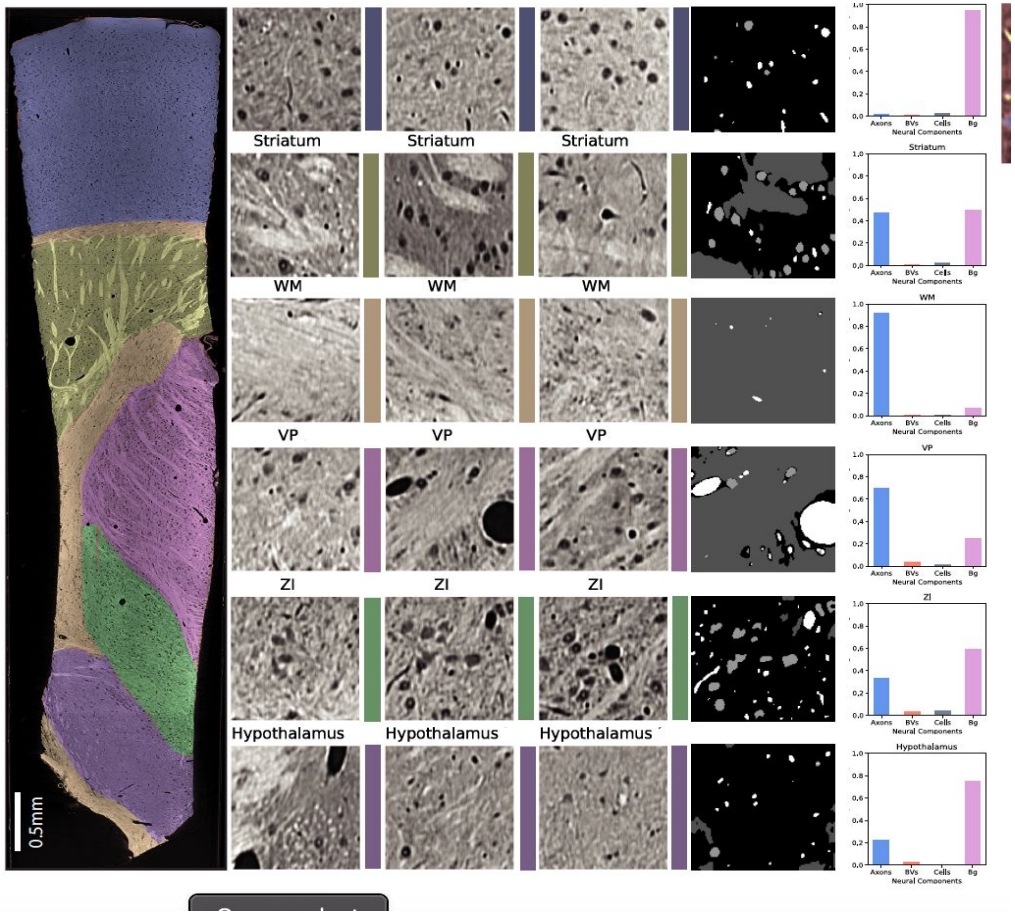
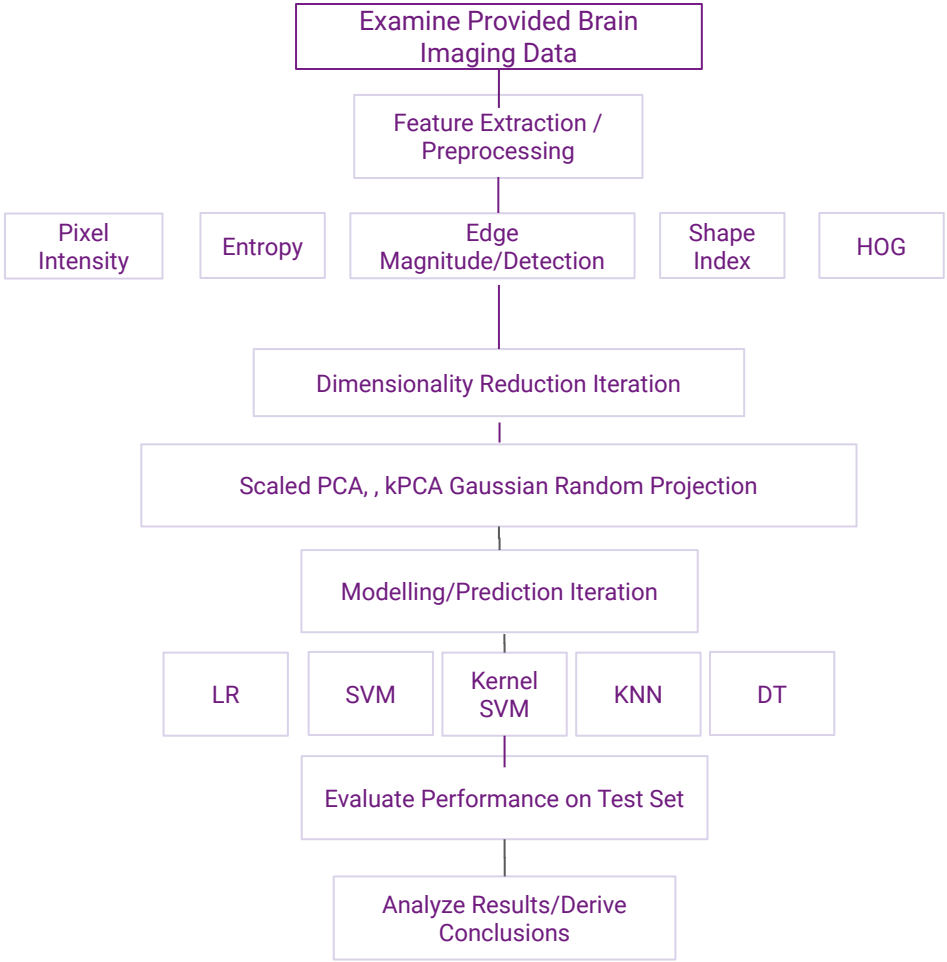
Brain Mapping

