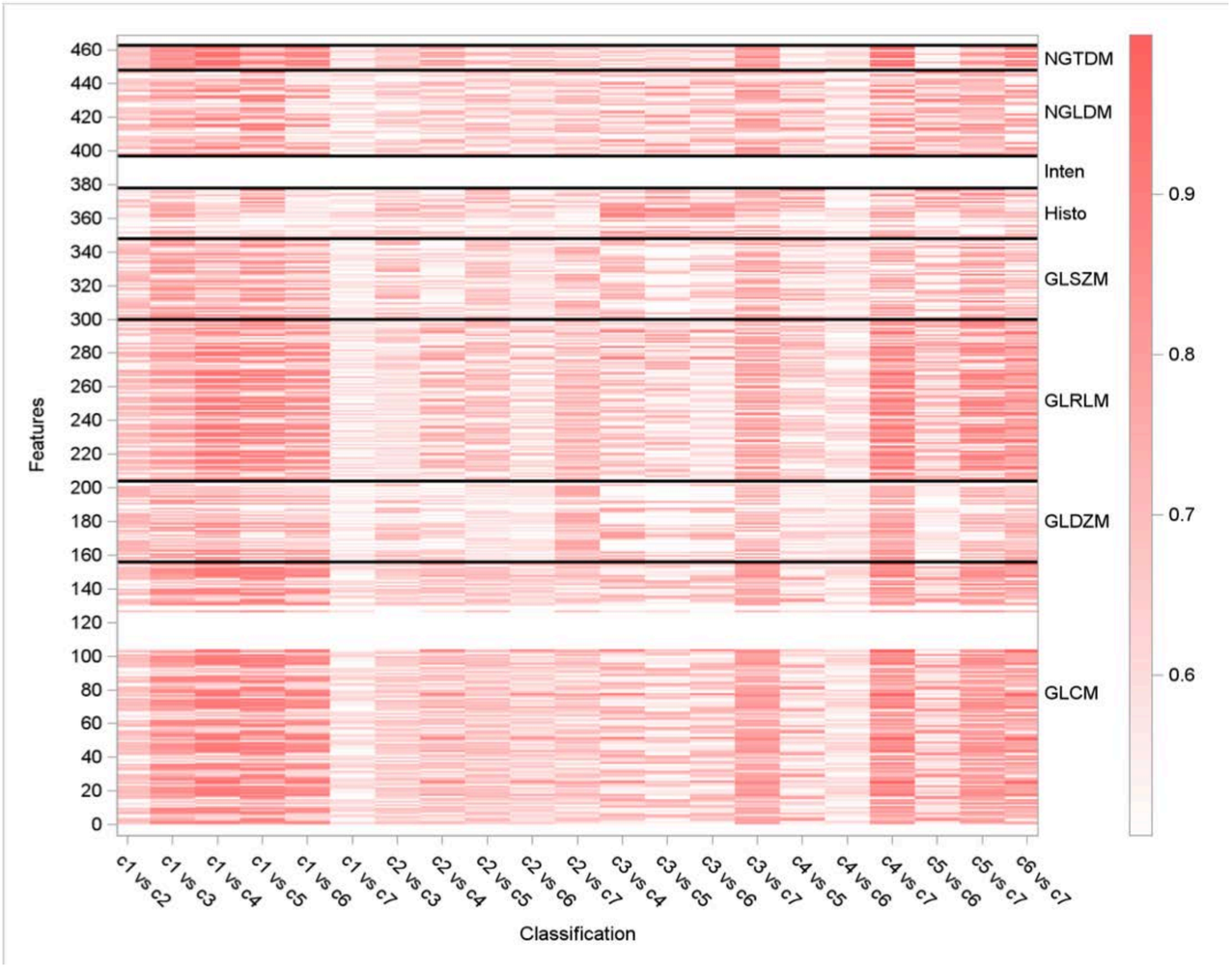
7 Texture Clusters

- goal of paper to find which metrics from the IBSI standard identify which types of textures
- Easiest to separate highly ordered and highly disordered textures



