RogueWave
SOFTWARE
Accelerating Great Code

IMSL® Library for Java

Function Catalog

Version 7.2

Table of Contents

IMSL® LIBRARY for Java VERSION 7.2

The IMSL Library for Java is a pure Java numerical library, providing a broad range of advanced mathematics, statistics, and charting for the Java environment. It extends core Java numerics and allows developers to seamlessly integrate advanced mathematical, statistical, financial, and charting functions into their Java applications.

General Features of the Library

IMSL NUMERICAL LIBRARIES

The IMSL Numerical Libraries, including JMSL, offer an extensive and comprehensive package of trusted IMSL mathematical and statistical numerical algorithms.

These libraries free developers from building their own internal code by providing pre-written mathematical and statistical algorithms that can be embedded into C, C++, .NET, Java™, Fortran, and Python applications.

CONVENIENCE AND OPEN STANDARDS

The IMSL Library for Java (or JMSL Library) is a pure Java library that operates in the Java J2SE and J2EE frameworks. The library extends core Java numerics and allows developers to seamlessly integrate advanced mathematical, statistical, financial, and charting functions into their Java applications.

Rogue Wave Software has taken individual algorithms and released them as object-oriented, Java classes. The JMSL Library is thread safe and, like all IMSL products, is fully tested and documented, with code examples included.

The JMSL Library also adds financial functions and charting to the library. The JMSL Library is designed with extensibility in mind; new classes may be derived from existing ones to add functionality to satisfy particular requirements.

ERROR HANDLING

Diagnostic error messages are clear and informative – designed not only to convey the error condition, but also to suggest corrective action if appropriate. These error-handling features:

- Allow faster and easier program debugging
- Provide more productive programming and confidence that the algorithms are functioning properly

COST-EFFECTIVE

The IMSL Library for Java significantly shortens program development time and promotes standardization. Using the JMSL Library saves time in the design, development, documentation, testing and maintenance of applications.

FULLY TESTED

Rogue Wave Software has almost four decades of experience in testing numerical algorithms for quality and performance across an extensive range of the latest compilers and environments. This experience has allowed Rogue Wave Software to refine its test methods to a great level of detail. The result of this effort is a robust, sophisticated suite of test methods that allows the IMSL Library user to rely on the numerical analysis functionality and focus their time on application development and testing.

Data Mining Classes

The JMSL Library includes a comprehensive set of functions for data mining, modeling, prediction, and optimization. There are time series models such as ARIMA, GARCH, and vector auto-regression, plus decision trees, Apriori analysis, neural networks, linear regression, K-means clustering, nearest neighbor classification, Bayes classification, and much more.

Distributed Computing and Parallelism

Distributed computing is the general term for breaking a problem down into parts and communicating the parts across a network. Parallel computing, on the other hand, refers to the simultaneous processing of parts of the larger problem.

The Apache™ Hadoop® is a Java open-source project for distributed computing, which may be used with JMSL classes that may require the processing of large amounts of data. Examples are the Apriori class used for market basket analysis, and the linear regression class.

The JMSL Library uses Java Threads to implement parallel processing. The JMSL implementation provides methods for specifying the number of threads to be used in selected classes that may benefit most from parallel processing, such as those in the Optimization, Time Series, and Data Mining categories.

COMPREHENSIVE DOCUMENTATION

Documentation for the IMSL Library for Java is comprehensive, clearly written and standardized. Detailed information about each class consists of the name, purpose, synopsis, exceptions, return values and usage examples.

The IMSL Library for Java includes an extensive demonstration gallery. The Gallery goes beyond the documentation examples, putting the algorithms and charting features to use in representative end-user applications. The complete source code for the Gallery is included with the product to help users get started using the features more quickly.

UNMATCHED PRODUCT SUPPORT

Behind every Rogue Wave Software license is a team of professionals ready to provide expert answers to questions about the IMSL Libraries. Product support options include product maintenance, ensuring the value and performance of IMSL Library software.

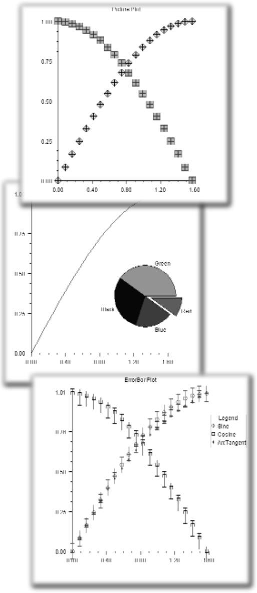
Product support:

- Gives users direct access to Rogue Wave Software's resident staff of expert product support specialists
- Provides prompt, two-way communication
- Includes product maintenance updates

CONSULTING SERVICES

Rogue Wave Software offers expert consulting services for algorithm development as well as complete application development. Please contact Rogue Wave Software to learn more about its extensive experience in developing custom algorithms, building algorithms in scalable platforms, and full applications development.

