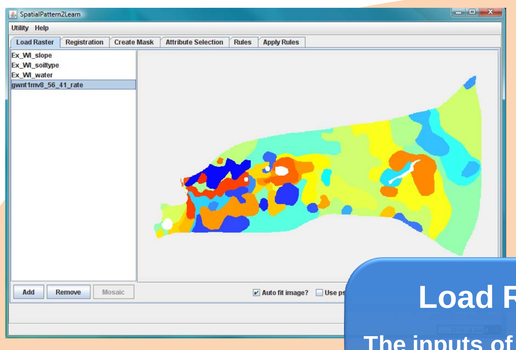
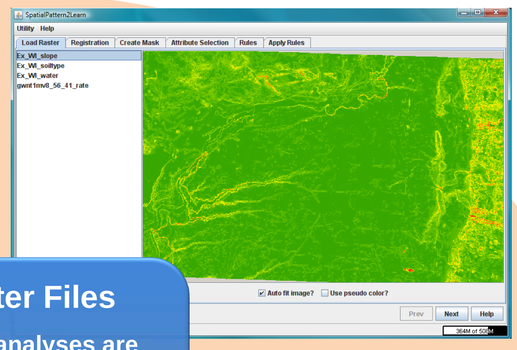
SP2Learn and PRO-GRADE

Download http://www.sws.uiuc.edu/gws/sware/

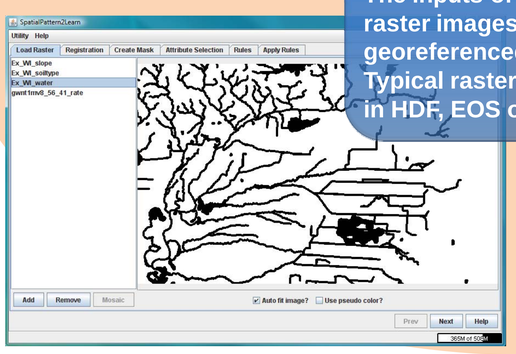
Software for Pattern Learning, Pattern Recognition and Recharge Estimation

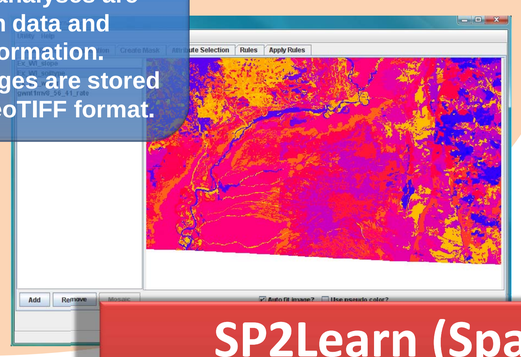


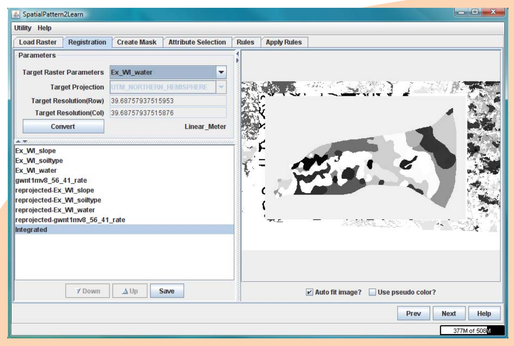


Load Raster Files

The inputs of the analyses are raster images with data and georeferenced information. Typical raster images are stored in HDF, EOS or GeoTIFF format.

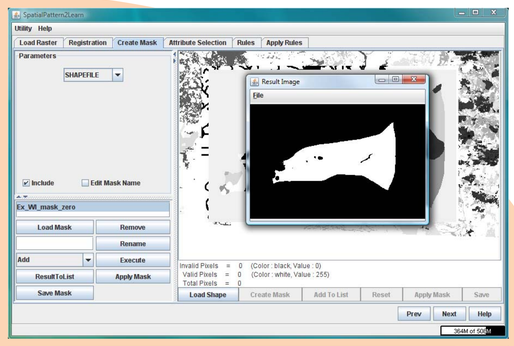


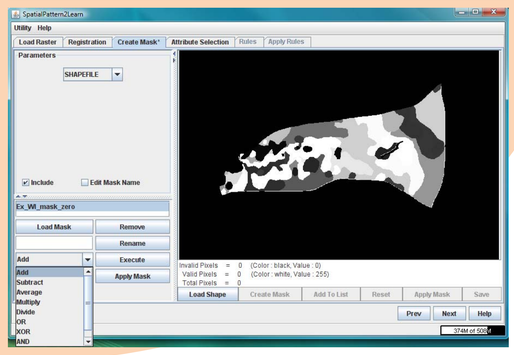




Registration and Masking

- Registering all raster datasets to form a stack with consistent spatial resolution as well as geographic projection.
- Creating and modifying masks to define the area of interest for analysis.



