

Bibliography of the Book *Matrix Computations*

Original authors: Gene H. Golub
(Stanford University)

Charles Van Loan
(Cornell University)

BIBTEX conversion by
Chris Paige

Clement Pellerin
(McGill University)

L^AT_EX wrapper and prettyprinting by
Nelson H. F. Beebe

Center for Scientific Computing
Department of Mathematics

University of Utah
Salt Lake City, UT 84112
USA

Tel: +1 801 581 5254

E-mail: Beebe@math.utah.edu (Internet)

07 May 1999

Version 1.10

Abstract

This bibliography is from the book *Matrix Computations*, Second Edition, by Gene H. Golub and Charles F. Van Loan, The Johns Hopkins University Press, Baltimore, Maryland 21218, 1989.

The original bibliography was prepared by Charles Van Loan (Computer Science, Cornell University, Ithaca, NY 14853). It was corrected, edited, and put in BIBTEX format in September 1990 by Chris Paige and Clement Pellerin (Computer Science, McGill Univer-

sity, Montreal, PQ, Canada H3A 2A7). Send any corrections by e-mail to Charles Van Loan at cv@cs.cornell.edu.

This wrapper, and the prettyprinting of the bibliography file, were supplied by Nelson H. F. Beebe (University of Utah).

The master bibliography is available from the netlib service; to fetch a copy, send e-mail to netlib@ornl.gov with the text `send gvl.bib from bib`.

This prettyprinted version is available from the tuglib service; send e-mail to tuglib@math.utah.edu with the text `send gvl.bib`

from tex/bib.

Title word cross-reference

$(A - \lambda B)x = 0$ [Sch74]. $^{-1}$ [KW87]. A [PW69, You72]. $A - \lambda B$ [Kåg85, Kåg86, TW70]. $A = 1 + H$ [Buc74]. $\{a_{ij}\}$ [Asp59]. $a_{ij} = 0$ [Asp59]. $AX + XB = C$ [BS72, GNL79]. $AX - XB^T = C$ [Bye84]. $Ax = \lambda Bx$ [Erd67, GUV72, MW68c, PW69, Pua70a, Rod73, Ste72, Ste75b]. $Ay = \lambda By$ [TW72]. B [PW69]. ℓ [Hoc83]. H [Buc74]. ijk [OR88]. $j > i + p$ [Asp59]. k [NV83]. L_1 [BCS78, BR73, CP76]. L_2 [GV74]. L_∞ [BCC78]. M [Bar87, MdV77]. N [JH88]. $O(n^2)$ [Dor73]. R^N [Bjö88]. $\sum f_p(A)Xg_p(A)$ [WZ72]. $\|A^{-1}\|$ [Var76].

- [OS81]. **-Cube** [JH88]. **-Matrix** [Bar87, MdV77]. **-Scaling** [GV74]. **-Solutions** [CP76]. **-step** [NV83].

100 [LV75, NV75]. **10P** [DD88].

2 [CDH84]. **200/VF** [DD88].

3090 [DD88]. **3090-200** [DD88].

3090-200/VF [DD88].

4 [DH86]. **400** [KL88].

Accelerating [Ste69]. **Acceleration** [YJ80]. **Accuracy** [Don83, DMW83, Hig88a, Pai80, Rob77, Sco85, War77]. **Accurate** [DK88]. **ADI** [CmDp84]. **Adjoint** [GK69]. **Advances** [Wil77]. **after** [Ruh69b]. **Aid** [LO83]. **Algebra** [Bun87, CDH84, DJK⁺88, DCHH88a, DGK84, DH86, DS86, FF63, FF77, Fox64, GJM87, GJMS88, Gol74, Hag88, Hel78, Hig85, Joh87a, Kah66, Kan66, Lau85,

LHKK79a, LHKK79b, Leo80, Mir55, ND77, Str88, Wil77, WR71, DCDH88, DCHH88b]. **Algebraic** [AL84, Bye83, FM67, Nas75, Rob77, Wil63, Wil65a, Wil68c, vdS70]. **Algebraically** [Cul78, CD74]. **Algorithm** [AC84, APP88, AL73, AL85, AC76, Bai88a, BP75a, BR73, BS79, Bjö84, BB71, BG84b, BG69, Bye86, Cha82a, Cha82b, CD87, CP77, CVD88, Cra86, CD74, CWL83, Cyb80, Cyb84, DT71, DCHH88a, DE84, DS87a, Dub70, DMW68, Eld84, Eld88, FH72, GJMS88, GPS76a, Gol74, GUV72, Gra86, Gre81, HL69, Hel76, HP78, Hua81, HV88a, HV88b, HVH87, JP71, Kåg86, KR80a, KR80b, Kar74, Kau74, Kau77, Ker82, LH69, LHKK79a, LPS87, Loa75a, MPW70, MRW70, MW68b, MP82, MS73b, ML82, Nan85, O'L80a, Paa71, Pai76, Pai80, PD86, PS78, PS82a, PS82b, Par65, Par66, Par68, Par80a, PR81, PS79, PSS82, Ros69, Ruh69a, Saa82, SS86, Sco79b, SB79, Sim84, Ste70, Ste76a, Ste79a, Ste85, Sto73, Swa79, Swe74, Swe77, Tre64, War75, Wat73, Wat82, Wil68b, Wil79, Win68, Zoh69]. **Algorithmic** [CdB80]. **Algorithms** [AL84, BG76, BS86, Bis88b, BE73, BMRW68, Bre70, Bud64, Bun87, Bye83, Cal86, CDH84, CW77, CW85b, CW85a, Cyb78, DGKS76, DGK84, DH86, DSS86, Doo83, DGR79, EHHR88, Eld77a, FOH87, GR84, GPS76b, Hea78, Hel78, Hig86b, Hig87b, JH87a, JH88, KNP87, KNP88, KP74, Knu81, Kub61, Lew77, Loa73, Mod88, MvdV87, O'L76, OS85, Pai81, Par71, Pry85, Ris73, Ruh79, Sam71, SHW86, Wil65b, Woz80]. **Allowing** [SS79]. **Almost** [Ruh75, Wed73a, Wil68a]. **Alternating** [CJZ83, JH87b]. **Alternative** [MC86]. **Among** [Par76]. **Analogue** [Fra61]. **Analyses** [Mei83]. **Analysis** [Abd71, APP88, AL85, Bel70, Bjö87, Bre70, Bun71a, CdB80, Cyb78, Dem88, Eld77b, Elm86, FNO87, Gen73a, GL80, Gre52, HN81, Hig87b, Hig89, Hoa77, Hoc65, Hot57, Hou74, Huf87, IP87, JO74, KP74, Kie87,

Loa83, MS78, MM83, NV83, Ort72, Pai73, Pai76, Pai79a, Par71, Ple86, Pry85, Sco78, Sim84, Sor85, Sun83, Var62, Wil61, Wil68c, Wil71, Woz80, dBP77]. **Analyst** [Dem83b]. **Angles** [BG73]. **Application** [ES86, FU69, JO71, Kau79, Loa77a, McC72, Ris73, Sch09, Ste80]. **Applications** [AG87, AG88, Bar87, BS68, Fox88, Fra64a, Fra64b, GLR86, GT81, HL69, Hig86a, Hig88d, Hig88e, LH69, Leo80, Loa73, Nas76, Opp78, RW72a, Str88, TG81, Van71, Var73]. **Applied** [Hag88, HY81, ND77, Ple86]. **Applying** [PR68]. **Approach** [CdB80, Doo81b, HV87, KP81, KM86a, McC72]. **Approaching** [DH86]. **Approximate** [AP86, KPJ82, OP64, Ste71]. **Approximating** [DGR79, Loa84]. **Approximation** [BR73, GHS88, Gre52, Loa77a, Saa86]. **Approximations** [FL70]. **Arbitrary** [HS88, Hua75, JH87a, Lot56, Ruh68, Sch79, Swe77]. **Architectures** [Bis87, Joh84, Joh85, Joh86, Joh87b, JH88, Kun82]. **Arguments** [Var76]. **Arising** [Saa86, Var72]. **Arithmetic** [Gre81, KM86b, Ste81a, Yoh79]. **Array** [BL86, KB84, Luk86b, Sch86]. **Arrays** [AC84, BL85, ES86, GK82, ST86, SHW86]. **Art** [IP87]. **Aspect** [Nic74]. **Aspects** [Hel76, Lau85, Ruh79, Ruh83, Rut69]. **Assignment** [MP82, OS86]. **Associated** [HVH87, Ste73b, SW80]. **Asymptotic** [Ste84a]. **aufzulösen** [Jac46]. **Augmented** [Cox81]. **Automatic** [KdV77]. **Average** [TS87]. **Axis** [EY39].

Backward [ADD88, dBP77]. **Balancing** [PR69, War81]. **Band** [All73, Boh75, CKS78, CS87, Cox81, Cra73, JO77, Joh86, MRW70, MW65, MW67, PW69, Rei67, Ruh79, Sch68, Sco84, Tre74]. **Banded** [DS84, Eld84, Joh85, WAC⁺88]. **Bandwidth** [Cut72, GPS76a, GPS76b]. **Based** [Cal86, CW80, HN81]. **Basic** [DCHH88a, Joh87a, LHKK79a, LHKK79b, Par68, DCDH88, DCHH88b]. **Bauer** [Rut69]. **be** [Bus68]. **Behavior** [Gre81, Ste84a]. **Best** [BB71, GV74]. **Between** [AR85, BG73]. **Bibliographical** [Ste76b]. **Bidiagonalization** [OS81, Pai74a, PS78]. **Biharmonic** [BD74]. **Bilineari** [Bel73]. **Binary** [Ste81a]. **Biorthogonalization** [Saa82]. **Bisection** [BMW67]. **Bisectors** [Par71]. **Björck** [Hig87b]. **Björck-Pereyra** [Hig87b]. **BLAS** [DD88, KL88]. **BLAS3** [GJM87]. **Block** [AP86, BS79, Bis87, Bun76, Cal86, CGM85, CD74, Dem83a, DHS87, ER88, FV62, Geo74, GLO81, GT81, GU77, Hel76, KB84, Mer85, Meu84, O'L80a, Ple86, Ris73, RW84a, RW84b, Saa80, SP87, Sco79a, SHW86, SS87, Swe77, TG81, Uhl73, Und75, Var72, Wat73]. **Block-Oriented** [Cal86]. **Block-Tridiagonal** [Var72]. **Boolean** [JH87a, JH87b, JH88]. **Both** [Mad59]. **Bound** [PNO85, Var75]. **Boundary** [FU69]. **Bounding** [Sco85, Var76]. **Bounds** [AK75, Boh75, Bro73, CR79, Des63, FL74, Hen62, Kåg77a, KPJ82, Lem73, OP64, Ruh70a, Ste71, Ste73b, Ste77b, Ste79c, SW80, Var68b, Wed72].

Calculating [BK77, GK65, Ste75c, Ste76a]. **Calculation** [BMW67, BS70, CGP76, GW69, KG83, LS78, MW67, PR69, PW71, Var68a]. **Calculations** [FF77, Fos86, JMP83, TW72]. **Calculus** [Dav73]. **Can** [Bus68, Pan84]. **Canonical** [Dem83b, Doo79, GW76, MW31, Par67, TA61, Uhl76, Wil78, Wil79]. **Case** [TS87, Wed73a]. **CDC** [LV75]. **CDC-STAR** [LV75]. **Certain** [All73, Buc77, HZ68, JO77, Ste73b, Var72]. **Chains** [Bar87, GM86]. **Changes** [SS79]. **Characteristic** [Hou68, Lot56, Sch09]. **Characterization** [GV74]. **Characterizing** [Hoc83]. **Chebychev** [BP75a, GO88, GV61]. **Cholesky** [BBDdH87, GH85, GHL86, HHP88, Hig89,

Kie87, Man79, Mei83, ST86, Ste79a].
Choosing [GHW79]. **Circle** [FV62, Sco85].
Circulant [Cha88]. **Class** [Eis84, MP74, Ros69, Ser80, WG78, Wid78, Woz80].
Classes [Bud64]. **Cline** [BCC78]. **Close** [Wil68a]. **Closed** [Ste71]. **Closeness** [Ruh75]. **Closest** [Pea01, Ruh87]. **Clusters** [CD87, Kah67]. **Coarse** [Bis88b]. **Codes** [Hig88d]. **Coefficient** [Kog55, MdV77].
Coefficients [OP64, Ste77c]. **Collection** [DH84]. **Collinearity** [HV87, Ste87].
Column [Dav86, Fos86, Ste84b].
Combination [Cra86, CM83, War75].
Combinations [Bau65, Mah79].
Comments [Huf88]. **Communication** [GR84, Joh87a, SS85a]. **Compact** [Bun69].
Comparison [BG76, DR76, GPS76b, GWM76].
Compatibility [OP64]. **Complement** [Cot74]. **Complete** [Kub61]. **Complex** [AL73, AL76, BMPW66, BGG88, BG69, Ebe70, Ebe71, FH60, Fro65, Hig88d, KR80a, KR80b, MW68b, Mue66, Saa86, Sea69, Ser80, Var68a, Var68b]. **Complexity** [GR84, Mil75]. **Computation** [BLL85, Cha85, Cul78, CW79, Doo79, Eld85, FG86, Giv58, Gol69, GW76, Jen77b, JP71, Kåg77b, KR80a, KR80b, Mod88, Pai71, Par74a, Ruh79, Rut69, SP87, War77, WG78, Wra73, Wra75]. **Computational** [FF63, Kan66, KF64, Mil75].
Computations [BR76, CL88, CW85b, CW85a, DHS87, FMM77, Gen73b, GL89, Joh87a, Lau81, Lau85, Luk78, Mol86, OS85, Pai79b, Ple86, Ric81, Rod82a, Rod82b, Ste73c]. **Compute** [GM86, ML78]. **Computed** [Don83, DMW83]. **Computer** [CMR88, FM67, FMM77, GL81a, KM86b, LV75, NV75, Pai79a, Sam71]. **Computers** [DKH86, DS86, Hoc83, HJ88, KB84, Meu84, Meu89, OV85, PO87, Sch87]. **Computing** [AK75, Bai88a, BS79, Bis88a, BL86, BB71, BG73, Cha82a, Cha82b, CP77, CVD88, CD74, CWL83, CL86, DK87, FH60, GMS75, GLO81, GU77, HLPW86, HS86, Hen58, Hig86a, Hig87a, Hig88b, HVH87, Kåg86, Loa78a, Loa85a, Luk80, Luk86a, Luk86b, Pai81, Pai86, PD86, Sch87, Sco84, SB79, Ste76d, Ste83, Ste85, Var70a, Hig86b].
Concepts [AS83]. **Concerning** [PT57].
Concurrent [AS83, DSS86, FJL⁺88].
Condensed [DHS87, DR75]. **Condition** [AR85, Bro73, Bye84, CP77, CCL82, CMSW79, CR83, Dem83a, FL74, GL81b, Hag84, Hig87c, Hig88d, Lem73, Loa87, Loi69, O'L80b, Ric66b, Saa86, Smi67, Ste80, vdS69, vdS70, Hig86b]. **Conditioned** [Eld77a, Eld84, Eld85, FH72, Gau75b, GW76, PW79, Ruh70b, Var73, Wil72].
Conditioning [MS73a]. **Conditions** [FM84]. **Conference** [Hea86, KR83].
Configured [JH87b, JH88]. **Confluent** [BE73, GP71]. **Conjectures** [Dem87a].
Conjugate [Ada85, Ash87, AMS88, Axe80, Cli76b, CGM85, CGO76, CW77, CW80, JT87, Eis84, FM84, Gin71, Gre81, Hes80, HS52, JY83, Jen77a, JMP83, Jor84, Mel87, Meu84, O'L76, O'L80a, Rei71b, Rei72, RW72b, Sea86, Ste73a, Ste75a, Woz80, YJ80, vdSdV86].
Connected [BLL85]. **Connection** [Wed72].
Conquer [Cup81, KM86a]. **Considerations** [AGG88, Wra73, Wra75]. **Consistency** [vdSV79]. **Consistent** [BV68, Nic74, You72].
Constrained [BNP88, Bjö84, Eld77b, Eld83, Hea78, KP81, Loa83, Loa85c, SS79, Dem87c].
Constraint [Gan81]. **Constraints** [Eld80, GU70, Mer85]. **Construction** [EN83, BPS86a, BPS86b]. **Control** [DJK⁺88, DK88, Lau85, Loa82].
Controllability [Pai81]. **Convection** [CMdP84]. **Convection-Diffusion** [CMdP84]. **Converge** [Sco79b].
Convergence [AL73, AR85, Bai88a, BP75b, GO88, Har82, Hen58, HP78, Hua81, Jen77a, Loi72, PD86, Par65, Par68, Ruh67, Ruh68, Saa80, Sch64, SS87, Ste75a, Wil65b, Wil68b,