Project by: Cori Harber, Lisa Meyer-Baese, Erika Moreno, Hope Mumme, Heather Whittaker


0.5mm
Striatum
Striatum
Striatum
WM
WM
WM
VP
VP
VP
ZI
ZI
ZI
Hypothalamus
Hypothalamus
Hypothalamus
Striatum
WM
VP
ZI
Hypothalamus
Axons
BVs
Cells
Bg
Neural Components


Examine Provided Brain Imaging Data
Feature Extraction / Preprocessing
Pixel Intensity
Entropy
Edge Magnitude/Detection
Shape Index
HOG
Dimensionality Reduction Iteration
Scaled PCA, , kPCA Gaussian Random Projection
Modelling/Prediction Iteration
LR
SVM
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Evaluate Performance on Test Set
Analyze Results/Derive Conclusions

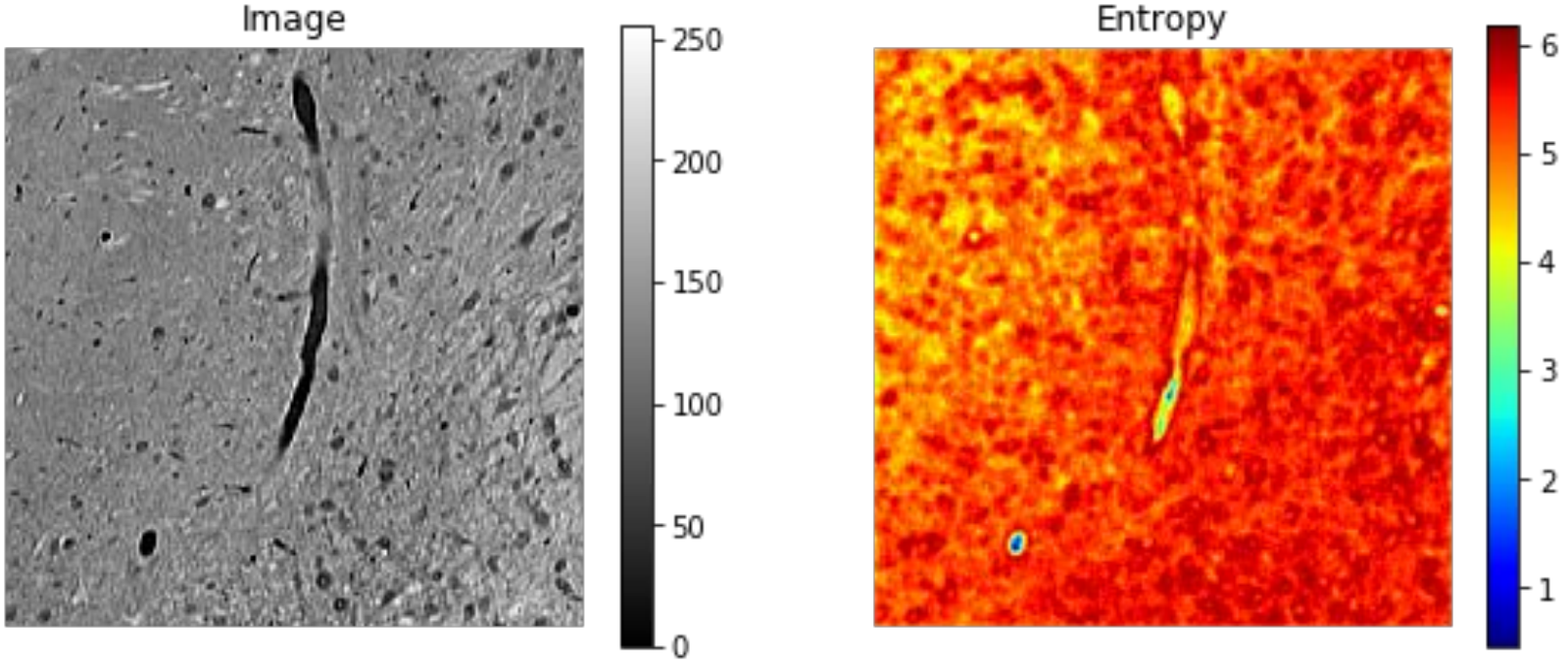


Image
250
200
150
100
50
0
Entropy
6
5
4
3
2
1

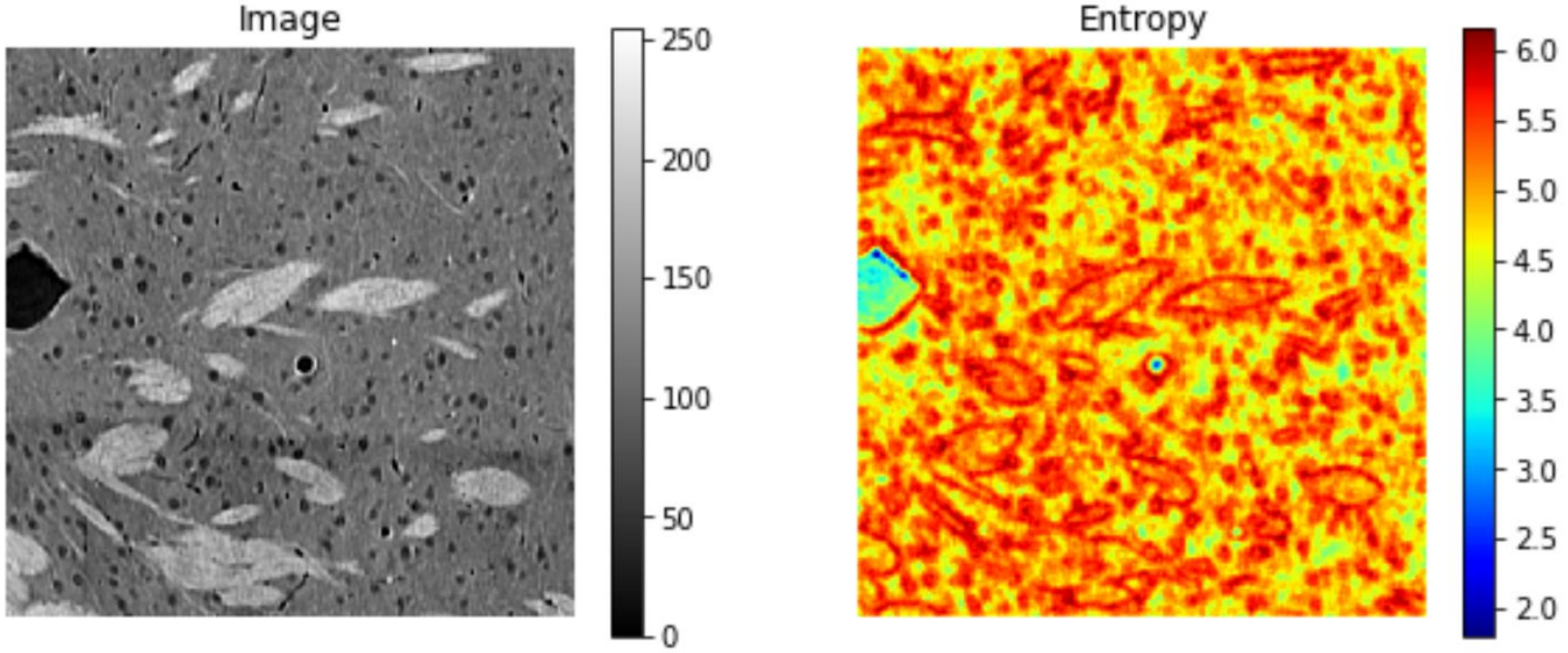
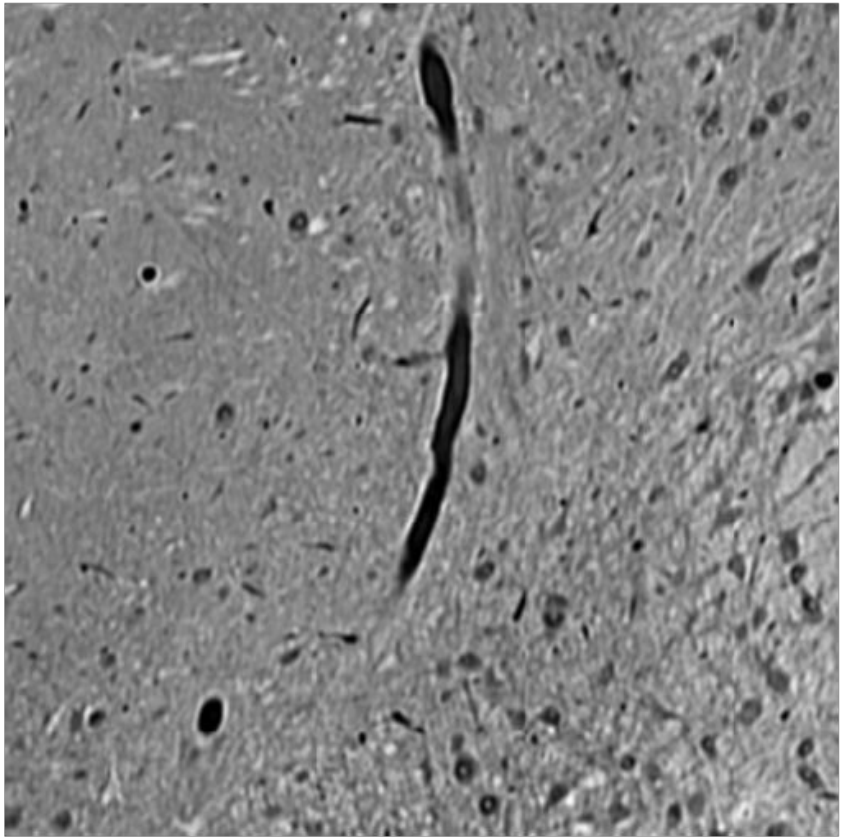
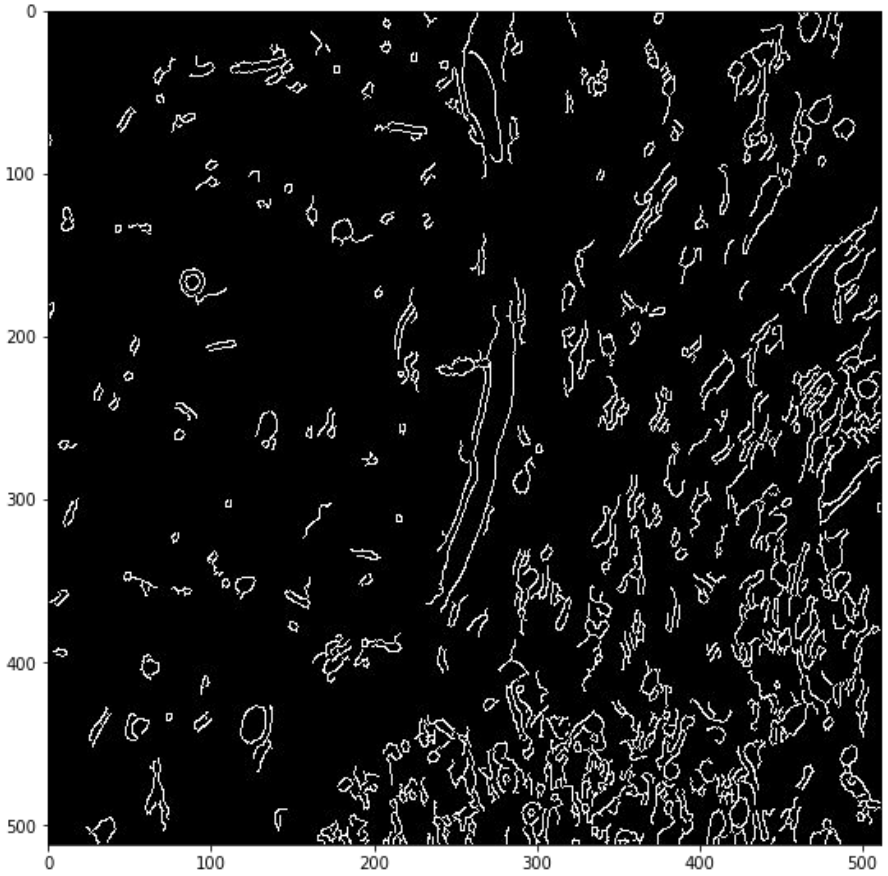
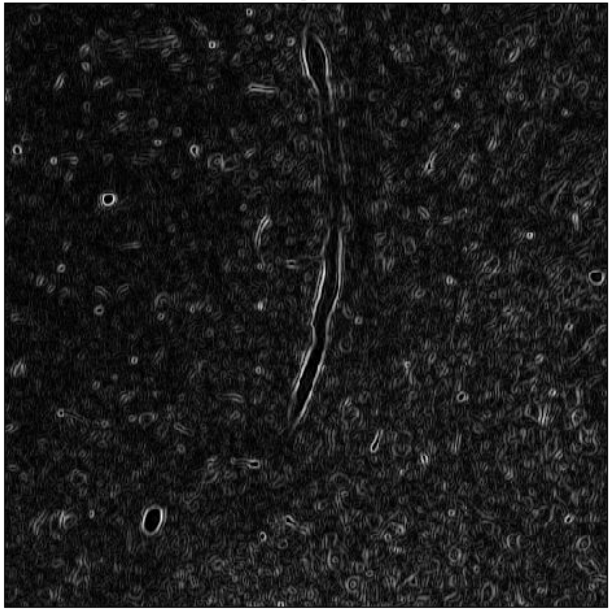


