Classification of remote sensing images with GeoDMA - Geographic Data Mining Analyst

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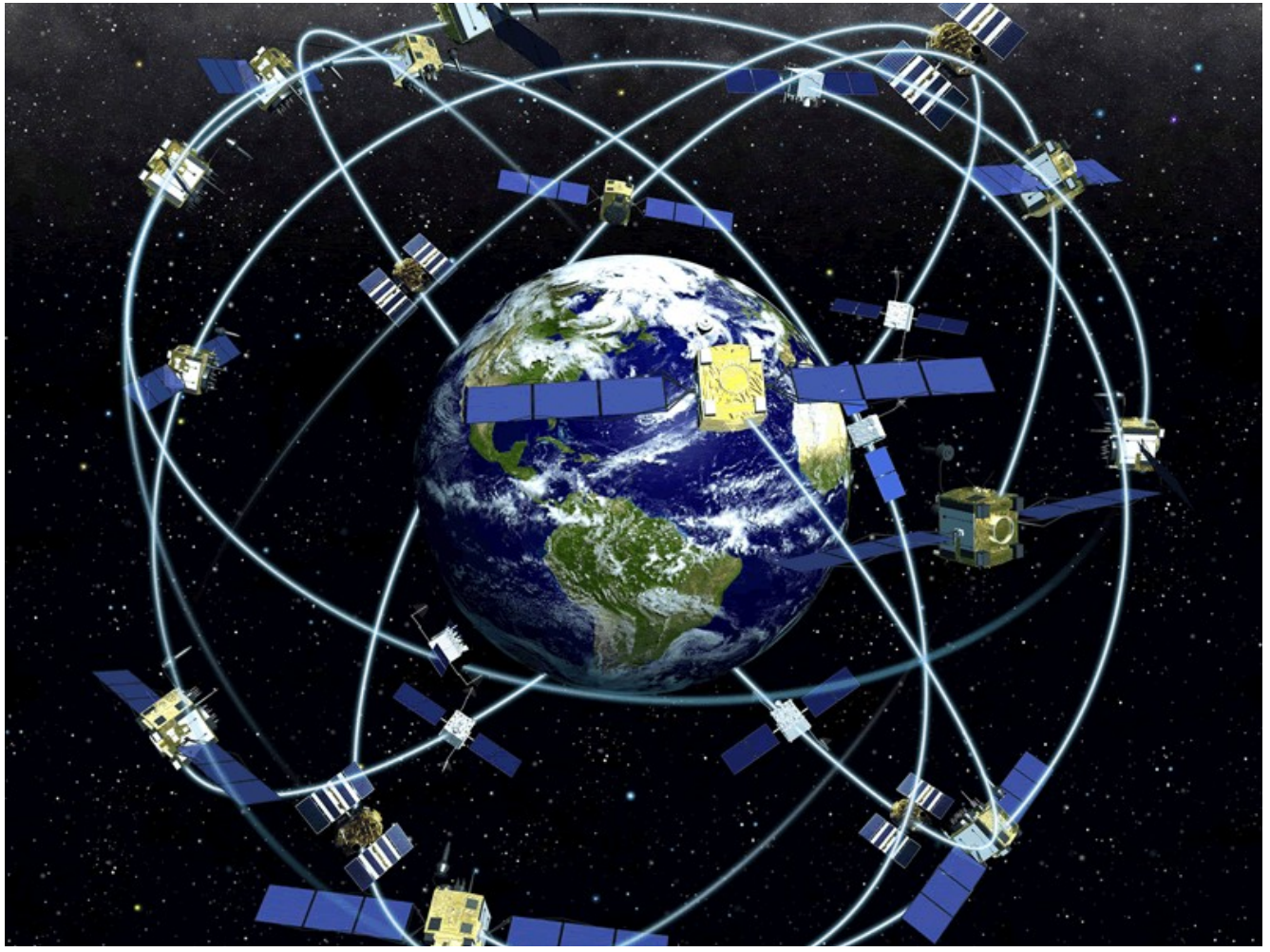
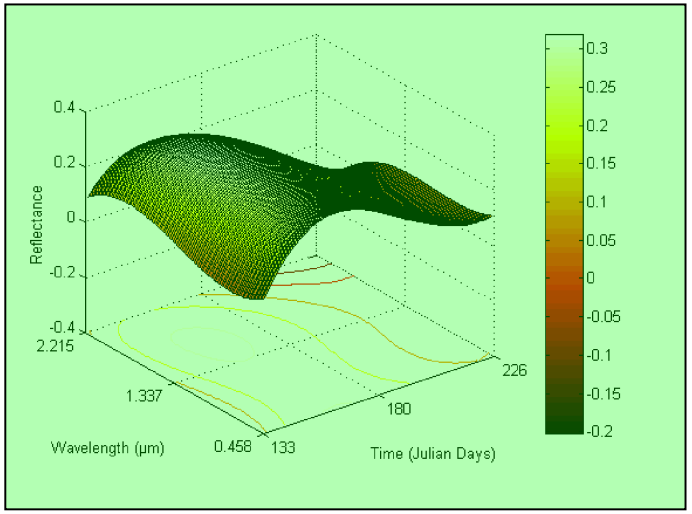
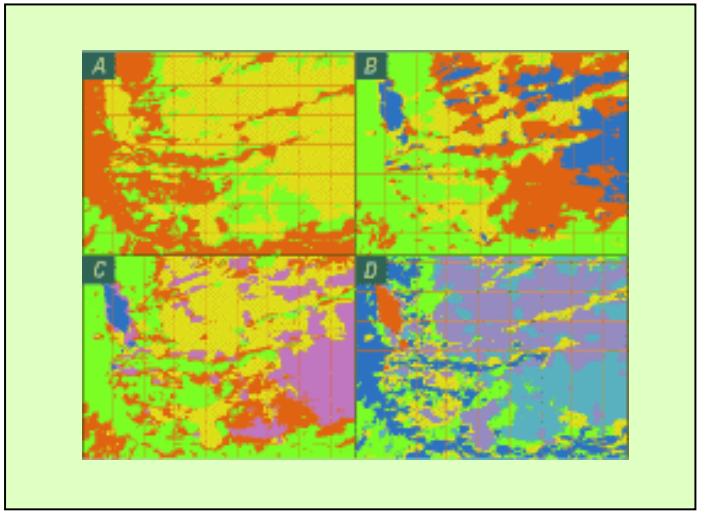
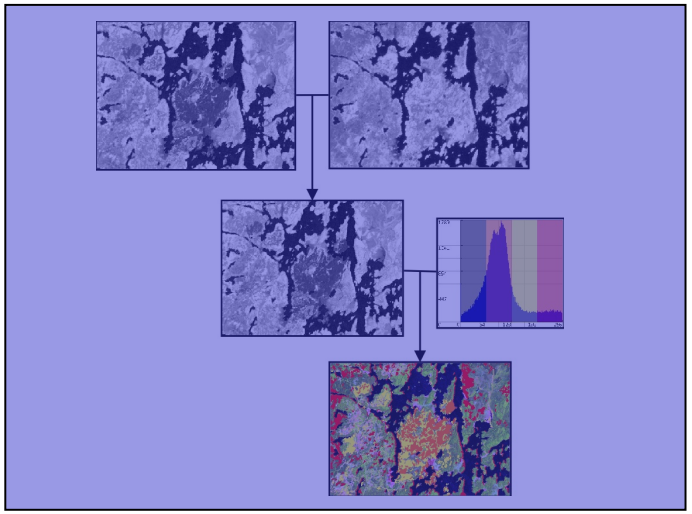
Starting with LANDSAT-1 in 1973, satellites provide a rich data set that helps us to follow changes in our planet.

