

# List of Algorithms

<b>Algorithm 9.1</b>	Inner Product of Two Vectors	164
<b>Algorithm 9.2</b>	Frobenius Norm	164
<b>Algorithm 9.3</b>	Product of Two Matrices	165
<b>Algorithm 9.4</b>	Solving an Upper Triangular System	169
<b>Algorithm 9.5</b>	Solving a Lower Triangular System	169
<b>Algorithm 9.6</b>	The Thomas Algorithm	173
<b>Algorithm 11.1</b>	$LU$ Decomposition Without a Zero on the Diagonal	216
<b>Algorithm 11.2</b>	Gaussian Elimination with Partial Pivoting	223
<b>Algorithm 11.3</b>	Solve $Ax = b$ for Multiple Right-Hand Sides	226
<b>Algorithm 11.4</b>	Iterative Improvement	229
<b>Algorithm 12.1</b>	Cubic Spline Approximation	255
<b>Algorithm 13.1</b>	Computing the $LU$ Decomposition of a Tridiagonal Matrix	265
<b>Algorithm 13.2</b>	Solve a Factored Tridiagonal System	266
<b>Algorithm 13.3</b>	The Cholesky Decomposition	271
<b>Algorithm 14.1</b>	Classical Gram-Schmidt	285
<b>Algorithm 14.2</b>	Modified Gram-Schmidt	286
<b>Algorithm 14.3</b>	Modified Gram-Schmidt $QR$ Decomposition	288
<b>Algorithm 16.1</b>	Least-Squares Solution Using the Normal Equations	327
<b>Algorithm 16.2</b>	Solving the Least-Squares Problem Using the $QR$ Decomposition	328
<b>Algorithm 16.3</b>	Solving the Least-Squares Problem Using the SVD	330
<b>Algorithm 16.4</b>	Minimum Norm Solution to the Least-Squares Problem	336
<b>Algorithm 16.5</b>	Solution of Full-Rank Underdetermined System Using $QR$ Decomposition	340
<b>Algorithm 17.1</b>	Product of a Givens Matrix $J$ with a General Matrix $A$	356
<b>Algorithm 17.2</b>	Computing the Givens Parameters	359
<b>Algorithm 17.3</b>	Givens $QR$ Decomposition	360
<b>Algorithm 17.4</b>	Zero Out Entries in the First Column of a Matrix using a Householder Reflection	368
<b>Algorithm 17.5</b>	Computation of $QR$ Decomposition Using Householder Reflections	371
<b>Algorithm 18.1</b>	The Power Method	391
<b>Algorithm 18.2</b>	Transformation to Upper Hessenberg Form	400
<b>Algorithm 18.3</b>	Unshifted Hessenberg $QR$ Iteration	402
<b>Algorithm 18.4</b>	Single Shift Using the Francis Iteration of Degree One	413
<b>Algorithm 18.5</b>	Implicit Double-Shift $QR$	419
<b>Algorithm 18.6</b>	Inverse Iteration to Find Eigenvector of an Upper Hessenberg Matrix	422
<b>Algorithm 18.7</b>	Compute the Condition Number of the Eigenvalues of a Matrix	426
<b>Algorithm 19.1</b>	Jacobi Method for Computing All Eigenvalues of a Real Symmetric Matrix	445
<b>Algorithm 19.2</b>	Orthogonal Reduction of a Symmetric Matrix to Tridiagonal Form	450
<b>Algorithm 20.1</b>	SOR Iteration	472
<b>Algorithm 21.1</b>	Steepest Descent	496
<b>Algorithm 21.2</b>	Conjugate Gradient	500
<b>Algorithm 21.3</b>	Preconditioned Conjugate Gradient	505
<b>Algorithm 21.4</b>	Arnoldi Process	511
<b>Algorithm 21.5</b>	GMRES	513
<b>Algorithm 21.6</b>	Incomplete $LU$ Decomposition	514
<b>Algorithm 21.7</b>	Lanczos Method	517
<b>Algorithm 21.8</b>	MINRES	519
<b>Algorithm 22.1</b>	The Implicitly Restarted Arnoldi Process	543
<b>Algorithm 23.1</b>	One-Sided Jacobi Algorithm	555
<b>Algorithm 23.2</b>	Reduction of a Matrix to Upper-bidiagonal Form	559
<b>Algorithm 23.3</b>	Demmel and Kahan Zero-Shift $QR$ Downward Sweep.	563