With in-database models from Fuzzy Logix, MicroStrategy users can leverage enterprise. The benefits are that model builders can focus on innovation and dynamic SQL, model builders can now build models and deploy them to the enterprise. Users are resigned to running the same models over and over again with only slight changes. Instead of innovating, model builders are focused on keeping the same models running. One way to improve performance is to use native database functions and process the data in-database. While many MicroStrategy customers are familiar with the performance benefits of using native database functions, most databases do not have a complete library of functions for data mining, regression modeling, scoring, simulation and other types of more advanced analytics. Although it is possible to build models in individual databases, since many enterprises use multiple platforms, it would be nearly impossible to have advanced functionality available across the enterprise and accessible by MicroStrategy unless a library of models could be deployed in all platforms. In addition, the models would need to be tested, certified, and easy to install.

Fuzzy Logix spent 12 years building exactly the type of solution needed and offers over 800 in-database models on eight database platforms (and counting). DB Lytix, installs in less than 30 minutes, contains a rich set of functionality, has never been beaten in performance, is highly scalable and is accessible via SQL statements. MicroStrategy can call the models with SQL or with deeper integration such as with apply function. Our in-database models are a vast enhancement of native functions.

The benefits have been proven by customers and include:

- Improving the speed of analytics by 10X to 100X
- Reducing data movement
- Running large complex models on big data (regression models with 11,500 variables on billions of rows)
- Reducing the processing burden of the Intelligent Server
- Allowing more complex models to be run by business users

In addition to the speed and performance benefits of using in-database analytics, the ability for business users to run analytic models on big data is also driving operational and organizational change.

Traditionally, business users were dependent on model builders to run analytics. Once models are built, business users commonly request a variation of the model that only needs simple changes. Instead of innovating, model builders are resigned to running the same models over and over again with only slight variation because they own the analytic technology. Using in-database analytics and dynamic SQL, model builders can now build models and deploy them to the enterprise. The benefits are that model builders can focus on innovation and complex problem solving and business users can run analytics on demand.

With in-database models from Fuzzy Logix, MicroStrategy users can leverage high-performance models to perform simple or complex analytics on big data.

THE BIG DATA PROBLEM SOLVED

MicroStrategy puts analytics in the hands of decision makers and leverages high performance features such as 64-bit processing, in-memory technology, and query optimization to deliver solutions quickly. Within the last few years two trends have created an opportunity to add additional performance solutions. First, the amount of data created, stored and analyzed has grown exponentially. Second, the complexity of the models involved in analyzing the data has increased as users become familiar with basic analytics and desire to run more complex models to yield deeper understanding.

One way to improve performance is to use native database functions and process the data in-database. While many MicroStrategy customers are familiar with the performance benefits of using native database functions, most databases do not have a complete library of functions for data mining, regression modeling, scoring, simulation and other types of more advanced analytics. Although it is possible to build models in individual databases, since many enterprises use multiple platforms, it would be nearly impossible to have advanced functionality available across the enterprise and accessible by MicroStrategy unless a library of models could be deployed in all platforms. In addition, the models would need to be tested, certified, and easy to install.

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FINANCIAL MODELING

In addition to providing solutions for general business, Fuzzy Logix offers in-database solutions to financial services companies for modeling items such as valuation of cash flows, fixed income, equity derivatives, interest rate and time series modeling. We also offer solutions for risk management, pricing and portfolio analysis.

SOLUTIONS & RESULTS

There are many ways in which innovative companies are leveraging in-database analytics. A few examples from recent client engagements:

- Product Promotion & Customer Churn analysis - 52 weeks of data, 80,000 products, 20 million customers. Astonishing gains in processing time from 4-20 hours to 20 minutes
- Increased Revenue & Profitability - Reduced the cost of sale by 50% while raising the sales volume by 10%, reduced customer churn and therefore capital reserves by 10%, improved revenue per call by 10%
- Preventive Healthcare – Analysis of 5-10 million lifetime medical records with 2,000 variables in less than 30 minutes dramatically shrunk the cycle time for research
- Scoring – Reduced the process to analyze and score the quality and efficiency of care across 700 million episodes and 250,000 physicians from 6 weeks to 40 minutes enabling this to move from a bi-annual to weekly process
- Next Likely Purchase – Movie Recommendation Engine that can be used by consumers to pick movies they would like to watch based on their viewing history and by marketing to suggest the next likely movie that customers may purchase
- Financial Services - Value at Risk Calculations – more than 100 billion calculations in less than 1.5 minutes, VWAP on NYSE’s TAQ Data for all symbols for a given day (approximately 30 million trades) in less than 10 seconds, NBBO on all symbols for a given day (approximately 500 million quotes) in less than 3 minutes
- Instant prediction of Click-Thru-Rate (CTR) for advertisements based on last 4-20 hours to 20 minutes
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- Instant prediction of Click-Thru-Rate (CTR) for advertisements based on last 24 hours of data-used to modify ad spend for each day
- Realization of a 25:1 return on investment in 12 months based on revenues driven by customer analytics
grow rapidly. In addition to general models, Fuzzy Logix has also developed a
OEM and managed services solutions. Fuzzy Logix has developed over 800
the value of our solutions. We also develop custom analytic solutions and offer
(10X to 100X faster than other products) and we offer structured trials to prove
performance. Our solutions are easy to use and deploy and run very fast
provide a new generation of in-database and GPU-based analytic solutions
Fuzzy Logix is an analytics software and professional services company. We
FUZZY LOGIX - THE GLOBAL LEADER IN-DATABASE ANALYTICS