Functionality Overview



CHARTING FUNCTIONALITY

- Scatter
- Line
- High-Low-Close
- Candlestick
- Pie
- Bar
- Histogram
- Log and Semilog
- Polar
- Area
- Error Bar
- Contour Plot
- Box Plot
- Heat Map
- Tree Map
- Dendrogram
- 3D Surface
- 3D Scatter
- Shewhart Control Charts
- Function and Spline
- Support for XML
- Date/Time Support
- Support for Servlets

MATHEMATICS, STATISTICS, DATA MINING, AND FINANCE FUNCTIONALITY

- Basic Types
- Linear Algebra
- Eigensystems Analysis
- Interpolation and Approximation
- Quadrature
- Differential Equations
- Transforms
- Nonlinear Equations
- Optimization
- Special Functions
- Basic Statistics
- Regression
- Variances, Covariances, and Correlations
- Analysis of Variance
- Nonparametric Tests
- Goodness of Fit
- Time Series and Forecasting
- Survival and Reliability Analysis
- Distribution Functions
- Random Number Generation
- Data Mining
- Neural Networks
- Decision Trees
- Maximum Likelihood Estimation
- Finance and Bond Calculations

IMSL® Libraries are also available for Fortran, C, and C# for .NET

IMSL Library for C

The IMSL Library for C delivers advanced mathematical and statistical functionality for programmers to embed in C/C++ applications. This comprehensive set of functions is based upon the same algorithms contained in the highly regarded IMSL Library for Library. The IMSL Library for C is available on a wide range of development platforms and offers functions in key areas such as optimization, data mining, forecasting and design of experiments analysis. These pre-tested functions result in superior performance, increased scalability, ease of integration and greater reliability for software applications that require advanced mathematics and statistics. Dozens of algorithms take advantage of multi-core hardware using standard OpenMP directives.

IMSL Library for Fortran

The IMSL Library for Fortran is the gold standard mathematical and statistical code library for Fortran programmers developing high performance computing applications. The IMSL Library for Fortran contains highly accurate and reliable Fortran algorithms with full coverage of mathematics and statistics and complete backward compatibility. The IMSL Library for Fortran is a comprehensive library of mathematical and statistical algorithms available in one cohesive package. It combines the powerful and flexible interface features of the Fortran language with the performance benefits of both distributed memory and shared memory multiprocessing architectures.

IMSL Library for C#

The IMSL Library for C# is a numerical analysis library written in 100% C#, providing broad coverage of advanced mathematics and statistics for the .NET Framework. This offers .NET developers seamless accessibility to analytics capabilities in the most integrated language for the .NET environment with the highest degree of programming productivity and ease of use with Visual Studio®.

The IMSL Library for C# is the only numerical library to offer industry standard numerical analysis and charting for.NET languages. This Library provides unprecedented analytic capabilities and the most comprehensive and accessible mathematical, statistical and finance algorithms for.NET languages. With the IMSL Library for C#, IMSL has brought all of the benefits inherent in the.NET Framework to a new level by adding robust analytics to its broad set of capabilities. Written in C#, the library is easily integrated into any .NET language such as Visual Basic .NET, F# and IronPython among others.

com.imsl Package

com.imsl

The com.imsl package contains basic informational and error handling classes.

ERROR HANDLING

CLASS	DESCRIPTION
Messages	Retrieves and formats message strings.
IMSLFormatter	Simple formatter for classes that implement logging.
Warning	Handles warning messages.
WarningObject	Handles warning messages. This class maintains a single, private, WarningObject that actually displays the warning messages.
IMSLException	An Exception class for IMSL classes.
IMSLRuntimeException	A RuntimeException class for IMSL classes.
IMSLUnexpectedErrorException	An Exception class to handle critical errors.

com.imsl.math Package

com.imsl.math

The com.imsl.math package contains a wide range of mathematical classes, beginning with basic data types such as complex numbers and matrices and progressing to advanced numerical analysis.

BASIC TYPES

CLASS	DESCRIPTION
Complex	Implements complex numbers, providing the basic operations (addition, subtraction, multiplication, division) as well as a set of complex functions.
Matrix	Matrix manipulation functions.
ComplexMatrix	Complex matrix manipulation functions.
SparseMatrix	Data structures and manipulation functions for sparse matrices.
ComplexSparseMatrix	Data structures and manipulation functions for complex sparse matrices.