Exploring Textural Implications

Brodatz Texture Paper



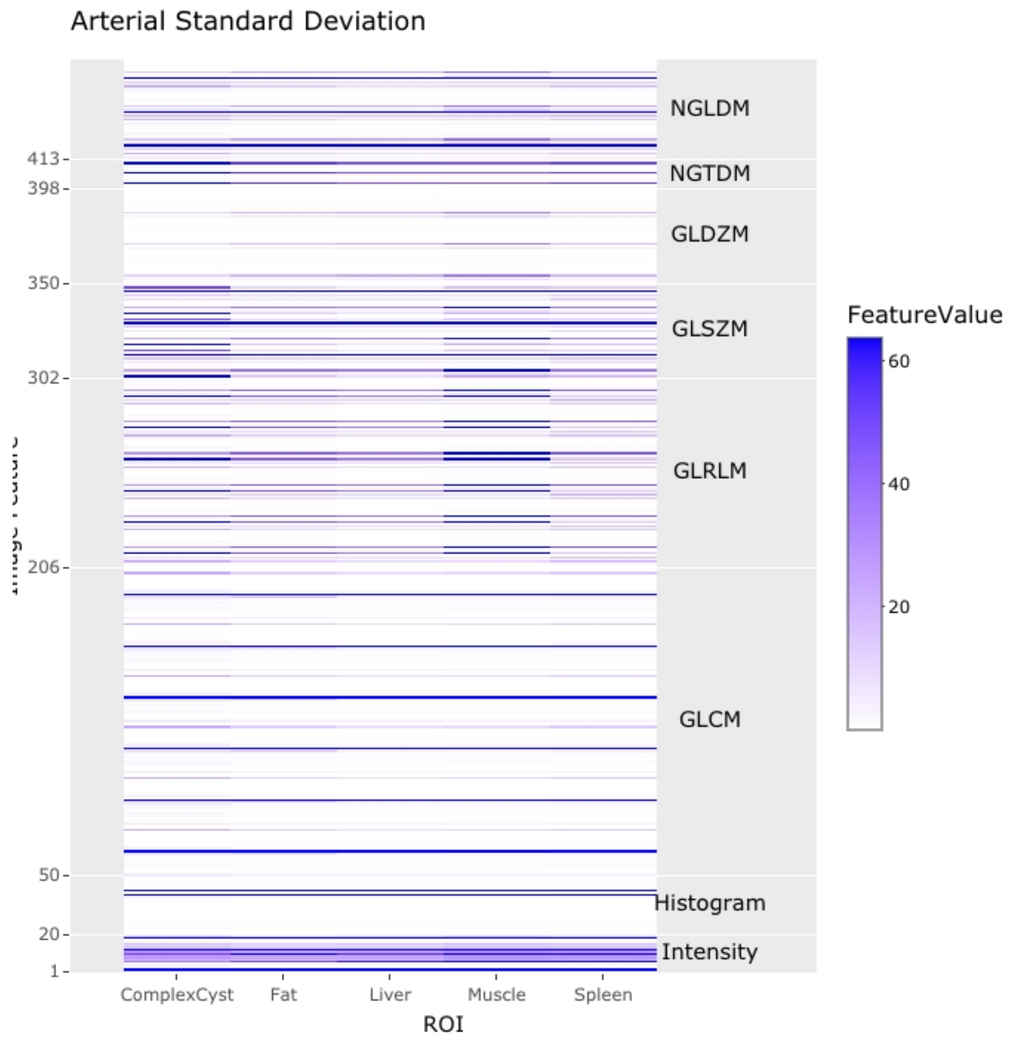
Informing Harmonization Strategies

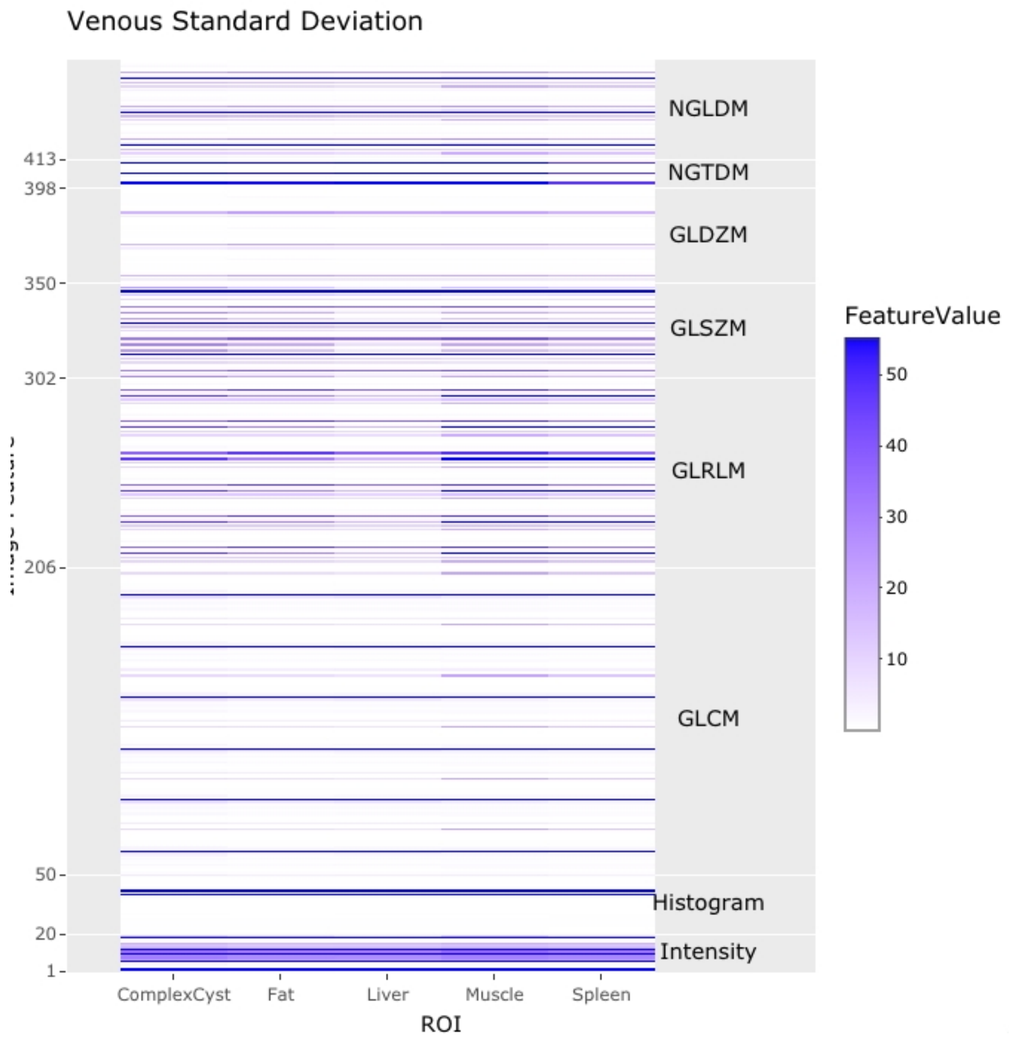
CT Kernel Paper

- Use to quantify differences between reconstruction kernels (settings on CT scanner)
- Same raw data, slice thickness, region of interest, patient
- Two phases used
- If data were unaffected by the reconstruction, no deviation in resulting data

