



University of Missouri

Unsupervised Classification on Hyperspectral Imagery

Introduction to Machine Learning and Pattern Recognition

Team Members:

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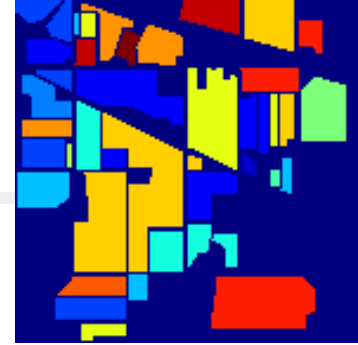
Patrick



Outline

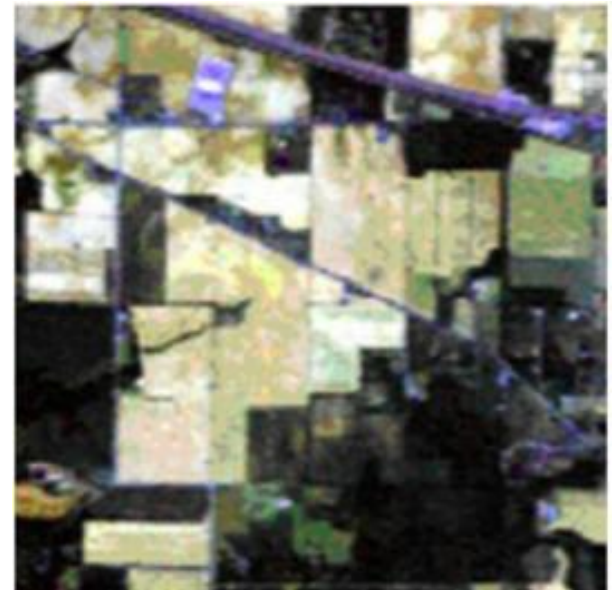
- Introduction
- Implementation
 - Dimensionality reduction
 - Classification
- Experiments and results
 - Localized PCA + split band PCA
 - Voting

Introduction



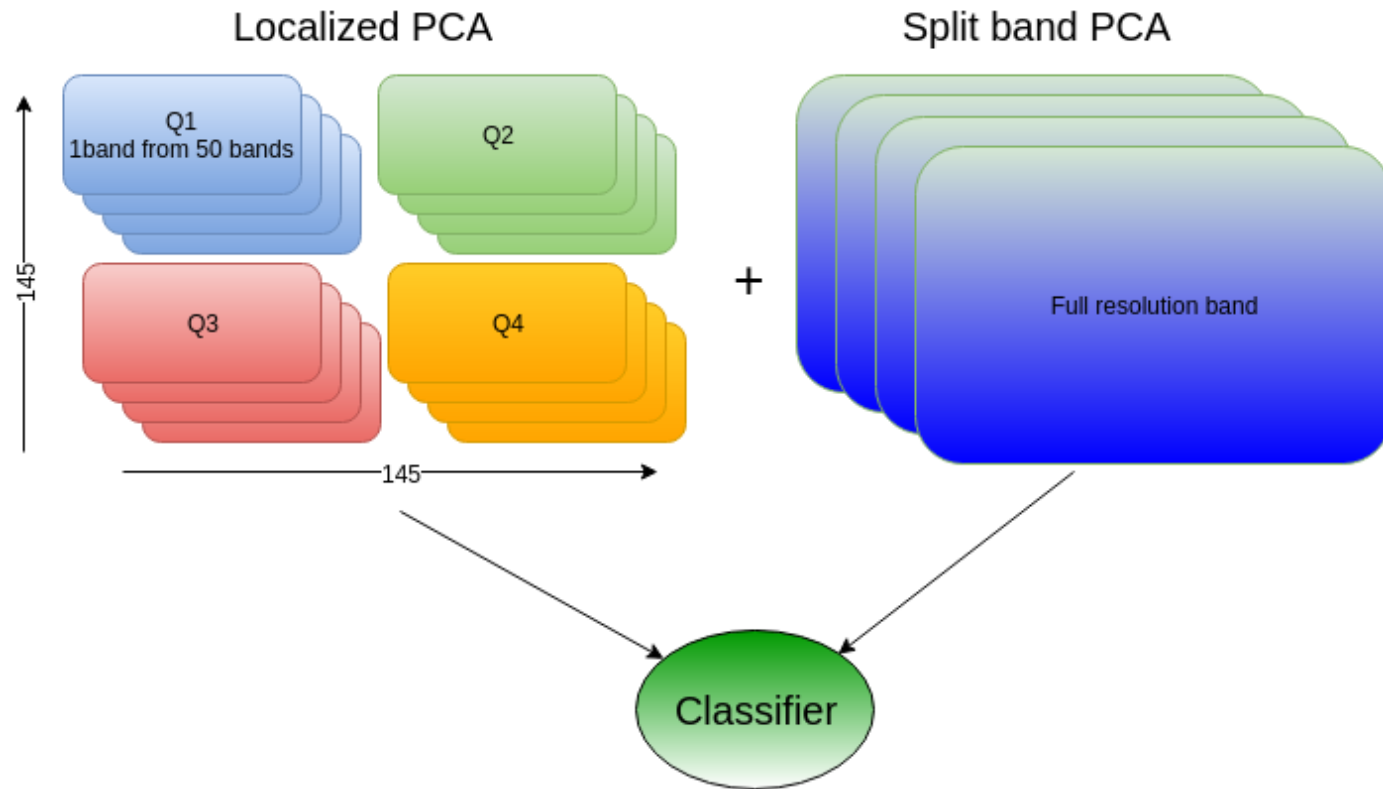
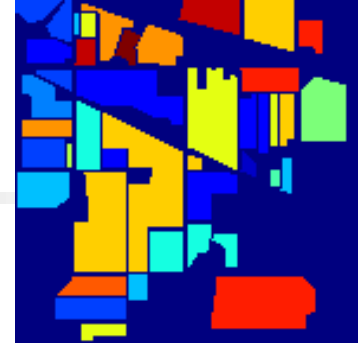
Difficulties:

