



## Knowledge Discovery Services

The Knowledge Discovery Services (Figure 1) uses both fuzzy, crisp, and symbolic pattern detection to generate if-then-else rules. The rule discovery facilities use either a deep pattern detection approach (Wang-Mendel) or several fuzzy and conventional classifiers and clustering algorithms. A Genetic Tuner can be used to optimize the configuration of the discovered knowledge base (1) thus producing a new, highly effective mode. You can also inject the discovered rule into an existing knowledge base (2). The Genetic tuner can then be run in tournament mode (3) to optimize the combine client and discovered rules. Along with this module is the Anterus Data Explorer GUI, a comprehensive data mining, knowledge discovery, and KB management environment.

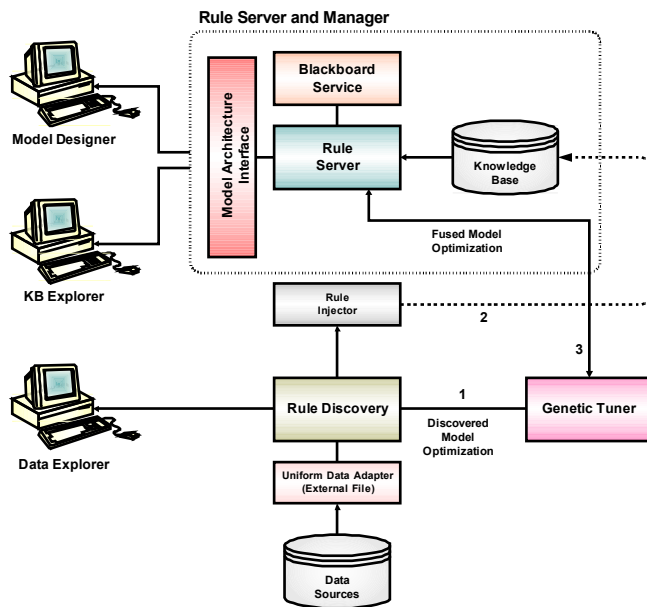


Figure 1. Knowledge Discovery and Optimization



## Features:

### Fuzzy Rule Induction

- Adaptation of Wang-Mendel Algorithm
- Uses Kosko-Spect Standard Additive Model (SAM)
- Generates an *if-then-else* executable knowledge base
- Driven by fuzzy semantics of data
- Partitioning heuristic divides data into fuzzy term set
- Easy data modeling
  - Handles ordinal, categorical, nominal, interval, ratio data
  - Discrete and continuous data
  - Automatic data interpolation
- Measures degree of evidence for rules
- Incorporates belief functions
- Merge multiple data sets with varying data integrity levels
- Consolidates multiple rules based on conflict tournament
- Genetic Tuning used to optimize model structure

### Classifiers and Clustering

- Fuzzy and crisp partitioning
- Automatic algorithm selection and refinement
- Used to generate if-then rules
- Deep pattern discovery, isolation, and quantification
- Multiple clustering algorithms
  - Yager Mountain Clustering Technique for Rule Generation
  - Hard K-means and Nearest neighbor clustering
  - Fuzzy C-means clustering in N-dimensional space
  - Fuzzy Adaptive Total (FAT) clustering
- Classifier algorithms
  - Extended ID3 classifier
  - Pao-Hu Entropy based classifiers
- Conifer Fuzzy Rule Induction

### Model Tuning and Calibration

- Multi-Objective genetic algorithm
  - Tunes number, shape, overlap of fuzzy sets
  - Tunes compensatory operator strengths in rule predicates
  - Tunes aggregation, correlation and defuzzification methods
- Percolation tournament between discovered and SME rules
- Automatic model reconfiguration based on statistics of underlying evidence
  - Measures and adjusts cumulative predictive error