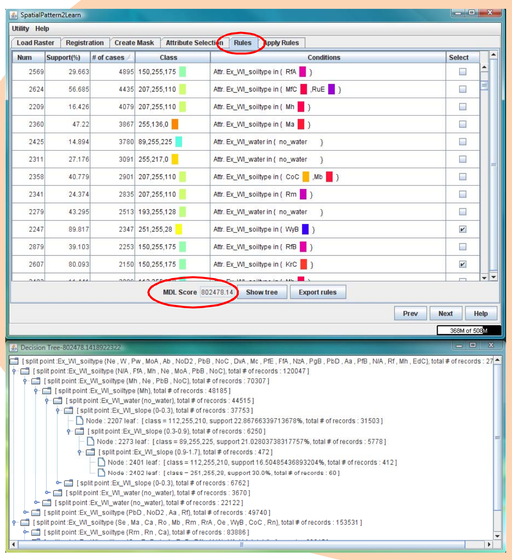


SP2Learn (Spatial Pattern to Learn)

A Software Suite for Geospatial Modeling from Ancillary Field Measurements Using Image Processing and Machine Learning

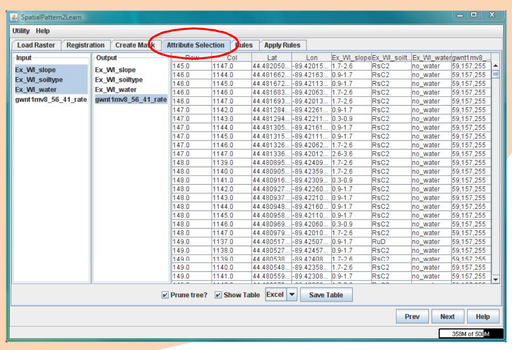
Hardware and software requirements:

- **Recommend at least 512MB of RAM**
- **Operating System capable of running JAVA**
- **JAVA 1.5**



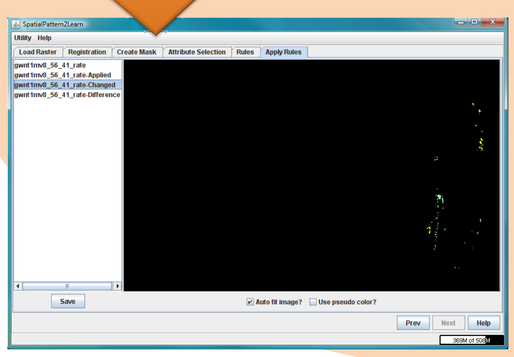
Steps in Decision Tree Algorithm

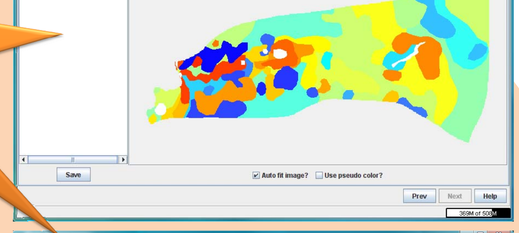
- Attributes are the input data for the algorithm.
- Rules are detected in the algorithm.
- MDL Score indicates pattern matching efficiency.

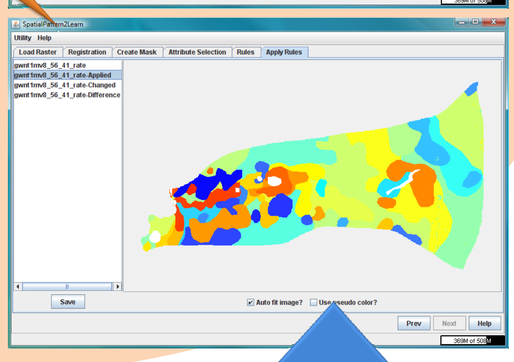


Select and Apply Rules

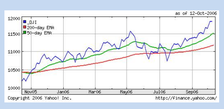
- Images before and after the selected rules are applied.
- Images of the location and magnitude of the difference after selected rules are applied.