- You70, vK66, vdSdV86]. **Coordinate** [Sch74]. **Corresponding** [CD74, GLO81]. **Cosine** [SB79]. **Counter** [CR83]. **Counterexample** [Dem87a]. **Course** [Ort72, Ort88]. **Cray** [Bai88b, Cal86, CDH84, DD88, DE84, DH86, Ker82, Sea86]. **Cray-1** [Ker82]. **Cray-2** [Bai88b, Cal86, DD88]. **Criterion** [Kar74, Lev47]. **Cross** [Eld85, GHW79]. **Cross-Validation** [Eld85, GHW79]. **Crout** [For60, McK62]. **Cryptograms** [MM83]. **CS** [Loa85a, Pai84]. **Cube** [JH87a, JH87b, JH88]. **Cyclic** [BP75b, DF76, EHHR88, FH60, Han63, Hel76, Hen58, Joh84, RW84a, RW84b, Swe74, Swe77, vK66, HZ68].
- D** [Enr79]. **DAP** [MP85]. **Data** [AC76, CR79, FG86, GH84, Hoa77, OS85, SS85a, SS79]. **Decomposition** [AG87, AG88, Bai88a, Bis88a, Bre70, BLL85, Bun82, BKP76, BG69, Cha82a, Cha82b, Cha84, CM88, CVD88, CMR86, Cup83, Eld88, Fos86, GR70, GT81, Ham85, HN81, Hig86a, Hig89, HS88, Kåg85, Kar74, Loa76, Loa82, Loa85a, Luk80, MPW65, MW65, Meu89, Nas75, Pai85, Pai86, PD86, PL81, PS81, Par67, Phi71, Ris73, Ste83, Ste85, TG81, WAC⁺88, Wed72]. **Decompositions** [BS86, BGG88, Gen73a, Gol69, HI83, Pai84, Ste84a]. **Deficient** [Wed73a]. **Definite** [AR85, BR70, Cra86, CM83, CL86, DI86, GL81a, GL79, MPW65, MPW66, MW65, Nic74, PR70, Ste79c, Sun82, Hig89]. **Definitions** [Rin55, Doo83]. **Deflated** [Cha84]. **Deflation** [Bus71b, Ste81b]. **Degeneracy** [GKS76, Ste84c]. **Degree** [FG65]. **Denelcor** [DH84]. **Dense** [BS86, DGK84, DH86, ISS86, Kau79]. **Descent** [Cli76a]. **Design** [GJMS88, GR84, Lau85, Lev47]. **Determination** [Ruh69a]. **Determined** [DR76, Var70a]. **Developing** [DS87b]. **Diagonal** [Bun71a, Var76, Wil68a].
- Diagonalization** [BS79, Ebe71, GH59, Kog55, MP85, PT57, Sea69, Uhl73]. **Diagonalize** [Dem83a]. **Diagonalizes** [AL73]. **Diagonally** [FV62, FNP82]. **Diagonals** [MRK76]. **dif** [KW87]. **Difference** [She55, Var72]. **Differentiable** [BCS78]. **Differential** [CGO76, DNT83, Lan50, Meu89, Nan85, OV85, Var61, Wil78]. **Differentiate** [GM86]. **Differentiation** [GP70, GP73, GP76]. **Difficult** [Dem88]. **Diffusion** [CMdP84]. **Digital** [KM86b, Opp78]. **Dimension** [Swe77]. **Dimensional** [Fro65, Hal58]. **Direct** [BCC78, BP71, BD74, BDGG71, BGN70, CG73, Dor70, Dor73, DER86, Hoc65, JO74, SS73, Wil61]. **Direction** [CJZ83, Hes80, JH87b, Ste73a]. **Directions** [JT87]. **Discrete** [BR73, BDGG71, Dor70, Dor73, ES86, SS73]. **Discretizations** [OS81]. **Disk** [SS73]. **Dissection** [Geo73]. **Distance** [Dem87b]. **Distributed** [Bis88a, Bis88b, EHHR88, HR88, LC88, Mol86, PJV87]. **Distributed-Memory** [LC88]. **Divide** [Cup81, KM86a]. **Divisors** [Wil84]. **Domain** [Meu89]. **Dominance** [Var76]. **Dominant** [FV62, FNP82]. **Downdating** [BBDdH87, HHP88, Ste79a]. **Dubious** [ML78]. **Durbin** [Cyb80].
- E.** [Enr79]. **Eberlein** [Har82]. **Eckart** [GHS88]. **Economical** [Ste76c]. **Effect** [Ske81]. **Effectiveness** [Pai80]. **Effects** [LS78, Ste77c, Ste79a]. **Efficient** [CVD88, CG73, Eis84, Enr79, Hig86b, HVH87, Joh87a, LS78, Lau81, MP85, Ruh78, SL89, Ste80, Sto73, Mel87]. **Eigendecompositions** [DK87]. **Eigenproblem** [AL84, BE68, BNS78, Cup81, Ebe70, MW68c, Nas75, Pai80, PW70a, Ruh70b, Wil72]. **Eigenproblems** [Jen72, PR81, Und75]. **Eigensolution** [JS75]. **Eigenspace** [CD74]. **Eigenstructure** [Doo81a]. **Eigensystem**

[GBDM72, SBI⁺70, Var68b, Var70a, WG78].
Eigensystems [GW76, KPJ82].
Eigenvalue
 [AGG88, Arn51, BW73, BS70, BS86, BG78, BL85, BG84b, CJ71, Cra73, Cra76, CW85b, CW85a, CW86, CL86, DNT83, DHS87, DKH86, DS87a, Doo81b, ES82, ER80, FH72, Fri75, Fri77, FNO87, Gol73, Gup72, Jen77a, JO77, KdV77, Kau74, Kau77, Kub61, KF64, Lan50, Lew77, LPS87, Loa75a, McC72, MS73b, Paa71, Par80b, PSS82, PW69, Rod73, Ruh74, Rut58, Sch86, Sco79a, SHW86, Smi67, Ste72, Ste73b, Ste74, Ste75b, Ste76b, Ste78, Ste79c, SW80, War81, Wil65a].
Eigenvalues [BMW67, Bud64, CP77, CJ70, Cul78, CD74, DMW83, GWDF88, GU77, Hen58, Kah67, KM86a, Loa84, Loa87, MW67, Pai71, Pai74b, PNO85, PR69, Ruh70a, Ruh75, Ruh79, SLN75, Sco84, Ste76a, Van71, Wil68a, vdS75a].
Eigenvector [BS70, SW80]. **Eigenvectors** [Bud64, CP77, CJ70, DK70, DMW83, GWDF88, Loa87, Pai71, PR69, PW71, Sco84, Ste69, Ste75c, Var68a].
Eigenwerteinschliessungen [Leh63].
EISPACK [GBDM72, SBI⁺70]. **Element** [Geo73]. **Elementary** [CdB80, Gou70, Wil84]. **Elements** [Par76].
Elimination [Bau65, Boh75, Bro73, Bus71a, Cli73, Coh74, CMR88, Cry68, DK77, DP88, Geo74, HH89, Ple74, Rei71a, Ske79, Ske80, Sor85, Str69, TS87]. **Elliptic** [BPS86a, BPS86b, CG73, CGO76, She55, Wac66].
Engineers [Jen77b]. **Ensemble** [Joh84, Joh85, Joh86, Joh87b, JH88].
Environment [DS87b]. **Equality** [BNP88, Eld80, Loa83, Loa85c].
Equality-Constrained [Loa83]. **Equation** [BS68, BS72, BD74, BDGG71, Bye83, Bye84, Cal86, CMdP84, DF76, DH84, Dor70, Dor73, Erd67, Hoc65, KNP87, KNP88, KW87, Sto75a, Sto75b, SS73, WZ72]. **Equations** [AL84, Axe77, Axe80, Axe85, BG76, BP75a, Bau65, Bjö87, Bjö88, BP70, BMPW66, Bun85, BP71, BGN70, Cli76a, CG73, CGO76, Cox81, Cyb80, DNT83, DS83, Doo81b, DR76, ED83, Joh84, Kog55, Lan70, MP74, MPW66, MW67, MdV77, Meu89, Nan85, OP64, OV85, Pai73, Pai74a, PS75, PS78, PS82a, PS82b, Par80a, PR70, PW79, Rei67, Rei71b, Rei72, Rob77, RO88, Ros69, Sch09, She55, Smi70, Ste73a, Ste81b, Sto73, Swa79, Var61, Var72, Vet75, Wid78, Wil78, dV77].
Equilibration
 [Bun71b, McK62, Ske81, vdS69, vdS70].
Equivalence [CW77, Dem83a, Rin55].
Ergodic [Bar87]. **Error**
 [Abd71, ADD88, AL85, Bre70, Cyb78, Gen73a, Hig87b, JO74, Kie87, Lev47, Mad59, Mei83, OP64, Pai73, Pai76, PNO85, Pry84, Pry85, Rob77, Ste71, Ste73b, Ste79a, SW80, Wil61, Wil68c, Wil71, Woz80, dBP77].
Errors [Boh75, Coc68, HV87, HS66, LS78, Ste77c, Wil63]. **Estimate**
 [BB71, CMSW79, HZ68, War77, GM86].
Estimates
 [Dem87d, Gau75a, Hag84, Kan66, Rob77].
Estimating
 [Hig88d, Loa87, O'L80b, PSS82].
Estimation [GL81b, Hig87c, Hig88d, Huf87].
Estimator [Bye84, CCL82]. **Estimators** [CR83, GWM76, Ste80, KW87]. **ETA** [DD88]. **ETA-10P** [DD88]. **Euclidean** [Blu78]. **Evaluate** [PS73]. **Evaluation** [CJ70, Loa78b]. **Even** [Joh84]. **Exact** [All73]. **examples** [CR83]. **EXCHNG** [Ste76a]. **Exclusion** [BF60a, BF60b].
Execution [AC84]. **Existence**
 [Cha85, FM84, TW72]. **Expansion** [Ste84d].
Experiences [CDH84, KL88].
Experiments [PT57, Ric66a]. **Explicit**
 [Dav73, Lan70]. **Exploratory** [Hoa77].
Exponential
 [FL70, Kåg77a, Loa75b, Loa77a, Loa77b, Loa78a, ML78, War77, Wra73, Wra75].
Extended [DCHH88a, DCHH88b].
Extension [GBDM72]. **Extensions**
 [HL69, LH69]. **Extra** [Bai88b]. **Extremal**

[AM65]. **Extreme** [Ste75a].

F.L [Rut69]. **FACR** [Hoc83]. **Factor** [Gre52, Hot57]. **Factoring** [Ris73, Ser80]. **Factorization** [AP86, Bis88b, BBDdH87, BBdH86, DGKS76, DD88, DSS86, Elm86, ER74, GH85, GH86, GHL86, GM76, GM86, HS86, Kie87, Luk86a, Man79, Mei83, Mer85, OS86, OR88, PJV87, SS79, ST86, Ste77b, Ste79a]. **Factorizations** [Cha85, Cha87, CJZ83, GGMS74]. **Factorized** [Gol76]. **Factorizing** [Fle76]. **Factors** [GMS75, HH89]. **Far** [KP76]. **Fast** [CG73, Hig88c, HS88, Hoc65, MP74, Pai79b, Rat82]. **Few** [Cul78, Sco84]. **Fields** [Hen62]. **Filter** [Lev47]. **Find** [Blu78, Cra86]. **Finding** [Bud64, CM83, GWDF88, Van71]. **Finite** [Geo73, Gre81, Hal58, Tre64, Var72]. **Finite-Difference** [Var72]. **First** [Hea86]. **Fit** [Pea01]. **Fitting** [Dur60, Mad59]. **Floating** [Mol67, Ste81a]. **Flow** [FG86, OS85]. **Form** [Aas71, Bus69, Cup83, Dem83b, Doo79, Giv58, GW76, KR80a, KR80b, MW68c, MW68d, MW31, Uhl76, Wat73, Wil78, Wil79, DHS87]. **Forms** [DR75, GU70, OR88]. **Formulation** [FNO87]. **Fortran** [Blu78, DCHH88a, DCHH88b, DE84, DH79, Hig88d, KW87, LHKK79a, LHKK79b, Ste76a]. **Found** [Ruh87]. **Fourier** [Hoc65]. **Frequency** [Lau81]. **Fully** [DS87a]. **Function** [Eld85, Rin55]. **Functional** [Dav73]. **Functions** [BCS78, Des63, Fra64a, Fra64b, Kåg77b, Mir60, Par74a, Par76, PT57]. **Funzioni** [Bel73].

Game [TW72]. **Gauge** [Mir60]. **Gauss** [BR70, GW69, KP81]. **Gauss-Jordan** [BR70]. **Gauss-Markov** [KP81]. **Gaussian** [Boh75, Bro73, Bus71a, Coh74, CMR88, Cry68, DK77, DP88, HH89, Rei71a, Ske79, Ske80, Sor85, Str69, TS87]. **General** [Bjö84, FJL⁺88, Giv58, Kåg85, KP81,

Loa75a, MW68d, McC72, Pai85, Ruh69a, Swa79, Var68a, Var68b, Var70a].

Generalization

[GHS88, Gou70, Ruh68, You72]. **Generalizations** [BV68, FV62, Par74b]. **Generalized** [AL84, BG84b, CGO76, Cra73, Cra76, JT87, Doo81a, Doo81b, Eld83, Eld85, ES82, ER80, FH72, FNP82, GHW79, JY83, JO77, Kåg85, KW87, KdV77, Kau74, Kau77, Kau87, KF64, Loa73, Loa83, Loa85a, MS73b, Nas76, Pai79a, Pai79b, Pai85, Pai86, PS81, PW70a, SS86, Sch66, Ste75b, Ste76b, Ste78, Ste79c, Ste83, Sun83, Swe74, Van71, War81, YJ80, dV77, dV82a]. **Generalizing** [CCL82, Loa76]. **Generate** [Uhl76]. **Generation** [AOU87, Ste80]. **Geometric** [PP73]. **Geometrical** [Nic74]. **Geometry** [AM65]. **Gershgorin** [FV62, Joh71, Sco85, Ste75b, Var70b]. **Gigaflop** [DH86]. **Given** [OP64]. **Givens** [Duf74, Gen73a, Gen73b, GH80, Ham74, MC86, Rat82]. **Gleichungen** [Jac46]. **Global** [Har82, HP78, Par68, Wil68b]. **GMRES** [SS86, Wal88]. **Go** [KP76]. **Good** [GHW79]. **Gradient** [Ada85, Ash87, AMS88, Axe80, Cli76b, CGM85, CGO76, CW77, CW80, Eis84, FM84, Gin71, Gre81, JY83, Jen77a, JMP83, Jor84, Mel87, Meu84, O'L76, O'L80a, Rod73, Sea86, Woz80, YJ80]. **Gradients** [HS52, Rei71b, Rei72, RW72b, Ste75a, vdSdV86]. **Grain** [Bis88b]. **Gram** [Abd71, Bjö67b, DGKS76, Ric66a, Ruh83, Saa86]. **Gram-Schmidt** [Abd71, Bjö67b, DGKS76, Ric66a, Ruh83]. **Grands** [GM83]. **Granularity** [CDH84]. **Group** [GM86]. **Growth** [DP88, HH89]. **GSV** [Pai84]. **GSYLV** [KW87]. **GSYLV-** [KW87]. **Guang** [Pai84]. **Guide** [DBMS78, GBDM72, Mol80, MLB87, SBI⁺70].

Hamiltonian [Bye83, Bye86, Loa84, PL81]. **Hand** [OP64, Saa87]. **Handbook** [BE68, CL88, AL76]. **Hankel** [Phi71, Ris73]. **having** [Cox81]. **Havsbad** [KR83]. **HEP**

- [DH84, LO83]. **Hermite** [GP71].
Hermitian
 [AG87, AG88, BBI71, CM83, DT71, EY39, Gou70, Hen58, Kah67, Kah75, Mah79, Mue66, Pai74b, Sch79, Ste69, Ste76d].
Hessenberg [Bus69, Bus71b, GNL79, Gra86, Ike79, Loa82, MPW70, MW68b, MW68d, Par67, Par68, Ste76a].
Hessenberg-Schur [GNL79]. **Hestenes** [Han88]. **Hierarchical** [GJM87, GJMS88].
High [Bai88b, DKH86, DS86]. **Higher** [Var61]. **Higher-Order** [Var61].
Householder [BL87, BG67, BG65, CM88, Cup84, HL69, Kau79, Kau87, LH69, MW68a, Mue66, PR68, Rei67, SL89, Tsa75, Wal88].
HQR3 [Ste76a]. **Hybrid** [O'L76].
Hyperbolic [APP88, DI86]. **Hypercube** [Bis87, Dav86, Ebe87, FOH87, GH85, GH86, GWDF88, Hea86, Hea87, HHP88, Joh87a, KNP87, MvdV87]. **Hypercubes** [SS85a, SS85b, WAC⁺88]. **Hypermatrix** [NV75].
- IBM** [DD88, KL88]. **ICCG** [Ker82, PO87, dV82b]. **Identity** [Bre70]. **II** [Bjö68, BPS86b, Fra61, Fra64a, GV61, Hou68, MS78, OR88, Wra75]. **III** [DK70]. **III** [Dem87b, DK88, Eld77a, Eld84, Eld85, ES86, FH72, GW76, OS81, PW79, Ruh70b, Var73, Wil72]. **III-Conditioned** [Eld77a, Eld84, Eld85, FH72, GW76, PW79, Ruh70b, Var73, Wil72]. **III-Posed** [Dem87b, DK88, ES86, OS81, Var73].
ILLIAC [Luk80]. **Impact** [GJMS88, GR84].
Implementation [CVD88, DCHH88a, DSS86, Eis84, KL88, LO83, Mel87, MP85, Ruh79, Wal88].
Implementations [MvdV87].
Implementing [DGK84, DH86, Tsa75].
Implicit [Dub70, DMW68, Ste81b, Var61].
Implies [JW77, Ske80]. **Improved** [BR73, Cha82a, Cha82b]. **Improving** [Don83, DMW83]. **Inaccurate** [CR79].
Inclusion [Kah67]. **Incomplete** [CJZ83, Elm86, Man79, RW84a, RW84b].
Inconsistent [Axe80]. **Incorporating** [Ste70]. **Indefinite** [AG87, AG88, BG76, BP71, Fle76, PS75, Saa84]. **Independent** [Ste77c]. **Inequalities** [MM64]. **Inertia** [BK77]. **Inexact** [GO88]. **Influence** [Jen77a]. **Inner** [Win68]. **Integral** [JP71, Lan50, Sch09, Smi70]. **Integrals** [Loa78a]. **Interchanges** [Fos86].
Intermediate [SLN75]. **Interpretation** [CW80]. **Interpreting** [Jor87]. **Interval** [Yoh79]. **Intervals** [CW79]. **Introduction** [Bel70, Fox64, GK69, Lue73, Mir55, Ste73c, TA61]. **Invariance** [Ste84b]. **Invariant** [Dem87d, GLR86, MP82, Mir60, Par66, Ruh70a, Ste71, Ste76d, Var70a]. **Inverse** [Asp59, BG78, DGR79, Fri75, Fri77, FNO87, GK65, PW71, PW79, RW72b, Var68a].
Inverses [All73, Gau75a, GP73, GP76, Hen62, Ike79, Nas76, PW70b, Ste77a, Wed73b]. **Inversion** [BR70, GM86, Tre64, Tre74, Wat73, Wil61, Zoh69]. **Involving** [Hig88c, Loa78a].
Irregular [BD74, BDGG71]. **Isolated** [Ste75a]. **Iterates** [Hen62]. **Iteration** [CJ70, CJ71, JO71, JS75, Lan50, Man77, McK62, Par74b, PW71, PW79, RW72b, Rut69, Rut70, Ste69, Ste75c, Ste76d, Var68a].
Iterations [Arn51, PP73]. **Iterative** [Axe77, Axe85, BI75, BNP88, BS70, Bjö67a, Bjö68, BB71, BG67, Bun69, DGR79, Eva84, GO88, GV61, GW66, HY81, JW77, MPW66, McC72, MdV77, Mol67, NV83, Ple86, Ske80, Und75, Var62, Wac66, You71, YJ80, EN83].
IV [Fra64b, Luk80].
- J** [Pai84]. **J.-Guang** [Pai84]. **Jacobi** [AL76, AR85, BS86, Bis87, BG78, BG84a, BE68, BP75b, Ebe70, Ebe87, FH60, GH84, Han62, Han63, Hen58, HZ68, Hua75, KG83, Loi72, MP85, PT57, Ruh67, Ruh68, Rut66, Sam71, Sch64, SHW86, Sea69, SS87, Ste85, vK66].
Jacobi-Like [Sam71, Ste85]. **Jacobi-Type** [AL76, BE68, Ebe70, Hua75]. **JNF** [KR80a].

