

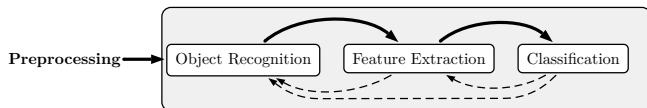
An architecture based on class dependent neural networks for object-based classification

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Object-base Image Analysis



Feature Extraction

Intrinsic/sensorical object features

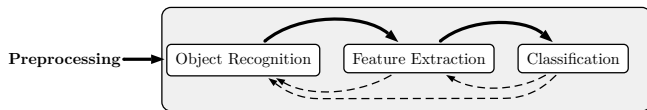
- ▶ Spectrum
- ▶ Shape
- ▶ Texture

Semantic object features

- ▶ Intrinsic relationship between objects
- ▶ Relationships out of object organisation

⇒ Multitude of features in feature space

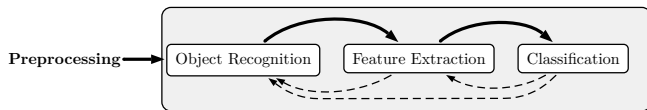
Object-base Image Analysis



Classification

- ▶ Assignment of meaning to spatial objects
- ▶ Creation of a conceptual scheme / Ontology
- ▶ Classification (conceptual scheme ↔ classifier) → classify

Object-base Image Analysis



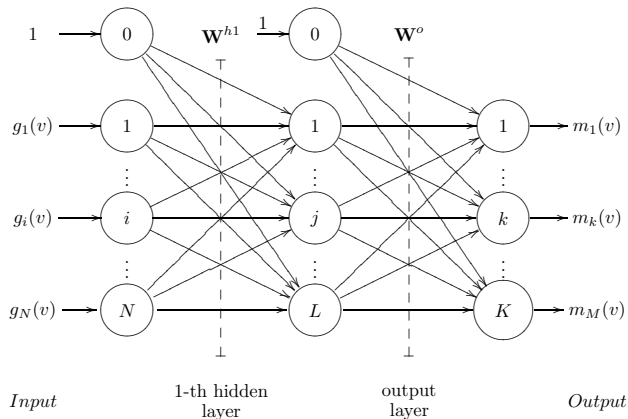
Classification

- ▶ Assignment of meaning to spatial objects
- ▶ Creation of a conceptual scheme / Ontology
- ▶ Classification (conceptual scheme ↔ classifier) → classify

How about automated classifiers?

Classification - Neural Networks

2-layered feed forward network



Classification - Neural Networks

Training of the classifier:

- ▶ Backpropagation
- ▶ Kalman Filter-training
- ▶ Scaled-gradient Conjugated

Classification - Neural Networks

Training of the classifier:

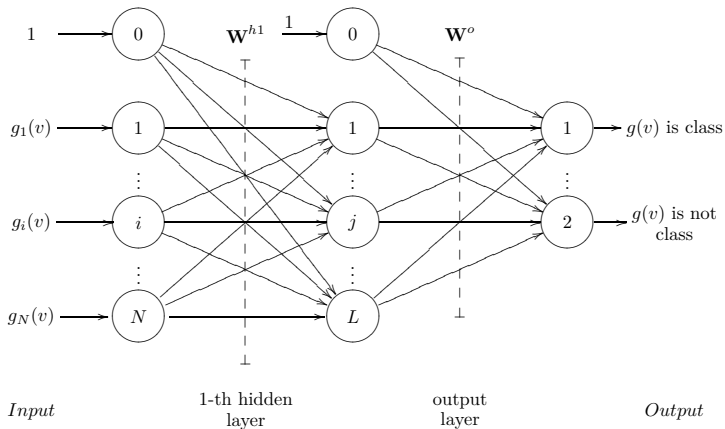
- ▶ Backpropagation
- ▶ Kalman Filter-training
- ▶ Scaled-gradient Conjugated

Modification of network:

- ▶ Class against classes \rightarrow 'is' / 'is not' class state
- ▶ Classification of 'is' / 'is not' class state

