RTMath

REAL-TIME MATH
High performance math libraries
for real-time computing

RTMath

RTMath provides a set of .NET and Java components and libraries for numerical calculations, time-series data analysis and visualization. Based on very efficient integration with Intel® Math Kernel Library (MKL) and Intel® Integrated Performance Primitives (IPP), RTMath components are highly optimized, extensively threaded math routines that provide outstanding performance and scalability. RTMath components offer both ultra-fast execution and efficient memory usage.

All RTMath components provide excellent computational efficiency and memory utilization, they are easy to use, and well documented. The installation includes API references with the description of classes and class members combined with detailed code samples.

Components

FinMath

FinMath is a highly optimized numerical library that provides components for the development of mathematical, scientific, and financial applications on Java and the .NET platform. It offers classes for working with vectors and matrices, solving optimization problems, random number generation, statistical analysis, option valuation and other uses. FinMath combines a broad range of functionality, outstanding efficiency, and modern easy-to-use object-oriented interface.

Functionality:

- Full-featured vector and matrix classes for double-precision floating point numbers.
- Classes for factoring matrices, including LU, Cholesky, QR, LQ and SVD.
- Classes for solving least squares problems, including Ordinary LS, Weighted LS, General LS, Feasible LS and Stepwise LS.
- Classes for performing Fast Fourier Transforms in real and complex domains.
- Random number generation from various probability distributions and their characteristics (like moments, PDF, CDF etc.).
- Extension methods that allow computing various descriptive statistics for different data sources.
- Various implementations of option valuation algorithms, including Monte-Carlo, Black-Scholes and Binomial.
- Factor analysis algorithms, including PCA and LSMI.
- Classes for minimizing multivariate functions using quasi-Newton method.
- Classes for linear programming (LP) and quadratic programming (QP).
- Derivative-free optimization (including Genetic algorithm, Evolution strategies, Cross-entropy method, Nelder-Mead method).
- Support-vector machine models for multi-class classification, regression and provability density estimation.
- Decision tree algorithm based on Classification and Regression Tree.

- Neural Networks including Multilayer Perceptron, Autoencoder and Deep Neural Network topologies.

FinAnalysis

FinAnalysis is a comprehensive .NET and Java libraries of technical indicators, predicates, and generic-purpose classes for real-time data analysis. It includes 40+ advanced technical indicators and 15+ logical predicates for expressing relationships between two or more time-series data sets. FinAnalysis is optimized for performance classes for processing large quantities of real-time and historical time-series data with built-in correlation analysis and calculations of descriptive statistics.

Functionality

- Great simplicity. Indicators' API specially designed to make simple operations in purely intuitive way:
- All indicators use optimized algorithms and formulas that allow to perform fast recalculation in minimal time.
- A high precision mode has been added to prevent the growth of a computation error during data processing.
- Various options for technical indicators usage: point based sliding windows, time-based sliding window, offline data processing.
- All indicators support large number of options: input validation, resampling factors, cloning, and copying of its internal state, accessing history of previous values, stability indicator.
- All indicators equipped with special attributes and interfaces making integration with any automated system as charting or pattern fetching frameworks simple.
- Base classes provide an easiest way to extend library with your own indicators, which will automatically support all indicators' library features.
- Special collections make custom indicators implementation straightforward and intuitive. Custom collections maintain sliding windows and support statistics calculation.

Key Features

Outstanding Performance

All complex computations are amplified by state-of-the-art libraries: Intel® Math Kernel Library, Intel® Integrated Performance Primitives (IPP), LibSVM, Shark, BOOST and others. Special engineering helps to achieve the lowest possible friction cost and deliver native performance without losses.

Cost-Efficient Full Pack

RTMath products offer a full set of tools that may be required for heavy math-focused applications development: from linear algebra and statistics to machine learning and competitive numerical solvers. With RTMath you can save time and effort spent on purchasing, studying, and integration of multiple libraries and concentrate on your core tasks.

Real-Time Computing

RTMath was initially designed for efficient real-time computations on financial markets. Interfaces produce minimal or zero garbage and allow to quickly re-estimate parameters of quantitative models based on the latest observations.

Powerful and Easy-to-Use APIs

RTMath offers simple object-oriented APIs, identical in C# and Java (FinAnalysis has a slightly different Java API). APIs cover most scientific complexities by default for fast and easy prototyping and on the other hand offer a vast variety of tuning options to achieve the maximum precision when solving specific tasks. Rich documentation and handy samples make RTMath adoption quick and easy.