MAGMA

THE UNIVERSITY OF TENNESSEE KNOXVILLE

Linear algebra solvers and spectral decompositions for hardware accelerators.
Portable dense direct and sparse iterative solvers for GPUs and coprocessors.

- **Dense Linear Algebra Solvers**
  - Linear systems of equations
  - Linear least squares
  - Singular value decomposition
- **Matrix spectrum methods**
  - Symmetric and non-symmetric eigenvalues
  - Generalized eigenvalue problems
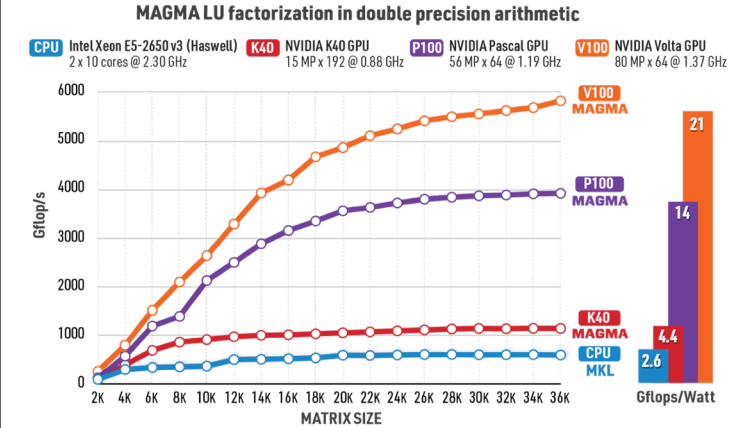 - Singular Value Decomposition
- **Sparse Solvers & Tensor Computations**

MAGMA SPARSE

ROUTINES	BiCG, BiCGSTAB, Block-Asynchronous Jacobi, CG, CGS, GMRES, IDR, Iterative refinement, LOBPCG, LSQR, QMR, TFQMR
PRECONDITIONERS	ILU / IC, Jacobi, ParILU, ParILUT, Block Jacobi, ISAI
KERNELS	SpMV, SpMM
DATA FORMATS	CSR, ELL, SELL-P, CSR5, HYB

FEATURES AND SUPPORT
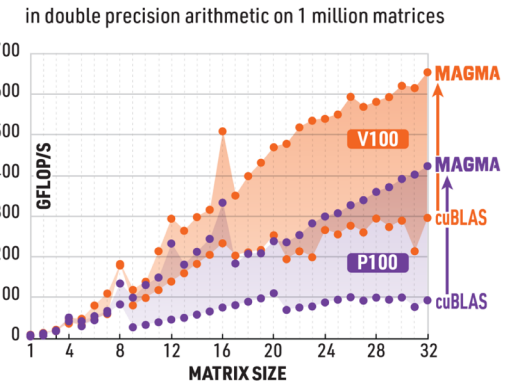
▸ **MAGMA 2.3** FOR **CUDA**
▸ **cIMAGMA 1.4** FOR **OpenCL**
▸ **MAGMA MIC 1.4** FOR **Intel Xeon Phi**

CUDA	OpenCL	Intel Xeon Phi	
●	●	●	Linear system solvers
●	●	●	Eigenvalue problem solvers
●	●		Auxiliary BLAS
●			Batched LA
●		●	Sparse LA
●	●	●	CPU/GPU Interface
●	●	●	Multiple precision support
●			Non-GPU-resident factorizations
●	●	●	Multicore and multi-GPU support
● *NEW*			MAGMA Analytics/DNN
●	●	●	LAPACK testing
●	●	●	Linux
●	●		Windows
●	●		Mac OS

PERFORMANCE & ENERGY EFFICIENCY
MAGMA LU factorization in double precision arithmetic

CPU Intel Xeon E5-2650 v3 (Haswell) 2 x 10 cores @ 2.30 GHz **K40** NVIDIA K40 GPU 15 MP x 192 @ 0.88 GHz **P100** NVIDIA Pascal GPU 56 MP x 64 @ 1.19 GHz **V100** NVIDIA Volta GPU 80 MP x 64 @ 1.37 GHz

PERFORMANCE OF BATCHED LU
in double precision arithmetic on 1 million matrices

http://icl.utk.edu/magma