Visual Numerics®

VERSION 4.0.2

IMSL™

C# Numerical Library

Function Catalog

IMSL™ C# NUMERICAL LIBRARY

Written for C# and Visual Basic™ .NET programmers for use on the .NET Framework, based on the world's most widely called numerical subroutines.

The IMSL C# Numerical Library is a 100% C# analytical library, providing broad coverage of advanced mathematics and statistics for the Microsoft® .NET Framework. The IMSL C# Numerical Library is documented and tested managed code for full compatibility with the .NET Framework.

IMSL MATHEMATICAL AND STATISTICAL LIBRARIES

At the heart of the IMSL Numerical Libraries lies the comprehensive and trusted set of 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 embeded into C/C++, C#, Visual Basic™ .NET (VB.NET), Java™, and Fortran applications.

CONVENIENCE AND OPEN STANDARDS

Using the IMSL C# Numerical Library, applications built on the .NET Framework provide more powerful business analytics than ever before. The IMSL C# Library delivers a new level of embeddable and scalable analytics capability to Visual Studio™ users that was once only found in traditional high performance computing environments.

The advanced mathematical, statistical, and finance algorithms found in the IMSL C# Library are written in 100% C#. This offers C# and VB.NET developers seamless accessibility to advanced 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.

Visual Numerics has taken C# to a new level by extending the mathematical framework of the language, significantly increasing the high performance analytics capabilities available for the .NET Framework. The algorithms in the IMSL C# Library are extremely accurate, as they are based on over three decades of Visual Numerics' technical computing experience with the IMSL Family of products.

The IMSL C# Library provides necessary mathematical classes to the .NET Framework that enable C# and VB.NET developers to build advanced analytics applications not previously available on this platform. Classes such as a complex numbers class, a matrix class, as well as advanced random number generator classes provide a foundation from which advanced mathematics can be built. Applications ranging from Monte Carlo simulations for financial market and scientific simulations to derivatives pricing and engineering models will be enabled by these advanced mathematical capabilities.

MOST ADVANCED NUMERICAL ANALYSIS LIBRARY FOR MICROSOFT .NET APPLICATIONS

The C# and VB.NET languages naturally make programming easier and faster. The IMSL C# Numerical Library is written in pure C# and ensures that programs written today will stay in compliance and remain compatible with future applications. Managed code provides interoperability and deployment flexibility for .NET-connected applications. A developer can write an application in C# or VB.NET and seamlessly use the IMSL C# Library as the analysis engine without the need to wrap in unmanaged code.

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:

- Make it faster and easier to debug programs.
- Provide for more productive programming and confidence that the algorithms are functioning properly.

COST-EFFECTIVE

The IMSL C# Numerical Library significantly shortens program development time and promotes standardization. Using the IMSL C# Library saves time in source code development and the design, development, documentation, testing and maintenance of applications.

FULLY TESTED

Visual Numerics has over three decades of experience in testing IMSL numerical algorithms for quality and performance across an extensive range of the latest compilers and environments. This experience has allowed Visual Numerics 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 user to rely on the numerical analysis functionality and focus their bandwidth on application development and testing.

EASY INTEROPERABILITY WITH A BROAD RANGE OF CHARTING CAPABILITIES

The IMSL C# Library provides seamless interoperability within the .NET Framework allowing for easy access to Excel, .NET utilities and third party charting packages for simple to advanced visualization. For example, an analytic solution developer can take advantage of the IMSL C# Library for spreadsheets or database analytics in a 100% .NET compliant offering. This would allow business analysts to leverage the high-end analytics of the IMSL C# Library and the charting capabilities of Excel.

COMPREHENSIVE DOCUMENTATION

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

UNMATCHED PRODUCT SUPPORT

Behind every Visual Numerics license is a team of professionals ready to provide expert answers to questions about the IMSL family of products. Product support options include product maintenance, ensuring value and performance of your new software. Product support:

- Gives users direct access to Visual Numerics resident staff of expert product support specialists
- Provides prompt, two-way communication
- Includes product maintenance updates

PROFESSIONAL SERVICES

Visual Numerics offers expert consulting services for algorithm development as well as complete application development. Please contact us to learn more about our extensive experience in developing custom algorithms, building algorithms on scalable platforms, and full applications development.