Image
250
200
150
100
50
0
Entropy
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0

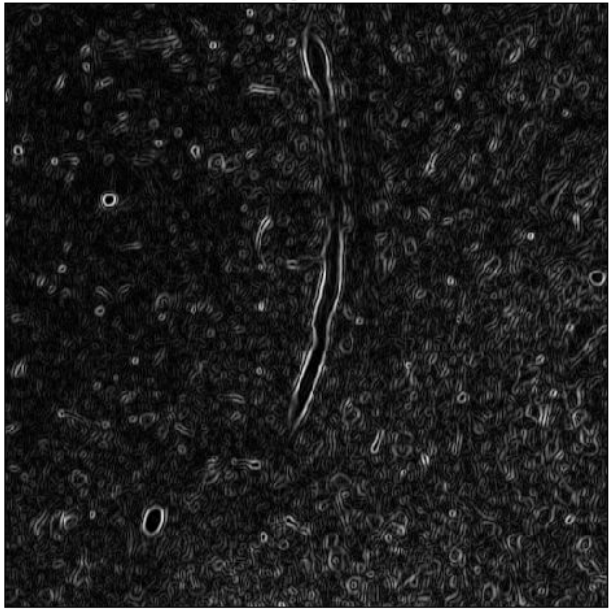



0
100
200
300
400
500
0
100
200
300
400
500

