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	**Functions**
Matrix/vector multiply	Multiply()
Matrix/vector transpose multiply	TransposeMultiply()
Matrix multiply transpose	MultiplyTranspose()
Matrix or vector transpose	Transpose()

Vector/Matrix Norms	**Functions**
1-norm (column norm)	OneNorm()
2-norm (spectral norm)	TwoNorm()
Infinity-norm (row norm)	InfinityNorm()
Frobenius norm	FrobeniusNorm()

Other Vector/Matrix Metrics	**Functions**
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	**Functions**
Square (full-rank) system solver	SolveFullRankLinearSystem(), SolveFullRankLinearSystemEB()
General system solver (via LQ/QR)	SolveLsqLinearSystem(), SolveLsqLinearSystemEB()
General system solver (via SVD)	SolveLsqLinearSystemSvd(), SolveLsqLinearSystemSvdEB()

Singular Value Decomposition	**Functions**
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	**Functions**
Eigenvalues	Eigenvalues(), EigenvaluesEB()
Eigenvalues and right eigenvectors	EigenvaluesRightEigenvectors()

Cholesky Factorization	**Functions**
Lower Cholesky factorization	LowerCholeskyFactorization()
Upper Cholesky factorization	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.