Informing Harmonization Strategies

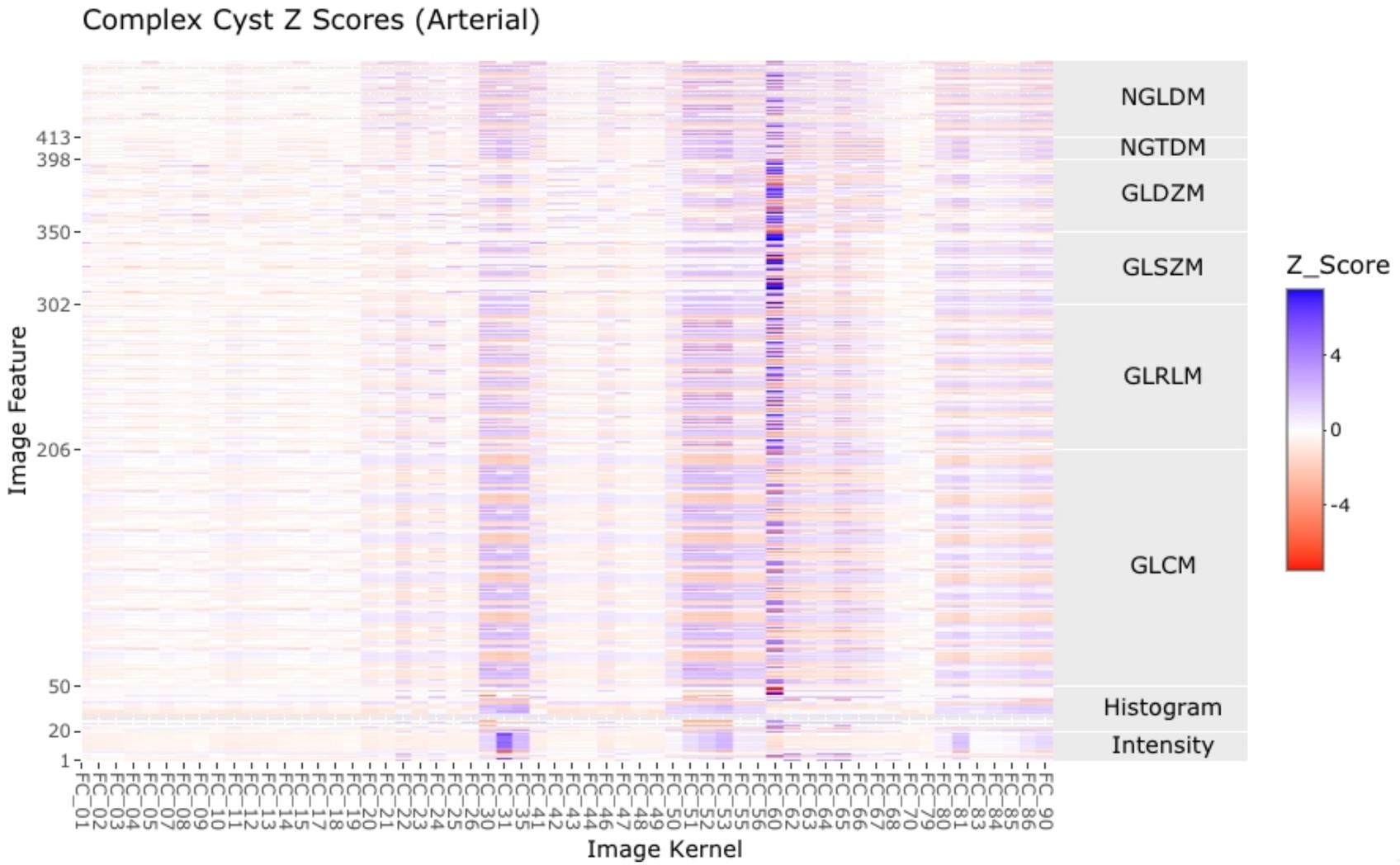
CT Kernel Paper





Informing Harmonization Strategies

CT Kernel Paper



Octave Package

Octave Package

- Open source, full transparency
- Equivalent of MATLAB package, calculates 463 image features from 2D and 3D images
- Widespread implementation
- Bypasses paywall