Freely Available Software for Linear Algebra (September 2016)

Here is a list of freely available software for the solution of linear algebra problems. The interest is in software for high-performance computers that's available in "open source" form on the web for solving problems in numerical linear algebra, specifically dense, sparse direct and iterative systems, and sparse iterative eigenvalue problems. Please let us know about updates and corrections.

A survey of Iterative Linear System Solver Packages can be found at:
http://www.netlib.org/utk/papers/iterative-survey/

Thanks,
Jack and
Ahmad

SUPPORT ROUTINES	License	Support	Type		Language			Mode			Dense	Sparse		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist				
Armadillo	Mozilla	yes	X	X			X	X			X			2015-05-24
Armas	LGPL	yes	X			X		X			X			2015-12-20
ATLAS	BSD like	yes	X	X	X	X		X			X			2014-07-10
BLAS	PD	yes	X	X	X	X		X			X			2013-11-01
BLIS	New BSD	yes	X	X	X	X		X			X			2014-10-23
Blitz++	LGPLv3+	yes	X	X			X	X			X			2012-07-04
clMath	Apache	yes	X	X		X	X	X	O		X			2013-04-02
KBLAS	BSD	yes	X	X		X	X	X	C		X			2015-01-20
librsb	LGPLv3	yes	X	X	X	X	X	X				X		2015-05-02
LINALG *	?	?												n/a
MR3-SMP	New BSD	yes	X	X	X	X		X			X			2013-06-24
MTL	Own	yes	X				X	X			X			2014-05-22
NEWMAT	Own	yes	X				X	X			X			2008-11-20
NIST Sparse BLAS	PD	yes	X	X		X	X	X				X		2009-04-27
OpenBLAS	BSD	yes	X	X	X	X		X			X			2015-03-24
PMRRR	New BSD	yes	X	X	X	X		X			X			2014-02-23
pOSKI	BSD	yes	X	X	X	X	X	X				X		2012-04-27
PSBLAS	BSD	yes	X	X	F90			X		M		X		2015-04-18
Scotch	CeCILL-C	yes			X	X		X		M		X		2012-12-02
SparseLib++	PD	yes	X	X		X	X	X				X		2008-10-30
Trilinos/Epetra	BSD	yes	X		X	X	X	X		M	X			2015-05-07
Trilinos/Kokkos	BSD	yes	X	X			X	X			X			2015-05-07
Trilinos/Teuchos	BSD	yes	X	X			X	X		M	X			2015-05-07
Trilinos/Tpetra	BSD	yes	X	X			X	X		M	X			2015-05-07
uBLAS	Boost	yes	X	X		X	X	X			X			2015-04-17

LINALG *: This is a collection of software that is available but too varied to describe.

DIRECT SOLVERS	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
Chameleon	CeCILL-C	See authors	X	X		X		X	C	M	X								2014-04-15
DPLASMA	BSD	yes	X	X		X		X	C	M	X								2014-04-14
Eigen	Mozilla	yes	X	X			X	X			X	X		X	X	X			2015-01-21
Elemental	New BSD	yes	X	X			X			M	X	X	X	X					2014-11-08
ELPA	LGPL	yes	X	X	F90	X		X		M	X								2015-05-29
FLENS	BSD	yes	X	X			X	X			X								2014-05-11
hmat-oss	GPL	yes	X	X	X	X	X	X			X			X					2015-03-10
LAPACK	BSD	yes	X	X	X	X		X			X								2013-11-26
LAPACK95	BSD	yes	X	X	X			X			X								2000-11-30
libflame	New BSD	yes	X	X	X	X		X			X								2014-03-18
MAGMA	BSD	yes	X	X	X	X		X	C/O/X		X				X	X	X		2015-05-05
NAPACK	BSD	yes	X		X			X			X				X		X		?
PLAPACK	LGPL	yes	X	X	X	X				M	X								2007-06-12
PLASMA	BSD	yes	X	X	X	X		X			X								2015-04-27
rejtrix	by-nc-sa	yes	X				X	X			X				P	P			2013-10-01

ScaLAPACK	BSD	yes	X	X	X	X				M/P	X							2012-05-01
Trilinos/Pliris	BSD	yes	X	X		X	X			M	X							2015-05-07
ViennaCL	MIT	yes	X				X	X	C/O/X		X				X	X	X	X	2014-12-11

SPARSE DIRECT SOLVERS	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
DSCPACK	PD	yes	X			X		X		M		X							?
KKTDirect	PD	yes	X			X	X	X				LDL^T							2010-04-21
MUMPS	CeCILL-C	yes	X	X	X	X		X		M		X	X	X					2015-02-20
PaStiX	CeCILL-C	yes	X	X	X	X	X	X	C	M		X	X	X	X	X			2014-12-18
PSPASES	Own	yes	X		X	X				M		X							1999-05-09
QR-MUMPS	LGPL	yes	X	X	X	X		X						X					2012-08-01
Quern	PD	yes	X			X	X	X						X		X			2009-02-04
SPARSE	Own	?	X	X		X		X				X		X					1988-04-01
SPOOLES	PD	?	X	X		X		X		M				X		X			1999-04-08
SPRAL	New BSD	yes	X	X	X	X		X	C			X	X				X		2015-04-20
SuiteSparse	LGPL	yes	X	X		X		X	C			X		X					2015-03-24
SuperLU	Own	yes	X	X	X	X		X	C	M				X					2015-05-01
TAUCS	Own	yes	X	X		X		X				X		X	X	X			2003-09-04
Trilinos/Amesos	LGPL	yes	X			X	X	X		M		X		X					2015-05-07
Trilinos/Amesos2	BSD	yes	X	X			X	X		M		X		X					2015-05-07
Y12M	?	yes	X		X			X				X		X					?