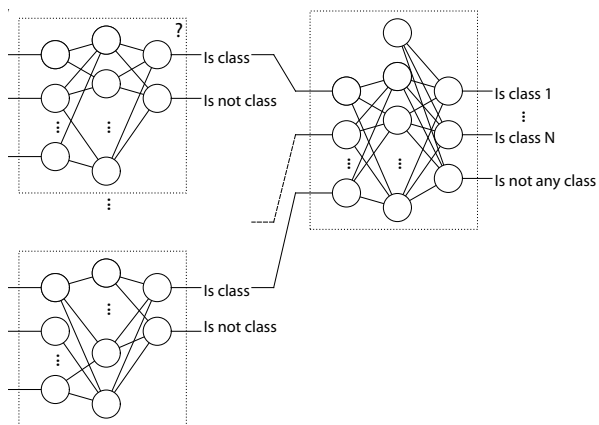
Classification - Neural Networks

'is'/'is not' class feed forward network \rightarrow Class discrimination



Classification - Neural Networks

Building a Class Dependent Network (CDN)

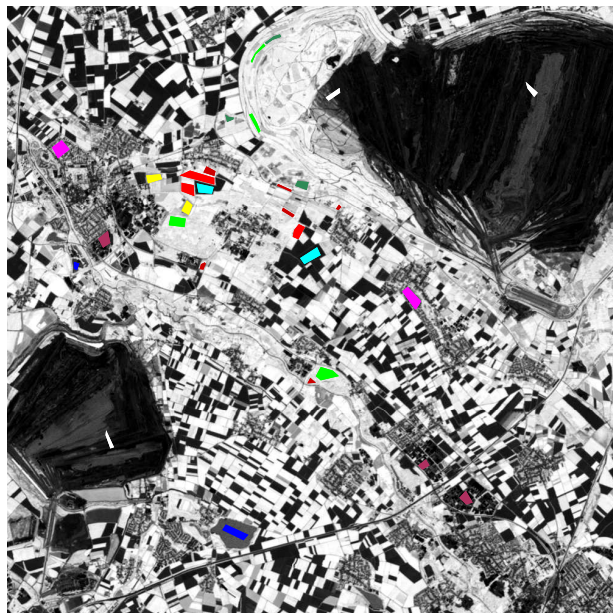


Classification

Problems of controlled classifiers

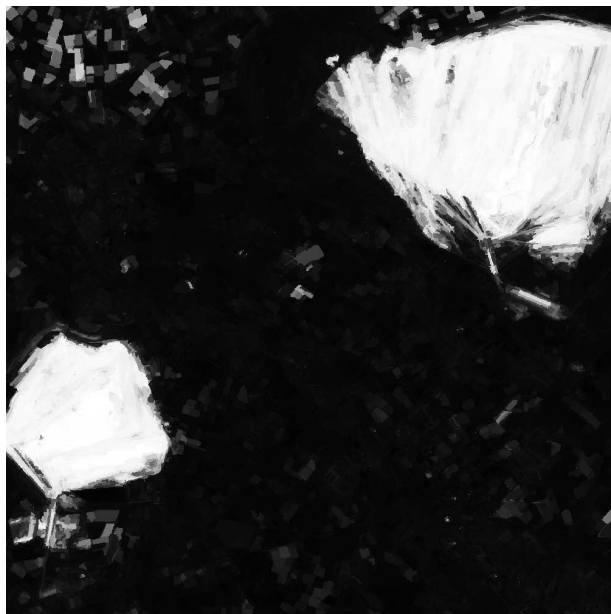
- ▶ Number of samples, adequate samples
- ▶ Feature reduction, separability
- ▶ Non-unique result of classification (especial problem of FFNs), error propagation
- ▶ Intransparent classification
- ▶ Semantics of classes, still manual 'fuzzy' rules

Sample Image (Aster/Juelich)



- classes
- beets
 - canola
 - coniferous forest
 - deciduous forest
 - grain
 - industries
 - meadow
 - open pit
 - settlement
 - water

