INF 5300 – Suggested topics for projects
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- Practical information:
    - Amount of work equivalent to 1 week full time
    - Deadline can be individual depending on subject
    - You can either select one of the suggested topics or discuss a topic related to you master or phd work.

Overview of suggested topics

- Snake segmentation of seismic images
- Automatic feature selection and dimensionality reduction (lecture 14.3)
- Contextual classification (lecture 25.4)
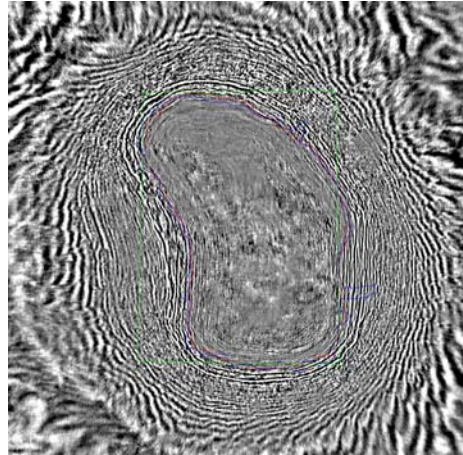- Topic related to your master/phd work.

Snakes for seismic data

Snakes for seismic data

1. Literature study
2. Find a good feature with a minimum value at the boundary
3. Find an initial curve
4. Do the snake segmentation in 2D
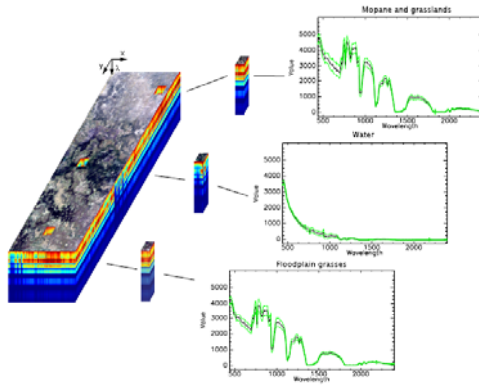5. If time: try it on 3D using neighboring 2D slices.

Feature selection/dimensionality reduction

- Automatic methods to select k out of N features
- Find a good subset of features automatically
- Three possible approaches:
  - Automatic feature selection
    - Select k of the original features by feature selection optimization algorithms.
  - Principal component analysis:
    - Construct a low-dimensional subset of the original features based on finding the directions with maximum variance (unsupervised)
  - Fisher's linear discriminant:
    - Construct a low-dimensional subset of the original features by finding a lower-dimensional projection that maximizes the distance between the classes (supervised).
- You should select ONE of the methods above
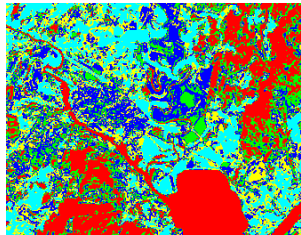- Suggested data set: hyperspectral image with 70 spectral bands.

Hyperspectral data

- High dimensional (50 – 200 features)
- Correlated features
- Sample sparsity
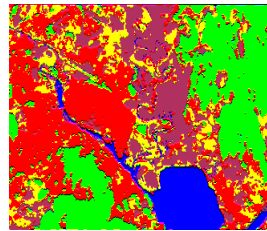 - Ground truth expensive

- Beware of curse-of-dimensionality

Contextual classification

- Normally we classify each pixel f(x,y) to the most probably class based on Bayes rule
- Neighboring pixels are likely to belong to the same class
- We formulate an energy function computed over a local neighborhood. The energy function combines the posterior probability that the pixels belongs to class c with a term encouraging neighboring pixels to have the sameclass label.
- This optimization problem is solved iteratively using a simple algorithm.

- Non-contextual classification

- Contextual classification