Jordan [BR70, Dem83b, GW76, KR80a, KR80b, Loi69].

Kogbetliantz

[Bai88a, CD87, CVD88, PD86]. **Kronecker** [Doo79, Kåg86, Wil78, Wil79]. **Krylov** [Saa81, Saa84].

Lanczos [CGP76, CD74, CW77, CW79, CW80, CW85b, CW85a, CWL83, ER80, Gol74, GLO81, GU77, GUW72, KP74, KP76, KdV77, Pai70, Pai76, Pai80, Par80a, PR81, PS79, PSS82, Ruh79, Saa80, Saa82, Saa87, Sco78, Sco79a, Sco79b, Sim84, Und75, Wid78, dV82a]. **Large**

[BPS81, Cul78, CD74, CW79, CW85b, CW85a, CW86, CWL83, Enr79, ER80, GL81a, GM76, HH89, Jen72, OS81, Pai71, PR81, Rei71b, Ruh74, Ruh79, Saa81, Saa82, Ste74, Ste76b, Und75, Van71, You71].

Large-Scale [BPS81]. **Largest**

[Cul78, CD74, PSS82]. **Latent** [GWM76].

Lattice [Cyb84]. **LDV** [GMS75]. **Least**

[Abd71, APP88, AK75, BNP88, Bau65, Bjö67a, Bjö67b, Bjö68, Bjö84, BG67, BG65, Cli73, Cox81, Cyb84, Eld77a, Eld77b, Eld80, Eld83, Eld84, Eld85, Gan81, Gen73b, GH80, Gol65, GKS76, GL80, GP73, GP76, GR70, GW66, GWM76, HL69, Huf87, Huf88, HV87, HV88a, HV88b, JO74, Kar74, KP81, LH69, LH74, Lin61, Loa83, Loa85c, Pai79a, Pai79b, PS78, PS82a, PS82b, PW70b, Ple74, PR68, Rei67, Saa86, SS79, Ste77a, Ste87, Wed73a, vdS75b, Dem87c]. **leichtes** [Jac46]. **Level** [DD88, DCDH88, KL88]. **Level-3** [DD88].

Levinson [Cyb80]. **Levinson-Durbin**

[Cyb80]. **Like** [Sam71, Ste85, Hig88c].

Limitation [Loa77a]. **Linéaires** [GM83].

Linear

[Abd71, AM65, ADD88, AC76, Axe77, Axe80, Axe85, BCC78, BCS78, BG76, BP75a, BR73, Bau65, Bjö67a, Bjö67b, Bjö68, Bjö84, BG67, BG73, BMPW66, Buc77, Bun76, Bun87, BK77, BP71, BG65, Cal86, CDH84,

Cli73, CP76, Cox81, Cra86, CM83, Cyb84, DJK⁺88, DCHH88a, DGK84, DH84, DH86, DS86, Doo81a, DR76, DS58, Eld80, ES86, Enr79, FF63, FF77, FM67, Fox64, GJM87, GJMS88, Geo74, GH80, GK69, Gol65, Gol74, GL79, GO88, GU70, Hag88, HL69, Hel76, Hel78, HS52, Hig85, ISS86, JY83, Joh87a, Kah66, Kan66, Kar74, Kat66, Ker82, Kog55, KP81, LV75, Lan50, Lan70, Lau85, LH69, LHKK79a, LHKK79b, Leo80, Lue73, Mah79, Mak75, MP74, Man77, MG76, MdV77, MP82, Mir55, NV83, ND77, OP64, Pai74a, Pai79b, Pai85, PS75, PS78, PS82a, PS82b, Par80a, PR70, Ple74, PR68, Rei67, Rei71b, Rei72, Rob77, Ros69, Saa81, Saa84, SS86, SK78, Sch09, SS79, Ste71, Ste73a, Ste77a, Ste77c, Ste81b, Sto73, Str88, Var73, Vet75, WAC⁺88, Wid78, Wil77, Wil78, WR71, You71, dBP77, vdS70, vdS75b, DCDH88, DCHH88b]. **Lines** [Mad59, Pea01]. **LINPACK** [CCL82, DBMS78, Bye84]. **Linpack-Style** [Bye84]. **Local** [Cal86].

Local-Memory-Based [Cal86].

Logarithms [Hel68]. **Look** [Par80a]. **Loops**

[DH79]. **Low** [AG87, AG88]. **Lower** [Var75].

Lowers [Wat88, Dem87c]. **Lowest** [BS70].

LR [Fra61, MW68b, Wil65b]. **LSQR**

[PS82a, PS82b]. **LU** [Cha85, Dav86, DD88,

Elm86, PP73, WAC⁺88]. **Lyapunov**

[BS68, BN87]. **LZ** [Kau74].

m [Ada85]. **m-step** [Ada85]. **Machine**

[DGK84, Var68b]. **Macros** [LO83]. **Make**

[Sco79b]. **Manifestations** [Cot74]. **Markov**

[Bar87, GM86, KP81, SS76]. **Mathematical**

[FMM77, Hoa77, Ric81]. **MATLAB**

[Mol80, MLB87]. **Matrices**

[All73, AL76, AOU87, AG87, AG88, AR85, AC76, Asp59, AP86, Bau63, BR68, BR70, BBI71, BL87, BBdH86, BG78, BG84a, BMRW68, Buc74, Bud64, Bun71b, Bun74, Bun82, BGG88, Bus68, Bus71b, Cra86, CM83, CD74, CW79, CWL83, Cup84, Cut72, DT71, Des63, DGK84, DHS87, Dub70,

Duf74, DER86, DR75, Ebe65, Ebe71, EY39, FV62, FL74, FU69, Fle76, Fou84, Fri75, Fro65, FNP82, Gan59a, Gan59b, Gau75a, Gau75b, GWDF88, GLR86, GH59, Gou70, Gra86, GH84, GL81b, Har82, HLPW86, Hel68, Hen58, Hen62, Hig87c, Hou74, Hua81, Ike79, JO77, JS75, Joh71, JH87a, Kah67, Kah75, KP74, KPJ82, Kau87, KG83, LT85, Lem73, Loi69, Loi72, Lot56, Mah79, MPW70, MRW70, MW65, MW67, MW68b, MS73a, Mue66, MW31, Nic74, Osb60, Paa71, Pai71, Pai74a, Pai74b, PL81, Par66, Par67, Par68, Par74a, Par74b, Par76, Phi71, PT57, RB68, Ris73, RW72a, Ruh67, Ruh68, Ruh74, Ruh75, Ruh79, Rut66, Rut70, Saa86, SLN75, Sch79, Sea69, Ser80, Ste70, Ste75c, Ste76d, Ste80, Tre64, Tre74, TA61, Uhl73, Uhl76, Van71, Var70b, Var79, WAC⁺88, WG78, Wat73, Wil68a, Wil72, Wil84, vdS69, vdS75a].

Matrix [Aas71, AK75, AL73, Arn51, Bai88b, Bar87, BI75, BMW67, BS68, Bel70, BS70, BB71, BH83, BPS81, BG78, Bre70, BKP76, BR76, Bus69, BG69, CP77, CS87, CJ70, CMSW79, CL88, CMR86, Cul78, CL86, Dem83a, DK87, DSS86, DGR79, Duf77, DS78, ER88, Erd67, ER74, FH60, Fos86, FOH87, Fra64a, Fra64b, FG86, GBDM72, GH86, GK82, GPS76a, GGMS74, GM76, GMS75, Giv58, Gol69, Gol73, GK65, GL89, GLO81, GNL79, GT81, GV74, HS86, Hig86c, Hig87a, Hig88b, Hig88d, Hig88e, Hig89, HS88, Hou58, Hua75, HVH87, Jen77b, Joh86, JH88, JP71, Kåg77a, Kåg77b, KR80a, KR80b, KR83, Kau79, Kau83, Kog55, KM86a, Lan70, Lew77, Loa75a, Loa75b, Loa77a, Loa77b, Loa78a, Loa78b, Loa84, Loa85b, Luk78, MRK76, MM64, MPW65, MW68a, MW68d, MdV77, Mod88, Mol86, ML78, MS73b, O'L80b, OS85, OS86, Ort88, Pai73, Pai76, Pan84, PR69, PR70, Pry85, Ric81, Rin55, Ris73, Rod73, Ruh69a, Ruh69b, Ruh70b, Ruh78, Ruh87, Sch68, Sco84, Sco85, SB79, Smi67, SBI⁺70, Ste69, Ste73c, Ste76a, Ste77b, Ste85, Sun82, TG81, TW72, Var62, Var68a, Var68b, Var70a, Var75, Vet75, War77, Wat88, Wil61, WZ72, Wra73, Wra75, Zoh69, Hig86b]. **Max** [Bun71b]. **Max-Norm** [Bun71b]. **Maximizing** [PT57]. **Means** [Ruh70a]. **Measure** [Pry84]. **Measurement** [Coc68]. **Measurements** [HN81, Jor87]. **Measures** [Ebe65]. **Mechanics** [BW73]. **Memory** [Cal86, EHHR88, GJM87, GJMS88, DHL86, HR88, JH87a, KNP88, LC88, Mol86, PJV87]. **Mesh** [BLL85, Geo73]. **Method** [Abd71, AL76, AR85, Bar71, BCC78, BMW67, Bis87, Bjö87, BH83, BG84a, BE68, Bun71a, Cli73, Cli76a, CGP76, CJ71, CGM85, CGO76, Cup81, DF76, Ebe70, Ebe87, ER80, FM84, FH60, Gin71, GHW79, GLO81, GNL79, GU77, Gup72, Han87, Han88, Har82, HS86, Hig86c, Hua75, Jen77a, JO71, KW87, Lan50, Lin61, Loa84, Loa85c, Loi72, Luk86a, MP74, MdV77, Meu84, MP85, Mue66, Nas75, Pai73, PJ84, PW79, PT57, PR68, Rei71b, Rod73, Ruh67, Ruh68, RW72b, Rut66, Rut69, Rut70, Saa87, Sch74, SS79, Sea69, Ste75a, Ste83, Und75, Wal88, Wid78, vK66]. **Methods** [Ada85, Ash87, AMS88, Axe77, Axe80, Axe85, AP86, BNP88, BW73, BR70, BV68, BG73, BP75b, Bun76, Bun85, BK77, BP71, BGN70, Cli76b, CG73, Dem87d, DS83, DER86, DR76, EN83, Eis84, Eld77b, Eva84, FF63, FMM77, FNO87, GGMS74, GMS75, Gol65, Gol76, GO88, GV61, HY81, Han62, Han63, Hen58, Hes80, HS52, Hot57, JY83, JH87b, KMN88, Kau83, KF64, Loa83, McC72, Mel87, Meu89, NV83, O'L80a, OR88, PO87, Ruh74, Saa80, Saa81, Saa82, Saa84, SS87, Sim84, Ste73a, Ste75c, Van71, Var61, Wil61, You70, YJ80, dV82b]. **Metric** [Gol76]. **MGS** [Ple74]. **MIMD** [CMR88]. **Minimal** [SS86, Var70b]. **Minimization** [BCS78]. **Minimized** [Arn51]. **Minimum** [CL86]. **Mirsky** [GHS88]. **Missized** [FG86]. **Model** [DCHH88a, KP81, Pai85]. **Modelling** [AC84]. **Models** [Dur60, HS66, SS76]. **Modern** [Wil71].

- Modes** [CGP76]. **Modification** [AGG88, BNS78]. **Modifications** [Ham74]. **Modified** [BG84a, EHHR88, Gol73, MW68b, Sea69]. **Modifying** [GGMS74, GMS75]. **Moments** [Hou68]. **Monitoring** [Bus71a, ER74, KdV77]. **Monitors** [LO83]. **Most** [DE84, DKH86]. **MP** [CDH84, DH86, Sea86]. **Multicolor** [PO87]. **Multidimensional** [GP70]. **Multiple** [JH87b, Wil68a]. **Multiplication** [Bai88b, Bre70, CS87, FOH87, MRK76, Pan84]. **Multiplicative** [PS73]. **Multiplicatives** [Fri75, Pry85]. **Multiplying** [JH87a]. **Multiprocessing** [CDH84]. **Multiprocessor** [BS86, BL85, Dav86, GH85, GWDF88, GHL86, KNP87, LC88, LPS87, PJ84, PJV87]. **Multiprocessors** [EHHR88, Hea86, Hea87, HR88, Joh87a, JH87b, Mol86]. **Multitasking** [DH86]. **Multivariable** [Lau81]. **Multivariate** [Ham85, Hot57].
- Narrow** [Joh85]. **Near** [Loa85b]. **Nearest** [Dem87b, Hig88b]. **Nearly** [Cha84, Kah75, Ste81b]. **Nearness** [Hig85, Hig88e]. **Necessary** [FM84, PS73]. **Neighboring** [Wil84]. **Nested** [Geo73]. **Networks** [HI83]. **Newer** [Hot57]. **Newton** [BR68, Hig86c, PW79, RB68]. **Nineteen** [ML78]. **Non** [BS70, Bun69, Ebe65, EY39, GK69, Hen62, Ste76d]. **Non-Hermitian** [EY39, Ste76d]. **Non-Iterative** [Bun69]. **Non-Normal** [Hen62]. **Non-normality** [Ebe65]. **Non-Self-Adjoint** [GK69]. **Non-Symmetric** [BS70]. **Nongeneric** [Huf88]. **Nonhermitian** [Ste85]. **Nonlinear** [DS83, GP73, GP76, Lue73]. **Nonlinearly** [Hea78]. **Nonnormal** [KPJ82, Par74b, vdS75a]. **Nonnormality** [Loi69]. **Nonscalar** [PS73]. **Nonseparable** [CG73]. **Nonsingular** [Uhl76]. **Nonsymmetric** [Hou58, Man77, Saa84, SS86, Wid78].
- Nonsymmetrizable** [JY83, YJ80]. **Norm** [BP75a, Blu78, BE68, Bun71b, Des63, Ebe70, Gau75a, Hig88d, Ruh69b]. **Norm-Reducing** [BE68, Ebe70]. **Normal** [CGP76, GH59, Hen62, Hua81, KR80a, KR80b, Loi72, Ruh67, Ruh75, Ruh87]. **normality** [Ebe65]. **Norms** [BF60a, BF60b, HZ68, Mir60]. **Notations** [AS83]. **Note** [Bai88a, BBI71, BBDdH87, Buc74, Bun82, Coh74, Dub70, Eld85, GW66, Ham74, Kie87, Loa78b, Pai84, Rei67, Rei71a, Ruh78, Ste79b, Sun82, Tsa75, Wil72]. **Null** [Fos86, Ste84b]. **Number** [Bro73, CMSW79, CR83, Dem83a, GL81b, Han88, Hig87c, PS73, Saa86, Hig86b]. **Numbers** [AR85, CP77, FL74, Lem73, Loi69, O'L80b, Smi67, vdS69]. **Numerical** [BG73, Bun87, Bus71a, CdB80, CG73, CGO76, Cyb80, Cyb84, Dem83b, Dem84, Dem88, DS83, Eld77b, Enr79, ER80, Fox64, FNO87, GP70, GR84, Gol65, Gol74, Hag88, Hea78, Hel78, Hig85, Hou74, IP87, JW77, Kåg77b, KR80a, KR80b, Kah66, KMN88, Lau85, Mil75, Ort72, Pai81, Ruh69a, Ruh83, She55, Ske79, Ske80, Ste74, Var73, War77, Wil77, dV77]. **Numerically** [Bus71b, GH84, Pai79b]. **Numerique** [GM83]. **numerisch** [Jac46].
- O.** [Enr79]. **Oblique** [Gre52, Saa82]. **Observation** [Lin61]. **observations** [Cli76b]. **Oceans** [CGP76]. **Odd** [Joh84]. **Odd-Even** [Joh84]. **One** [BNS78, Hig88d, McC72, Nas75]. **One-Norm** [Hig88d]. **One-Sided** [Nas75]. **One-Step** [McC72]. **Operations** [Dor73, ER88]. **Operator** [BN87, FL70]. **Operators** [DS58, GK69, HZ68, Kat66, Lan50, Ste71]. **Optimal** [AC76, BI75, Cha88, MS73a, Str69]. **Optimale** [Leh63]. **Optimally** [Bau63, Bus68, FL74, Gau75b]. **Optimization**