IMSL Libraries are also available for C, Java and Fortran

IMSL C Numerical Library

The IMSL C Numerical Library is a comprehensive set of pre-built thread safe mathematical and statistical analysis functions that C or C++ programmers can embed directly into their numerical analysis applications. It significantly shortens program development time by taking full advantage of the intrinsic characteristics and desirable features of the C language. Variable argument lists simplify calling sequences. The concise set of required arguments contains only the information necessary for usage. Optional arguments provide added functionality and power to each function. Using the IMSL C Library saves significant effort in source code development and in the design, development, testing and maintenance of applications.

JMSL™ Numerical Library for Java Applications

The JMSL Numerical Library is a pure Java numerical library that operates in the Java J2SE or 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. To build this library, Visual Numerics has taken individual algorithms and re-implemented them as object-oriented, Java methods. The JMSL Library is 100% thread safe and, like all Visual Numerics products, is fully tested and documented, with code examples included. The JMSL Library also adds financial functions and charting to the library, taking advantage of the collaboration and graphical benefits of Java. The JMSL Library is designed with extensibility in mind; new classes may be derived from existing ones to add functionality to satisfy particular requirements. The JMSL Library can provide advanced mathematics in client-side applets, server-side applications or even non-networked desktop applications. JMSL applets perform all processing on the Java client, whether it is a thin client, such as a network computer, a PC or workstation equipped with a Java Virtual Machine. Client-side processing reduces the number of “round trips” to a networked server, which in turn minimizes network traffic and system latency.

IMSL Fortran Numerical Library and IMSL Thread Safe Fortran Numerical Library

The IMSL Fortran Numerical Library is used by technical professionals for business, engineering, finance, and education applications. The IMSL Fortran Library is a single package that incorporates all of the algorithms and features from the IMSL family of Fortran libraries. The IMSL Fortran Numerical Library allows users to utilize the fast, convenient optional arguments of the modern Fortran syntax throughout the library, in all areas where optional arguments can apply, while maintaining full backward compatibility.

The IMSL Thread Safe Fortran Numerical Library is a 100% fully thread safe edition of the IMSL Fortran Library allowing the convenience and performance of multi-threading on selected environments. Thread safety allows users to create multiple instances of routines running in multiple threads and to include any routine in the library in these threads. As a result, thread safety simplifies the programming task because users can comfortably take advantage of multi-threading across the entire numerical library. It also allows programmers to achieve the performance benefits of multi-threading.

The IMSL Fortran Numerical Library includes all of the algorithms from the IMSL family of Fortran libraries including the former IMSL F90 Library, the IMSL Fortran 77 Library, and the IMSL parallel processing features.

Imsl.Math

PACKAGE

The package Imsl.Math contains a wide range of mathematical classes. Beginning with basic data types like complex numbers and matrices and progressing to advanced numerical analysis classes.

BASIC FUNCTIONS

Class Name	Subset / 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.

LINEAR ALGEBRA

Class Name	Subset / Description
LU	Solves a real general system of linear equations Ax = b. Includes methods for inverse, determinant and condition number.
ComplexLU	Solves a complex general system of linear equations Ax = b. Includes methods for inverse, determinant and condition number.
Cholesky	Solves a real symmetric positive definite system of linear equations Ax = b.
QR	Solves a linear least-squares problem Ax = b.
SVD	Computes the singular value decomposition of a real rectangular matrix A.

EIGENSYSTEMS

Class Name	Subset / Description
Eigen	Computes the eigenexpansion of a real matrix A.
SymEigen	Computes the eigenexpansion of a real symmetric matrix A.

INTERPOLATION AND APPROXIMATION

Class Name	Subset / 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.
CsInterpolate	Extension of the Spline class to compute a cubic spline interpolant with specified derivative endpoint conditions.
CsPeriodic	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.
RadialBasis	Computes a least-squares fit to scattered data over multiple dimensions.