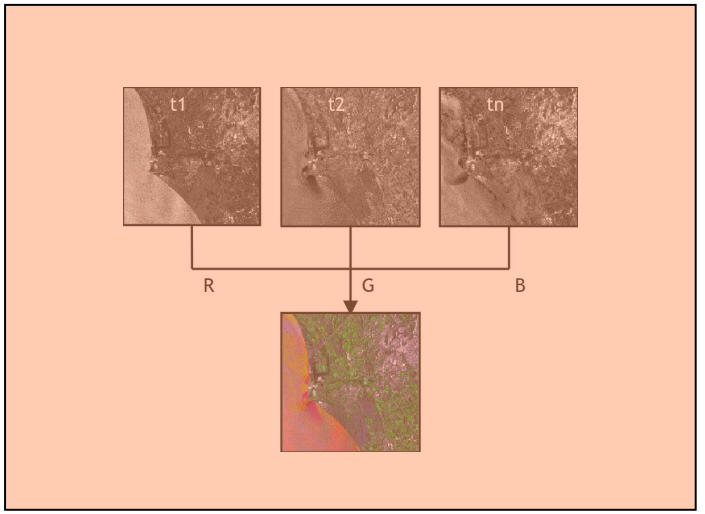


To extract information from images, we need proper image interpretation algorithms.

