Model-Based Methods for Rice Type Detection in Hyperspectral Images

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HYPERSPECTRAL IMAGING:

- Collecting and processing reflectance information across electromagnetic spectrum, extensively used in food quality inspection.
  - Visible Infrared Spectra (VIS): 380 – 750 nm
  - Near Infrared Spectra (NIR): 780 – 2526 nm

CAN THE WHITE AND BROWN RICE BE CLASSIFIED USING THE HYPERSPECTRAL IMAGES ?

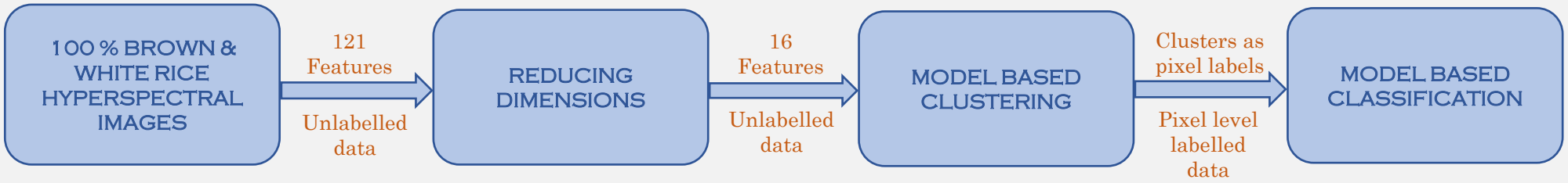
CHALLENGES:

- High dimensional data: each pixel has 121 features.
- No pixel level labels(brown/white/background) for the images. Only information on proportion of white/brown rice in each sample is available.

TRADITIONAL APPROACH:

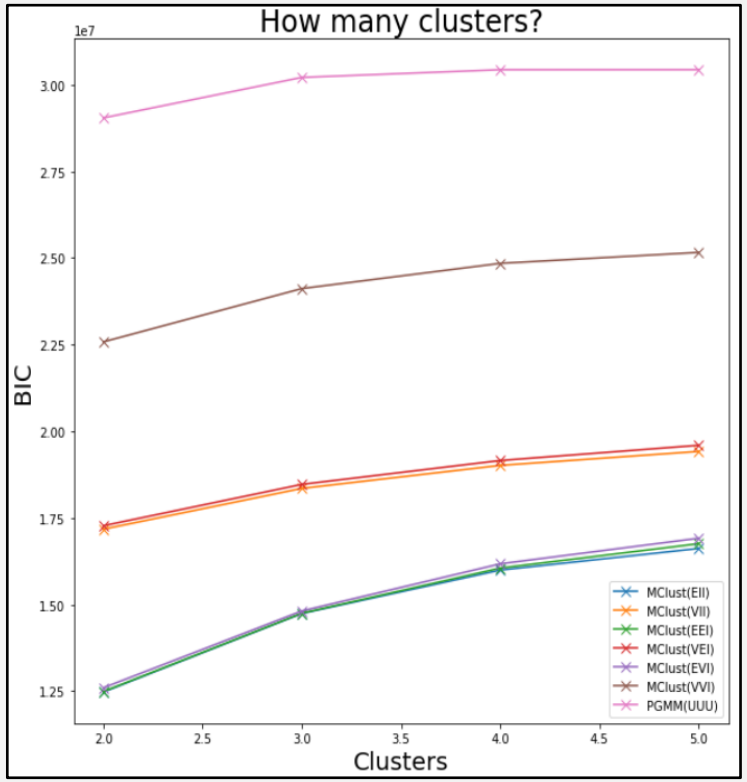
- Threshold(Mean) based approach to create the labels.