LINEAR ALGEBRA

CLASS	DESCRIPTION
LU	Solves a real general system of linear equations $Ax = b$. Includes methods for inverse, determinant and condition number.
SuperLU	Computes the LU factorization of a general sparse matrix of type SparseMatrix by a column method and solves a real sparse linear system of equations $Ax = b$.
ComplexLU	Solves a complex general system of linear equations $Ax = b$. Includes methods for inverse, determinant and condition number.
ComplexSuperLU	Computes the LU factorization of a general sparse matrix of type ComplexSparseMatrix by a column method and solves a complex sparse linear system of linear equations $Ax = b$.
Cholesky	Solves a real symmetric positive definite system of linear equations $Ax = b$.
SparseCholesky	Computes the Cholesky factorization of a matrix of type SparseMatrix.
ComplexSparseCholesky	Computes the Cholesky factorization of a matrix of type ComplexSparseMatrix.
QR	Computes the *QR* decomposition of a matrix using Householder transformations.
SVD	Computes the singular value decomposition of a real rectangular matrix A.
GenMinRes	Linear system solver using the restarted generalized minimum residual (GMRES) method.
ConjugateGradient	Solves a real symmetric definite linear system using the conjugate gradient method with optional preconditioning.

EIGENSYSTEMS

CLASS	DESCRIPTION
Eigen	Computes the eigen expansion of a real matrix *A*.
SymEigen	Computes the eigen expansion of real symmetric matrix *A.*

INTERPOLATION AND APPROXIMATION

CLASS	DESCRIPTION
Spline	A collection of spline functions. Includes methods to evaluate, integrate and compute derivatives of splines.
CsAkima	Extension of the Spline class to compute an Akima cubic spline interpolant.
CsTCB	Extension of the Spline class to handle a tension-continuity-bias (TCB) cubic spline, also known as a Kochanek-Bartels spline and is a generalization of the Catmull-Rom spline.
CsInterpolate	Extension of the Spline class to compute a cubic spline interpolant with specified derivative endpoint conditions.
CsPerodic	Extension of the Spline class to compute a cubic spline interpolant with periodic boundary conditions.
CsShape	Extension of the Spline class to compute a cubic spline interpolant consistent with the concavity of the data.
CsSmooth	Extension of the Spline class to construct a smooth cubic spline to noisy data.
CsSmoothC2	Extension of the Spline class to construct a smooth cubic spline to noisy data using cross-validation to estimate the smoothing parameter.
BSpline	A collection of B-Spline functions, including methods to evaluate, integrate, and compute derivatives of B-Splines, plus conversion of B-Splines to piecewise polynomials for charting.
BsInterpolate	Extension of the BSpline class to interpolate data points.
BsLeastSquares	Extension of the BSpline class to compute a least squares B-spline approximation to data points.
Spline2D	Represents and evaluates tensor-product splines.
Spline2DLeastSquares	Computes a two-dimensional, tensor-product spline approximant using least squares.
Spline2DInterpolate	Computes a two-dimensional, tensor-product spline interpolant from two-dimensional, tensor-product data.
RadialBasis	Computes a least-squares fit to scattered data over multiple dimensions.

QUADRATURE

CLASS	DESCRIPTION
Quadrature	A general-purpose integrator that uses a globally adaptive scheme to reduce the absolute error.
HyperRectangleQuadrature	Integrates a function on a hyper-rectangle using a quasi-Monte-Carlo method.

DIFFERENTIAL EQUATIONS

CLASS	DESCRIPTION
ODE	ODE represents and solves an initial-value problem for ordinary differential equations.
OdeRungeKutta	Solves an initial-value problem for ordinary differential equations using the Runge-Kutta-Verner fifth-order and sixth-order methods.
OdeAdamsGear	Extension of the ODE class to solve a stiff initial-value problem for ordinary differential equations using the Adams-Gear methods.
FeynmanKac	Solves the generalized Feynman-Kac PDE.

TRANSFORMS

CLASS	DESCRIPTION
FFT	Discrete Fourier transform of a real sequence.
ComplexFFT	Discrete Fourier transform of a complex sequence.

NONLINEAR EQUATIONS

CLASS	DESCRIPTION
ZeroPolynomial	Finds the zeros of a polynomial with complex coefficients using Aberth’s method.
ZerosFunction	Finds the real zeros of a real, continuous, univariate function, $f(x)$.
ZeroSystem	Solves a system of n nonlinear equations $f(x) = 0$ using a modified Powell hybrid algorithm.

OPTIMIZATION

CLASS	DESCRIPTION
MinUncon	Finds the minimum point of a smooth function $f(x)$ of a single variable.
MinUnconMultiVar	Minimizes a function $f(x)$ of n variables using a quasi-Newton method.

