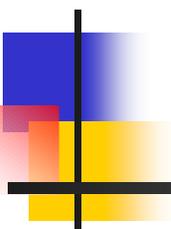
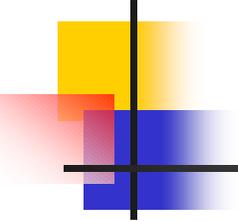


Spatio-Spectral Feature Selection for Pixel Classification with SVMs



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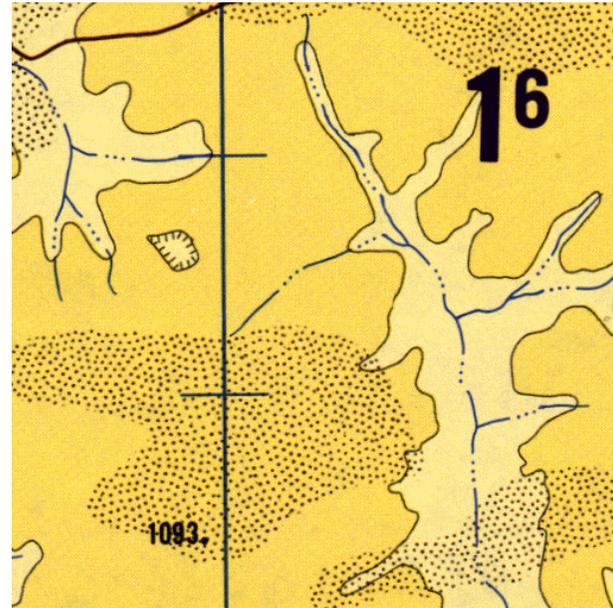


Problem Definition

- Pixel by pixel classification of images, e.g.:



Environmental Monitoring



Map Vectorization

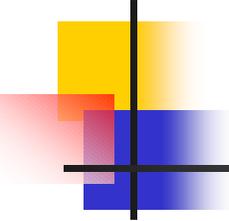
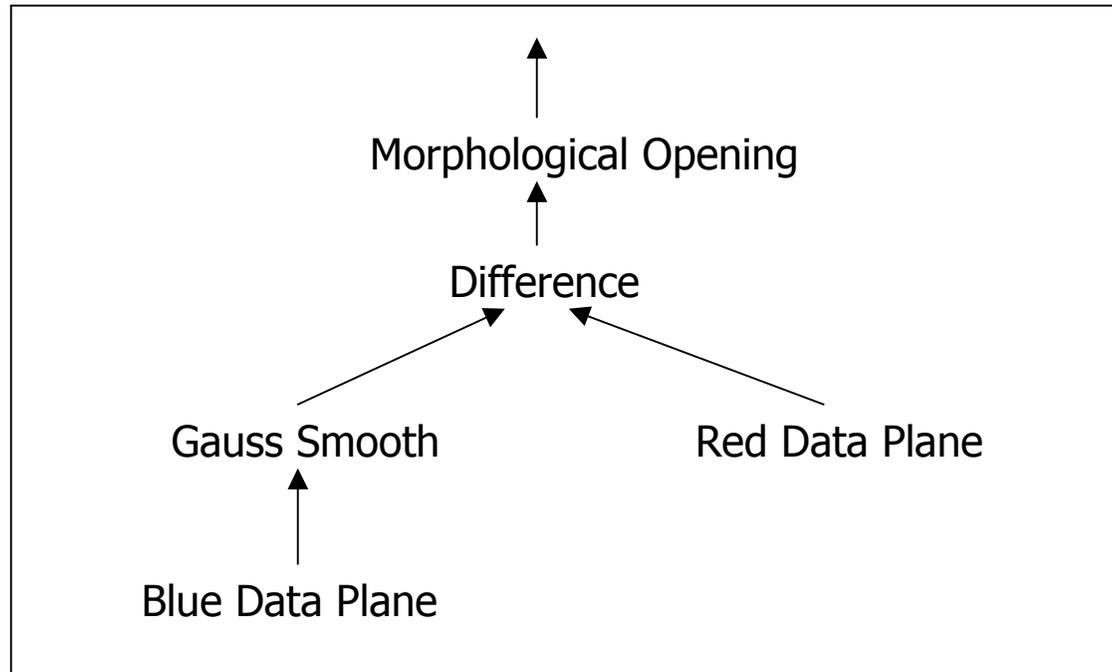


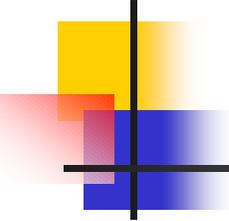
Image-Specific Problems

- Spectral information often ambiguous – we must use spatial context.
- But what spatio-spectral features?
- Image processing is slow, so we want minimal feature sets for large image databases.
- How do we select pixels for training data?

Afreet – Feature Representation



- Simple but flexible tree representation allows a very large number of features to be constructed from primitive operations.