QUADRATURE

Class Name	Subset / Description
Quadrature	A general-purpose integrator that uses a globally adaptive scheme to reduce the absolute error.
HypercubeQuadrature	Integrates a function on a hyper-rectangle using a quasi-Monte-Carlo method.

DIFFERENTIAL EQUATIONS

Class Name	Subset / Description
OdeRungeKutta	Solves an initial-value problem for ordinary differential equations using the Runge-Kutta-Verner fifth-order and sixth-order methods.

TRANSFORMS

Class Name	Subset / Description
FFT	Discrete Fourier transform of a real sequence.
ComplexFFT	Discrete Fourier transform of a complex sequence.

NONLINEAR EQUATIONS

Class Name	Subset / Description
ZeroPolynomial	Finds the zeros of a polynomial with complex coefficients using Aberth’s method.
ZeroFunction	Finds the real zeros of a real function using Müller’s method.
ZeroSystem	Solves a system of n nonlinear equations f(x) = 0 using a modified Powell hybrid algorithm.

OPTIMIZATION

Class Name	Subset / 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.
NonlinLeastSquares	Solves a nonlinear least-squares problem using a modified Levenberg-Marquardt algorithm.
DenseLP	Solves a linear programming problem using an active set strategy.
MPSReader	Reads a linear programming problem from an MPS file.
LinearProgramming	Solves a linear programming problem using the revised simplex algorithm.
QuadraticProgramming	Solves a quadratic programming problem subject to linear equality or inequality constraints.
MinConGenLin	Minimizes a general objective function subject to linear equality and/or inequality constraints.
BoundedLeastSquares	Solves a nonlinear least-squares problem subject to bounds on the variables using a modified Levenberg-Marquardt algorithm.
MinConNLP	Solves a general nonlinear programming problem using a sequential equality constrained quadratic programming method.

SPECIAL FUNCTIONS

Sfun	Collection of special functions including the methods:
Class Name	**Subset / Description**
Asinh	Returns the hyperbolic arc sine of a double.
Beta	Evaluates the value of the Beta function.
BetaIncomplete	Evaluates the incomplete Beta function ratio.
Cot	Evaluates the cotangent.
Erf	Evaluates the error function.
Erfc	Evaluates the complementary error function.
ErfcInverse	Evaluates the inverse of the complementary error function.
ErfInverse	Evaluates the inverse of the error function.
Fact	Evaluates the factorial of an integer.
Gamma	Evaluates the Gamma function of a double.
Log10	Evaluates the common (base 10) logarithm.
Log1p	Returns log(1+x), the logarithm of a double.
LogBeta	Evaluates the logarithm of the Beta function.
LogGamma	Evaluates the logarithm of the absolute value of the Gamma function.
Poch	Evaluates a generalization of Pochhammer's symbol.
R9lgmc	Returns the Log Gamma correction term for argument values greater than or equal to 10.0.
Sign	Evaluates the value of x with the sign of y.

Bessel	Collection of Bessel functions.
Class Name	**Subset / Description**
I	Evaluates a sequence of modified Bessel functions of the first kind with real or integer order and real argument.
J	Evaluates a sequence of Bessel functions of the first kind with real or integer order and real positive argument.

SPECIAL FUNCTIONS (con't)

K	Evaluates a sequence of modified Bessel functions of the third kind with real order and real fractional or integer argument.
ScaledK	Evaluates a sequence of exponentially scaled modified Bessel functions of the third kind with fractional order and real argument.
Y	Evaluates a sequence of Bessel functions of the second kind with real nonnegative order and real positive argument.

MISCELLANEOUS

Class Name	Subset / Description
Complex	Set of mathematical functions for complex numbers.
Physical	Return the value of various mathematical and physical constants.
EpsilonAlgorithm	Determines the limit of a sequence of approximations by means of the Epsilon algorithm.
Messages	Retrieves and formats message strings.
Version	Prints version information.
Warning	Handles warning messages.
WarningObject	Handles warning messages.