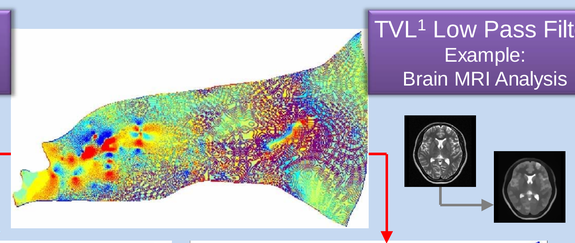


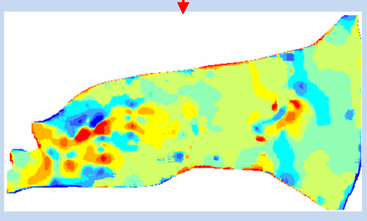


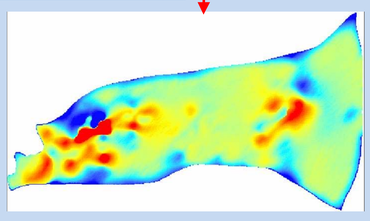
2D Moving Average
Example:
Stock Market Analysis



TVL[1] Low Pass Filter
Example:
Brain MRI Analysis







PRO-GIS

Pattern Recognition Organizer for GIS

- Customized image processing algorithms can be added to the GUI through the use of Microsoft Visual Basic. Thus, future developers can expand the capabilities of PRO-GIS and tailor the application to the needs of each individual project.
- PRO-GIS demonstrates the benefit of organizing various image processing algorithms into one graphical user interface (GUI).
- PRO-GIS can work with three methods of image processing:
  (1) existing program objects such as ArcObjects
  (2) existing codes for traditional algorithms
  (3) code written within PRO-GIS for new algorithms
- PRO-GIS is a pattern recognition tool with wide applications, including but not limited to groundwater recharge and discharge pattern recognition.

An Example Case for PRO-GRADE and SP2Learn

An example case is included in the PRO-GRADE and SP2Learn download packages as a tutorial for users. The example case is the Buena Vista Groundwater Basin, which has been intensively studied in several research projects. The example files were processed using data provided by the US Geological Survey, Wisconsin Water Science Center, Middleton, Wisconsin; the Wisconsin Geological and Natural History Survey; and the Central Wisconsin Groundwater Center of the University of Wisconsin – Extension.

Hardware and software requirements:

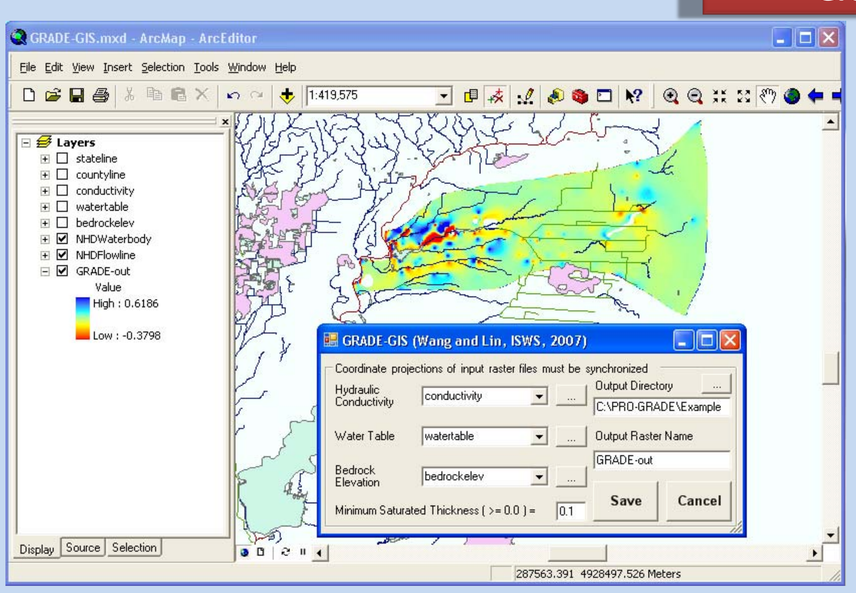
- **Recommend at least 512MB of RAM**
- **Operating System: Windows XP – SP2 or Vista**
- **ArcGIS 9.2 – SP2**
- **ArcMap Spatial Analyst Extension**
- **ArcGIS.NET support**

PRO-GRADE (PRO-GIS and GRADE-GIS)

Pattern Recognition Organizer and Groundwater Recharge And Discharge Estimator for GIS

Installation

- PRO-GRADE uses the same Microsoft Windows Installer as many Windows based programs.
- The PRO-GRADE package includes two ArcGIS plug-in tools: PRO-GIS and GRADE-GIS.
- PRO-GIS and GRADE-GIS need to activated in the ArcMap toolbar as customized icons.



GRADE-GIS

Groundwater Recharge And Discharge Estimator for GIS

GRADE-GIS provides groundwater recharge and discharge estimations in steady state and two-dimensional aquifers based on a mass balance approach that requires only hydraulic conductivity, water table and bedrock elevation (Stoertz and Bradbury,1989)

The output from GRADE-GIS is format-ready for PRO-GIS based on the concept of coupling the mass balance method and the image processing approach for more advanced groundwater recharge and discharge estimation (Lin and Anderson, 2003).