- [CW80, DS83, Gol76, Hea78, Hes80].
Optimizing [Hoc83]. **Order** [GV61, Ste84d, Var61]. **Ordering** [Duf74, MC86, Nic74, Ste76a, You72].
Orderings [BV68]. **Ordinary** [DNT83].
Oriented [Cal86]. **Origin** [Hua81, Ste70, Wil68b]. **Orthogonal** [AOU87, BB71, ER88, GM76, Gre52, HI83, Hig88c, MW31, PJV87, Rat82, Sch66, Ste69, Ste80, vdSV79]. **Orthogonalization** [BI75, Bjö67b, PS79, Ric66a, Ruh83]. **Other** [GP76, Saa82, LO83]. **Over-Determined** [DR76]. **Over-Relaxation** [BV68, GV61, PJ84, You70].
Overdetermined [BCC78, BCS78, BP75a, Cli76a, Cox81].
Package [Yoh79]. **Padé** [FL70, Loa77a].
Pair [Uhl76]. **Pairs** [Sun82]. **Pairwise** [Sor85]. **Parabolic** [Var61]. **Parallel** [AP86, BBD⁺87, CM88, CKS78, CMR86, CMR88, DI86, DH84, DS84, DS87a, DS87b, Eld88, Eva84, ED83, FF77, FG86, GJM87, GR84, GH85, GHL86, HR88, Hel78, Hoc83, HJ88, Jor84, Jor87, KNP87, KNP88, LC88, Luk78, LO83, MRK76, Meu89, Mod88, ML82, OS85, OS86, OR88, OV85, Ple86, Rod82a, Rod82b, RO88, Sam71, SK78, SHW86, Sto73, Sto75a, Sto75b, Swa79].
Parallelized [PJ84]. **Parallelizing** [Sea86].
Parameter [GHW79, Huf87]. **Part** [DS58, Fra64a, Fra64b]. **Partial** [Bun74, CGO76, HV88a, HV88b, JS75, Meu89, OV85, Ske81, Var61]. **Partitioned** [Joh71, Var70b]. **Parts** [Fra61, GV61]. **PC** [MLB87]. **PC-Matlab** [MLB87]. **PDFIND** [Cra86]. **Pencil** [Doo79, Ruh78, Uhl76].
Pencils [BBI71, Dem83a, DK87, Kåg86, KR83, TW72]. **Pereyra** [Hig87b].
Performance [DKH86, DS86, Jor87].
Periodic [BG78, BG84a]. **Permutations** [GP74]. **Perturbation** [DK70, Eld80, ES82, Kåg77a, Kat66, Pai79a, Ruh70a, Ste73b, Ste77a, Ste77b, Ste78, Ste79b, Ste79c, Ste84d, Sun83, Wat88, Wed72, Wed73b, Dem87c]. **Perturbations** [AG87, AG88, Sch79, vdS75a]. **Perturbed** [Pai74b, Ste84b]. **Phenomena** [CW80].
Piecewise [BCS78]. **Pipeline** [DGK84].
Pipelined [HS86]. **Pite** [KR83]. **Pivot** [Coh74, Cry68, Duf74]. **Pivoting** [Bun71a, Bun74, Dav86, DK77, For60, HH89, Ser80, Ske81, Sor85, vdS70]. **pivots** [Cha85].
Plane [Giv58, Ham74, Saa86, Ste76c].
Planes [Pea01]. **Point** [Mol67, PJ84, Ste81a]. **Points** [Pea01, Ste75a]. **Poisson** [Bun69, BD74, BDGG71, BGN70, DF76, Dor70, Dor73, Hoc65, Hoc83, SS73]. **Polar** [Hig86a, HS88]. **Pole** [MP82]. **Polynomial** [Ash87, FG65, JMP83]. **Polynomials** [Hig88c, Loa78b, PS73, Ris73]. **Poorly** [Var70a]. **Portable** [Blu78, BBD⁺87, DS87b, Yoh79]. **Posed** [Dem87b, DK88, ES86, OS81, Var73].
Positive [AR85, Bar87, BR70, Cra86, CM83, CL86, DI86, GL81a, GL79, Hig88b, MPW65, MPW66, MW65, Nic74, Ris73, dBP77].
Possessing [Rei72]. **Power** [PP73].
Practical [CKS78, ML82, Pai70, Saa84, Wra75].
Precision [Gre81]. **Preconditioned** [Ada85, Axe85, Eis84, Mel87, Meu84].
Preconditioner [Cha88]. **Preconditioners** [BPS86a, BPS86b, JMP83, Jor84].
Preconditioning [Ash87, CMDP84, CGM85, Osb60, RW84a, RW84b].
Prediction [Cyb84, Lev47, Mak75, MG76].
Presence [CD87]. **Primitives** [JH87a].
Principal [EY39, FH60]. **Principle** [Arn51].
Principles [Lin61]. **Priori** [Wil68c].
Probabilistic [HS66]. **Probabilities** [GM86]. **Probability** [Dem88]. **Problem** [AGG88, AC76, Arn51, BG78, BG84b, CJ71, Cra73, Cra76, DNT83, Dem87b, Dem88, DS87a, Doo81a, Eld80, ES82, FH72, GL80, GNL79, GUW72, Hig88f, Huf87, Huf88, Kåg85, Kar74, Kau74, Kau77, Kub61, KF64,

Lan50, LPS87, Par80b, PW70b, Rod73, Ruh74, Sch66, Smi67, Ste72, Ste75b, Ste76b, Ste78, Ste79c, Sun83, War81, Wed73a, Wil65a, vdS75b]. **Problems** [Abd71, BNP88, BW73, Bau65, Bjö67b, Bjö84, BPS81, BPS86a, BPS86b, BL85, Cli73, CW86, Cyb84, DK88, Eld77a, Eld83, Eld84, Eld85, ES86, ER80, FU69, FJL⁺88, Fri75, Fri77, FNO87, FG86, GH80, Gol65, Gol73, GKS76, GP73, GP76, Gup72, HL69, Hig85, Hig88e, HV87, JO71, JO77, KdV77, Kau83, LH69, LH74, Lew77, Loa85c, MW68c, McC72, MS73b, OS81, Pai79a, Pai79b, PS78, PS82a, PR68, Rut58, Sch86, SS79, Sco79a, Ste73b, Ste74, Ste77a, Var73, Dem87c]. **Procedure** [BS70, GH59, OS81]. **Proceedings** [DS78, Hea86, KR83]. **Process** [Bro73, KP76, Pai70, Sch64, Sco78]. **Processes** [SS76, Wil63, Wil68c]. **Processing** [APP88, Cyb78, ML82, Opp78]. **Processor** [AC84, GJM87, Jor87, Luk86b, MRK76]. **Processors** [AP86, Bis88a, BL86, BBD⁺87, BLL85, DGR79, FJL⁺88, ISS86, Jor84, LO83]. **Procrustes** [Hig88f, Sch66]. **Product** [Cup83, HLPW86, Win68]. **Products** [BL87, Cup84, SL89]. **Profile** [GPS76a, GPS76b]. **Program** [Blu78, CP77]. **Programming** [AS83, Lue73, LO83]. **Programs** [BBD⁺87, CW85b, DCHH88a, DS87b]. **Progress** [PR81]. **Projection** [Saa82, vdSV79]. **Projections** [Ste77a]. **Proof** [HP78]. **Propagation** [HS66]. **Properties** [AM65, FU69, Pai81, Ruh70b, SS85b, You70, Doo83]. **Property** [Rei72, You72]. **Proposed** [Ste81a]. **Pseudo** [GK65, GP73, GP76, PW70b, Ste77a, Wed73b]. **Pseudo-Inverse** [GK65]. **Pseudo-Inverses** [GP73, GP76, PW70b, Ste77a, Wed73b]. **Pseudoinverse** [Eld83].

Q [CD74]. **QL** [BMRW68, Dub70, DMW68, HP78]. **QR** [BR68, Bis88b, BBdH86, BMRW68, Bye86, Cha87, CMR86, DGKS76, DT71, Eld88, Fra61, Gen73a, GM86, Gra86, HS86, Hua81, Kar74, Luk86a, MPW70, MRW70, Nan85, Par65, Par66, Par68, PP73, RB68, Ste70, Ste77b, Ste84a, Wat82, Wil65b, Wil68b]. **Quadratic** [AL73, Bai88a, Gan81, GU70, Loi72, PD86, Ruh67, Ruh68, Sch64, Wil84, vK66]. **Quadrature** [GW69]. **Quasicyclic** [Han62, Hen58]. **Queueing** [Kau83]. **Quotient** [Par74b]. **QZ** [Kau77, War75, Wil79].

Random [AOU87, Ste80]. **Rank** [AG87, AG88, AGG88, BNS78, Cha87, Fos86, GKS76, Ste84c, TW70, Wat88, Wed73a, vdSV79, Dem87c]. **Rank-Deficient** [Wed73a]. **Rank-One** [BNS78]. **Rank-Revealing** [Cha87]. **Rate** [Jen77a, vdSdV86]. **Rates** [Saa80]. **Ratio** [GU70]. **Rational** [BR68, RB68]. **Rayleigh** [Par74b, Van71]. **Real** [AR85, BS70, BMPW66, Bud64, CJ70, Cra86, CD74, CW79, Har82, Hig87a, Hig88d, JS75, Mah79, MPW70, MW31, Rut66, Sco85, Ste76a, Uhl73, Uhl76]. **Realistic** [SW80]. **Reasonable** [Yoh79]. **Reconfigurable** [KB84]. **Reconstruction** [GH84]. **Rectangle** [Dor70]. **Rectangular** [BD74, CMR86]. **Recurrence** [Par76]. **Recursive** [APP88]. **Reducing** [BS79, BE68, Bus69, Cut72, Doo83, Ebe70, GPS76a, Han88, Kåg86, TW70]. **Reduction** [Aas71, Cra73, DF76, DHS87, Duf74, DR75, GPS76b, Hel76, Joh84, MW68c, MW68d, RW84a, RW84b, Swe74, Swe77]. **Reductions** [Rei67]. **Refined** [Mei83, PNO85]. **Refinement** [Bjö67a, Bjö68, BG67, GW66, JW77, MPW66, Mol67, Ske80]. **Refining** [Dem87d]. **Reflections** [Par71]. **Reflectors** [SP87].

Regions [BD74, BDGG71]. **Regression** [GWM76, Ste77c, Ste87]. **Regular** [FJL⁺88, Geo73]. **Regularization** [Eld77a, Eld77b, Eld84, Han87, OS81]. **Regulator** [AC76]. **Related** [MW68c, O’L80a, Pai81, Wil65b]. **Relations** [AR85, Hot57, TW72]. **Relative** [Pry84]. **Relaxation** [BV68, GV61, PJ84, Sch74, You70]. **Reliability** [Dem84]. **Reliable** [Enr79, HVH87]. **Reorthogonalization** [DGKS76, Pai70, Sim84]. **Representation** [BL87, SL89, SS76]. **Research** [Duf77]. **Residual** [KPJ82, SS86, Ske81]. **Résolution** [GM83]. **Response** [Lau81]. **Restoring** [vdSV79]. **Restricted** [AGG88]. **Restructuring** [BG84a]. **Result** [Pai84]. **Revealing** [Cha87]. **Review** [Mak75]. **RGSVD** [Kåg86]. **Riccati** [AL84, Bye83, Doo81b]. **Richardson** [GO88, GV61]. **Ridge** [GHW79]. **Right** [OP64, Saa87]. **Rigorous** [Var68b]. **Ring** [BL86, ISS86]. **RMS** [Lev47]. **Root** [BH83, GWM76, Hig86c]. **Roots** [Gen73b, Hig87a, Hou68, Sch09, TW72]. **Rotation** [APP88, DK70, Ham74, Luk86a]. **Rotations** [DI86, GH80, Giv58, PT57, Rat82, Ste76c]. **Rounding** [Boh75, Kie87, Ste79a, Wil63]. **Roundoff** [Abd71, HS66, LS78, MS78, Woz80]. **Routine** [Cra86]. **Routines** [DH84, GBDM72, KL88, KW87, SBI⁺70]. **Row** [Bau65, Duf74]. **Rowwise** [PJ84]. **Rules** [GW69].

Säculärstörungen [Jac46]. **Sample** [AC76]. **Sample-Data** [AC76]. **Satisfy** [Asp59]. **Scale** [BPS81, CW86, OS81]. **Scaled** [Bau63, Bus68, FL74, Ste84a]. **Scaling** [GV74, Ske79, Ste84b]. **Scattered** [CM88]. **Scheduling** [OS86]. **Scheme** [NV75, Ple86, dV82a]. **Schemes** [KdV77]. **Schmidt** [Abd71, Bjö67b, DGKS76, Ric66a, Ruh83]. **Schur** [BH83, Cot74, GNL79, KW87, PL81, Ste85]. **Scientific** [Sch87]. **Scientists** [Jen77b]. **Second** [FG65, GV61, Ort72, Ort88, Ste84d]. **Second-Degree** [FG65]. **Second-Order** [GV61]. **Sectioning** [Jen72]. **Selection** [Duf74, HV87]. **Selective** [PS79]. **Self** [GK69]. **Semi** [EN83, GV61, Hig89]. **Semi-definite** [Hig89]. **Semi-Iterative** [GV61, EN83]. **Semidefinite** [Hig88b]. **Seminormal** [Bjö87]. **Seminumerical** [Knu81]. **Seminumerical-Algorithms** [Knu81]. **Sense** [BCC78]. **Sensitivity** [GM86, Loa77b, Pai84, Ste72, Ste77c]. **Separable** [GP76]. **Separate** [GP73]. **Separation** [Var79]. **Sequence** [Gup72]. **Series** [Dur60]. **Set** [CR83, DCDH88, DCHH88a, DCHH88b]. **Sets** [Var70b]. **Several** [Cli76b, Cut72, GPS76b, Saa87]. **Shapes** [JH87a]. **Shared** [GHL86, JH87a, KNP88]. **Shift** [BR68, RB68, War75]. **Shifted** [DT71, Man79]. **Shifts** [Hua81, Ste70, Wil68b]. **Short** [Dub70]. **Should** [KP76]. **SIAM** [Hea86]. **Sided** [Bis87, Nas75]. **Sides** [OP64, Saa87]. **Signal** [APP88, Cyb78, Opp78]. **Signals** [DJK⁺88]. **Similarity** [DR75, MW68d, Rat82, Ruh69b]. **Simple** [SW80]. **Simplex** [Bar71]. **Simplification** [JY83]. **Simultaneous** [CJ70, CJ71, Cul78, JO71, JS75, Rut69, Rut70, Ste75c, Ste76d, Uhl73]. **Single** [Ker82]. **Singular** [AK75, Bai88a, Bar87, BS86, Bis88a, BL85, BLL85, BGG88, BG69, BN87, Cha82a, Cha82b, Cha84, CVD88, CWL83, Cup83, Don83, Doo79, Eld83, GK65, GLO81, GR70, Ham85, HN81, HVH87, Kåg85, Kåg86, Kar74, Loa73, Loa76, Loa85a, Luk80, Luk86b, MM83, Nas75, Pai85, Pai86, PD86, PS81, Par66, Ruh75, Sch86, Ste79b, Ste81b, Ste83, Ste84a, Ste84d, Sun83, Var75, Wed72]. **Size** [Coh74, Cry68, Ske81]. **Skew** [Buc74,

Buc77, Bun82, KdV77, Paa71, WG78].
Skew-Symmetric [Buc74, Buc77, KdV77, WG78]. **Slowly** [Sco79b]. **Small** [CDH84, Ste84d, Cha85]. **Smallest** [Bar87, Cul78, HVH87, Var75, Wat88, Dem87c]. **Social** [SS76]. **Software** [AL84, Dem84, Hoa77, KMN88, MS78, Ric81, Sco79a, Yoh79]. **Solution** [Abd71, Arn51, Axe77, BCS78, BP75a, BS72, BW73, Bjö67a, Bjö68, BP70, BE68, BMPW66, BL85, Buc77, BD74, BDGG71, Cal86, Cli73, Cli76a, CG73, CGO76, Cox81, DI86, DF76, Dor70, Dor73, DR76, Ebe70, Enr79, ER80, ED83, FM67, GP70, GH80, GL81a, GW66, Gup72, HR88, Hig88c, Hoc65, Huf88, Jen72, Joh84, Ker82, Kog55, Kub61, KF64, LV75, Lan50, Lan70, MPW66, MW67, MdV77, ML82, OV85, Pai74a, Pai79a, PS75, PR70, Rei67, Rei71b, RO88, Ruh78, Rut58, Sch66, SS79, She55, Sto73, SS73, Und75, Var72, Var73, Wac66, WAC⁺88, You71].
Solutions [BG67, BG65, Cha84, CP76, CR79, DK88, GR70, Hig88a, OP64, Vet75, vdS75b]. **Solve** [Kau74]. **Solver** [Bun69, Hoc83, LC88]. **Solvers** [CKS78, DKH86, DS84, Joh86, SK78, Sto75a, Sto75b]. **Solving** [ADD88, AL85, BCC78, BG76, Bau65, Bjö67b, Bun76, Bun85, BK77, BP71, BGN70, CMdP84, Doo81b, EHHR88, GP71, Gol65, GO88, HL69, HS52, Hig87b, Joh85, Joh87b, KNP87, KNP88, KW87, KB84, Kau77, LH69, LH74, MP74, Pai73, Par80a, Ros69, Saa81, Saa82, Saa84, Saa87, SS86, Sch86, Ste73a, Swa79, Swe77, Var61, WZ72]. **Some** [BS68, Bro73, BK77, Cyb78, DS84, DSS86, DR76, FL74, FU69, Gol73, Gol74, Hel76, Kan66, Kau77, Kub61, Loa83, Par74b, Saa84, Saa86, Wil77, dV82b]. **SOR** [Eva84, Nic74, Ruh74]. **Space** [Fos86, Pea01]. **Spaces** [AM65, Hal58]. **Sparse** [ADD88, Bun76, BR76, Cul78, CD74, CW79, Duf74, Duf77, DER86, DR75, DR76, DS78, ER74, ER80, Geo74, GH80, GL81a, GPS76a, GM76, GL81b, HS86, Kau79, Kau87, Lew77, Luk78, Pai71, PS75, PS78, PS82a, PS82b, Rei71b, RW72a, Ruh74, Ruh79, SLN75, Ste76b, Und75]. **Special** [Ros69, vK66]. **Specified** [CW79, PW71]. **Spectra** [Kah75]. **Spectral** [AG87, AG88, Des63, ER80, GH84, Hen62]. **Spectrum** [CW79, Jen77a, Ste75a]. **Speech** [MG76]. **Speed** [Bai88b, Hen58, Pan84, PT57]. **Sphere** [FG65]. **Spread** [Sco85]. **Square** [BH83, CM88, Eld77b, Gen73b, Hig86c, Hig87a]. **Squares** [Abd71, APP88, BNP88, Bau65, Bjö67a, Bjö67b, Bjö68, Bjö84, BG67, BG65, Cli73, Cox81, Cyb84, Eld77a, Eld80, Eld83, Eld84, Eld85, Gan81, Gen73b, GH80, Gol65, GKS76, GL80, GP73, GP76, GR70, GW66, GWM76, HL69, Huf87, Huf88, HV87, HV88a, HV88b, JO74, Kar74, KP81, LH69, LH74, Lin61, Loa83, Loa85c, Pai79a, Pai79b, PS78, PS82a, PS82b, PW70b, Ple74, PR68, Rei67, Saa86, SS79, Ste77a, Ste87, Wed73a, vdS75b, Dem87c]. **Squeezing** [DE84, DKH86]. **Stability** [Bjö87, Bun85, Bun87, Bus71a, Cyb80, Cyb84, Dem87a, Elm86, ER74, JW77, Mil75, Rei71a, Ske79, Ske80, TS87, vdS75b]. **Stabilization** [Bar71]. **Stable** [Bun82, BK77, Bus71b, Cra76, DGKS76, DK87, GH84, Loa85b, Pai79b, SK78, Var61]. **Staircase** [Fou84]. **Standard** [MW68c, Ste81a]. **STAR** [LV75, NV75]. **STAR-100** [NV75]. **State** [IP87, JP71]. **Stationary** [FG65, GM86, GU70]. **Statistical** [Gol69, Hot57]. **Statistics** [Coc68, Ham85]. **Step** [McC72, Ada85, NV83]. **Stewart** [Sun82]. **Storage** [Mer85, SL89, Ste76c]. **Straight** [Mad59]. **Strapdown** [BI75]. **Stratagem** [CM88]. **Strategies** [Bun74, Cut72]. **Strategy** [Buz86]. **Strong** [Bun87]. **Structural** [BW73, Ple86]. **Structure** [Cox81, Gre52, Kåg86, Ruh69a]. **Structures** [Vet75]. **Study** [Loa75b]. **Sturm** [Gup72].