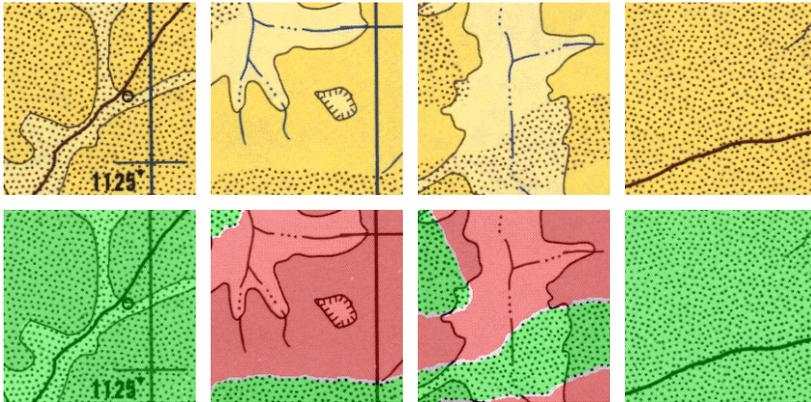


Afreet – Feature Refinement

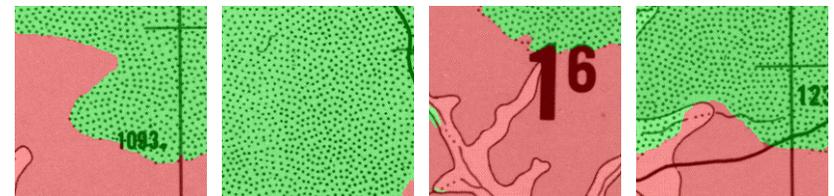
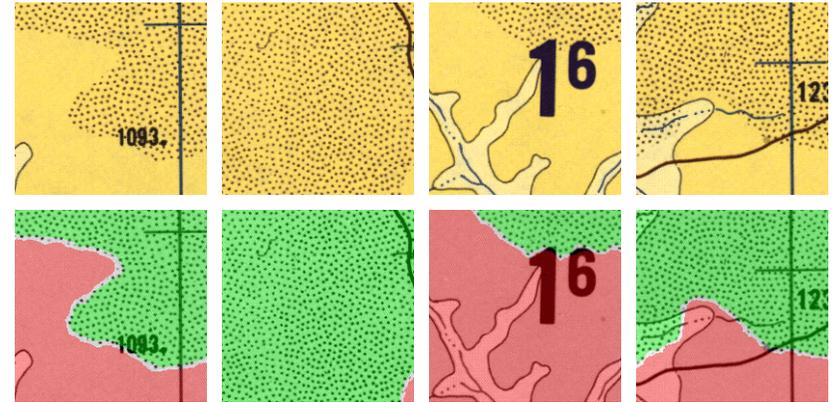
- Set of features initially randomly generated (within user constraints).
- Assess feature importance by seeing how much performance is degraded by altering it.
- Mutate good features, replace bad ones. Iterate for a fixed number of cycles.
- Greedy strategy – only keep changes that improve SVM optimization criterion.

Example – Map Vectorization

Training Data

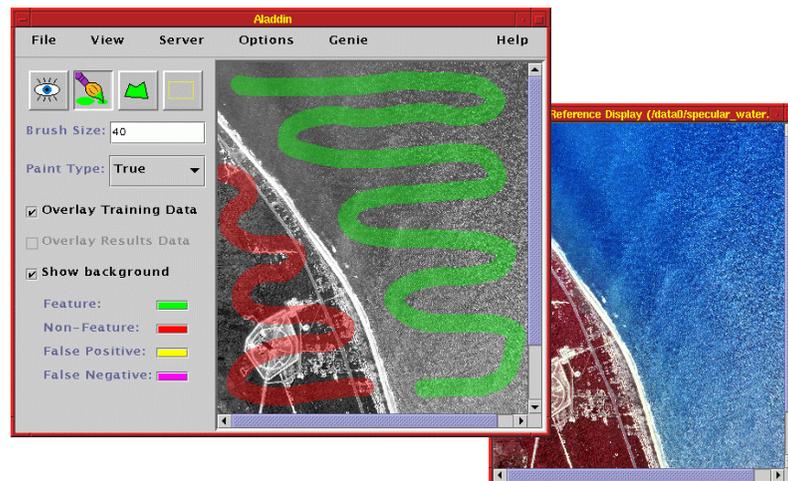


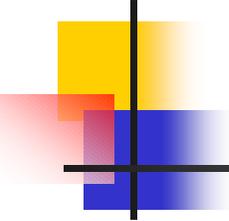
Test Data



Training Data Selection

- How to obtain a minimal subset of training data sufficient to solve the task.
- Our current solution: use a human in the training loop.





Future Work

- Speed up training times
- More automated instance selection
- Boosting rather than linear SVMs
- Better initial feature sets
- Increased interactivity with trainer