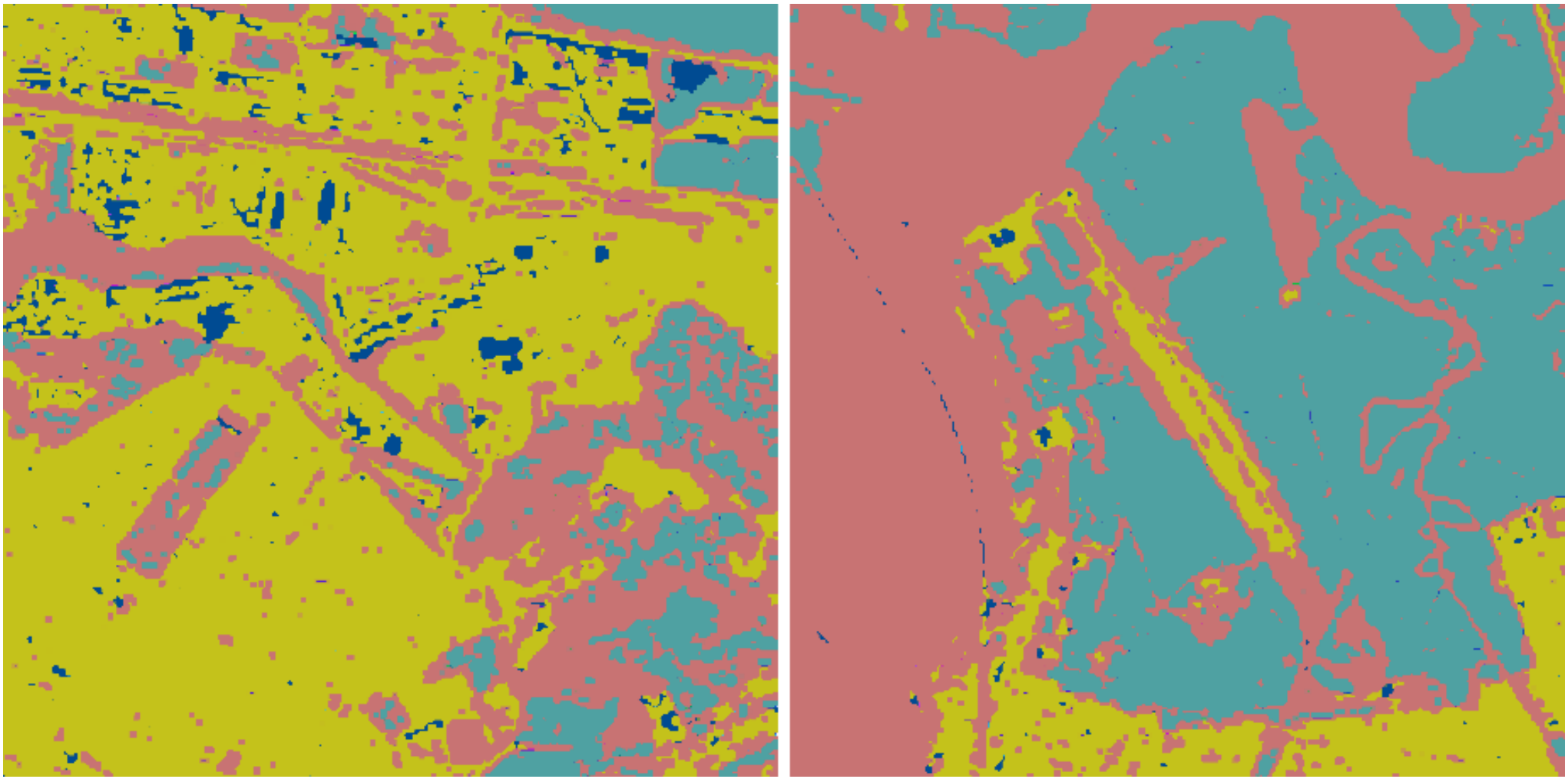








During the 1980s and 1990s, most image classification techniques used pixel-based statistical analysis.

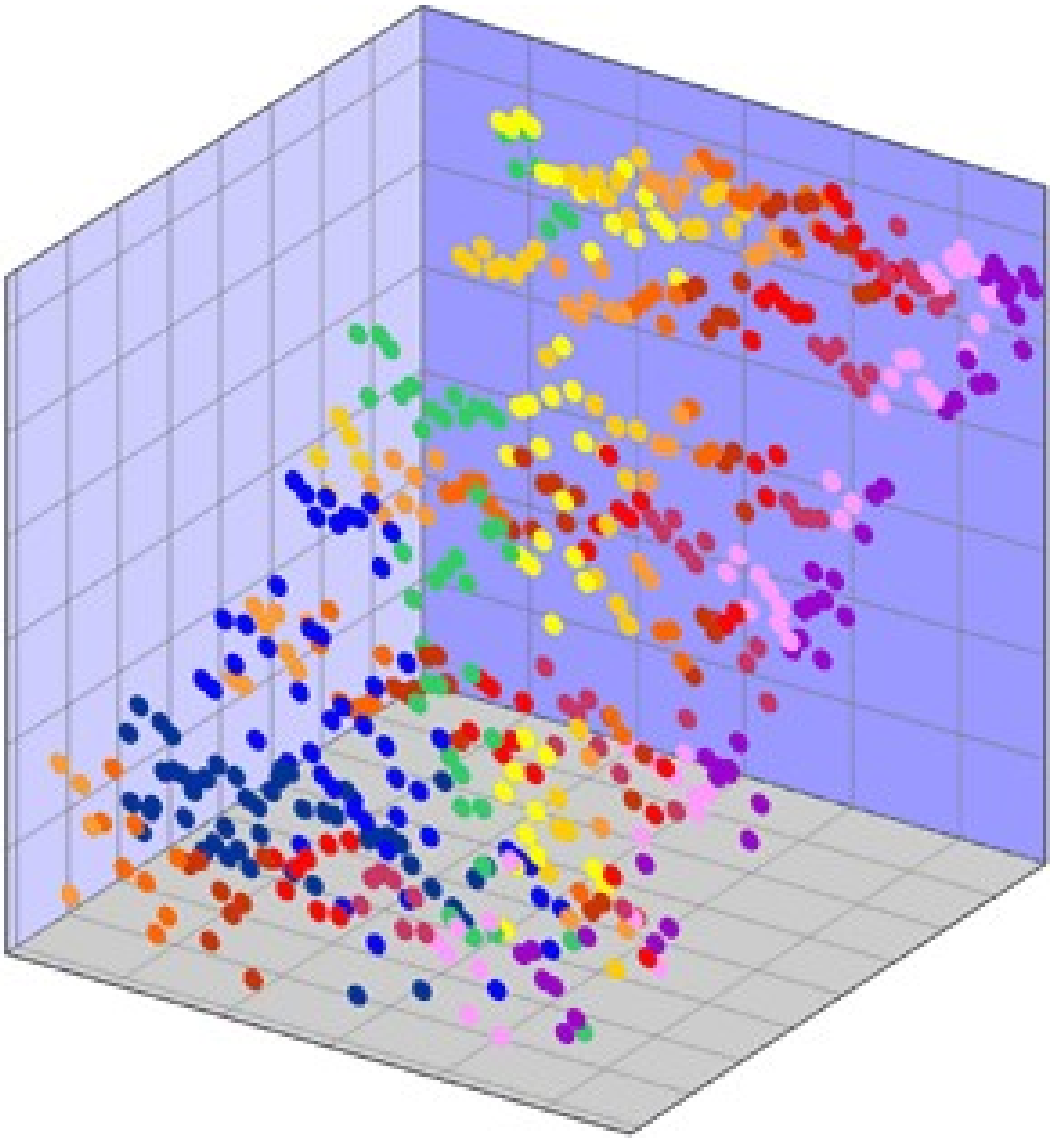


Object-based classification took a long time to reach the mainstream users.