Style [Bye84]. **Subject** [AG87, AG88, GU70, Mad59]. **Submatrix** [Wat88, Dem87c]. **Subprograms** [DCHH88a, LHKK79a, LHKK79b, DCDH88, DCHH88b]. **Subroutines** [Ste76a]. **Subsequent** [SS79]. **Subset** [HV87]. **Subspace** [HVH87, Saa81, Saa84]. **Subspaces** [BS79, BG73, Dem87d, Doo83, GLR86, Kåg86, Ruh70a, Ste71, Ste73b, Ste76d, Var70a]. **Substitution** [Sch09]. **Structuring** [BPS86a, BPS86b]. **Successive** [BV68, GV61, PJ84]. **Sufficient** [FM84]. **Suitable** [AP86]. **Sulle** [Bel73]. **Summability** [NV83]. **Sun** [Pai84]. **Supercomputers** [Mel87]. **Survey** [Axe85, Duf77, Hel78, Hig87c, MM64]. **SVD** [BL86, CD87, Han87, HLPW86, Loa83]. **Sweeps** [Han88]. **Sylvester** [KNP87, KNP88, KW87]. **Symmetric** [Aas71, AL73, AL76, AGG88, BG76, BMW67, BR68, BS70, BBI71, BS86, BMRW68, BL85, Buc74, Buc76, Bud64, Bun71b, Bun74, Bun82, BG84b, BGG88, BK77, BKP76, BNS78, BP71, Bus71b, CJ70, Cra73, Cra86, Cul78, CD74, CW79, CW85b, CW85a, Cup81, CL86, DK77, DNT83, DI86, DS87a, Dub70, Ebe71, ER80, Fle76, GUW72, Hig88b, Hig88f, Jen72, KP74, KdV77, KM86a, LPS87, Mah79, MPW65, MRW70, MW65, MW67, MW68a, MW68c, MdV77, Mir60, Paa71, Pai70, Pai76, Pai80, Par80a, Par80b, PR70, PR81, PW69, PT57, RB68, Ruh79, Rut66, Rut70, Saa87, SLN75, Sch68, Sco78, Sco79a, Sco84, Sco85, Sea69, Ser80, Sim84, Ste70, Uhl73, Uhl76, Und75, WG78, You70]. **Symplectic** [Bye83, Loa84]. **System** [AL85, BCS78, BP75a, Bis88a, DS84, Doo81a, Joh86, MPW66, ML82, PR70, Rei67, SK78, Sto73, dV77]. **Systèmes** [GM83]. **Systems** [ADD88, Axe77, Axe80, Axe85, BCC78, BG76, Bis88b, BE73, BP70, Boh75, BMPW66, Buc77, Bun76, Bun85, BK77, BP71, Cha84, Cha88, CKS78, CS87, Cli76a, CP76, CR79, Cyb80, DJK⁺88, DI86, DR76, EHHR88, Enr79, ED83, FM67, Fou84, GJMS88, GP70, GP71, Geo74, GL81a, GL79, GO88, HR88, Hel76, HS52, Hig87b, Hig88a, Hig88c, ISS86, JY83, Joh84, Joh85, Joh87b, JH87b, KB84, Ker82, LV75, MP74, Man77, MdV77, MP82, ML82, NV83, OR88, PS75, Par80a, Rei72, Rob77, RO88, Ros69, Ruh78, Saa81, Saa82, Saa84, Saa87, SS86, Ste73a, Ste81b, Swe77, Var72, Var73, Wac66, WAC⁺88, Wid78, You71, dBP77, vdS70]. **Systolic** [ES86, GK82, HI83, Kun82, Sch86, ST86, SHW86].

Tales [GP76]. **Taxonomy** [AMS88]. **Tchebychev** [Man77]. **Techniques** [BCS78, DK77, FJL⁺88, Kan66, KB84]. **Test** [DCHH88a]. **Tests** [HS66]. **Their** [FU69, RW72a]. **Theorem** [FV62, GHS88, Sco85, Sun82]. **Theorems** [BF60a, BF60b, ES82, Joh71, Kah67]. **Theoretical** [AGG88, Wra73]. **Theorie** [Jac46]. **Theory** [BV68, CW85a, DK88, Doo81a, Eld80, Gan59a, Gan59b, GK69, Hou74, Kat66, LT85, Lin61, Loa82, MM64, Nic74, NV83, Ort88, PP73, Ric66b, Sch09, SP87, Ste75b, Ste78, TW72, TA61, Wed73b]. **Thoughts** [Kau77]. **Three** [CR83, Dem87d]. **Time** [AC84, Dur60, MP82]. **Toeplitz** [BBdH86, Bun85, Cha88, Cyb80, CL86, Ris73, Tre64, Tre74, Wat73, Zoh69]. **Topological** [SS85b]. **Torus** [FG86]. **Total** [GL80, Huf87, Huf88, HV87, HV88a, HV88b, Dem87c]. **Totally** [dBP77]. **Tour** [Ste76b]. **Tracking** [PR81]. **Transformation** [BR68, BG67, EY39, ER80, Fra61, Kau87, Nas75, Pry85, Ruh69b, Rut58, Tsa75]. **Transformations** [AM65, BG65, Dem83a, DR75, Fro65, Gen73a, Gen73b, Kau79, MW31, RB68, SL89, Wal88]. **Transforming** [Giv58]. **Transition** [JP71]. **Transposition** [JH88]. **Trapezoid** [Lem73]. **Treatment** [Ste74, dV77]. **Trees** [ER88]. **Trench** [Zoh69]. **Triangular** [AK75, Bre70, CKS78, Cup84, EHHR88,

ER74, ED83, Giv58, HR88, Hig87c, Hig88a, KNP87, KNP88, Lem73, LC88, Luk86b, ML82, Par74a, Par76, Phi71, Ris73, RO88].

Triangularization [Fro65, GK82, Hou58].

Triangularizing [Hua75]. **Tridiagonal** [Aas71, BMW67, BR68, Bus71b, Dub70, FU69, Hel76, HP78, Joh84, Joh87b, JH87b, KB84, Ker82, KM86a, LV75, LPS87, MP74, RB68, Ros69, Ste70, Sto73, Sto75a, Sto75b, Swa79, Swe77, Var72, Wil68b, Hig86b].

Tridiagonalization

[CM88, GP74, MW68a, Sch68].

Tridiagonalizing [Pai76]. **Tridiagonals**

[Mer85, PNO85]. **Truncated** [Han87].

Truncation [Kar74]. **Tutorial** [Mak75].

Two [Bis87, Bud64, Cra86, CM83, Fro65, HLPW86, Uhl73, Var79, Dem87a].

Two-Dimensional [Fro65]. **Two-Sided**

[Bis87]. **Type**

[AL76, Axe80, BE68, Ebe70, GP71, Hua75].

Unconstrained [DS83, Gol76]. **Undamped**

[JO71]. **Underdetermined** [AL85, CP76].

Underflow [Dem84]. **Undersized** [Sch86].

Understanding [Wat82]. **Unicomputers**

[Hoc83]. **Uniform** [Cli76a]. **Uniprocessor**

[Cal86]. **Unit** [FG65]. **Unitarily** [Mir60].

Unitary

[AM65, Fra61, Fro65, Giv58, Gra86, Hou58].

Unrolling [DH79]. **Unstable** [Loa85b].

Unsymmetric [Axe80, CJ71, GWDF88, GL79, JO77, MW67, Saa81, Saa82, You70].

Updating

[Bjö84, Cup84, DGKS76, PNO85, ST86].

Upper [Ste76a]. **Usage**

[LHKK79a, LHKK79b]. **Use**

[Cli76b, CG73, DD88, DGR79, GJM87,

Huf87, Pai70, PNO85, Rei72, Saa84]. **Used**

[RW72b]. **User** [Mol80]. **Users**

[DBMS78, MLB87]. **Uses** [Gol74]. **Using**

[Bre70, BLL85, CM88, CGP76, DH86,

Ebe87, ER88, Fos86, GWDF88, GH80,

GM86, Hoc65, HV87, JH87a, Loa82, PT57,

SHW86, Sea69, Wal88].

Validation [Eld85, GHW79]. **Value**

[AK75, Bai88a, Bar87, BS86, Bis88a, BL85,

BLL85, BGG88, BG69, Cha82a, Cha82b,

CVD88, Cup83, FU69, GR70, Ham85, HN81,

Kåg85, Loa76, Loa85a, Luk80, MM83, Nas75,

Pai85, Pai86, PD86, PS81, Sch86, Ste83,

Ste84a, Sun83, Var75, Wed72]. **Values**

[CWL83, Don83, Eld83, FG65, FH60, GK65,

GLO81, GU70, Hen62, HVH87, Loa73,

Lot56, Luk86b, Ruh75, Ste79b, Ste84d].

Vandermonde

[BE73, BP70, GP70, GP71, Gau75a, Gau75b,

GT81, Hig87b, Hig88c, TG81, dV77].

Vandermonde-like [Hig88c]. **Variable**

[Gol76]. **Variables**

[GP73, HV87, Mad59, Ste77c]. **Variant**

[dV82b]. **Variation** [Hen62]. **Vector**

[AP86, Bis88a, Blu78, DGK84, DGR79,

Hal58, Jor84, MRK76, Mel87, Meu84, OV85,

PO87, Sch87, Vet75]. **Vectorizable** [dV82b].

Vectorization [Buz86, Ker82]. **Vectors**

[BN87, CWL83, GLO81, Pry84, Ruh83,

Ste84b]. **Verfahren** [Jac46]. **Very**

[Pai71, Ruh70b, Wil72]. **VF** [DD88, KL88].

VF/400 [KL88]. **Vibration** [JO71]. **VLSI**

[CS87]. **Vol** [FJL⁺88]. **Volume**

[CW85b, CW85a]. **vorkommenden** [Jac46].

W.F [Zoh69]. **Ways** [ML78]. **Weak**

[Bun87]. **Weighted** [Bau65, Eld83].

Weighting [AC76, Loa83, Loa85c]. **Weiner**

[Lev47]. **Which**

[Asp59, Bus68, MdV77, Dem87c, Wat88].

Whose [GP73, PR70]. **Winograd** [Bre70].

Without [Gen73b, Ser80, CP77, Fos86].

WR [Rut58]. **WY** [BL87, SL89].

X [CDH84, DH86, Sea86]. **X-MP** [Sea86].

X-MP-2 [CDH84]. **X-MP-4** [DH86].

Young [GHS88].

References

- [Aas71] J. O. Aasen. On the reduction of a symmetric matrix to tridiagonal form. *BIT*, 11:233–242, 1971. **Aas71** [AG87]
- [Abd71] N. N. Abdelmalek. Roundoff error analysis for Gram-Schmidt method and solution of linear least squares problems. *BIT*, 11:1345–1368, 1971. **Abd71** [AG88]
- [AC76] E. S. Armstrong and A. K. Caglayan. An algorithm for the weighting matrices in the sample-data optimal linear regulator problem. Technical Report TN D-8372, NASA, 1976. **ArmC76** [AGG88]
- [AC84] L. Adams and T. Crockett. Modelling algorithm execution time on processor arrays. *IEEE Computer*, 17:38–43, 1984. **AdaC84** [AK75]
- [Ada85] L. Adams. m-step preconditioned conjugate gradient methods. *SIAM J. Sci. Statist. Comput.*, 6:452–463, 1985. **Ada85** [AL73]
- [ADD88] M. Arioli, J. W. Demmel, and I. S. Duff. Solving sparse linear systems with sparse backward error. Technical Report CSS 214, Computer Science and Systems Division, AERE Harwell, Didcot, UK, 1988. **AriDD88** [AL76]
- ArbG87**
P. Arbenz and G. H. Golub. On the spectral decomposition of Hermitian matrices subject to indefinite low rank perturbations with applications. Technical Report NA 87-07, Computer Science, Stanford University, Stanford, CA, USA, 1987.
- ArbG88**
P. Arbenz and G. H. Golub. On the spectral decomposition of Hermitian matrices subject to indefinite low rank perturbations with applications. *SIAM J. Matrix Anal. Appl.*, 9:40–58, 1988.
- ArbGG88**
P. Arbenz, W. Gander, and G. H. Golub. Restricted rank modification of the symmetric eigenvalue problem: Theoretical considerations. *Linear Algebra Appl.*, 104:75–95, 1988.
- AndK75**
N. Anderson and I. Karasalo. On computing bounds for the least singular value of a triangular matrix. *BIT*, 15:1–4, 1975.
- AndL73**
P. Anderson and G. Loizou. On the quadratic convergence of an algorithm that diagonalizes a complex symmetric matrix. *J. Inst. Math. Appl.*, 12:261–271, 1973.
- AndL76**
P. Anderson and G. Loizou. A Jacobi-type method for complex

- symmetric matrices (Handbook). *Numer. Math.*, 25:347–363, 1976.
- ArnL84**
- [AL84] W. F. Arnold and A. J. Laub. Generalized eigenproblem algorithms and software for algebraic Riccati equations. *Proc. IEEE*, 72:1746–1754, 1984.
- AriL85**
- [AL85] M. Arioli and A. Laratta. Error analysis of an algorithm for solving an underdetermined system. *Numer. Math.*, 46:255–268, 1985.
- All73**
- [All73] E. L. Allgower. Exact inverses of certain band matrices. *Numer. Math.*, 21:279–284, 1973.
- AmiM65**
- [AM65] A. R. Amir-Moez. Extremal properties of linear transformations and geometry of unitary spaces. Mathematics Series 243, Texas Tech University, Lubbock, TX, USA, 1965.
- AshMS88**
- [AMS88] S. Ashby, T. A. Manteuffel, and P. E. Saylor. A taxonomy for conjugate gradient methods. Technical Report UCRL-98508, Lawrence Livermore National Laboratory, Livermore, CA, USA, 1988.
- AndOU87**
- [AOU87] T. W. Anderson, I. Olkin, and L. G. Underhill. Generation of random orthogonal matrices. *SIAM J. Sci. Statist. Comput.*, 8:625–629, 1987.
- AxeP86**
- [AP86] O. Axelsson and B. Polman. On approximate factorization methods for block matrices suitable for vector and parallel processors. *Linear Algebra Appl.*, 77:3–26, 1986.
- AlePP88**
- [APP88] S. T. Alexander, C. T. Pan, and R. J. Plemmons. Analysis of a recursive least squares hyperbolic rotation algorithm for signal processing. *Linear Algebra Appl.*, 98:3–40, 1988.
- AriR85**
- [AR85] M. Arioli and F. Romani. Relations between condition numbers and the convergence of the Jacobi method for real positive definite matrices. *Numer. Math.*, 46:31–42, 1985.
- Arn51**
- [Arn51] W. E. Arnoldi. The principle of minimized iterations in the solution of the matrix eigenvalue problem. *Quart. Appl. Math.*, 9:17–29, 1951.
- AndS83**
- [AS83] G. Andrews and F. B. Schneider. Concepts and notations for concurrent programming. *Comput. Surveys*, 15:1–43, 1983.
- Ash87**
- [Ash87] S. F. Ashby. *Polynomial Preconditioning for Conjugate Gra-*

- dient Methods*. PhD thesis, Computer Science, University of Illinois, ILL, 1987.
- [Asp59] E. Asplund. Inverse of matrices $\{a_{ij}\}$ which satisfy $a_{ij} = 0$, $j > i + p$. *Math. Scand.*, 7:57–60, 1959.
- [Axe77] O. Axelsson. Solution of linear systems of equations: Iterative methods. In V. A. Barker, editor, *Sparse Matrix Techniques: Copenhagen, 1976*. Springer-Verlag, Berlin, Germany, 1977.
- [Axe80] O. Axelsson. Conjugate gradient type methods for unsymmetric and inconsistent systems of linear equations. *Linear Algebra Appl.*, 29:1–66, 1980.
- [Axe85] O. Axelsson. A survey of preconditioned iterative methods for linear systems of equations. *BIT*, 25:166–187, 1985.
- [Bai88a] Z. Bai. Note on the quadratic convergence of Kogbetliantz’s algorithm for computing the singular value decomposition. *Linear Algebra Appl.*, 104:131–140, 1988.
- [Bai88b] D. Bailey. Extra high speed matrix multiplication on the Cray-2.
- [Bar71] R. H. Bartels. A stabilization of the simplex method. *Numer. Math.*, 16:414–434, 1971.
- [Bar87] J. L. Barlow. On the smallest positive singular value of an M -matrix with applications to ergodic Markov chains. *SIAM J. Algebraic Discrete Methods*, 7:414–424, 1987.
- [Bau63] F. L. Bauer. Optimally scaled matrices. *Numer. Math.*, 5:73–87, 1963.
- [Bau65] F. L. Bauer. Elimination with weighted row combinations for solving linear equations and least squares problems. *Numer. Math.*, 7:338–352, 1965. Also in [WR71, pages 119–133].
- [BjoB71] Å. Björck and C. Bowie. An iterative algorithm for computing the best estimate of an orthogonal matrix. *SIAM J. Numer. Anal.*, 8:358–364, 1971.
- [BBD⁺87] J. Boyle, R. Butler, T. Disz, B. Glickfield, E. Lusk, R. Overbeek, J. Patterson, and R. Stevens. *Portable Programs for Parallel Processors*. Holt, Rinehart and Winston, 1987.