PRINTING

Class Name	Subset / Description
PrintMatrix	Matrix printing utilities.
PrintMatrixFormat	Customize the actions of PrintMatrix.

Imsl.Stat

PACKAGE

The package Imsl.Stat contains a wide range of statistical classes, including summary statistics, regression, and ANOVA.

BASIC STATISTICS

Class Name	Subset / Description
Summary	Computes basic univariate statistics, including methods:
ConfidenceMean	Evaluates the confidence interval for the mean (assuming normality).
ConfidenceVariance	Evaluates the confidence interval for the variance (assuming normality).
EmpiricalQuantiles	Computes empirical quantiles.
Kurtosis	Evaluates the kurtosis of the given data set and associated weights.
Maximum	Evaluates the maximum of the given data set.
Mean	Evaluates the mean of the given data set with associated weights.
Median	Evaluates the median of the given data set.
Minimum	Evaluates the minimum of the given data set.
Mode	Evaluates the mode of the given data set.
SampleStandardDeviation	Evaluates the sample standard deviation of the given data set and associated weights.
SampleVariance	Evaluates the sample variance of the given data set and associated weights.
Skewness	Evaluates the skewness of the given data set and associated weights.
StandardDeviation	Evaluates the population standard deviation of the given data set and associated weights.
Variance	Evaluates the population variance of the given data set and associated weights.

BASIC STATISTICS (con't)

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.
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.
Sort	Sorts observations by specified keys.
Ranks	Computes the ranks, normal scores, or exponential scores for a vector of observations.

NONPARAMETRIC TESTS

Class Name	Subset / Description
ContingencyTable	Performs a chi-squared analysis of a two-way contingency table.
SignTest	Performs a sign test.
WilcoxonRankSum	Performs a Wilcoxon rank sum test.

GOODNESS OF FIT

Class Name	Subset / Description
ChiSquaredTest	Chi-squared goodness-of-fit test.
NormalityTest	Performs a test for normality.

REGRESSION

Class Name	Subset / Description
LinearRegression	Fits a multiple regression model.
UserBasisRegression	Generates summary statistics using user supplied functions in a nonlinear regression model.

VARIANCES, COVARIANCES, AND CORRELATIONS

Class Name	Subset / Description
Covariances	Computes the sample variance-covariance or correlation matrix.

MULTIVARIATE ANALYSIS

Class Name	Subset / Description
ClusterKMeans	Performs a K-means (centroid) cluster analysis.
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.

ANALYSIS OF VARIANCE

Class Name	Subset / Description
ANOVA	Analysis of Variance table and related statistics.
ANOVAFactorial	Analyzes a balanced factorial design with fixed effects.
MultipleComparisons	Performs Student-Newman-Keuls multiple comparisons test.

TIME SERIES AND FORECASTING

Class Name	Subset / Description
AutoCorrelation	Computes the sample autocorrelation function of a stationary time series.
CrossCorrelation	Computes the sample cross-correlation function of two stationary time series.
MultiCrossCorrelation	Computes the multichannel cross-correlation function of two mutually stationary multichannel 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.
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.

DISTRIBUTION FUNCTIONS

Class Name	Subset / Description
CDF	Class CDF covers 19 distributions. Most have associated cumulative probability distribution methods, probability density methods, inverse cumulative probability distribution methods and mean and variance methods.
InverseCDF	Evaluates the inverse of a user-supplied cumulative distribution function.

RANDOM NUMBER GENERATION

Class Name	Subset / Description
FaureSequence	Computes a low-discrepancy shuffled Faure sequence.
Random	Class Random covers 25 distributions, including the methods.
MersenneTwister	Initializes the 32-bit Mersenne Twister generator.
MersenneTwister64	Initializes the 64-bit Mersenne Twister generator.

Imsl.Datamining.Neural

PACKAGE

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

Class Name	Subset / 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	An activation function.
Link	A link in the neural network between two network nodes.
Trainer	Trains the neural net.
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 alltraining patterns and is optional.