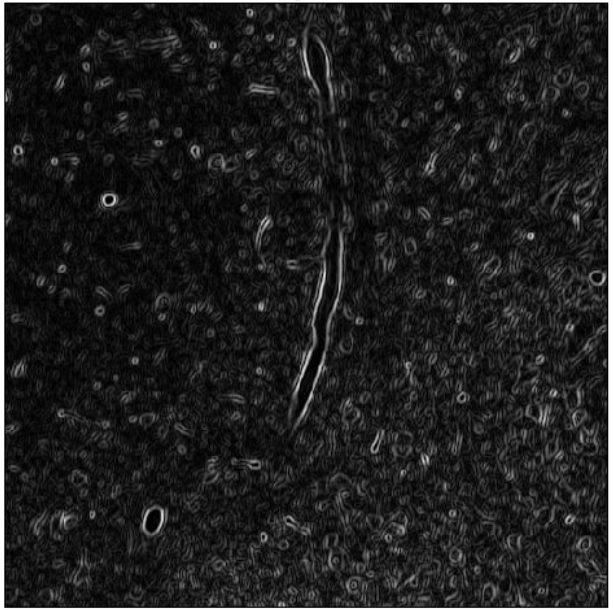
Roberts Edge Detection



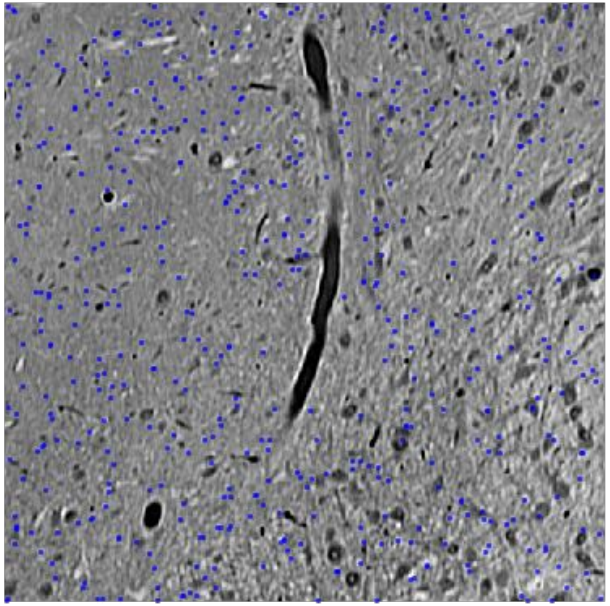
Sobel Edge Detection



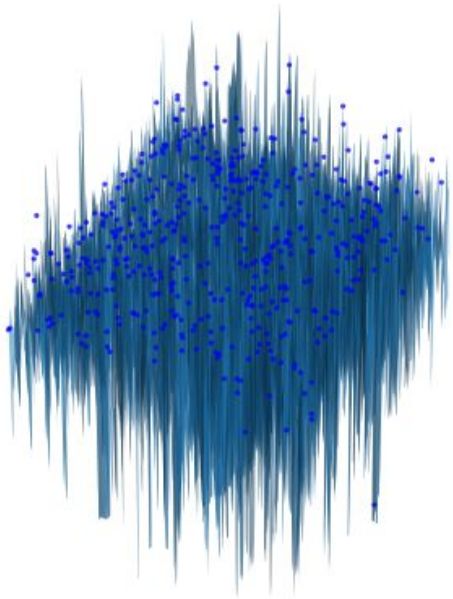
Scharr Edge Detection