- [BBDdH87] **BojBDdH87**
A. W. Bojanczyk, R. P. Brent, P. Van Dooren, and F. R. de Hoog. A note on downdating the Cholesky factorization. *SIAM J. Sci. Statist. Comput.*, 8:210–221, 1987.
- [BBdH86] **BojBdH86**
A. W. Bojanczyk, R. P. Brent, and F. R. de Hoog. QR factorization of Toeplitz matrices. *Numer. Math.*, 49:81–94, 1986.
- [BBI71] **BerBI71**
A. Berman and A. Ben-Israel. A note on pencils of Hermitian of symmetric matrices. *SIAM J. Appl. Math.*, 21:51–54, 1971.
- [BCC78] **BarCC78**
R. H. Bartels, A. R. Conn, and C. Charalambous. On Cline’s direct method for solving overdetermined linear systems in the L_∞ sense. *SIAM J. Numer. Anal.*, 15:255–270, 1978.
- [BCS78] **BarCS78**
R. H. Bartels, A. R. Conn, and J. W. Sinclair. Minimization techniques for piecewise differentiable functions: The L_1 solution to an overdetermined linear system. *SIAM J. Numer. Anal.*, 15:224–241, 1978.
- [BD74] **BuzD74**
B. L. Buzbee and F. W. Dorr. The direct solution of the biharmonic equation on rectangular regions and the Poisson equation on irregular regions. *SIAM J. Numer. Anal.*, 11:753–763, 1974.
- [BDGG71] **BuzDGG71**
B. L. Buzbee, F. W. Dorr, J. A. George, and G. H. Golub. The direct solution of the discrete Poisson equation on irregular regions. *SIAM J. Numer. Anal.*, 8:722–736, 1971.
- [BE68] **BooE68**
J. Boothroyd and P. J. Eberlein. Solution to the eigenproblem by a norm-reducing Jacobi-type method (handbook). *Numer. Math.*, 11:1–12, 1968. Also in [WR71, pages 327–338].
- [BE73] **BjoE73**
Å. Björck and T. Elfving. Algorithms for confluent Vandermonde systems. *Numer. Math.*, 21:130–137, 1973.
- [Bel73] **Bel73**
E. Beltrami. Sulle funzioni bilineari. *Giorn. Mat.*, 11:98–106, 1873.
- [Bel70] **Bel70**
R. Bellman. *Introduction to Matrix Analysis*. McGraw-Hill, New York, NY, USA, second edition, 1970.
- [BF60a] **BauF60a**
F. L. Bauer and C. T. Fike. Norms and exclusion theorems. *Numer. Math.*, 2:137–144, 1960.

- [BF60b] **BauF60b**
F. L. Bauer and C. T. Fike. Norms and exclusion theorems. *Numer. Math.*, 2:137–144, 1960.
- [BG65] **BusG65**
P. A. Businger and G. H. Golub. Linear least squares solutions by Householder transformations. *Numer. Math.*, 7:269–276, 1965. Also in [WR71, pages 111–118].
- [BG67] **BjoG67**
Å. Björck and G. H. Golub. Iterative refinement of linear least squares solutions by Householder transformation. *BIT*, 7:322–337, 1967.
- [BG69] **BusG69**
P. A. Businger and G. H. Golub. Algorithm 358: Singular value decomposition of a complex matrix. *Comm. ACM*, 12:564–565, 1969.
- [BG73] **BjoG73**
Å. Björck and G. H. Golub. Numerical methods for computing angles between linear subspaces. *Math. Comp.*, 27:579–594, 1973.
- [BG76] **BarG76**
V. Barwell and J. A. George. A comparison of algorithms for solving symmetric indefinite systems of linear equations. *ACM Trans. Math. Software*, 2:242–251, 1976.
- [BG78] **BolG78**
D. L. Boley and G. H. Golub. The matrix inverse eigenvalue problem for periodic Jacobi matrices. In *Proceedings Fourth Symposium on Basic Problems of Numerical Mathematics, Prague*, pages 63–76, 1978.
- [BG84a] **BolG84a**
D. Boley and G. H. Golub. A modified method for restructuring periodic Jacobi matrices. *Math. Comp.*, 42:143–150, 1984.
- [BG84b] **BunG84b**
A. Bunse-Gerstner. An algorithm for the symmetric generalized eigenvalue problem. *Linear Algebra Appl.*, 58:43–68, 1984.
- [BGG88] **BunGG88**
A. Bunse-Gerstner and W. B. Gragg. Singular value decompositions of complex symmetric matrices. *J. Comput. Appl. Math.*, 21:41–54, 1988.
- [BGN70] **BuzGN70**
B. L. Buzbee, G. H. Golub, and C. W. Nielson. On direct methods for solving Poisson’s equations. *SIAM J. Numer. Anal.*, 7:627–656, 1970.
- [BH83] **BjoH83**
Å. Björck and S. Hammarling. A Schur method for the square root of a matrix. *Linear Algebra Appl.*, 52/53:127–140, 1983.
- [BI75] **BarI75**
I. Y. Bar-Itzhack. Iterative optimal orthogonalization of the strapdown matrix. *IEEE Trans.*

- Aerospace Electron. Systems*, 11: 30–37, 1975. **Bjo84**
- [Bis87] C. H. Bischof. The two-sided block Jacobi method on hypercube architectures. In M. T. Heath, editor, *Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1987. **Bis87**
- [Bis88a] C. H. Bischof. Computing the singular value decomposition on a distributed system of vector processors. Technical Report 87 869, Computer Science, Cornell University, Ithaca, NY, USA, 1988. **Bis88a**
- [Bis88b] C. H. Bischof. *QR Factorization Algorithms for Coarse Grain Distributed Systems*. PhD thesis, Computer Science, Cornell University, Ithaca, NY, USA, 1988. **Bis88b**
- [Bjö67a] Å. Björck. Iterative refinement of linear least squares solution I. *BIT*, 7:257–278, 1967. **Bjö67a**
- [Bjö67b] Å. Björck. Solving linear least squares problems by Gram-Schmidt orthogonalization. *BIT*, 7:1–21, 1967. **Bjö67b**
- [Bjö68] Å. Björck. Iterative refinement of linear least squares solution II. *BIT*, 8:8–30, 1968. **Bjö68**
- [Bjö84] Å. Björck. A general updating algorithm for constrained linear least squares problems. *SIAM J. Sci. Statist. Comput.*, 5:394–402, 1984. **Bjö84**
- [Bjö87] Å. Björck. Stability analysis of the method of seminormal equations. *Linear Algebra Appl.*, 88/89:31–48, 1987. **Bjö87**
- [Bjö88] Å. Björck. *Solution of Equations in R^N* , volume 1 of *Least Squares Methods: Handbook of Numerical Analysis*. North-Holland, 1988. **Bjö88**
- [BK77] J. R. Bunch and K. Kaufman. Some stable methods for calculating inertia and solving symmetric linear systems. *Math. Comp.*, 31:162–179, 1977. **BunK77**
- [BKP76] J. R. Bunch, K. Kaufman, and B. N. Parlett. Decomposition of a symmetric matrix. *Numer. Math.*, 27:95–109, 1976. **BunKP76**
- [BL85] R. P. Brent and F. T. Luk. The solution of singular value and symmetric eigenvalue problems on multiprocessor arrays. *SIAM J. Sci. Statist. Comput.*, 6:69–84, 1985. **BreL85**
- [BL86] C. H. Bischof and C. Van Loan. Computing the SVD on a ring of **BisL86**

- array processors. In J. Cullum and R. Willoughby, editors, *Large Scale Eigenvalue Problems*, pages 51–66. North-Holland, 1986.
- [BL87] C. H. Bischof and C. Van Loan. The WY representation for products of Householder matrices. *SIAM J. Sci. Statist. Comput.*, 8:s2–s13, 1987.
- [BLL85] R. P. Brent, F. T. Luk, and C. Van Loan. Computation of the singular value decomposition using mesh connected processors. *J. VLSI Comput. Syst.*, 1:242–270, 1985.
- [Blu78] J. M. Blue. A portable Fortran program to find the Euclidean norm of a vector. *ACM Trans. Math. Software*, 4:15–23, 1978.
- [BMPW66] H. J. Bowdler, R. S. Martin, G. Peters, and J. H. Wilkinson. Solution of real and complex systems of linear equations. *Numer. Math.*, 8:217–234, 1966. Also in [WR71, pages 93–110].
- [BMRW68] H. Bowdler, R. S. Martin, C. Reinsch, and J. H. Wilkinson. The QR and QL algorithms for symmetric matrices. *Numer. Math.*, 11:293–306, 1968. Also in [WR71, pages 227–240].
- [BMW67] W. Barth, R. S. Martin, and J. H. Wilkinson. Calculation of the eigenvalues of a symmetric tridiagonal matrix by the method of bisection. *Numer. Math.*, 9:386–393, 1967. Also in [WR71, pages 249–256].
- [BN87] R. Byers and S. G. Nash. On the singular vectors of the Lyapunov operator. *SIAM J. Algebraic Discrete Methods*, 8:59–66, 1987.
- [BNP88] J. L. Barlow, N. K. Nichols, and R. J. Plemmons. Iterative methods for equality constrained least squares problems. *SIAM J. Sci. Statist. Comput.*, 9:892–906, 1988.
- [BNS78] J. R. Bunch, C. P. Nielsen, and D. C. Sorensen. Rank-one modification of the symmetric eigenproblem. *Numer. Math.*, 31:31–48, 1978.
- [Boh75] Z. Bohte. Bounds for rounding errors in the Gaussian elimination for band systems. *J. Inst. Math. Appl.*, 16:133–142, 1975.
- [BP70] Å. Björck and V. Pereyra. Solution of Vandermonde systems of equations. *Math. Comp.*, 24:893–903, 1970.

- [BP71] J. R. Bunch and B. N. Parlett. Direct methods for solving symmetric indefinite systems of linear equations. *SIAM J. Numer. Anal.*, 8:639–655, 1971. **BunP71**
- [BP75a] I. Barrodale and C. Phillips. Algorithm 495: Solution of an overdetermined system of linear equations in the Chebychev norm. *ACM Trans. Math. Software*, 1:264–270, 1975. **BarP75a**
- [BP75b] K. W. Brodlie and M. J. D. Powell. On the convergence of cyclic Jacobi methods. *J. Inst. Math. Appl.*, 15:279–287, 1975. **BroP75b**
- [BPS81] Å. Björck, R. J. Plemmons, and H. Schneider. *Large-Scale Matrix Problems*. North-Holland, New York, NY, USA, 1981. **BjoPS81**
- [BPS86a] J. H. Bramble, J. E. Pasciak, and A. H. Schatz. The construction of preconditioners for elliptic problems by substructuring I. *Math. Comp.*, 47:103–134, 1986. **BraPS86a**
- [BPS86b] J. H. Bramble, J. E. Pasciak, and A. H. Schatz. The construction of preconditioners for elliptic problems by substructuring II. *Math. Comp.*, 49:1–17, 1986. **BraPS86b**
- [BR68] F. L. Bauer and C. Reinsch. Rational QR transformation with Newton shift for symmetric tridiagonal matrices. *Numer. Math.*, 11:264–272, 1968. Also in [WR71, pages 257–265]. **BauR68**
- [BR70] F. L. Bauer and C. Reinsch. Inversion of positive definite matrices by the Gauss-Jordan methods. In J. H. Wilkinson and C. Reinsch, editors, *Handbook for Automatic Computation Vol. 2: Linear Algebra*, pages 45–49. Springer-Verlag, New York, NY, USA, 1970. **BauR70**
- [BR73] I. Barrodale and F. D. K. Roberts. An improved algorithm for discrete L_1 linear approximation. *SIAM J. Numer. Anal.*, 10:839–848, 1973. **BarR73**
- [BR76] J. R. Bunch and D. J. Rose, editors. *Sparse Matrix Computations*. Academic Press, New York, NY, USA, 1976. **BunR76**
- [Bre70] R. P. Brent. Error analysis of algorithms for matrix multiplication and triangular decomposition using Winograd’s identity. *Numer. Math.*, 16:145–156, 1970. **Bre70**
- [Bro73] C. G. Broyden. Some condition number bounds for the Gauss- **Bro73**

- sian elimination process. *J. Inst. Math. Appl.*, 12:273–286, 1973.
- [BS68] S. Barnett and C. Storey. Some applications of the Lyapunov matrix equation. *J. Inst. Math. Appl.*, 4:33–42, 1968.
- [BS70] C. F. Bender and I. Shavitt. An iterative procedure for the calculation of the lowest real eigenvalue and eigenvector of a non-symmetric matrix. *J. Comput. Phys.*, 6:146–149, 1970.
- [BS72] R. H. Bartels and G. W. Stewart. Solution of the equation $AX + XB = C$. *Comm. ACM*, 15:820–826, 1972.
- [BS79] C. Bavely and G. W. Stewart. An algorithm for computing reducing subspaces by block diagonalization. *SIAM J. Numer. Anal.*, 16:359–367, 1979.
- [BS86] M. Berry and A. Sameh. Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions. In *Proceedings International Conference on Parallel Processing*, pages 433–440, 1986.
- [Buc74] A. Buckley. A note on matrices $A = 1 + H$, H skew-symmetric. *Z. Angew. Math. Mech.*, 54:125–126, 1974.
- [Buc77] A. Buckley. On the solution of certain skew-symmetric linear systems. *SIAM J. Numer. Anal.*, 14:566–570, 1977.
- [Bud64] C. D. La Budde. Two classes of algorithms for finding the eigenvalues and eigenvectors of real symmetric matrices. *J. Assoc. Comput. Mach.*, 11:53–58, 1964.
- [Bun69] O. Buneman. A compact non-iterative Poisson solver. Technical Report 294, Institute for Plasma Research, Stanford University, Stanford, CA, USA, 1969.
- [Bun71a] J. R. Bunch. Analysis of the diagonal pivoting method. *SIAM J. Numer. Anal.*, 8:656–680, 1971.
- [Bun71b] J. R. Bunch. Equilibration of symmetric matrices in the max-norm. *J. Assoc. Comput. Mach.*, 18:566–572, 1971.
- [Bun74] J. R. Bunch. Partial pivoting strategies for symmetric matrices. *SIAM J. Numer. Anal.*, 11:521–528, 1974.
- [Bun76] J. R. Bunch. Block methods for solving sparse linear systems.

- In J. R. Bunch and D. J. Rose, editors, *Sparse Matrix Computations*. Academic Press, New York, NY, USA, 1976. **Bun82**
- [Bun82] J. R. Bunch. A note on the stable decomposition of skew symmetric matrices. *Math. Comp.*, 158:475–480, 1982. **Bun82** [Buz86]
- [Bun85] J. R. Bunch. Stability of methods for solving Toeplitz systems of equations. *SIAM J. Sci. Statist. Comput.*, 6:349–364, 1985. **Bun85** [BV68]
- [Bun87] J. R. Bunch. The weak and strong stability of algorithms in numerical linear algebra. *Linear Algebra Appl.*, 88/89:49–66, 1987. **Bun87** [BW73]
- [Bus68] P. A. Businger. Matrices which can be optimally scaled. *Numer. Math.*, 12:346–348, 1968. **Bus68** [Bye83]
- [Bus69] P. A. Businger. Reducing a matrix to Hessenberg form. *Math. Comp.*, 23:819–821, 1969. **Bus69**
- [Bus71a] P. A. Businger. Monitoring the numerical stability of Gaussian elimination. *Numer. Math.*, 16:360–361, 1971. **Bus71a** [Bye84]
- [Bus71b] P. A. Businger. Numerically stable deflation of Hessenberg and symmetric tridiagonal matrices. *BIT*, 11:262–270, 1971. **Bus71b** [Bye86]
- [Buz86] B. L. Buzbee. A strategy for vectorization. *Parallel Comput.*, 3:187–192, 1986. **Buz86**
- [BerV68] M. J. M. Bernal and J. H. Verner. On generalizations of the theory of consistent orderings for successive over-relaxation methods. *Numer. Math.*, 12:215–222, 1968. **BerV68**
- [BatW73] K. J. Bathe and E. L. Wilson. Solution methods for eigenvalue problems in structural mechanics. *Internat. J. Numer. Methods Engrg.*, 6:213–226, 1973. **BatW73**
- [Bye83] R. Byers. *Hamiltonian and Symplectic Algorithms for the Algebraic Riccati Equation*. PhD thesis, Center for Applied Mathematics, Cornell University, Ithaca, NY, USA, 1983. **Bye83**
- [Bye84] R. Byers. A Linpack-style condition estimator for the equation $AX - XB^T = C$. *IEEE Trans. Automat. Control*, AC-29:926–928, 1984. **Bye84**
- [Bye86] R. Byers. A Hamiltonian QR algorithm. *SIAM J. Sci. Statist. Comput.*, 7:212–229, 1986. **Bye86**

- [Ca86] Cal86 D. A. Calihan. Block-oriented, local-memory-based linear equation solution on the Cray-2: Uniprocessor algorithms. In *Proceedings of the 1986 Conference on Parallel Processing*, pages 375–378, 1986.
- [CCL82] CliCL82 A. K. Cline, A. R. Conn, and C. Van Loan. Generalizing the LINPACK condition estimator. In J. P. Hennart, editor, *Numerical Analysis*, Lecture Notes in Mathematics 909. Springer-Verlag, New York, NY, USA, 1982.
- [CD74] CulD74 J. Cullum and W. E. Donath. A block Lanczos algorithm for computing the Q algebraically largest eigenvalues and a corresponding eigenspace of large, sparse real symmetric matrices. In *Proceedings of the 1974 IEEE Conference on Decision and Control, Phoenix, AZ*, pages 505–509, 1974.
- [CD87] ChaD87 J. P. Charlier and P. Van Dooren. On Kogbetliantz’s SVD algorithm in the presence of clusters. *Linear Algebra Appl.*, 95: 135–160, 1987.
- [CdB80] CdB80 S. D. Conte and C. de Boor. *Elementary Numerical Analysis: An Algorithmic Approach*. McGraw-Hill, New York, NY, USA, third edition, 1980.
- [CDH84] CheDH84 S. Chen, J. Dongarra, and C. Hsuing. Multiprocessing linear algebra algorithms on the Cray X-MP-2: Experiences with small granularity. *J. Parallel and Distrib. Comput.*, 1:22–31, 1984.
- [CG73] ConG73 P. Concus and G. H. Golub. Use of fast direct methods for the efficient numerical solution of nonseparable elliptic equations. *SIAM J. Numer. Anal.*, 10:1103–1120, 1973.
- [CGM85] ConGM85 P. Concus, G. H. Golub, and G. Meurant. Block preconditioning for the conjugate gradient method. *SIAM J. Sci. Statist. Comput.*, 6:220–252, 1985.
- [CGO76] ConGO76 P. Concus, G. H. Golub, and D. P. O’Leary. A generalized conjugate gradient method for the numerical solution of elliptic partial differential equations. In J. R. Bunch and D. J. Rose, editors, *Sparse Matrix Computations*. Academic Press, New York, NY, USA, 1976.
- [CGP76] CliGP76 A. K. Cline, G. H. Golub, and G. W. Platzman. Calculation of normal modes of oceans using a Lanczos method. In J. R. Bunch and D. J. Rose, editors, *Sparse*

Matrix Computations, pages 409–426. Academic Press, New York, NY, USA, 1976.

