



## Statistical Learning and Prediction Models

The Statistical Learning and Prediction Models (Figure 1) use the time series data associated with model variables. This module contains the linear and nonlinear (polynomial) regression facilities, the adaptive feed back protocols, the statistical compatibility analysis (to measure the amount of entropy or error in a model over time), parametric and non-parametric correlation analysis, and other statistical techniques used to learn the behavior or individual or clustered. Statistical learning automatically generates multiple models of recurring patterns with differing periodicity in time series data. The abrupt change modeler is able to distinguish between spikes and actual changes in learned patterns.

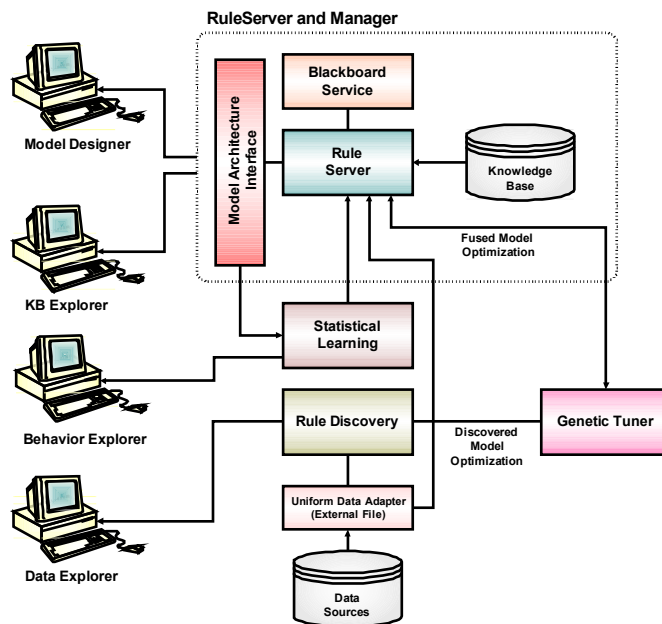


Figure 1. Statistical Learning and Prediction



## Features:

### **Basic Statistical Modeling**

Descriptive Statistics

- Minimum and Maximum

- Mean (Average)

- Weighted Average

- Mode

- Median

- Standard Deviation

- Kurtosis

- Skew

Parametric and non-parametric correlation

Linear and non-linear regression

Automatic smoothing and data fitting

Histograms

### **Principal Component Analysis**

Isolates variables that are not auto-correlated

Measures degree of contribution

Uses genetically supported minimum-error model

Can generate and test randomly computed fields

Selects attributes for root model

### **Statistical Learning**

Modified implementation of Vapnik-Chervonenkis-Theory

Detection of multiple patterns with different periodicity

Implicit component isolation: trend, seasonal, cyclical, irregular periods

Learning coefficients based on adaptive feedback

Spike analysis and abrupt change modeling (based on

- Basseville and Nikiforov, *Detection of Abrupt Changes*)

Off-line and on-line pattern analysis

Variable history depth selection based on model periodicity

Coupled to nonlinear prediction

- Variable forecast window

- Measures error of estimate

Automatic noise modeling

Durbin-Watson autocorrelation analysis

Reduction in random fluctuations (smoothing)

- Exponential, moving average, stepwise medians, difference (deltas)

Automatic time series calibration (minimum and maximum thresholds)

Threshold predictions