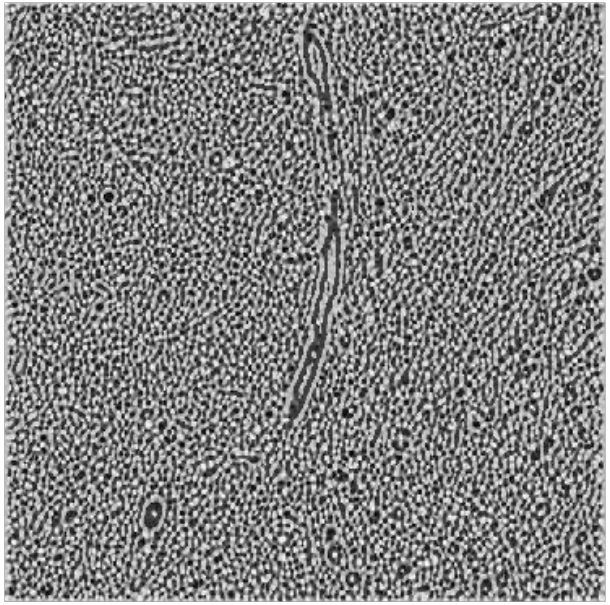
Input image

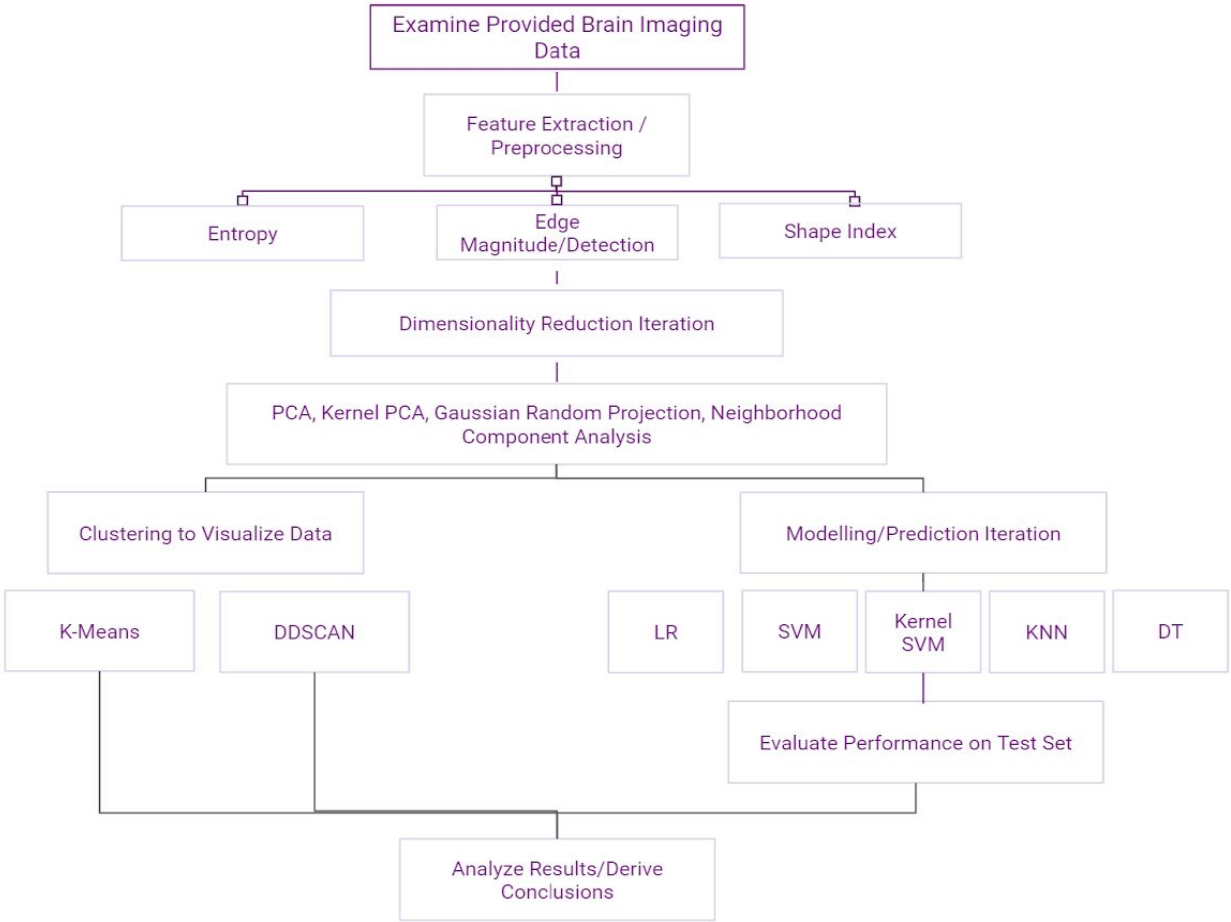


3D visualization



Shape index, $\sigma = 1$

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