1 Top-10 CiSE algorithms of the 20th century

As the century turned forward, the SIAM community made a top-10 list of best algorithms, of the 20th century, in Computing in Science & Engineering (CiSE). According to the report by Cipra [2000], these algorithms are, in chronological order,

1. the Metropolis algorithm or the Monte Carlo method,
   by John von Neumann, Stanislaw Ulam, and Nicholas Metropolis, 1946

2. the complex method or linear programming,
   by George Dantzig, 1947

3. the Krylov subspace iteration methods,
   by Magnus Hestenes, Eduard Stiefel, and Cornelius Lanczos, 1950

4. the matrix factorization approach,
   by Alston Householder, 1951

5. the Fortran optimizing compiler,
   by a team led by John Backus, 1957

6. the QR algorithm (for eigenvalue problem),
   by John G. F. Francis, 1959-1961

7. the QuickSort algorithm,
   by Anthony Hoare, 1962

8. the Fast Fourier Transform,
   by James Cooley and John Tukey, 1965

9. the integer relation detection algorithm,
   by Helaman Ferguson and Rodney Forcade, 1977

10. the fast multipole algorithm,
    by Leslie Greengard and Vladimir Rokhlin, 1987

References

2 Trefethen’s list of 13 classic articles

Professor L. N. Trefethen suggested, to applied mathematics students and researchers, a list of 13 classic papers in his posting at NA-net, May 9, 1993. I list the algorithms or numerical issues addressed in the papers in chronological order.

1. The **FEM** method among other variational methods by [Courant](1943)
2. The **CG** method by [Hestenes and Stiefel](1952)
3. **Stiffness** by [Curtiss and Hirschfelder](1952)
4. **QR** factorization(s) by [Householder](1958)
5. The **gradient method** for nonlinear optimization by [Fletcher and Powell](1963-1964)
6. the **FFT** by [Cooley and Tukey](1965)
7. the **SVD** by [Golub and Kahan](1965)
8. the **CFL condition** for Numerical PDE solutions with FDM [Courant et al.](1967)
9. **B-splines** by [de Boor](1972)
10. **Multigrid** algorithms or **MLAT** by [Brandt](1977)
11. **Stability** by [Wanner et al.](1978)
12. **Linear Programming** by [Karmarkar](1984)
13. The **FMM** by [Greengard and Rokhlin](1987)

References


3 Textbooks and monographs

Numerical Analysis (at introductory level)
- Burden and Faires [2011] (or its earlier editions),
- Cheney and Kincaid [1996], 2nd Ed.;
- Cheney and Kincaid [2003], 5th Ed.;
- Cheney and Kincaid [2012], 7th Ed.
- Dahlquist and Björck [1974];
- Dahlquist and Björck [2008]

Matrix Computations or Numerical Linear Algebra
- Golub and van Loan [1996]
- Steward [1973]
- Strang [2006]
- Trefethen and Bau [1997]

Optimization methods
- Bonnans et al. [2006]
- Nocedal and Wright [2000]
- Moré and Wright [1993]

References