Haralick, R. and L. Shapiro, Image segmentation techniques. Applications of Artificial Intelligence II., **1985**. 548: p. 2-9.

Câmara, G., et al., Spring: Integrating remote sensing and GIS by object-oriented data modelling. Computers and Graphics, **1996**. 20(3): p. 395-403.

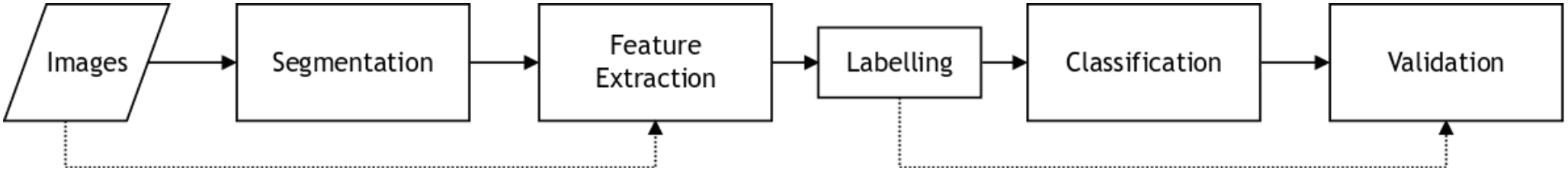
How to choose suitable object features for a good classification?