OPTIMIZATION

CLASS	DESCRIPTION
NonlinLeastSquares	Solves a nonlinear least-squares problem using a modified Levenberg-Marquardt algorithm.
SparseLP	Solves a sparse linear programming problem by an infeasible primal-dual interior-point method.
DenseLP	Solves a linear programming problem using an active set strategy.
QuadraticProgramming	Solves a quadratic programming problem subject to linear equality or inequality constraints.
MinConGenLin	Minimizes a general objective function subject to linear equality/inequality constraints.
BoundedLeastSquares	Solves a nonlinear least-squares problem subject to bounds on the variables using a modified Levenberg-Marquardt algorithm.
BoundedVariableLeastSquares	Solves a linear least-squares problem with bounds on the variables.
NonNegativeLeastSquares	Solves a linear least squares problem with non-negative constraints.
MinConNLP	Solves a general nonlinear programming problem using a sequential equality constrained quadratic programming method.
NumericalDerivatives	Computes the Jacobian matrix for a function *f*(*y*) with m components in *n* independent variables.

SPECIAL FUNCTIONS

CLASS	DESCRIPTION
Sfun	Collection of special functions including beta, gamma and others.
Bessel	Collection of Bessel functions.
JMath	Pure Java implementation of the standard java.lang.Math class.
IEEE	Pure Java implementation of the IEEE 754 functions as specified in IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE Standard 754-1985 (IEEE, New York).
Hyperbolic	Pure Java implementation of the hyperbolic functions and their inverses.

MISCELLANEOUS

CLASS	DESCRIPTION
Physical	Returns the value of various mathematical and physical constants.
EpisilonAlgorithm	Determines the limit of a sequence of approximations by means of the Epsilon algorithm.

PRINTING

CLASS	DESCRIPTION
PrintMatrix	Matrix printing utilities.
PrintMatrixFormat	Customizes the actions of PrintMatrix.

com.imsl.stat Package

com.imsl.stat

The package com.imsl.stat contains a wide range of statistical classes, including summary statistics, regression, ANOVA.

BASIC STATISTICS

CLASS	DESCRIPTION
Summary	Computes basic univariate statistics.
NormOneSample	Computes statistics for mean and variance inferences using a sample from a normal population.
NormTwoSample	Computes statistics for mean and variance inferences using samples from two normal populations.
Sort	Sorts observations by specified keys.
Ranks	Computes the ranks, normal scores, or exponential scores for a vector of observations.
EmpiricalQuantiles	Determines empirical quantiles.
TableOneWay	Tallies observations into a one-way frequency table.
TableTwoWay	Tallies observations into a two-way frequency table.
TableMultiWay	Tallies observations into a multi-way frequency table.

VARIANCES, COVARIANCES, AND CORRELATIONS

CLASS	DESCRIPTION
Covariances	Computes the sample variance-covariance or correlation matrix.
PartialCovariances	Computes the partial covariances or partial correlations from an input covariance or correlation matrix.

REGRESSION

CLASS	DESCRIPTION
RegressorsForGLM	Generates regressors for a general linear model from a data matrix.
LinearRegression	Computes a new linear regression object using least squares.
NonlinearRegression	Fits a multivariate nonlinear regression model using least squares.
UserBasisRegression	Generates summary statistics using user supplied functions in a nonlinear regression model.
RegressionBasis	Interface for user defined regression basis functions.
SelectionRegression	Selects the best multiple linear regression models.
StepwiseRegression	Builds multiple linear regression models using forward selection, backward selection, or stepwise selection.

ANALYSIS OF VARIANCE

CLASS	DESCRIPTION
ANOVA	Provides an Analysis of Variance table and related statistics.
ANOVAFactorial	Analyzes a balanced factorial design with fixed effects.
ANCOVA	Analyzes a one-way factorial classification model with covariates.
MultipleComparisons	Performs Student-Newman-Keuls multiple comparisons test.

CATEGORICAL AND DISCRETE DATA ANALYSIS

CLASS	DESCRIPTION
ContingencyTable	Provides an Analysis of Variance table and related statistics.
CategoricalGenLinModel	Analyzes categorical data using logistic, probit, Poisson, and other generalized linear models.

NONPARAMETRIC STATISTICS

CLASS	DESCRIPTION
SignTest	Performs a sign test.
WilcoxonRankSum	Performs a Wilcoxon rank sum test.