MATHEMATICAL FUNCTIONS:
- Trigonometric Functions — Sine, Cosine, Tangent, Cotangent, Secant, Cosecant
- Inverse Trigonometric Functions — Sine Inverse, Cosine Inverse, Tangent Inverse, Cotangent Inverse, Secant Inverse, Cosecant Inverse
- Hyperbolic Trigonometric Functions — Sine Hyperbolic, Cosine Hyperbolic, Tangent Hyperbolic, Cotangent Hyperbolic, Secant Hyperbolic, Cosecant Hyperbolic
- Inverse Hyperbolic Trigonometric Functions — Sine Hyperbolic Inverse, Cosine Hyperbolic Inverse, Tangent Hyperbolic Inverse, Cotangent Hyperbolic Inverse, Secant Hyperbolic Inverse, Cosecant Hyperbolic Inverse
- Permutation & Combination

Greatest Common Divisor (GCD) & Least Common Multiple (LCM)

Conversion of Values — Absolute, Modulo, Floor, Ceiling, Round, Truncate, Degrees, Radians, nth root, Sign

Exponential & Logarithm

Gamma Function and Fractional of non-integer values

Matrix Algebra — Product, Transpose, Inverse, Determinant

Area Under Curve — Trapezoidal, Simpson's 2/3rd, Simpson's 3/8th

Interpolation — linear interpolation, cubic spline, Nelson Siegel Method

STATISTICAL FUNCTIONS:
- Mean — (Arithmetic, Geometric, Harmonic), Median, Percentile, Mode, Square of Deviation from Mean
- Variance, Standard Deviation, Skewness, Kurtosis
- Covariance, Rank Covariance
- Correlation, Rank Correlation (Spearman's Correlation)
- Sum, Sum Product,
- Weighted Average, Weighted Variance, Weighted Standard Deviation
- Count, Count Missing, Minimum, Maximum, Rank, Percent Rank
- Distance Measures — Euclidean, Manhattan, Mahalanobis
- Cross Tab Evaluation: Chi-Squared, Phi Coefficient, Cramer’s V, Contingency Coefficient, Cohen’s kappa
- Hypothesis Testing: Student’s t-test, F-test, Binomial test, Wilcoxon Signed rank test, Chi-squared test, Mann Whitney test, Kolmogorov-Smirnov test, One-way ANOVA, Anderson-Darling test

DATA MINING TECHNIQUES:
- Principal Component Analysis — includes formation of correlation matrix, calculation of Eigen Values & Eigen Vectors, and framing the orthogonal matrix
- Linear Regression
- calculation of regression coefficients, standard error of coefficient, t Statistic, p Value, confidence interval
- goodness of fit measures - F statistic, R-squared, adjusted R-squared, variance inflation factor (VIF), residuals and tests for heteroscedasticity
- variable subset selection
- Logistic Regression & Probit Model
- calculation of regression coefficients, standard error of coefficient estimate, chi-square, p Value
- goodness of fit measures – concordance/discordance, Gini coefficient, false positives, false negatives, variance inflation factor (VIF)
- variable subset selection

Clustering Methods
- K Means, K Medoids, Fuzzy K Means
- Hierarchical Clustering — Hierarchical K Means, Hierarchical O - Cluster

Other Supervised Learning Methods
- Linear Discriminant Analysis
- Flexible Discriminant Analysis
- Mixture Discriminant Analysis
- Support Vector Machines
- Neural Networks
- Decision Trees
- Naive Bayes Classifier

DISTRIBUTIONS:
For each distribution, the following functionality is available:
- Calculation of cumulative probability distribution
- Calculation of the inverse of a cumulative distribution
- Generation of random numbers that follow the underlying distribution (Monte Carlo simulation)

UNIVARIATE:

Betz<br> Bradford<br> Burr<br> Cauchy<br> Chi<br> Chi-square<br> Cosine<br> Erlang<br> Exponential<br> ExtremeL9<br> Fisk<br> Folded Normal<br> Gamma

MULTIVARIATE:

Normal Copula<br> Student’s T Copula<br> Marshall Olkin Copula<br> Weibull Copula<br> Clayton Copula<br> Gumbel Copula<br> Frank Copula

FINANCIAL ANALYTICS

Valuation of Cash Flows
- Estimation of discount rate
- NPV
- IRR

Fixed Income/Bond Math
- Price
- Coupon dates – first coupon date, all coupon dates
- Computation of yield measures for fixed-rate bonds (Current yield, Yield to maturity, Yield to first call, Yield to first par call date, etc.)
- Discount Margin
- Duration, Modified Duration, McCaulay Duration
- DVO1, Convexity
- Computation of Forward Rates and bond valuation using forward rates
- Spreads (Zero-Volatility Spread, Option-adjusted Spread (OAS), Option Cost, Nominal Spread)
- Spot rate using bootstrapping
- Historical and Implied Yield volatility

Equity Derivatives
- Risk-neutral valuation of calls and puts using Black Scholes continuous
- Greeks – Delta, Theta, Gamma, Vega, Rho

Interest Rates
- Models for short rate
  - Vasicek
  - Cox
  - Ingersoll and Ross
  - Ho & Lee
  - Hull & White
- Models for forward rate
  - HJM
  - LMM

Time Series Analysis
- Autoregression ARCH(m)
- Moving Average EWMA
- GARCH(p,q) Model
- Regime Switch Model
- Holt Winters

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SEE FOR YOURSELF
Testing analytical solutions can be quick and easy. Our average installation takes less than 30 minutes and you can be in production with models in less than a week. To find out how your company can benefit from leveraging in-database analytics, please contact us at:

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