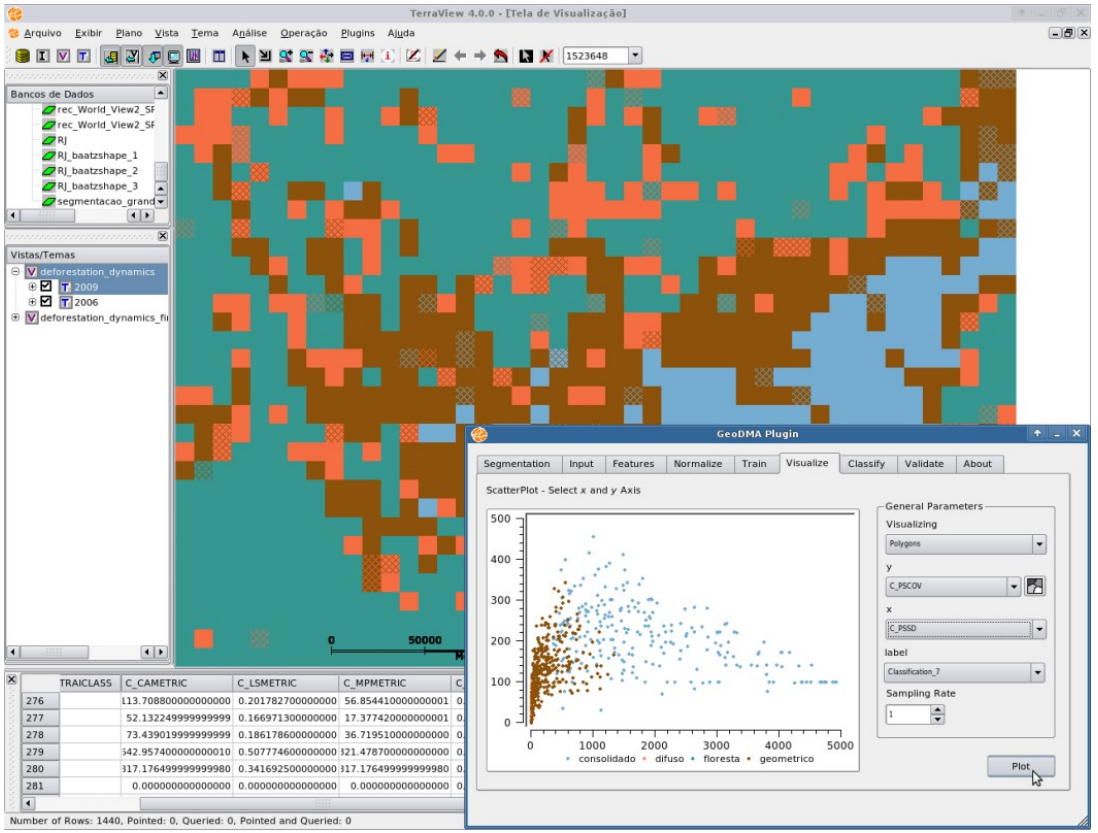


GeoDMA
Geographic Data Mining Analyst

- Version 0.2.1, plugin for TerraView 4.0.0
- Linux/Windows
- Segmentation Algorithms (based on):
  - Bins et al. 1996.
  - Baatz, M.; Schäpe, A. 2000.
  - Checkerboard
- Features
  - Shape
  - Texture
  - Landscape
- Classification
  - Decision Trees
  - Self-Organizing Maps
  - Neural Networks
- Validation
  - Kappa
  - Monte Carlo Simulation

Outline for object-based image classification





Object's features available in GeoDMA

Patch metrics	Landscape metrics	Spectral
Angle	Area-Weighted Mean Patch Fractal Dimension	Amplitude
Area	Area-Weighted Mean Shape Index	Entropy
Bounding Box area	Class Area	Maximum
Contiguity	Edge Density	Mean