- High dimensionality, Computationally Expensive
- Limitation on unsupervised methods
- Noisy data



Implementation

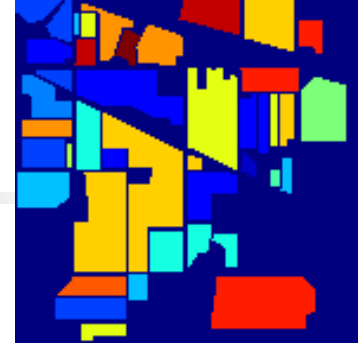
Dimensionality reduction



Implementation

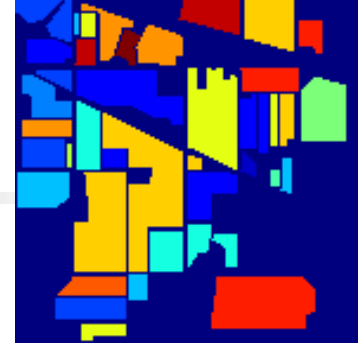
Classification

- K-means
- C-means
- LDA

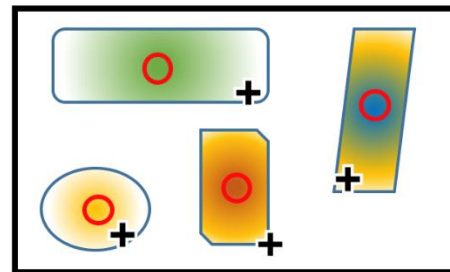


Implementation

Classification

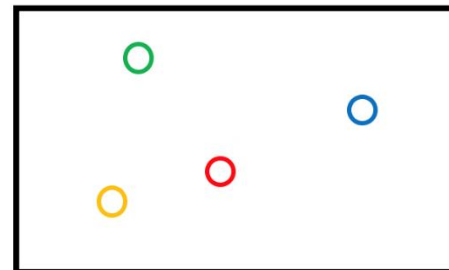


Two Stage Classification



+ Outliers
○ Inliers

Stage 1: C-Means

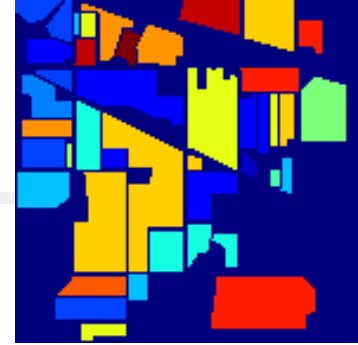


Class 1
Class 2
Class 3
Class 4

Stage 2: SVM

Implementation

Classification



LDA

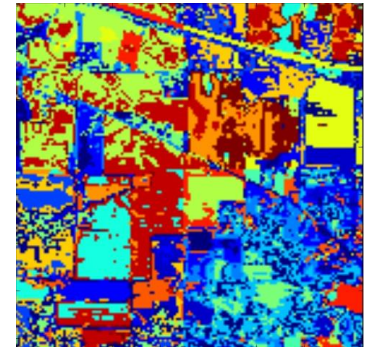
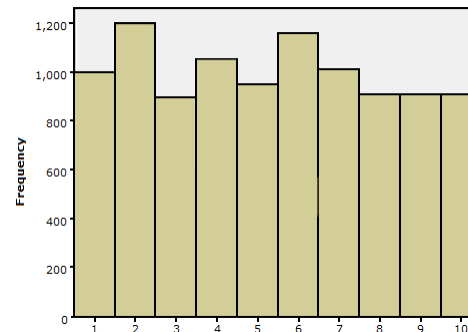
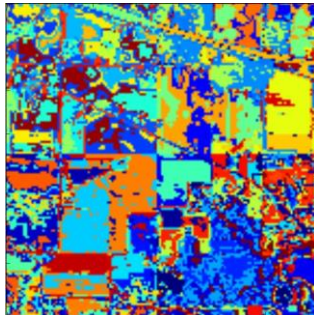
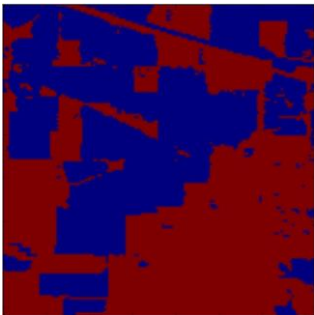
Document
Construction