Cha82a

- [Cha82a] T. F. Chan. Algorithm 581: An improved algorithm for computing the singular value decomposition. *ACM Trans. Math. Software*, 8:84–88, 1982. [CJ71]

Cha82b

- [Cha82b] T. F. Chan. An improved algorithm for computing the singular value decomposition. *ACM Trans. Math. Software*, 8:72–83, 1982. [CJZ83]

Cha84

- [Cha84] T. F. Chan. Deflated decomposition solutions of nearly singular systems. *SIAM J. Numer. Anal.*, 21:738–754, 1984. [CKS78]

Cha85

- [Cha85] T. F. Chan. On the existence and computation of LU factorizations with small pivots. *Math. Comp.*, 42:535–548, 1985. [CL86]

Cha87

- [Cha87] T. F. Chan. Rank-revealing QR factorizations. *Linear Algebra Appl.*, 88/89:67–82, 1987. [CL88]

Cha88

- [Cha88] T. F. Chan. An optimal circulant preconditioner for Toeplitz systems. *SIAM J. Sci. Statist. Comput.*, 9:766–771, 1988. [CJ70]

CliJ70

- [CJ70] M. Clint and A. Jennings. The evaluation of eigenvalues and

eigenvectors of real symmetric matrix by simultaneous iteration. *Comput. J.*, 13:76–80, 1970.

CliJ71

M. Clint and A. Jennings. A simultaneous iteration method for the unsymmetric eigenvalue problem. *J. Inst. Math. Appl.*, 8:111–121, 1971.

ChaJZ83

T. F. Chan, K. R. Jackson, and B. Zhu. Alternating direction incomplete factorizations. *SIAM J. Numer. Anal.*, 20:239–257, 1983.

CheKS78

S. Chen, D. Kuck, and A. Sameh. Practical parallel band triangular systems solvers. *ACM Trans. Math. Software*, 4:270–277, 1978.

CybL86

G. Cybenko and C. Van Loan. Computing the minimum eigenvalue of a symmetric positive definite Toeplitz matrix. *SIAM J. Sci. Statist. Comput.*, 7:123–131, 1986.

ColL88

T. Coleman and C. Van Loan. *Handbook for Matrix Computations*. SIAM Publications, Philadelphia, PA, USA, 1988.

Cli73

- [CJ73] A. K. Cline. An elimination method for the solution of linear least squares problems. *SIAM J. Numer. Anal.*, 10:283–289, 1973.

- [Cli76a] A. K. Cline. A descent method for the uniform solution to overdetermined systems of equations. *SIAM J. Numer. Anal.*, 13: 293–309, 1976. **Cli76a**
- [Cli76b] A. K. Cline. Several observations on the use of conjugate gradient methods. report 76-22, ICASE, NASA Langley Research Center, Hampton, VA, USA, 1976. **Cli76b**
- [CM83] C. R. Crawford and Y. S. Moon. Finding a positive definite linear combination of two Hermitian matrices. *Linear Algebra Appl.*, 51:37–48, 1983. **CraM83**
- [CM88] H. Y. Chang and M. Salama. A parallel Householder tridiagonalization stratagem using scattered square decomposition. *Parallel Comput.*, 6:297–312, 1988. **ChaM88**
- [CMdP84] R. C. Chin, T. A. Manteuffel, and J. de Pillis. ADI as a preconditioning for solving the convection-diffusion equation. *SIAM J. Sci. Statist. Comput.*, 5:281–299, 1984. **ChiMdP84**
- [CMR86] M. Costnard, J. M. Muller, and Y. Robert. Parallel QR decomposition of a rectangular matrix. *Numer. Math.*, 48:239–250, 1986. **CosMR86**
- [CMR88] M. Costnard, M. Marrakchi, and Y. Robert. Parallel Gaussian elimination on an MIMD computer. *Parallel Comput.*, 6:275–296, 1988. **CosMR88**
- [CMSW79] A. K. Cline, C. B. Moler, G. W. Stewart, and J. H. Wilkinson. An estimate for the condition number of a matrix. *SIAM J. Numer. Anal.*, 16:368–375, 1979. **CliMSW79**
- [Coc68] W. G. Cochran. Errors of measurement in statistics. *Technometrics*, 10:637–666, 1968. **Coc68**
- [Coh74] A. M. Cohen. A note on pivot size in Gaussian elimination. *Linear Algebra Appl.*, 8:361–368, 1974. **Coh74**
- [Cot74] R. W. Cottle. Manifestations of the Schur complement. *Linear Algebra Appl.*, 8:189–211, 1974. **Cot74**
- [Cox81] M. G. Cox. The least squares solution of overdetermined linear equations having band or augmented band structure. *IMA J. Numer. Anal.*, 1:3–22, 1981. **Cox81**
- [CP76] R. E. Cline and R. J. Plemmons. L_1 -solutions to underdetermined linear systems. *SIAM Rev.*, 18: 92–106, 1976. **CliP76**

- [CP77] S. P. Chan and B. N. Parlett. Algorithm 517: A program for computing the condition numbers of matrix eigenvalues without computing eigenvectors. *ACM Trans. Math. Software*, 3:186–203, 1977. **ChaP77**
- [CR79] J. E. Cope and B. W. Rust. Bounds on solutions of systems with inaccurate data. *SIAM J. Numer. Anal.*, 16:950–963, 1979. **CopR79**
- [CR83] A. K. Cline and R. K. Rew. A set of counter examples to three condition number estimators. *SIAM J. Sci. Statist. Comput.*, 4:602–611, 1983. **CliR83**
- [Cra73] C. R. Crawford. Reduction of a band symmetric generalized eigenvalue problem. *Comm. ACM*, 16:41–44, 1973. **Cra73**
- [Cra76] C. R. Crawford. A stable generalized eigenvalue problem. *SIAM J. Numer. Anal.*, 13:854–860, 1976. **Cra76**
- [Cra86] C. R. Crawford. Algorithm 646 PDFIND: A routine to find a positive definite linear combination of two real symmetric matrices. *ACM Trans. Math. Software*, 12:278–282, 1986. **Cra86**
- [Cry68] C. W. Cryer. Pivot size in Gaussian elimination. *Numer. Math.*, 12:335–345, 1968. **Cry68**
- [CS87] K. H. Cheng and S. Sahni. VLSI systems for band matrix multiplication. *Parallel Comput.*, 4:239–258, 1987. **CheS87**
- [Cul78] J. Cullum. The simultaneous computation of a few of the algebraically largest and smallest eigenvalues of a large sparse symmetric matrix. *BIT*, 18:265–275, 1978. **Cul78**
- [Cup81] J. J. M. Cuppen. A divide and conquer method for the symmetric eigenproblem. *Numer. Math.*, 36:177–195, 1981. **Cup81**
- [Cup83] J. J. M. Cuppen. The singular value decomposition in product form. *SIAM J. Sci. Statist. Comput.*, 4:216–222, 1983. **Cup83**
- [Cup84] J. J. M. Cuppen. On updating triangular products of Householder matrices. *Numer. Math.*, 45:403–410, 1984. **Cup84**
- [Cut72] E. Cuthill. Several strategies for reducing the bandwidth of matrices. In D. J. Rose and R. A. Willoughby, editors, *Sparse*

- Matrices and Their Applications*. Plenum Press, New York, NY, USA, 1972.
- [CVD88] J. P. Charlier, M. Vanbegin, and P. Van Dooren. On efficient implementation of Kogbetliantz's algorithm for computing the singular value decomposition. *Numer. Math.*, 52:279–300, 1988.
- [CW77] J. Cullum and R. A. Willoughby. The equivalence of the Lanczos and the conjugate gradient algorithms. Technical Report RC-6903, IBM, Yorktown Heights, NY, USA, 1977.
- [CW79] J. Cullum and R. A. Willoughby. Lanczos and the computation in specified intervals of the spectrum of large, sparse real symmetric matrices. In I. S. Duff and G. W. Stewart, editors, *Sparse Matrix Proceedings 1978*. SIAM Publications, Philadelphia, PA, USA, 1979.
- [CW80] J. Cullum and R. A. Willoughby. The Lanczos phenomena: An interpretation based on conjugate gradient optimization. *Linear Algebra Appl.*, 29:63–90, 1980.
- [CW85a] J. Cullum and R. A. Willoughby. *Lanczos Algorithms for Large Symmetric Eigenvalue Computations, Volume 1: Theory*. Birkhäuser, Boston, MA, USA, 1985.
- [CW85b] J. Cullum and R. A. Willoughby. *Lanczos Algorithms for Large Symmetric Eigenvalue Computations, Volume 2: Programs*. Birkhäuser, Boston, MA, USA, 1985.
- [CW86] J. Cullum and R. A. Willoughby, editors. *Large Scale Eigenvalue Problems*. North-Holland, 1986.
- [CWL83] J. Cullum, R. A. Willoughby, and M. Lake. A Lanczos algorithm for computing singular values and vectors of large matrices. *SIAM J. Sci. Statist. Comput.*, 4:197–215, 1983.
- [Cyb78] G. Cybenko. *Error Analysis of Some Signal Processing Algorithms*. PhD thesis, Princeton University, Princeton, NJ, USA, 1978.
- [Cyb80] G. Cybenko. The numerical stability of the Levinson-Durbin algorithm for Toeplitz systems of equations. *SIAM J. Sci. Statist. Comput.*, 1:303–310, 1980.
- [Cyb84] G. Cybenko. The numerical stability of the lattice algorithm for least squares linear prediction problems. *BIT*, 24:441–455, 1984.

- [Dav73] C. Davis. Explicit functional calculus. *Linear Algebra Appl.*, 6: 193–199, 1973.
- [Dav86] G. J. Davis. Column LU pivoting on a hypercube multiprocessor. *SIAM J. Algebraic Discrete Methods*, 7:538–550, 1986.
- [DBMS78] J. J. Dongarra, J. R. Bunch, C. B. Moler, and G. W. Stewart. *LINPACK Users Guide*. Philadelphia, PA, USA, 1978.
- [dBP77] C. de Boor and A. Pinkus. A backward error analysis for totally positive linear systems. *Numer. Math.*, 27:485–490, 1977.
- [DCDH88] J. J. Dongarra, J. Du Croz, I. S. Duff, and S. Hammarling. A set of level 3 Basic Linear Algebra Subprograms. Technical Report ANL-MCS-TM-88, Argonne National Laboratory, Argonne, ILL, 1988.
- [DCHH88a] J. J. Dongarra, J. Du Croz, S. Hammarling, and R. J. Hanson. Algorithm 656: An extended set of Fortran basic linear algebra subprograms: Model implementation and test programs. *ACM Trans. Math. Software*, 14:18–32, 1988.
- [DCHH88b] J. J. Dongarra, J. Du Croz, S. Hammarling, and R. J. Hanson. An extended set of Fortran Basic Linear Algebra Subprograms. *ACM Trans. Math. Software*, 14:1–17, 1988.
- [DD88] M. J. Dayde and I. S. Duff. Use of level-3 BLAS in LU factorization on the Cray-2, the ETA-10P, and the IBM 3090-200/VF. Technical Report CSS-229, Computer Science and Systems Division, Harwell Laboratory, Oxon OX11 0RA, UK, 1988.
- [DE84] J. J. Dongarra and S. Eisenstat. Squeezing the most out of an algorithm in Cray Fortran. *ACM Trans. Math. Software*, 10:221–230, 1984.
- [Dem83a] J. W. Demmel. The condition number of equivalence transformations that block diagonalize matrix pencils. *SIAM J. Numer. Anal.*, 20:599–610, 1983.
- [Dem83b] J. W. Demmel. *A Numerical Analyst's Jordan Canonical Form*. PhD thesis, Univ. of California at Berkeley, Berkeley, CA, USA, 1983.
- [Dem84] J. W. Demmel. Underflow and the reliability of numerical soft-

- ware. *SIAM J. Sci. Statist. Comput.*, 5:887–919, 1984.
- [Dem87a] J. W. Demmel. A counterexample for two conjectures about stability. *IEEE Trans. Automat. Control*, AC-32:340–342, 1987.
- [Dem87b] J. W. Demmel. On the distance to the nearest ill-posed problem. *Numer. Math.*, 51:251–289, 1987.
- [Dem87c] J. W. Demmel. The smallest perturbation of a submatrix which lowers the rank and constrained total least squares problems. *SIAM J. Numer. Anal.*, 24:199–206, 1987.
- [Dem87d] J. W. Demmel. Three methods for refining estimates of invariant subspaces. *Computing*, 38:43–57, 1987.
- [Dem88] J. W. Demmel. The probability that a numerical analysis problem is difficult. *Math. Comp.*, 50:449–480, 1988.
- [DER86] I. S. Duff, A. M. Erisman, and J. K. Reid. *Direct Methods for Sparse Matrices*. Oxford University Press, 1986.
- [Des63] J. Descloux. Bounds for the spectral norm of functions of matrices. *Numer. Math.*, 5:185–190, 1963.
- [DF76] M. A. Diamond and D. L. V. Ferreira. On a cyclic reduction method for the solution of Poisson’s equation. *SIAM J. Numer. Anal.*, 13:54–70, 1976.
- [DGK84] J. J. Dongarra, F. G. Gustavson, and A. Karp. Implementing linear algebra algorithms for dense matrices on a vector pipeline machine. *SIAM Rev.*, 26:91–112, 1984.
- [DGKS76] J. Daniel, W. B. Gragg, L. Kaufman, and G. W. Stewart. Re-orthogonalization and stable algorithms for updating the Gram-Schmidt QR factorization. *Math. Comp.*, 30:772–795, 1976.
- [DGR79] P. F. Dubois, A. Greenbaum, and G. H. Rodrigue. Approximating the inverse of a matrix for use on iterative algorithms on vector processors. *Computing*, 22:257–268, 1979.
- [DH79] J. Dongarra and A. Hinds. Unrolling loops in Fortran. *Software Prac. Experience*, 9:219–229, 1979.
- [DH84] J. J. Dongarra and R. E. Hiro-moto. A collection of parallel

- linear equation routines for the Denelcor HEP. *Parallel Comput.*, 1:133–142, 1984.
- [DH86] J. Dongarra and T. Hewitt. Implementing dense linear algebra algorithms using multitasking on the Cray X-MP-4 (or approaching the gigaflop). *SIAM J. Sci. Statist. Comput.*, 7:347–350, 1986.
- [DHS87] J. J. Dongarra, S. Hammarling, and D. C. Sorensen. Block reduction of matrices to condensed form for eigenvalue computations. Technical Report ANL-MCS-TM 99, Argonne National Laboratory, Argonne, IL, USA, 1987.
- [DI86] J. M. Delosme and I. C. F. Ipsen. Parallel solution of symmetric positive definite systems with hyperbolic rotations. *Linear Algebra Appl.*, 77:75–112, 1986.
- [DJK⁺88] B. N. Datta, C. R. Johnson, M. A. Kaashoek, R. Plemmons, and E. D. Sontag. *Linear Algebra in Signals, Systems, and Control*. SIAM Publications, Philadelphia, PA, USA, 1988.
- [DK70] C. Davis and W. M. Kahan. The rotation of eigenvectors by a perturbation III. *SIAM J. Numer. Anal.*, 7:1–46, 1970.
- [DK77] A. Dax and S. Kaniel. Pivoting techniques for symmetric Gaussian elimination. *Numer. Math.*, 28:221–242, 1977.
- [DK87] J. W. Demmel and B. Kågström. Computing stable eigendecompositions of matrix pencils. *Linear Algebra Appl.*, 88/89:139–186, 1987.
- [DK88] J. W. Demmel and B. Kågström. Accurate solutions of ill-posed problems in control theory. *SIAM J. Matrix Anal. Appl.*, pages 126–145, 1988.
- [DKH86] J. J. Dongarra, L. Kaufman, and S. Hammarling. Squeezing the most out of eigenvalue solvers on high performance computers. *Linear Algebra Appl.*, 77:113–136, 1986.
- [DMW68] A. Dubrulle, R. S. Martin, and J. H. Wilkinson. The implicit QL algorithm. *Numer. Math.*, 12:377–383, 1968. Also in [WR71, pages 241–248].
- [DMW83] J. J. Dongarra, C. B. Moler, and J. H. Wilkinson. Improving the accuracy of computed eigenvalues and eigenvectors. *SIAM J. Numer. Anal.*, 20:23–46, 1983.