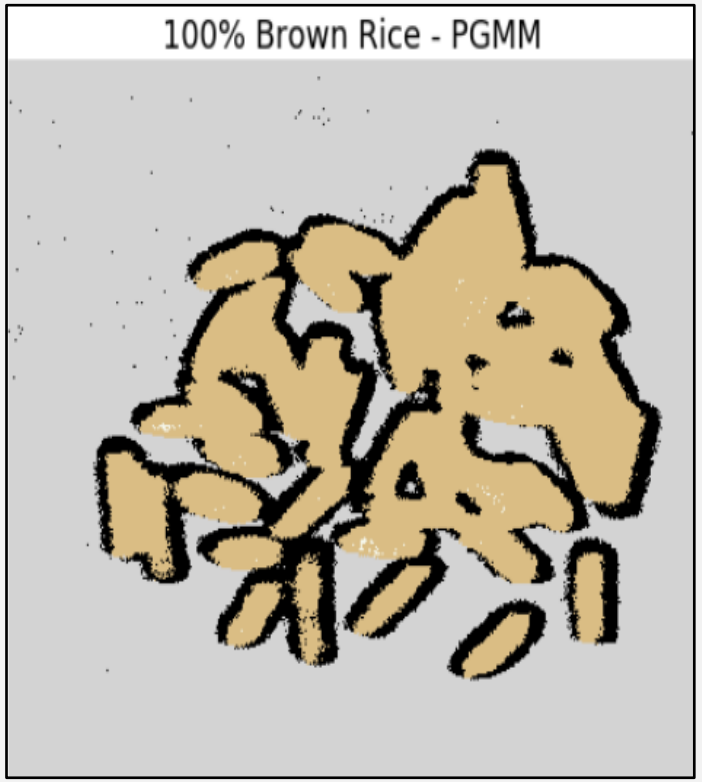
PROPOSED APPROACH:



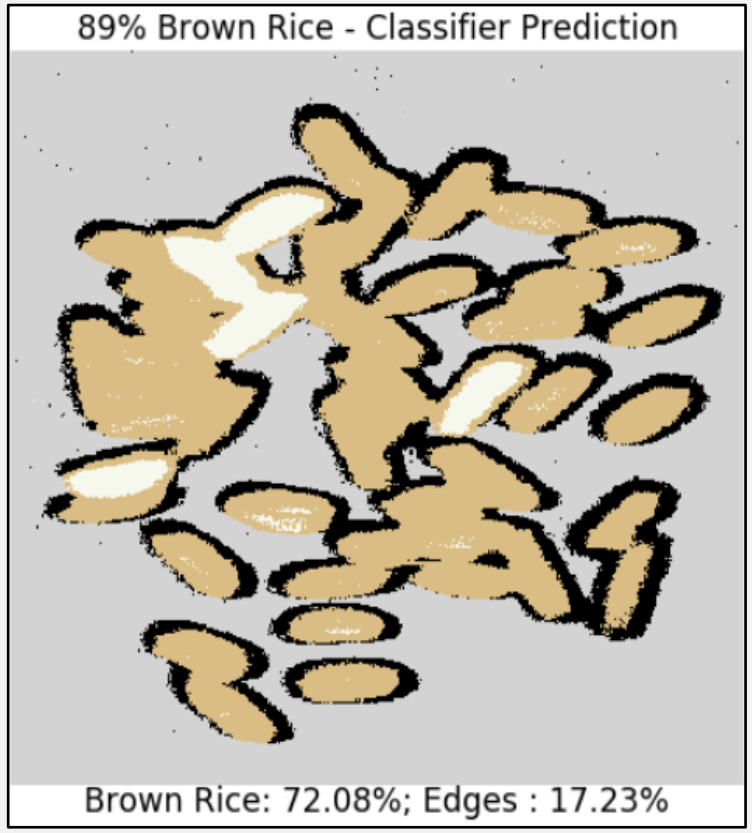
CLUSTERING ALGORITHMS:

- Multiple clustering algorithms for different numbers of clusters were fitted.
  - Model Based Clustering (mclust)
  - Parsimonious Gaussian Mixture Models (PGMM)





MODEL-BASED QUADRATIC DISCRIMINANT ANALYSIS CLASSIFIER:



OPEN PROBLEMS:

- No ground truth to validate the pixel-level performance of the classifier.
- How do we select the influential features?
- Need to incorporate spatial information.
- Methods to improve edge detection and consideration of overlapping rice grains.
- Develop a integrated inferential framework.