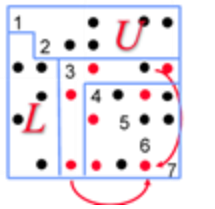
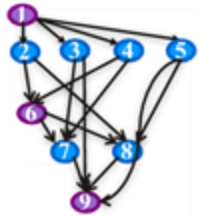
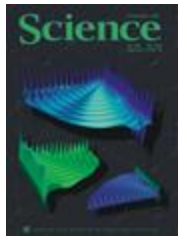
SuperLU

Supernodal Sparse LU Direct Solver. Flexible, user-friendly interfaces. Examples show various use scenarios. Testing code for unit-test. BSD license.

- **Capabilities**
  - Serial (thread-safe), shared-memory (SuperLU_MT, OpenMP or Pthreads), distributed-memory (SuperLU_DIST, hybrid MPI+ OpenM + CUDA/HIP). Written in C, with Fortran interface
  - Sparse LU decomposition (can be nonsymmetric sparsity pattern), triangular solution with multiple right-hand sides
  - Incomplete LU (ILUTP) preconditioner in serial SuperLU
  - Sparsity-preserving ordering: minimum degree or graph partitioning applied to A^TA or A^T+A
  - User-controllable pivoting: partial pivoting, threshold pivoting, static pivoting
  - Condition number estimation, iterative refinement, componentwise error bounds
  - Batched interface, mixed-precision routines
- **Exascale systems GPU-readiness**
  - Available: Nvidia GPU (CUDA), AMD GPU (HIP), Intel GPU (SYCL)
- **Parallel Scalability**
  - Factorization strong scales to 32,000 CPU cores (IPDPS'18, JPDC'19)
    - additional 10x speedup with GPUs
  - Triangular solve strong scales to 4000 CPU cores (SIAM CSC'18, SIAM PP'20, SC'23)
    - 3D algorithm strong scales to 256 GPUs
- **Open-source software**
  - Used in a vast range of applications, can be used through hypre, PETSc, SUNDIALS, Trilinos, etc.
  - available on github







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Widely used in commercial software, including AMD (circuit simulation), Boeing (aircraft design), Chevron, ExxonMobile (geology), Cray's LibSci, FEMLAB, HP's MathLib, IMSL, NAG, SciPy, OptimaNumerics, Walt Disney Animation.

https://portal.nersc.gov/project/sparse/superlu/