GOODNESS OF FIT

CLASS	DESCRIPTION
ChiSquaredTest	Chi-squared goodness-of-fit test.
NormalityTest	Performs a test for normality.
KolmogorovOneSample	Performs a Kolmogorov-Smirnov goodness-of-fit test in one sample.
KolmogorovTwoSample	Computes Kolmogorov-Smirnov two-sample test statistics for testing that two continuous cumulative distribution functions (CDF's) are identical based upon two random samples.

TIME SERIES AND FORECASTING

CLASS	DESCRIPTION
AutoCorrelation	Computes the sample autocorrelation function of a stationary time series.
ARAutoUnivariate	Automatically determines the best autoregressive time series model using Akaike's Information Criterion.
ARSeasonalFit	Estimates the optimum seasonality parameters for a time series using an autoregressive model, *AR*(*p*), to represent the time series.
ARMA	Computes least-square estimates of parameters for an ARMA model. Also computes forecasts and their associated probability limits for an ARMA model.
ARMAEstimateMissing	Estimates missing values in a time series collected with equal spacing. Missing values can be replaced by these estimates prior to fitting a time series using the ARMA class.
ARMAMaxLikelihood	Computes maximum likelihood estimates of parameters for an ARMA model with *p* and *q* autoregressive and moving average terms respectively.
ARMAOutlierIdentification	Detects and determines outliers and simultaneously estimates the model parameters in a time series whose underlying outlier free series follows a general seasonal or nonseasonal ARMA model.
AutoARIMA	Automatically identifies time series outliers, determines parameters of a multiplicative seasonal model and produces forecasts that incorporate the effects of outliers whose effects persist beyond the end of the series.
CrossCorrelation	Computes the sample cross-correlation function of two stationary time series.
Difference	Differences a seasonal or nonseasonal time series.
GARCH	Computes estimates of the parameters of a GARCH(*p*, *q*) model.
KalmanFilter	Performs Kalman filtering and evaluates the likelihood function for the state-space model.
MultiCrossCorrelation	Computes the multichannel cross-correlation function of two mutually stationary multichannel time series.
LackOfFit	Performs lack-of-fit test for a univariate time series or transfer function given the appropriate correlation function.
HoltWintersExponentialSmoothing	Calculates parameters and forecasts using the Holt-Winters Multiplicative or Additive forecasting method for seasonal data.
TimeSeries	A specialized class for time series data and analysis.
TimeSeriesOperations	Implemets special methods for TimeSeries objects.
VectorAutoregression	Performs a k-nearest Neighbor classification.

MULTIVARIATE ANALYSIS

CLASS	DESCRIPTION
ClusterKMeans	Performs a *K*-means (centroid) cluster analysis.
ClusterKNN	Performs a k-Nearest Neighbor classification.
Dissimilarities	Computes a matrix of dissimilarities (or similarities) between the columns (or rows) of a matrix.
ClusterHierarchical	Performs a hierarchical cluster analysis given a distance matrix.
FactorAnalysis	Performs Principal Component Analysis or Factor Analysis on a covariance or correlation matrix.
DiscriminantAnalysis	Performs a linear or a quadratic discriminant function analysis among several known groups.

SURVIVAL AND RELIABILTY ANALYSIS

CLASS	DESCRIPTION
KaplanMeierECDF	Computes the Kaplan-Meier reliability function estimates or the CDF based on failure data that may be multi-censored.
KaplanMeierEstimates	Computes Kaplan-Meier (or product-limit) estimates of survival probabilities for a sample of failure times that possibly contain right censoring.
ProportionalHazards	Analyzes survival and reliability data using Cox's proportional hazards model.
LifeTables	Computes population (current) or cohort life tables based upon the observed population sizes at the middle (for population table) or the beginning (for cohort table) of some user specified age intervals.

PROBABILITY DISTRIBUTION FUNCTIONS AND INVERSES

CLASS	DESCRIPTION
CDF	Cumulative distribution functions.
PDF	Probability density functions.
InvCdf	Inverse cumulative probability distribution functions.
CdfFunction	Interface for user defined cumulative distribution function.
InverseCdf	Evaluates the inverse of a continuous, strictly monotone function.
Distribution	Interface for user defined distribution function.
ProbabilityDistribution	Interface for user defined probability distribution.
NormalDistribution	Evaluates a normal (Gaussian) probability distribution.

PROBABILITY DISTRIBUTION FUNCTIONS AND INVERSES

CLASS	DESCRIPTION
GammaDistribution	Evaluates a gamma probability distribution.
LogNormalDistribution	Evaluates a lognormal probability distribution.
PoissonDistribution	Evaluates a Poisson probability distribution.