Word
Construction

Word distribution
across documents
construction

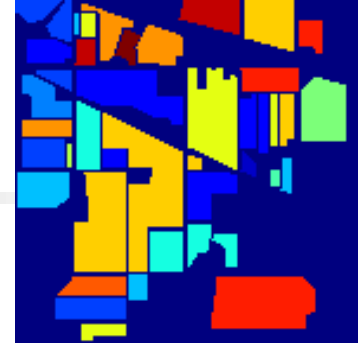
LDA (Topic
mixture and topic
per word is
generated)

Image
reconstruction



Experiments and results

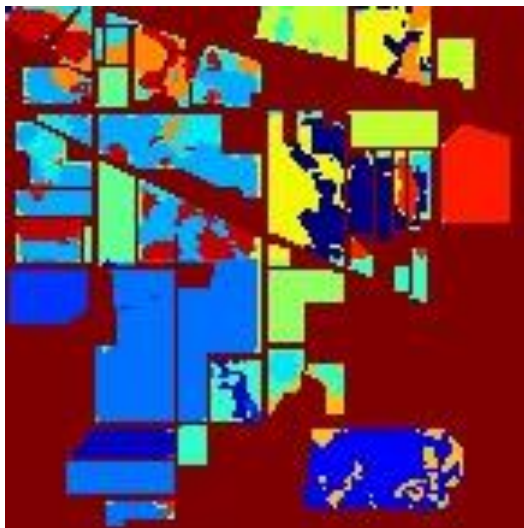
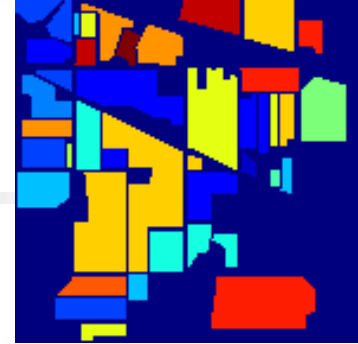
Local PCA + Split Band PCA



Local PCA	4 dimensions
Clustering Algorithm	Rand Index (%)
K-Means	86.5
C-Means	86.8
ISODATA	86.5
GMM	86.0
LDA	86.4
Two Stage	85.3
Voting	87.0

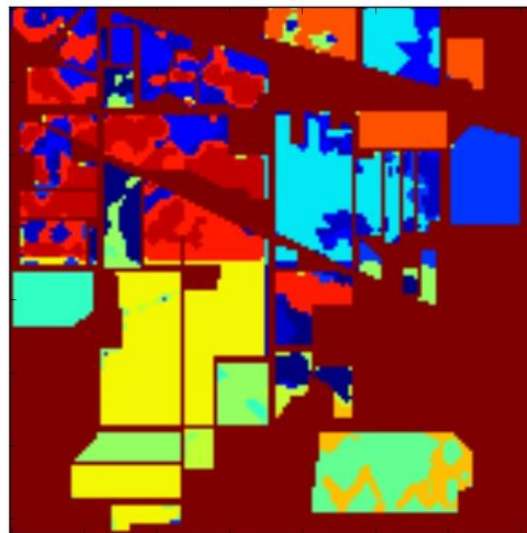
Combined Local-Split PCA	4 dimensions
Clustering Algorithm	Rand Index (%)
K-Means	87.9
C-Means	87.2
ISODATA	86.5
GMM	87.2
LDA	87.4
Two Stage	86.3
Voting	88.0

Experiments and results



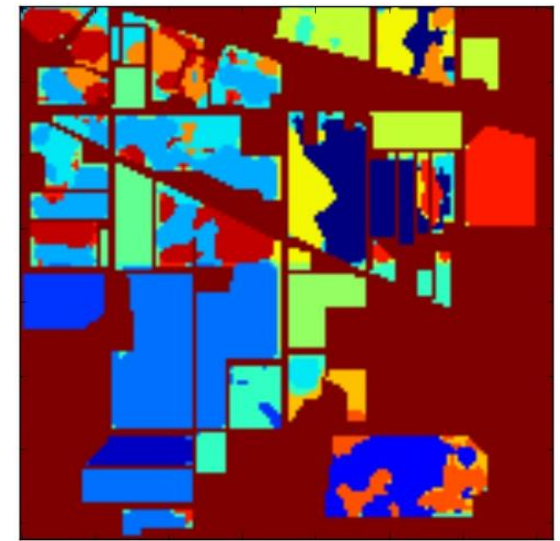
Voting

88%



C-means

87.2%

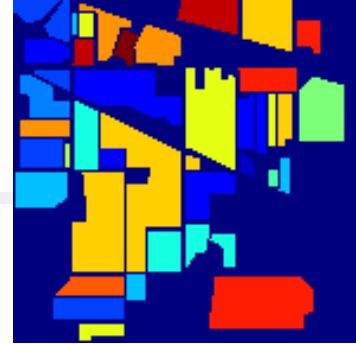


K-means

87.9%



Thanks!!!



Questions???