CLASSES (con't)

BinaryClassification	Classifies patterns into two categories.
MultiClassifiaction	Classifies patterns into multiple categories.
ScaleFilter	Scales or unscales continuous data prior to its use in neural network training, testing, or forecasting.
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.

Imsl.Finance

PACKAGE

The Imsl.Finance package contains a set of classes covering a variety of investment calculations including an extensive collection of bond functions.

CLASSES

Class Name	Subset / Description
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. Computations can be based on: • The assumption of 30 days per month and 360 days per year. • The number of days in a month based on the actual calendar value and the number of days, but assuming 360 days per year. • The number of days in a month based on the actual calendar value and the number of days, but assuming 365 days per year. • The actual calendar. • The assumption of 365 days per year.
Bond	Collection of bond functions, including the methods:

Class Name	Subset / Description
Accrint	Returns the interest which has accrued on a security that pays interest periodically.
Accrintm	Returns the interest which has accrued on a security that pays interest at maturity.
Amordegrc	Evaluates the depreciation for each accounting period. During the evaluation of the function a depreciation coefficient based on the asset life is applied.
Amorlinc	Returns the depreciation for each accounting period.
Convexity	Returns the convexity for a security.
Coupdaybs	Returns the number of days starting with the beginning of the coupon period and ending with the settlement date.
Coupdays	Returns the number of days in the coupon period containing the settlement date.

CLASSES (con't)

Coupdaysnc	Returns the number of days starting with the settlement date and ending with the next coupon date.
Coupncd	Returns the first coupon date which follows the settlement date.
Coupnum	Returns the number of coupons payable between the settlement date and the maturity date.
Couppcd	Returns the coupon date which immediately precedes the settlement date.
Disc	Returns the implied interest rate of a discount bond.
Duration	Returns the annual duration of a security where the security has periodic interest payments.
Intrate	Returns the interest rate of a fully invested security.
Mduration	Returns the modified Macauley duration of a security.
Price	Returns the price, per $100 face value, of a security that pays periodic interest.
Pricedisc	Returns the price of a discount bond given the discount rate.
Pricemat	Returns the price, per $100 face value, of a discount bond.
Priceyield	Returns the price of a discount bond given the yield.
Received	Returns the amount one receives when a fully invested security reaches the maturity date.
Tbilleq	Returns the bond-equivalent yield of a Treasury bill.
Tbillprice	Returns the price, per $100 face value, of a Treasury bill.
Tbillyield	Returns the yield of a Treasury bill.
Yearfrac	Returns the fraction of a year represented by the number of whole days between two dates.
Yield	Returns the yield of a security that pays periodic interest.
Yielddisc	Returns the annual yield of a discount bond.
Yieldmat	Returns the annual yield of a security that pays interest at maturity.
Finance	Collection of finance functions.

Class Name	Subset / Description
Cumipmt	Returns the cumulative interest paid between two periods.
Cumprinc	Returns the cumulative principal paid between two periods.

CLASSES (con’t)

Db	Returns the depreciation of an asset using the fixed-declining balance method.
Ddb	Returns the depreciation of an asset using the double-declining balance method.
Dollarde	Converts a fractional price to a decimal price.
Dollarfr	Converts a decimal price to a fractional price.
Effect	Returns the effective annual interest rate.
Fv	Returns the future value of an investment.
Fvschedule	Returns the future value of an initial principal taking into consideration a schedule of compound interest rates.
Ipmt	Returns the interest payment for an investment for a given period.
Irr	Returns the internal rate of return for a schedule of cash flows.
Mirr	Returns the modified internal rate of return for a schedule of periodic cash flows.
Nominal	Returns the nominal annual interest rate.
Nper	Returns the number of periods for an investment for which periodic, and constant payments are made and the interest rate is constant.
Npv	Returns the net present value of a stream of equal periodic cash flows, which are subject to a given discount rate.
Pmt	Returns the periodic payment for an investment.
Ppmt	Returns the payment on the principal for a specified period.
Pv	Returns the net present value of a stream of equal periodic cash flows, which are subject to a given discount rate.
Rate	Returns the interest rate per period of an annuity.
Sln	Returns the depreciation of an asset using the straight line method.
Syd	Returns the depreciation of an asset using the sum-of-years digits method.
Ydb	Returns the depreciation of an asset for any given period using the variable-declining balance method.
Xirr	Returns the internal rate of return for a schedule of cash flows.
Xnpv	Returns the present value for a schedule of cash flows.

