

Ponderosa Computing Linear Algebra .NET Class Library

Release Notes Version 1.2.0

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Features

The Ponderosa Computing Linear Algebra .NET Class Library implements the following **PonderosaComputing.LinearAlgebra** class methods:

Matrix Creation and Extraction

Functions

Create constant matrix	GenerateConstant()
Create random matrix	GenerateRandom()
Create identity matrix	GenerateIdentity()
Create diagonal matrix	GenerateDiagonal()
Extract diagonal elements	ExtractDiagonals()
Extract row vector	ExtractRow()
Extract column vector	ExtractColumn()

Extract rows

ExtractRows()

Extract columns

ExtractColumns()

Matrix Operations

Matrix/vector multiply

Multiply()

Matrix/vector transpose multiply

TransposeMultiply()

Matrix multiply transpose

MultiplyTranspose()

Matrix or vector transpose

Transpose()

Vector/Matrix Norms

1-norm (column norm)

OneNorm()

2-norm (spectral norm)

TwoNorm()

Infinity-norm (row norm)

InfinityNorm()

Frobenius norm

FrobeniusNorm()

Other Vector/Matrix Metrics

Vector dot product

Dot()

Determinant

Determinant()

Rank

Rank()

Spectral radius

SpectralRadius()

Trace

Trace()

1-norm inverse condition number

InverseOneNormConditionNumberEstimate()

Infinity-norm inverse condition number

InverseInfinityNormConditionNumberEstimate()

Linear System Solvers

Square (full-rank) system solver

Functions

SolveFullRankLinearSystem(),

SolveFullRankLinearSystemEB()

General system solver (via LQ/QR)

SolveLsqLinearSystem(),

SolveLsqLinearSystemEB()

General system solver (via SVD)

SolveLsqLinearSystemSvd(),

SolveLsqLinearSystemSvdEB()

Singular Value Decomposition

Singular values

SingularValues(), SingularValuesEB()

Singular values and left singular vectors

SingularValuesLeftVectors()

Singular values and right singular vectors

SingularValuesRightVectors()

Full singular value decomposition

SingularValueDecomposition()

Eigenvalues and Eigenvectors

Eigenvalues

Eigenvalues(), EigenvaluesEB()

Eigenvalues and right eigenvectors

EigenvaluesRightEigenvectors()

Cholesky Factorization

Lower Cholesky factorization

LowerCholeskyFactorization()

Upper Cholesky factorization

Functions

UpperCholeskyFactorization()

Requirements

The Ponderosa Computing Linear Algebra .NET Class Library requires:

1. Microsoft Windows 7, 8, or 10.
2. Microsoft .NET Framework 4.5.2.

Implementation

The Ponderosa Computing Linear Algebra .NET Class Library uses the [CLAPACK](#) implementation of the LAPACK software package.

Known Issues

1. The Ponderosa Computing Linear Algebra .NET Class Library was built using [CLAPACK](#) version 3.2.1. LAPACK enhancements and bug fixes implemented in subsequent versions of LAPACK have not yet been included in this class library. This class library does not provide special handling of nonfinite floating point matrix or vector elements, and its class methods might not provide reliable results for method arguments containing such elements.

Changes from Previous Versions

From Release 1.1.1:

1. The library namespace has been changed to PonderosaComputing.
2. The library was built using Visual Studio 2017 Platform Toolset v141. The corresponding Visual C++ Redistributable will be installed if necessary.