RANDOM NUMBER GENERATION

CLASS	DESCRIPTION
Random	Random number generators with support for several distributions.
FaureSequence	Generates the low-discrepancy shuffled Faure sequence. This is also called a quasi-random generator.
MersenneTwister	Generates uniform pseudorandom 32-bit numbers with a period of $2^{19937}-1$ and a 623-dimensional equidistribution property.
MersenneTwister64	Generates uniform pseudorandom 64-bit numbers with a period of $2^{19937}-1$ and a 623-dimensional equidistribution property.
RandomSequence	Interface implemented by generators of random or quasi-random multidimensional sequences.

com.imsl.datamining Package

com.imsl.datamining

The package com.imsl.datamining contains data mining classes including Naïve Bayes classifier, Apriori, and Kohonen Self Organizing Map

Datamining

CLASS	DESCRIPTION
NaiveBayesClassifier	Trains a Naïve Bayes Classifier.
Itemsets	Sets of items discovered by the Apriori algorithm.
AssociationRule	Association rules generated by the Apriori algorithm.
Apriori	Perform the Apriori algorithm for association rule discovery.
KohonenSOM	A Kohonen self organizing map.
KohonenSOMTrainer	Trains a Kohonen network.
PredicitiveModel	Defines the members and methods common to predictive models in univariate prediction or classification problems.
CrossValidation	Performs V-Fold cross-validation for predictive models.
BootstrapAggregation	Performs bootstrap aggregation to generate predictions using predictive models.
GradientBoosting	Performs stochastic gradient boosting for a single response variable and multiple predictor variables.

com.imsl.datamining.decision Tree Package

com.imsl.datamining.decisionTree

The package com.imsl.datamining.decisionTree contains decision tree data mining classes for CART™, C4.5, CHAID, and QUEST methods.

Decision Trees

CLASS	DESCRIPTION
TreeNode	A DecisionTree node which may be used as a child node of Tree.
Tree	Root node of a decision tree containing information about the relationship of child nodes.
DecisionTree	Generates a decision tree for a single response variable and two or more predictor variables.
DecisionTreeInfoGain	Extends DecisionTree for methods which use information gain criteria.
ALACART	Generates a decision tree using the CART™ method.
C45	Generates a decision tree using the C4.5 algorithm.
CHAID	Generates a decision tree using CHAID for categorical or discrete ordered predictor variables.
QUEST	Generates a decision tree using the QUEST algorithm.

com.imsl.datamining.neural Package

com.imsl.datamining.neural

The com.imsl.datamining.neural package contains feed forward multilayer neural network training and forecasting engines plus algorithms to facilitate data pre- and post-processing.

NEURAL NETS

CLASS	DESCRIPTION
Network	A neural network.
FeedForwardNetwork	A feed forward neural network.
Layer	The base class for the input, hidden, and output layers in a neural network.
InputLayer	The input layer in a neural network.
HiddenLayer	The hidden layer in a neural network.
OutputLayer	The output layer in a neural network.
Node	A node with an input node or perceptron in a neural network.
InputNode	A node in the input layer.
Perceptron	A perceptron node in a neural network.
OutputPerceptron	A perceptron in the output layer.
Activation	Interface implemented by perceptron activation functions.
Link	A link in the neural network between two network nodes.
Trainer	Interface implemented by classes used to train a network.
QuasiNewtonTrainer	Trains a feed forward network using quasi-Newton optimization.
LeastSquaresTrainer	Trains a feed forward network using the Levenberg-Marquardt nonlinear least squares algorithm.
EpochTrainer	A two-stage trainer. Stage I trains using epochs of randomly selected training patterns. Stage II uses all training patterns and is optional.
BinaryClassification	Classifies patterns into two categories.
MultiClassification	Classifies patterns into multiple categories.
ScaleFilter	Scales or unscales continuous data prior to its use in neural network training, testing, or forecasting.

NEURAL NETS

CLASS	DESCRIPTION
UnsupervisedNominalFilter	Encodes nominal data into a series of binary columns for input into a neural network. It also decodes binary columns in a single column of nominal values.
UnsupervisedOrdinalFilter	Encodes ordinal data into cumulative percentages. It also decodes cumulative percentages into an ordinal variable.
TimeSeriesFilter	Converts time series data to a format used for neural network training by lagging an input series into several columns, one for each lag requested.
TimeSeriesClassFilter	Converts categorized time series data to a format used for neural network training. An input series is lagged into several columns, one for each lag requested. Lagging is calculated within each class of a nominal variable.

com.imsl.datamining.distributions Package

com.imsl.datamining.distributions

The com.imsl.datamining.neural package contains feed forward multilayer neural network training and forecasting engines plus algorithms to facilitate data pre- and post-processing.