PRECONDITIONERS	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
BPKIT	LGPL	yes	X		X	X	X	X		M									2013-03-11
MLD2P4	BSD	yes	X	X	F90			X		M									2011-03-10
MSPAI	LGPL	yes	X	X			X	X		M									2009-09-17
Trilinos/IFPACK	BSD	yes	X				X	X		M									2015-05-07
Trilinos/IFPACK2	BSD	yes	X	X			X	X		M									2015-05-07
Trilinos/ML	LGPL	yes	X			X	X	X		M									2015-05-07
Trilinos/MueLu	BSD	yes	X	X			X	X		M									2015-05-07
Trilinos/Teko	BSD	yes	X	X			X	X		M									2015-05-07

SPARSE ITERATIVE SOLVERS	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
BDDCML	LGPL	yes	X		X			X		M					X	X			2014-03-12
BILUM	Own	yes	X		X			X							X	X			1998-03-18
BlockSolve95	Own	?	X		X	X	X			M					X	X			1997-07-08
CERFACS	?	yes	X	X	X			X							X	X			2007-07-01
DUNE / ISTL	GPL	yes	X	X			X	X		M					X	X			2014-12-18
GMM++	LGPL	yes	X	X			X	X				X		X	X	X			2014-08-21
HIPS	CeCILL-C	yes	X	X	X	X	X	X		M					X	X			2010-10-13
HYPRE	LGPL	yes	X		X	X		X		M					P	P	P		2015-01-22
IML++	PD	?	X				X	X							X	X			1995-01-05
ITL	Own	yes	X				X	X							X	X			2001-10-26
ITPACK	PD	?	X		X			X							X	X			1989-05-01
ITSOL	GPL	yes	X		X			X								X			2012-10-25
Lis	BSD	yes	X	X	X	X		X		M					P	P	P	P	2015-05-14
PARALUTION	GPL	yes	X				X	X	C/O						X	X			2015-02-27
pARMS	LGPL	yes	X		X	X		X		M					X	X			2011-01-14
PETSc	Own	yes	X	X	X	X		X	C/O	M					P	P			2015-01-31
PIM	Own	yes	X	X	X			X		M					X	X			2003-06-20
QMRPACK (tar.gz)	Own	?	X	X	X			X							X	X	X	X	1996-04-15
SLAP	PD	?	X		X										X	X			1998-07-21

SOL	CPL or BSD	yes	X		X	X		X							X	X			2015-05-14
SPARSKIT	LGPL	yes	X		X			X								X			2009-11-18
SPLIB (tar.gz)	Own	?	X		X			X							X	X			1999-04-01
Templates	BSD	yes	X		X	X		X							X	X			1998-07-21
Trilinos/AztecOO	BSD	yes	X		X	X	X	X		M					X	X			2015-05-07
Trilinos/Belos	BSD	yes	X	X			X	X		M					X	X			2015-05-07
Trilinos/Komplex	BSD	yes		X		X	X	X		M					X	X			2015-05-07

SPARSE EIGENVALUE SOLVERS	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
ARPACK	BSD	yes	X	X	X	X	X	X		M/P							X	X	2002-09-18
BLOPEX	LGPL	yes	X	X		X		X		M							P		2015-03-29
FEAST	BSD	yes	X	X	X	X		X		M							X	X	2015-06-17
FILTLAN	LGPL	yes				X	X	X									X		2012-05-07
LASO	PD	?	X		X			X									X		1983-06-01
PRIMME	LGPL	yes	X	X		X		X		M/P							X		2014-12-24
PROPACK	BSD	yes	X	X	X													SVD	2005-04-20
SLEPc	LGPL	yes	X	X	X	X		X		M							X	X	2014-12-14
Trilinos/Anasazi	LGPL	yes	X	X			X	X		M							P	P	2015-05-07
TRLan	Own	yes	X	X	F90	X		X		M							X		2010-10-10

Free for academic use only (not open source)	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
AGMG	Own	yes	X	X	F90			X		M					X	X			2014-03-11
HSL	Own	yes	X	X	X	X		X		M		X		X	X	X	X	X	2015-05-15

No longer available	License	Support	Type		Language			Mode			Dense	Sparse Direct			Sparse Iterative		Sparse Eigenvalue		Last release date
			Real	Complex	F77/ F95	C	C++	Shared	Accel.	Dist		SPD	SI	Gen	SPD	Gen	Sym	Gen	
SPAI	?	yes	X			X		X		M									---
PRISM	?	no	X		X			X		M	X								?
LASPack (see netlib)	?	?	X			X		X							X	X			1996-01-17

Notes:

Type:
- Real = Real arithmetic
- Complex = Complex arithmetic

Support: Contact information for where you can send questions and bug reports.

Language: F77/F95, C, C++

Mode:
- Shared = shared memory, sequential, vector or SMP/multithreaded versions
- Dist = distributed memory message passing (M = MPI, P = PVM)
- Accel. = GPU or Accelerator (C=CUDA, O=OpenCL, X=Intel Xeon Phi)

Dense: Dense, triangular, banded, tridiagonal matrices

Sparse: A sparse matrix representation is used to contain the data.
- Direct: A direct approach is used to factor and solve the system.
  - SI: The matrix is symmetric indefinite
  - SPD: The matrix is symmetric and positive definite
  - Gen: The matrix is general
- Iterative: An iterative method is used to solve the system.
  - SPD: The matrix is symmetric and positive definite
  - Gen: The matrix is general
  - P indicates preconditioners

Sparse eigenvalue: An iterative method is used to find some of the eigenvalues
- Sym: The matrix is symmetric (Hermitian in the complex case)
- Gen: The matrix is general

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