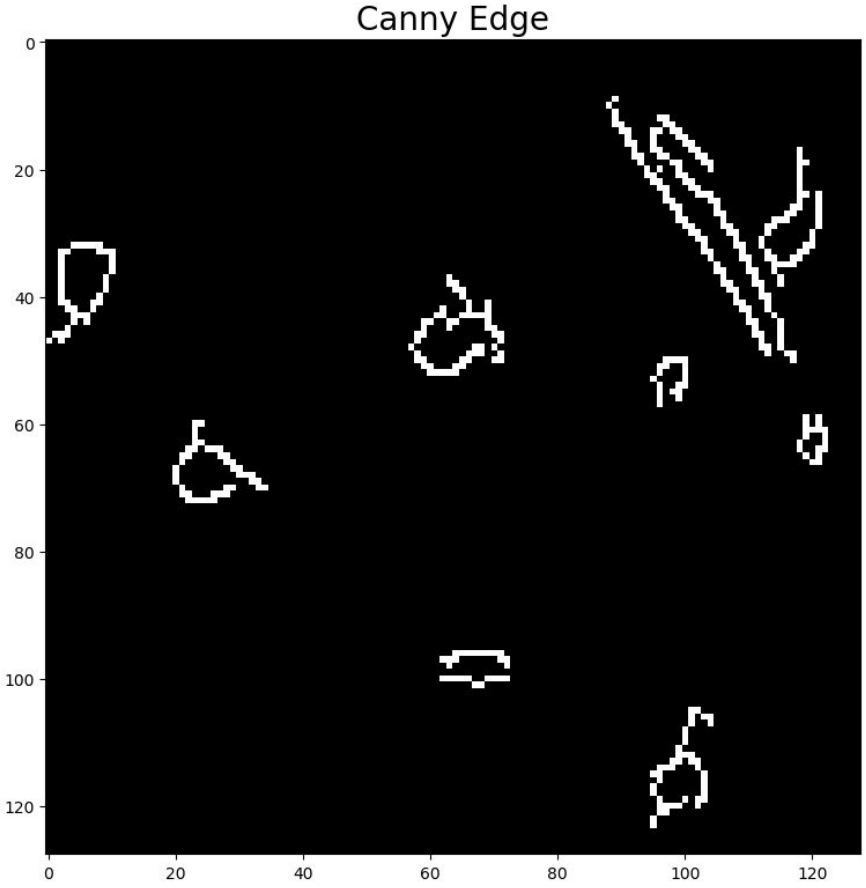
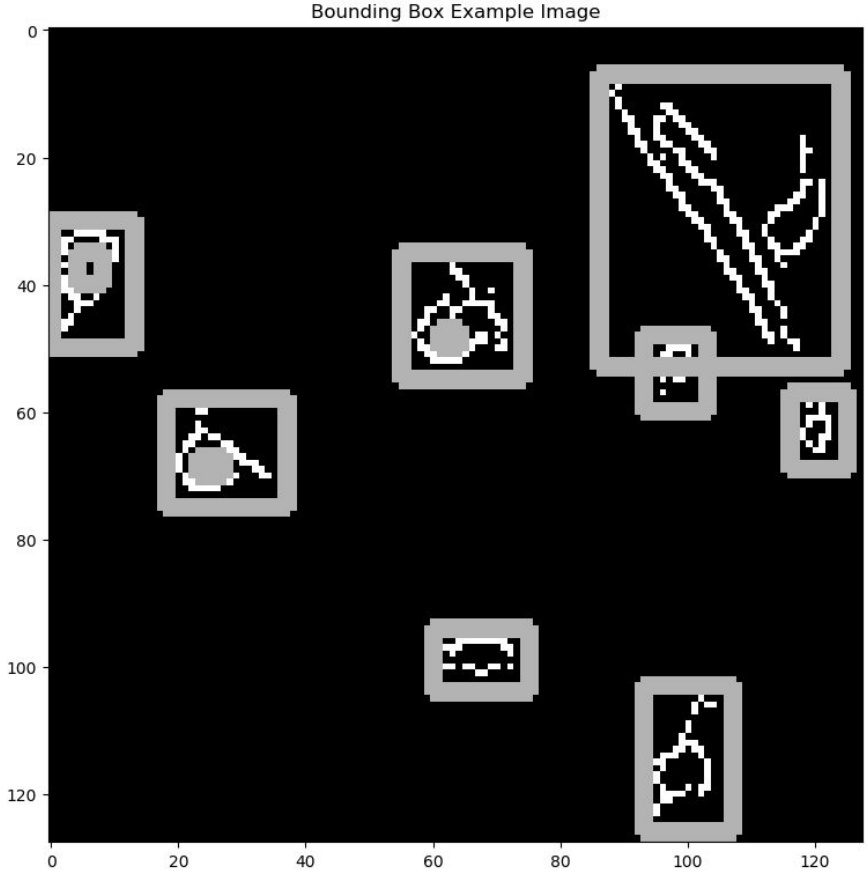
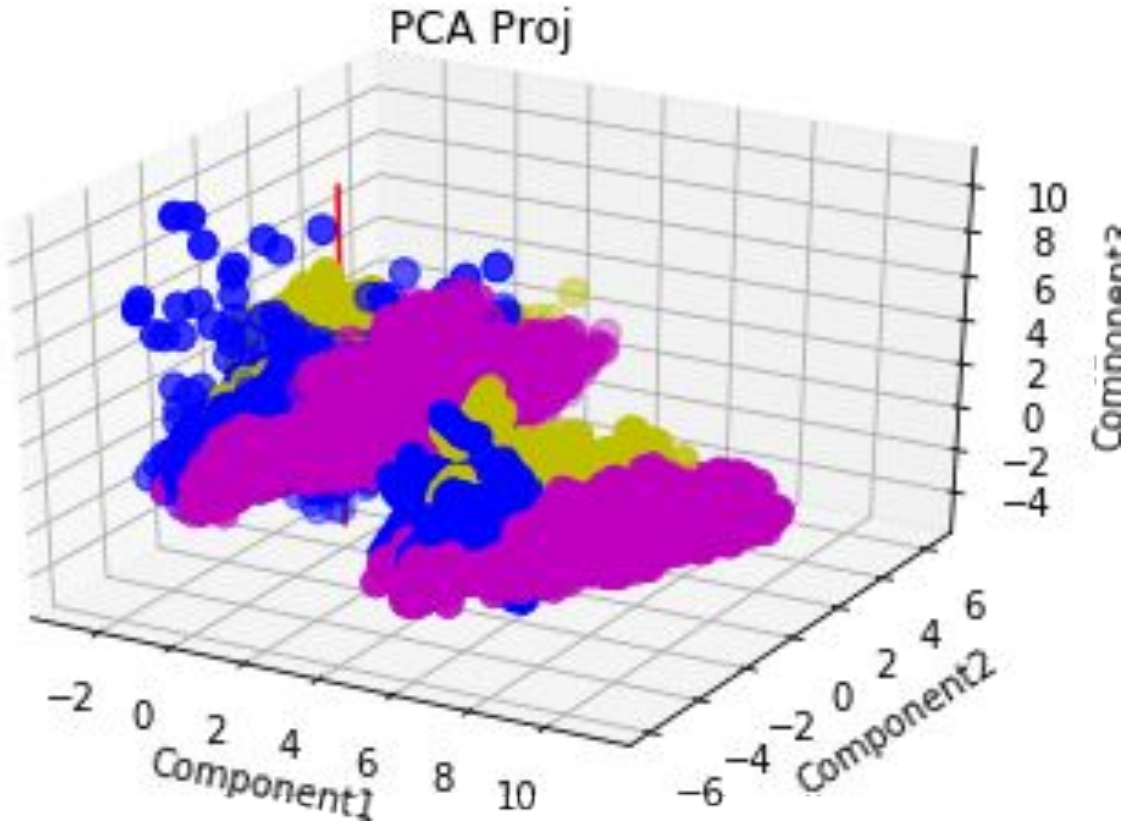
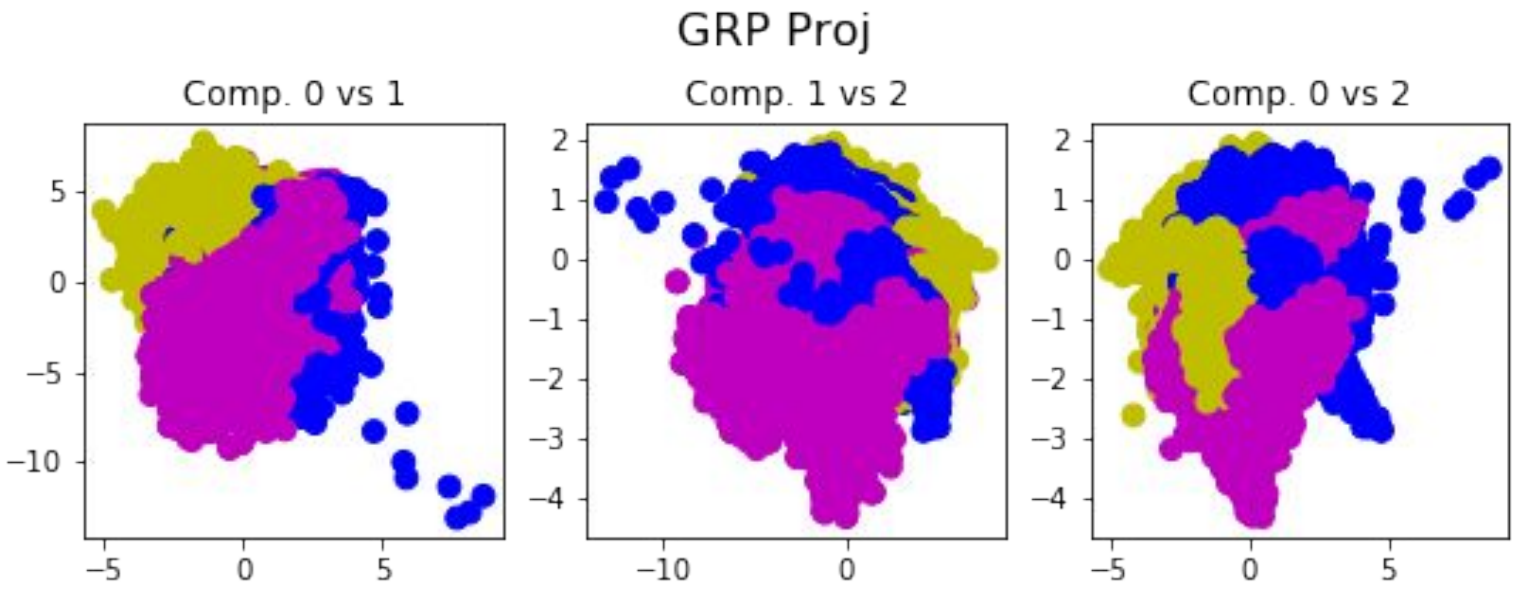
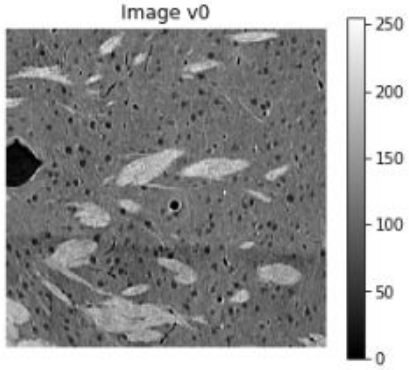