NEURAL NETS	
CLASS	DESCRIPTION
MaximumLikelihoodEstimation	Maximum likelihood parameter estimation.
ProbabilityDistribution	Defines members and methods common to univariate probability distributions and useful in parameter estimation.
PDFGradientInterface	Interface for probability distributions which supply a method to calculate the gradient of the density function.
PDFHessianInterface	Interface for probability distributions which supply methods to calculate the gradient and hessian of the density function.
ClosedFormMaximumLikelihoodInterface	Interface for probability distributions that provide a method for a closed form solution of the maximum likelihood function.
BetaPD	The beta probability distribution.
GammaPD	The gamma probability distribution.
NormalPD	The normal probability distribution.

com.imsl.finance Package

com.imsl.finance

The com.imsl.finance package contains a set of classes covering a variety of investment calculations including an extensive collection of bond functions.

Finance

CLASS	DESCRIPTION
BasisPart	Interface for day count basis.
Bond	Collection of bond functions including interest, and price and yield methods.
DayCountBasis	Rules for computing the number or days between two dates or number of days in a year. For many securities, computations are based on rules other than on the actual calendar.
Finance	Collection of finance functions including depreciations, present values, and internal rate of return methods.

com.imsl.chart Package

com.imsl.chart

The com.imsl.chart package is designed to allow the creation of highly customizable 2D charts. Supported chart types include:

- Scatter plots
- Candlestick charts
- Line plots
- Pie Charts
- Dendrogram chart
- Area plots
- Bar Charts
- Function plots
- Histograms
- Log and Semilog plots
- Polar plots
- Error Bars
- Contour Plot
- High-Low-Close-Open charts
- Box plot
- Heat Map
- Tree Map

The JMSL chart package can be used in several different ways, for example:

- A JMSL chart can be the output of a stand-alone Java application or Applet.
- A JMSL chart can be returned as images from a web server using servlets. This allows JMSL to be used as the "chart engine" for a website, either on the internet or a company intranet.
- A JMSL chart tree can be created from an XML file. XML (Extensible Markup Language) is a universal format for structured data. The use of XML allows for charts to be generated without writing a Java program for the desired chart.

CHART CLASSES

CLASS	DESCRIPTION
Chart	The root node of the chart tree.
AbstractChartNode	The base class of all of the nodes in both the 2D and 3D chart trees.
ChartNode	The base class of all of the nodes in the chart tree.
Background	Controls the background of a chart.
ChartTitle	Controls the main title of a chart.
Legend	Controls the chart legend.
Annotation	Draws an annotation.
Grid	Draws the grid lines perpendicular to an axis.
Axis	The axis node provides the mapping for all of its children from the user coordinate space to the device (screen) space.
AxisXY	Controls the axes for an x-y chart.
Axis1D	Controls an x-axis or a y-axis.
AxisLabel	Controls the labels on an axis.
AxisLine	Controls the axis line.
AxisTitle	Controls the title on an axis.
AxisUnit	Controls the unit title on an axis.
MajorTick	Controls the major tick marks.
MinorTick	Controls the minor tick marks.

CHART CLASSES

CLASS	DESCRIPTION
Transform	Interface to define a custom transformation along an axis.
TransformDate	Defines a transformation along an axis that skips weekend dates.
AxisR	Controls the R-axis in a polar plot.
AxisRLabel	Controls the labels on a radial axis.
AxisRLine	Controls the radius axis line in a polar plot.
AxisRMajorTick	Controls the major tick marks for the radius axis in a polar plot.
AxisTheta	Controls the angular axis in a polar plot.
GridPolar	Draws the grid lines for a polar plot.
Data	Draws a data node.
ChartFunction	Interface for allowing a function to be plotted.
ChartSpline	Wraps a spline into a ChartFunction to be plotted.
Text	The value of the attribute “Title”.
ToolTip	A ToolTip for a chart element.
FillPaint	A collection of methods to create Paint objects for fill areas.
Draw	Chart tree renderer. Draws the chart tree to the output device.
JFrameChart	JFrameChart is a JFrame that contains a chart.
JPanelChart	A swing JPanel that contains a chart.
DrawPick	Pick an object in a chart.
PickEvent	An event that indicates that a chart element has been selected.
PickListener	Listener interface for receiving pick events.
JspBean	Helper class to create charts in a Java Server Page that are later rendered using the ChartServlet.
ChartServlet	The base class for chart servlets.
DrawMap	Creates an HTML client-side imagemap from a chart tree.
Box plot	Draws a multi-group box plot.
Contour	A contour chart shows level curves of surface data.
ErrorBar	Data points with error bars.
HighLowClose	High-low-close plot of stock data.
Candlestick	Candlestick plot of stock data.
CandlestickItem	Controls a candlestick for the up days or the down days.
SplineData	A data set created from a Spline.
Bar	A bar chart.
BarItem	Controls a single bar in a bar chart.