Elliptic Fit	Landscape Shape Index	Minimum
Fractal Dimension	Mean Patch Fractal Dimension	Mode
Gyration Radius	Mean Patch Size	Ratio
Length/Width	Mean Perimeter Area Ratio	Standard Deviation
Patch Density	Mean Shape Index	Sum
Perimeter	Number of Patches	
Perimeter-Area ratio	Patch Size Coefficient of Variation	
Rectangularity	Patch Size Standard Deviation	
	Percentage of Landscape	

Classification algorithms

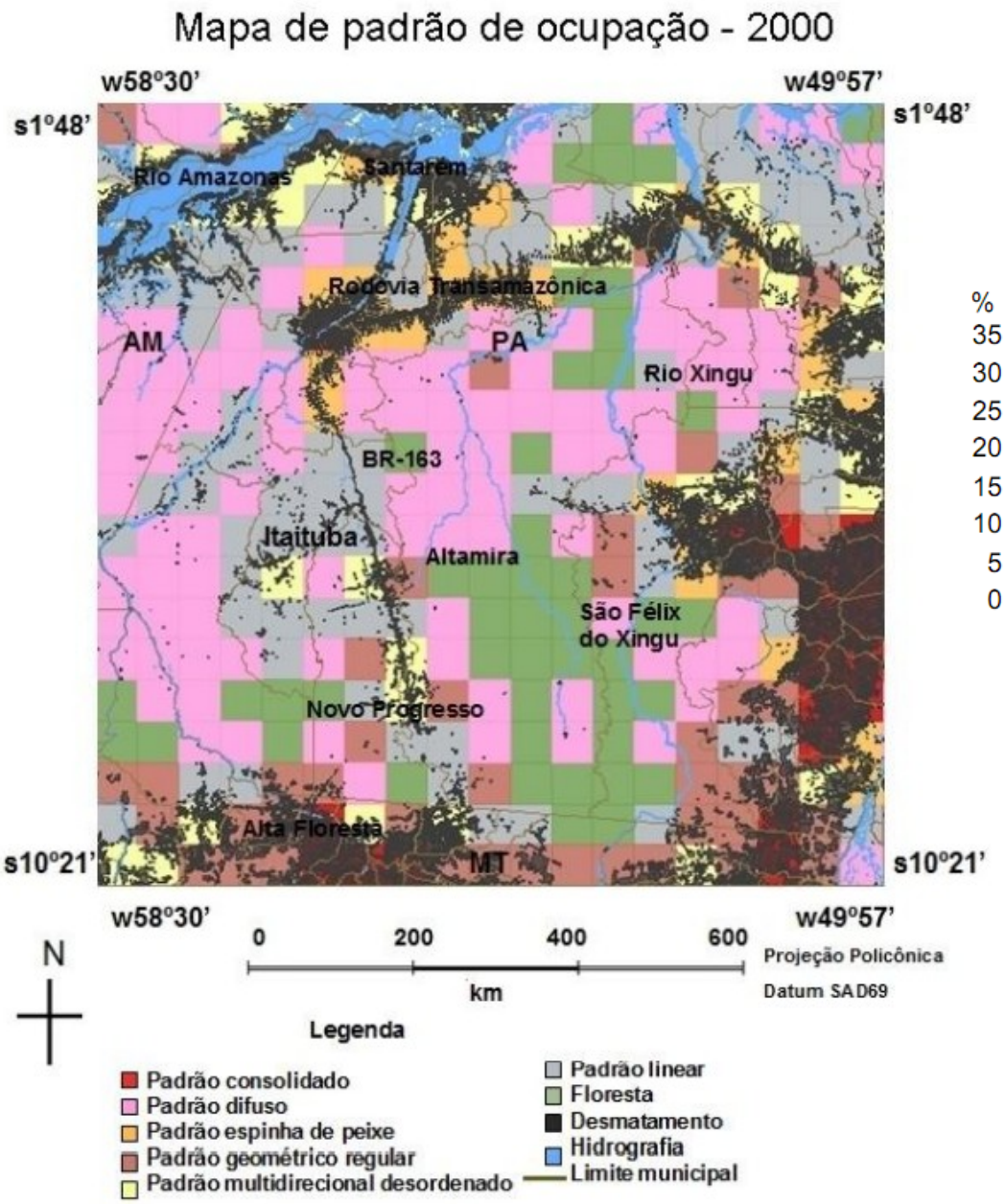
- The manual definition of an effective rule-set for classification is a time-consuming task.
- GeoDMA makes easy the knowledge discovery in the database, automatically creating decision trees, which find the best features for classification, and their relations to the classes of interest.