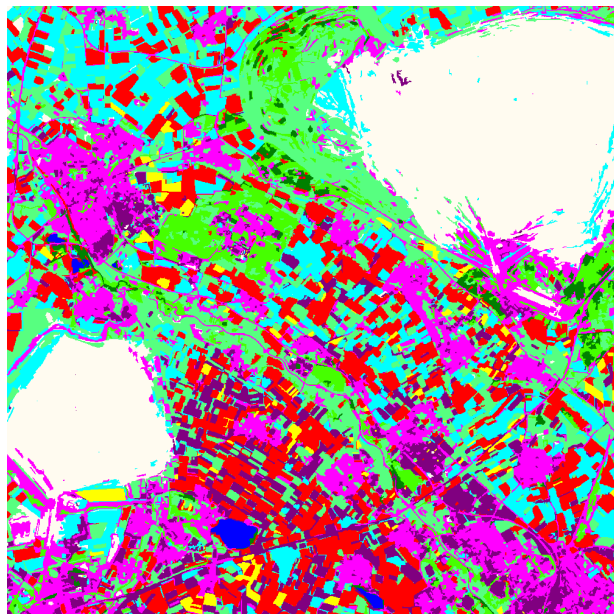
'is' class (open pit): fuzzy values



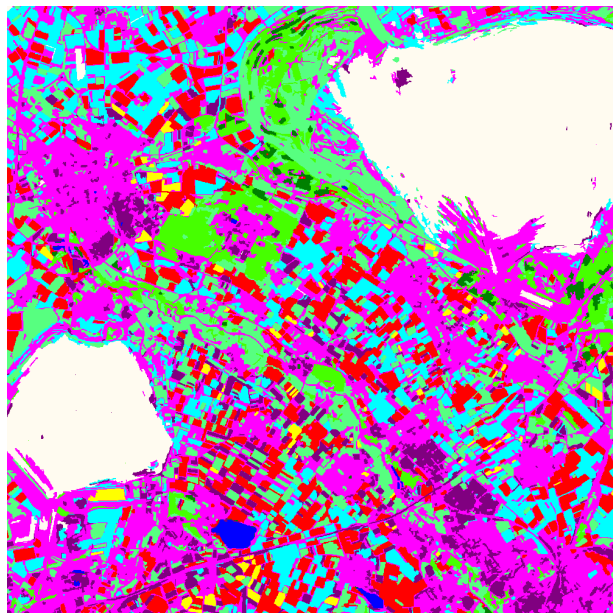
'is not' class (open pit): fuzzy values



Feed Forward Network



Class dependent Network



- classes
- beets
 - canola
 - coniferous forest
 - deciduous forest
 - grain
 - industries
 - meadow
 - open pit
 - settlement
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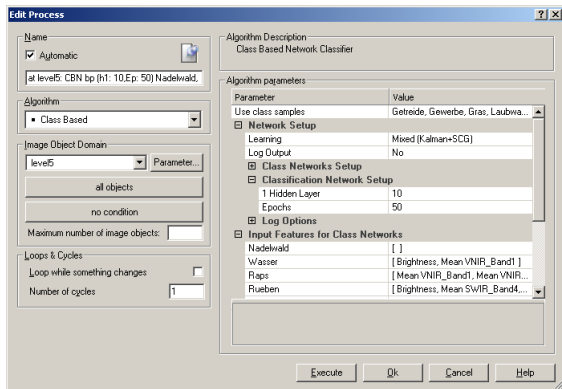
Classification

- ▶ Identification of good/bad classes by 'is' / 'is not' state
- ▶ Flexible with regard to class hierarchy and integration into the usual classification process
- ▶ Transferability of rulesets in time and space by retraining existing networks.

Implementation

Available for Definiens Developer

- **Neural Networks**
 - Feed Forward
 - Feed Forward against other
 - Class Based



<http://tu-freiberg.de/fakult3/mage/geomonitoring/software/software.html>

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