Canny Edge
0
20
40
60
80
100
120
0
20
40
60
80
100
120

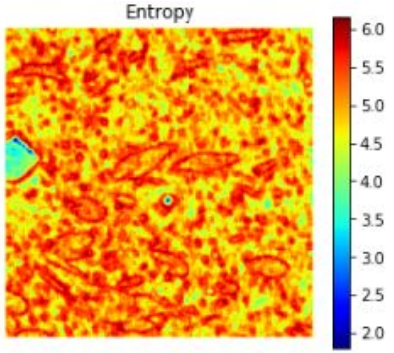

Bounding Box Example Image
0
20
40
60
80
100
120
0
20
40
60
80
100
120

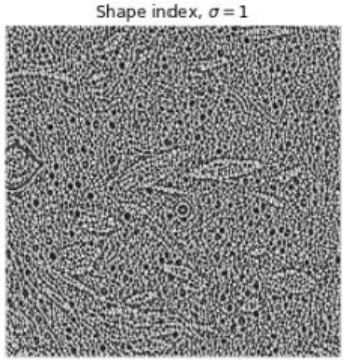

PCA Proj
10
8
6
4
2
0
−2
−4
−2
0
2
4
6
8
10
Component1
6
4
2
0
−2
−4
−6
Component2

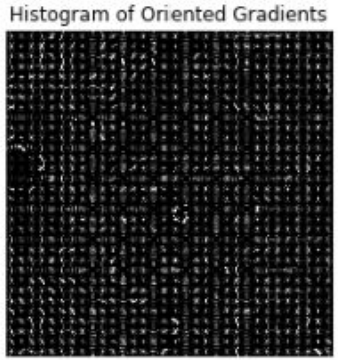

GRP Proj
Comp. 0 vs 1
Comp. 1 vs 2
Comp. 0 vs 2
5
0
−5
−10
−5
0
5
2
1
0
−1
−2
−3
−4
−10
0
2
1
0
−1
−2
−3
−4
−5
0
5

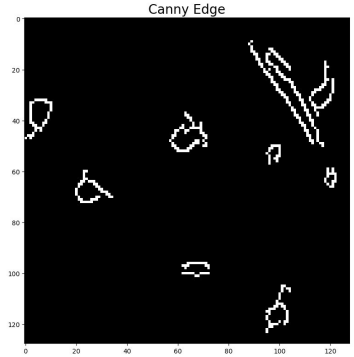
Feature Extraction Images

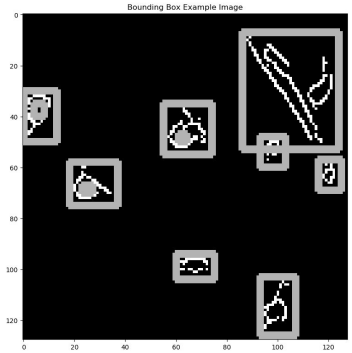




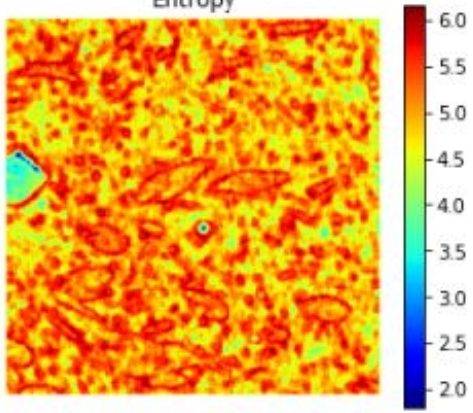




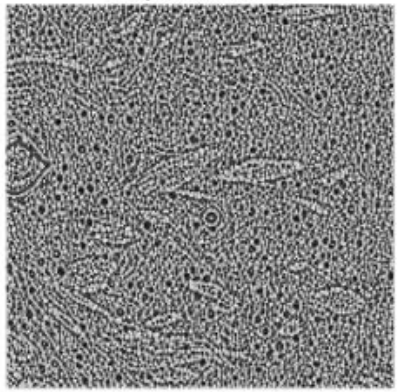




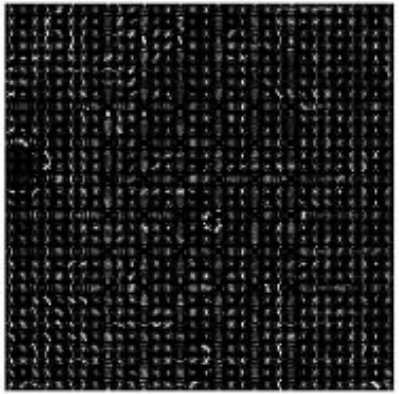
Entropy



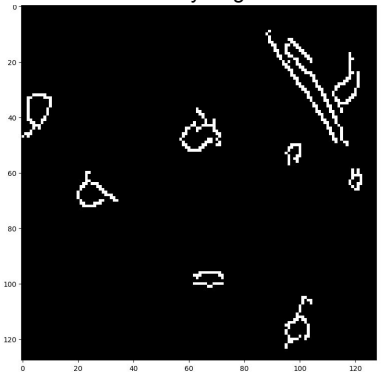
Shape index, $\sigma = 1$



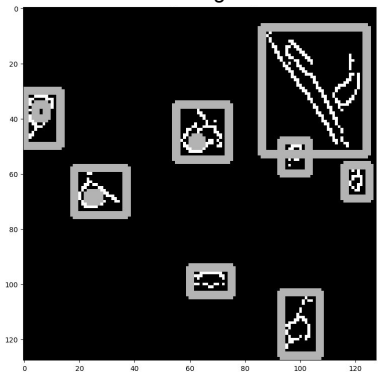
Histogram of Oriented Gradients



Canny Edge



Bounding Box



Classification Results

Without Dimensionality Reduction
Feature Set 1

Name	Train Acc	Test Acc
LR	0.902670	0.905208
kNN	0.995310	0.976338
SVM	0.901679	0.903466
KSVM	0.979119	0.975286
DT	0.834239	0.826420

With Dimensionality Reduction
Feature Set 2

Name	Train Acc	Test Acc
LR	0.950530	0.952495
kNN	0.985806	0.963636
SVM	0.950917	0.953112
KSVM	0.985032	0.978407
DT	0.834239	0.826420