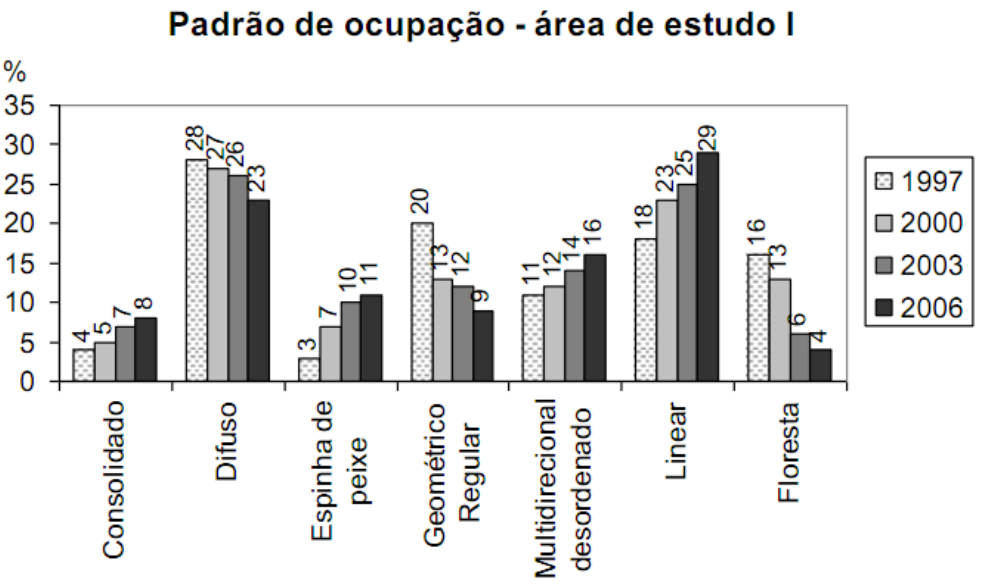
Applications – Urban classification

QuickBird scene, obtained in February, 2002, São Paulo, Brazil.

Applications – Urban classification

Applications – Deforestation Patterns





Future works

- New classification algorithms
- Feature selection user interface
- Time Series Analysis

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