CHART CLASSES

CLASS	DESCRIPTION
BarSet	Controls a set of bars in a bar chart.
Pie	A pie chart.
PieSlice	Control one wedge of a pie chart.
Dendrogram	A graphical way to display results from a hierarchical cluster.
Polar	This axis node is used for polar charts.
Heatmap	Creates a chart from an array of Color values, combined with the data range represented by that array.
TreeMap	Treemap creates a chart from two arrays of double precision values or one data array and one array of Color values.
ColorMap	Interface for mapping from the unit interval to Colors.

com.imsl.chart3d Package

com.imsl.chart3d

The com.imsl.chart3d package is designed to allow the creation of highly customizable 3D charts. Supported chart types include:

- 3D Scatter plots
- 3D Surface plots

CHART3D CLASSES

CLASS	DESCRIPTION
Chart3D	Creates a new instance of a Chart3D.
JFrameChart3D	JFrameChart3D is a JFrame that contains a chart.
ChartNode3D	The base class of all of the nodes in the 3D chart tree.
Background	Controls the background of the chart.
Canvas3DChart	Creates a Canvas3DChart.
BufferedPaint	A collection of methods to create an image on the canvas.
ChartLights	Defines a default set of lights for the chart.
AmbientLight	Creates an ambient light.
DirectionalLight	A directional light. A directional light is an oriented light with an origin at infinity.
PointLight	Creates a point light.
AxisXYZ	Controls the axes for an *x*-*y*-*z* chart.
AxisBox	Controls the box behind the axes. The box also includes grid lines.
Axis3D	Controls an *x*-axis, *y*-axis or a *z*-axis.
AxisLabel	Controls the labels on an axis.
AxisLine	Controls the axis line.
AxisTitle	Controls the title on an axis.
MajorTick	Controls the major tick marks.
Surface	Surface from a function or from a set of scattered data points.
Data	Draws a 3D data node.
ColorFunction	Interface for defining value dependent colors.
ColormapLegend	Adds a legend for a Colormap gradient to the background of the canvas.

com.imsl.chart.qc Package

com.imsl.chart.qc

The com.imsl.chart.qc package is designed to allow the creation of quality control charts. Supported chart types include:

- Shewhart Control Charts
- XBarS
- PChart
- CuSum
- ControlLimit
- SChart
- CChart
- CuSumStatus
- XbarR
- XmR
- UChart
- Contour Plot
- RChart
- NpChart
- EWMA
- Pareto

QUALITY CONTROL CHARTS

CLASS	DESCRIPTION
ShewhartControlChart	The base class for the Shewhart control charts.
ControlLimit	A control limit line on a process control chart.
XbarR	An X-bar chart for monitoring a process using sample ranges.
RChart	An R-chart using sample ranges to monitor the variability of a process.
XbarS	An X-bar chart for monitoring a process using sample standard deviations.
SChart	An S-chart using sample standard deviations to monitor the variability of a process.
XmR	A chart for monitoring a process using moving ranges.
NpChart	An np-chart for monitoring the number of defects when defects are not rare.
PChart	A p-chart for monitoring the defect rate when defects are not rare.
CChart	A c-chart for monitoring the count of the number of defects when defects are rare.
UChart	A u-chart for monitoring the defect rate when defects are rare.
EWMA	An exponentially weighted moving average control chart.
CuSum	A cumulative sum chart.
CuSumStatus	A cumulative sum status chart.
ParetoChart	A Pareto bar chart.

com.imsl.chart.xml Package

com.imsl.chart.xml

The com.imsl.chart.xml package is designed to allow the creation of xml charts.

XML	
CLASS	DESCRIPTION
ChartXML	Creates a chart from an XML file.

com.imsl.io Package

com.imsl.io

The com.imsl.io package is designed to allow input/output operations.

Input/Output	
CLASS	DESCRIPTION
AbstractFlatFile	Reads a text or a binary file as a ResultSet.
FlatFile	Reads a text file as a ResultSet.
Tokenizer	Breaks a line into tokens.
MPSReader	Reads a linear programming problem from an MPS file.

RogueWave
SOFTWARE

Accelerating Great Code

Rogue Wave provides software development tools for mission-critical applications. Our trusted solutions address the growing complexity of building great software and accelerates the value gained from code across the enterprise. Rogue Wave's portfolio of complementary, cross-platform tools helps developers quickly build applications for strategic software initiatives. With Rogue Wave, customers improve software quality and ensure code integrity, while shortening development cycle times.