Imsl.Chart2D

PACKAGE

The Imsl.Chart2D namespace is designed to allow the creation of highly customizable charts. Supported chart types include:

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

The IMSL C# chart package can be used in Windows.Forms applications as well as ASP.NET applications.

CHART2D CLASSES

Class Name	Subset / Description
AbstractChartNode	The base class of all of the nodes in 2D chart trees.
Axis	The axis node provides the mapping for all of its children from the user coordinate space to the device (screen) space.
Axis1D	Controls an *x*-axis or a *y*-axis.
AxisLabel	Controls the labels on an axis.
AxisLine	Controls the axis line.
AxisR	Controls the *R*-axis in a polar plot.
AxisRLabel	Controls the labels on an 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.
AxisTitle	Controls the title on an axis.
AxisUnit	Controls the unit title on an axis.

Chart2D CLASSES (con't)

AxisXY	Controls the axes for an *x-y* chart.
Background	Controls the background of a chart.
Bar	A bar chart.
BarItem	Controls a single bar in a bar chart.
BarSet	Controls a set of bars in a bar chart.
Boxplot	Draws a multi-group box plot.
BoxPlot.Statistics	Computes the statistics for one set of observations in a Boxplot.
Candlestick	Candlestick plot of stock data.
CandlestickItem	Controls a candlestick for the up days or the down days.
Chart	The root node of the chart tree.
ChartFunction	An interface that allows a function to be plotted.
ChartNode	The base class of all of the nodes in the chart tree.
ChartSpline	Wraps a spline into a ChartFunction to be plotted.
ChartTitle	Controls the main title of a chart.
ColorMap	Maps from a unit interval to Colors, creating a one dimensional parameterized path through the color cube.
Colormap_Fields	Colormaps are mappings from the unit interval to Colors.
Contour	A contour chart shows level curves of surface data.
Contour.Legend	A legend for a contour chart.
ContourLevel	ContourLevel draws a level curve line and the fill area between the level curve and the next smaller level curve.
Data	Draws a data node.
Dendrogram	A graphical way to display results from a hierarchical cluster.
Draw	Chart tree renderer. Draws the chart tree to the output device.

Chart2D CLASSES (con't)

DrawMap	Creates an HTML client-side imagemap from a chart tree.
DrawPick	Pick an object in a chart.
ErrorBar	Data points with error bars.
FillPaint	A collection of methods to create Paint objects for fill areas.
FrameChart	FrameChart is a Form that contains a chart.
Grid	Draws the grid lines perpendicular to an axis.
GridPolar	Draws the grid lines for a polar plot.
Heatmap	Creates a chart from an array of RGB color values, combined with the data range represented by that array.
Heatmap.Legend	A legend for use with a Heatmap.
HighLowClose	High-low-close plot of stock data.
Legend	Controls the chart legend.
MajorTick	Controls the major tick marks.
MinorTick	Controls the minor tick marks.
PanelChart	A Windows.Forms.Panel that contains a chart.
PickEventsArgs	An event that indicates that a chart element has been selected.
PickEventHandler	The delegate for receiving pick events.
Pie	A pie chart.
PieSlice	Control one wedge of a pie chart.
Polar	This axis node is used for polar charts.
SplineData	A data set created from a Spline.
Text	The value of the attribute “Title”.
ToolTip	A ToolTip for a chart element.

Chart2D CLASSES (con't)

Transform	Defines a custom transformation along an axis.
TransformDate	Defines a transformation along an axis that skips weekend dates.
WebChart	A WebChart provides a component to use in ASP.NET applications that holds a Chart object.