- [DNT83] P. Deift, T. Nande, and C. Tome. Ordinary differential equations and the symmetric eigenvalue problem. *SIAM J. Numer. Anal.*, 20:1–22, 1983. **DeiNT83**
- [Dor70] F. W. Dorr. The direct solution of the discrete Poisson equation on a rectangle. *SIAM Rev.*, 12:248–263, 1970. **Dor70**
- [Don83] J. J. Dongarra. Improving the accuracy of computed singular values. *SIAM J. Sci. Statist. Comput.*, 4:712–719, 1983. **Don83**
- [Dor73] F. W. Dorr. The direct solution of the discrete Poisson equation in $O(n^2)$ operations. *SIAM Rev.*, 15:412–415, 1973. **Dor73**
- [Doo79] P. Van Dooren. The computation of Kronecker’s canonical form of a singular pencil. *Linear Algebra Appl.*, 27:103–140, 1979. **Doo79**
- [DP88] J. Day and B. Peterson. Growth in Gaussian elimination. *Amer. Math. Monthly*, 95:489–513, 1988. **DayP88**
- [Doo81a] P. Van Dooren. The generalized eigenstructure problem in linear system theory. *IEEE Trans. Automat. Control*, AC-26:111–128, 1981. **Doo81a**
- [DR75] I. S. Duff and J. K. Reid. On the reduction of sparse matrices to condensed forms by similarity transformations. *J. Inst. Math. Appl.*, 15:217–224, 1975. **DufR75**
- [Doo81b] P. Van Dooren. A generalized eigenvalue approach for solving Riccati equations. *SIAM J. Sci. Statist. Comput.*, 2:121–135, 1981. **Doo81b**
- [DR76] I. S. Duff and J. K. Reid. A comparison of some methods for the solution of sparse over-determined systems of linear equations. *J. Inst. Math. Appl.*, 17:267–280, 1976. **DufR76**
- [Doo83] P. Van Dooren. Reducing subspaces: definitions, properties and algorithms. In B. Kågström and A. Ruhe, editors, *Matrix Pencils*, pages 58–73. Springer-Verlag, New York, NY, USA, 1983. **Doo83**
- [DS58] N. Dunford and J. Schwartz. *Linear Operators, Part I*. Interscience, New York, NY, USA, 1958. **DunS58**
- [DS78] I. S. Duff and G. W. Stewart, editors. *Sparse Matrix*. **DufS78**

- Proceedings*. SIAM Publications, Philadelphia, PA, USA, 1978.
- [DS83] J. E. Dennis and R. Schnabel. *Numerical Methods for Unconstrained Optimization and Nonlinear Equations*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1983.
- [DS84] J. J. Dongarra and A. H. Sameh. On some parallel banded system solvers. *Parallel Comput.*, 1:223–235, 1984.
- [DS86] J. J. Dongarra and D. C. Sorensen. Linear algebra on high performance computers. *Appl. Math. Comput.*, 20:57–88, 1986.
- [DS87a] J. J. Dongarra and D. C. Sorensen. A fully parallel algorithm for the symmetric eigenvalue problem. *SIAM J. Sci. Statist. Comput.*, 8:s139–s154, 1987.
- [DS87b] J. J. Dongarra and D. C. Sorensen. A portable environment for developing parallel programs. *Parallel Comput.*, 5:175–186, 1987.
- [DSS86] J. J. Dongarra, A. Sameh, and D. Sorensen. Implementation of some concurrent algorithms for matrix factorization. *Parallel Comput.*, 3:25–34, 1986.
- [DT71] T. J. Dekker and J. F. Traub. The shifted QR algorithm for Hermitian matrices. *Linear Algebra Appl.*, 4:137–154, 1971.
- [Dub70] A. Dubrulle. A short note on the implicit QL algorithm for symmetric tridiagonal matrices. *Numer. Math.*, 15:450, 1970.
- [Duf74] I. S. Duff. Pivot selection and row ordering in Givens reduction on sparse matrices. *Computing*, 13:239–248, 1974.
- [Duf77] I. S. Duff. A survey of sparse matrix research. *Proc. IEEE*, 65:500–535, 1977.
- [Dur60] J. Durbin. The fitting of time series models. *Rev. Inst. Internat. Statist.*, 28:233–243, 1960.
- [dV77] H. Van de Vel. Numerical treatment of a generalized Vandermonde system of equations. *Linear Algebra Appl.*, 17:149–174, 1977.
- [dV82a] H. A. Van der Vorst. A generalized Lanczos scheme. *Math. Comp.*, 39:559–562, 1982.
- [dV82b] H. A. Van der Vorst. A vectorizable variant of some ICCG meth-

- ods. *SIAM J. Sci. Statist. Comput.*, 3:350–356, 1982.
- [Ebe65] P. J. Eberlein. On measures of non-normality for matrices. *Amer. Math. Monthly*, 72:995–996, 1965.
- [Ebe70] P. J. Eberlein. Solution to the complex eigenproblem by a norm-reducing Jacobi-type method. *Numer. Math.*, 14:232–245, 1970. Also in [WR71, pages 404–417].
- [Ebe71] P. J. Eberlein. On the diagonalization of complex symmetric matrices. *J. Inst. Math. Appl.*, 7:377–383, 1971.
- [Ebe87] P. J. Eberlein. On using the Jacobi method on a hypercube. In M. T. Heath, editor, *Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1987.
- [ED83] D. J. Evans and R. Dunbar. The parallel solution of triangular systems of equations. *IEEE Trans. Comput.*, C-32:201–204, 1983.
- [EHHR88] S.C Eisenstat, M. T. Heath, C. S. Henkel, and C. H. Romine. Modified cyclic algorithms for solving triangular systems on distributed memory multiprocessors. *SIAM J. Sci. Statist. Comput.*, 9:589–600, 1988.
- [Eis84] S. C. Eisenstat. Efficient implementation of a class of preconditioned conjugate gradient methods. *SIAM J. Sci. Statist. Comput.*, 2:1–4, 1984.
- [Eld77a] L. Eldèn. Algorithms for the regularization of ill-conditioned least squares problems. *BIT*, 17:134–145, 1977.
- [Eld77b] L. Eldèn. *Numerical Analysis of Regularization and Constrained Least Square Methods*. PhD thesis, Linköping Studies in Science and Technology, Linköping, Sweden, 1977.
- [Eld80] L. Eldèn. Perturbation theory for the least squares problem with linear equality constraints. *SIAM J. Numer. Anal.*, 17:338–350, 1980.
- [Eld83] L. Eldèn. A weighted pseudoinverse, generalized singular values, and constrained least squares problems. *BIT*, 22:487–502, 1983.
- [Eld84] L. Eldèn. An algorithm for the regularization of ill-conditioned, banded least squares problems. *SIAM J. Sci. Statist. Comput.*, 5:237–254, 1984.

- [Eld85] L. Eldèn. A note on the computation of the generalized cross-validation function for ill-conditioned least squares problems. *BIT*, 24:467–472, 1985. **Eld85**
- [Eld88] L. Eldèn. A parallel QR decomposition algorithm. Technical Report LiTh Mat R 1988-02, Mathematics, Linköping University, Sweden, 1988. **Eld88**
- [Elm86] H. Elman. A stability analysis of incomplete LU factorization. *Math. Comp.*, 47:191–218, 1986. **Elm86**
- [EN83] M. Eiermann and W. Niethammer. On the construction of semi-iterative methods. *SIAM J. Numer. Anal.*, 20:1153–1160, 1983. **EieN83**
- [Enr79] W. Enright. On the efficient and reliable numerical solution of large linear systems of O. D. E.'s. *IEEE Trans. Automat. Control*, AC-24:905–908, 1979. **Enr79**
- [ER74] A. M. Erisman and J. K. Reid. Monitoring the stability of the triangular factorization of a sparse matrix. *Numer. Math.*, 22:183–186, 1974. **EriR74**
- [ER80] T. Ericsson and A. Ruhe. The spectral transformation Lanczos method for the numerical solution of large sparse generalized symmetric eigenvalue problems. *Math. Comp.*, 35:1251–1268, 1980. **Eld85**
- [ER88] A. Elster and A. P. Reeves. Block matrix operations using orthogonal trees. In G. Fox, editor, *The Third Conference on Hypercube Concurrent Computers and Applications, Vol. II, Applications*, pages 1554–1561. ACM Press, New York, NY, USA, 1988. **ElsR88**
- [Erd67] I. Erdelyi. On the matrix equation $Ax = \lambda Bx$. *J. Math. Anal. Appl.*, 17:119–132, 1967. **Erd67**
- [EN83] M. Eiermann and W. Niethammer. On the construction of semi-iterative methods. *SIAM J. Numer. Anal.*, 20:1153–1160, 1983. **ElsS82**
- [Enr79] W. Enright. On the efficient and reliable numerical solution of large linear systems of O. D. E.'s. *IEEE Trans. Automat. Control*, AC-24:905–908, 1979. **Enr79**
- [ES82] L. Elsner and J. Guang Sun. Perturbation theorems for the generalized eigenvalue problem. *Linear Algebra Appl.*, 48:341–357, 1982. **EldS86**
- [ER74] A. M. Erisman and J. K. Reid. Monitoring the stability of the triangular factorization of a sparse matrix. *Numer. Math.*, 22:183–186, 1974. **EriR74**
- [Eva84] D. J. Evans. Parallel SOR iterative methods. *Parallel Comput.*, 1:3–18, 1984. **Eva84**
- [ER80] T. Ericsson and A. Ruhe. The spectral transformation Lanczos method for the numerical solution of large sparse generalized symmetric eigenvalue problems. *Math. Comp.*, 35:1251–1268, 1980. **EckY39**
- [EY39] C. Eckart and G. Young. A principal axis transformation for non-

- Hermitian matrices. *Bull. Amer. Math. Soc.*, 45:118–121, 1939. **FoxJL+88**
- [FF63] D. K. Faddeev and V. N. Faddeeva. *Computational Methods of Linear Algebra*. W. H. Freeman and Co., San Francisco, CA, USA, 1963. **FadF63**
- [FF77] V. N. Fadeeva and D. K. Fadeev. Parallel calculations in linear algebra. *Kibernetika*, 6:28–40, 1977. **FadF77**
- [FG65] G. E. Forsythe and G. H. Golub. On the stationary values of a second-degree polynomial on the unit sphere. *SIAM J. Appl. Math.*, 13:1050–1068, 1965. **ForG65**
- [FG86] R. E. Funderlic and A. Geist. Torus data flow for parallel computation of missized matrix problems. *Linear Algebra Appl.*, 77:149–164, 1986. **FunG86**
- [FH60] G. E. Forsythe and P. Henrici. The cyclic Jacobi method for computing the principal values of a complex matrix. *Trans. Amer. Math. Soc.*, 94:1–23, 1960. **ForH60**
- [FH72] G. Fix and R. Heiberger. An algorithm for the ill-conditioned generalized eigenvalue problem. *SIAM J. Numer. Anal.*, 9:78–88, 1972. **FixH72**
- [FJL+88] G. Fox, M. Johnson, G. Lyzenga, S. Otto, J. Salmon, and D. Walker. *On Concurrent Processors Vol I: General Techniques and Regular Problems*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1988. **FaiL70**
- [FL70] W. Fair and Y. Luke. Padé approximations to the operator exponential. *Numer. Math.*, 14:379–382, 1970. **FenL74**
- [FL74] T. Fenner and G. Loizou. Some new bounds on the condition numbers of optimally scaled matrices. *J. Assoc. Comput. Mach.*, 1:514–524, 1974. **Fle76**
- [Fle76] R. Fletcher. Factorizing symmetric indefinite matrices. *Linear Algebra Appl.*, 14:257–272, 1976. **ForM67**
- [FM67] G. E. Forsythe and C. B. Moler. *Computer Solution of Linear Algebraic Systems*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1967. **FabM84**
- [FM84] V. Faber and T. Manteuffel. Necessary and sufficient conditions for the existence of a conjugate gradient method. *SIAM J. Numer. Anal.*, 21:352–362, 1984. **ForMM77**
- [FMM77] G. E. Forsythe, M. A. Malcolm, and C. B. Moler. *Computer*

- Methods for Mathematical Computations*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1977.
- [FNO87] S. Friedland, J. Nocedal, and M. L. Overton. The formulation and analysis of numerical methods for inverse eigenvalue problems. *SIAM J. Numer. Anal.*, 24: 634–667, 1987.
- [FNP82] R. E. Funderlic, M. Neuman, and R. J. Plemmons. Generalized diagonally dominant matrices. *Numer. Math.*, 40:57–70, 1982.
- [FOH87] G. Fox, S. W. Otto, and A. J. Hey. Matrix algorithms on a hypercube I: Matrix multiplication. *Parallel Comput.*, 4:17–31, 1987.
- [For60] G. E. Forsythe. Crout with pivoting. *Comm. ACM*, 3:507–508, 1960.
- [Fos86] L. V. Foster. Rank and null space calculations using matrix decomposition without column interchanges. *Linear Algebra Appl.*, 74:47–71, 1986.
- [Fou84] R. Fourer. Staircase matrices and systems. *SIAM Rev.*, 26:1–71, 1984.
- [Fox64] L. Fox. *An Introduction to Numerical Linear Algebra*. Oxford University Press, Oxford, UK, 1964.
- [Fox88] G. Fox, editor. *Applications*, volume 2 of *The Third Conference on Hypercube Concurrent Computers and Applications*. ACM Press, New York, NY, USA, 1988.
- [Fra61] J. G. F. Francis. The QR transformation: A unitary analogue to the LR transformation, parts I and II. *Comput. J.*, 4:265–272, 332–345, 1961.
- [Fra64a] J. S. Frame. Matrix functions and applications, part II. *IEEE Spectrum*, 1:102–108, April 1964.
- [Fra64b] J. S. Frame. Matrix functions and applications, part IV. *IEEE Spectrum*, 1:123–131, June 1964.
- [Fri75] S. Friedland. On inverse multiplicative eigenvalue problems for matrices. *Linear Algebra Appl.*, 12:127–138, 1975.
- [Fri77] S. Friedland. Inverse eigenvalue problems. *Linear Algebra Appl.*, 17:15–52, 1977.
- [Fro65] C. E. Froberg. On triangularization of complex matrices by two-dimensional unitary transformations. *BIT*, 5:230–234, 1965.

- [FU69] FisU69 C. Fischer and R. A. Usmani. Properties of some tridiagonal matrices and their application to boundary value problems. *SIAM J. Numer. Anal.*, 6:127–142, 1969.
- [FV62] FeiV62 D. G. Feingold and R. S. Varga. Block diagonally dominant matrices and generalizations of the Gershgorin circle theorem. *Pacific J. Math.*, 12:1241–1250, 1962.
- [Gan59a] Gan59a F. R. Gantmacher. *The Theory of Matrices*, volume 1. Chelsea, New York, NY, USA, 1959.
- [Gan59b] Gan59b F. R. Gantmacher. *The Theory of Matrices*, volume 2. Chelsea, New York, NY, USA, 1959.
- [Gan81] Gan81 W. Gander. Least squares with a quadratic constraint. *Numer. Math.*, 36:291–307, 1981.
- [Gau75a] Gau75a W. Gautschi. Norm estimates for inverses of Vandermonde matrices. *Numer. Math.*, 23:337–347, 1975.
- [Gau75b] Gau75b W. Gautschi. Optimally conditioned Vandermonde matrices. *Numer. Math.*, 24:1–12, 1975.
- [GBDM72] GarBDM72 B. S. Garbow, J. M. Boyle, J. J. Dongarra, and C. B. Moler. *Matrix Eigensystem Routines: EISPACK Guide Extension*. New York, NY, USA, 1972.
- [Gen73a] Gen73a W. M. Gentleman. Error analysis of QR decompositions by Givens transformations. *Linear Algebra Appl.*, 10:189–197, 1973.
- [Gen73b] Gen73b W. M. Gentleman. Least squares computations by Givens transformations without square roots. *J. Inst. Math. Appl.*, 12:329–336, 1973.
- [Geo73] Geo73 J. A. George. Nested dissection of a regular finite element mesh. *SIAM J. Numer. Anal.*, 10:345–363, 1973.
- [Geo74] Geo74 J. A. George. On block elimination for sparse linear systems. *SIAM J. Numer. Anal.*, 11:585–603, 1974.
- [GGMS74] GilGMS74 P. E. Gill, G. H. Golub, W. Murray, and M. A. Saunders. Methods for modifying matrix factorizations. *Math. Comp.*, 28:505–535, 1974.
- [GH59] GolH59 H. H. Goldstine and L. P. Horowitz. A procedure for the diagonalization of normal matrices.

- J. Assoc. Comput. Mach.*, 6:176–195, 1959.
- GeoH80**
- [GH80] J. A. George and M. T. Heath. Solution of sparse linear least squares problems using Givens rotations. *Linear Algebra Appl.*, 34:69–83, 1980.
- GraH84**
- [GH84] W. B. Gragg and W. J. Harrod. The numerically stable reconstruction of Jacobi matrices from spectral data. *Numer. Math.*, 44:317–336, 1984.
- GeiH85**
- [GH85] G. A. Geist and M. T. Heath. Parallel Cholesky factorization on a hypercube multiprocessor. Technical Report ORNL 6190, Oak Ridge Laboratory, Oak Ridge, TN, USA, 1985.
- GeiH86**
- [GH86] G. A. Geist and M. T. Heath. Matrix factorization on a hypercube. In M. T. Heath, editor, *Hypercube Multiprocessors*, pages 161–180. SIAM Publications, 1986.
- GeoHL86**
- [GHL86] J. A. George, M. T. Heath, and J. Liu. Parallel Cholesky factorization on a shared memory multiprocessor. *Linear Algebra Appl.*, 77:165–187, 1986.
- GolHS88**
- [GHS88] G. H. Golub, A. Hoffman, and G. W. Stewart. A generalization of the Eckart–Young–Mirsky approximation theorem. *Linear Algebra Appl.*, 88/89:317–328, 1988.
- GolHW79**
- [GHW79] G. H. Golub, M. Heath, and G. Wahba. Generalized cross-validation as a method for choosing a good ridge parameter. *Technometrics*, 21:215–223, 1979.
- Gin71**
- [Gin71] T. Ginsburg. The conjugate gradient method. In J. H. Wilkinson and C. Reinsch, editors, *Handbook for Automatic Computation Vol. 2: Linear Algebra*, pages 57–69. Springer-Verlag, New York, NY, USA, 1971.
- Giv58**
- [Giv58] W. Givens. Computation of plane unitary rotations transforming a general matrix to triangular form. *SIAM J. Appl. Math.*, 6:26–50, 1958.
- GalJM87**
- [GJM87] K. Gallivan, W. Jalby, and U. Meier. The use of BLAS3 in linear algebra on a parallel processor with a hierarchical memory. *SIAM J. Sci. Statist. Comput.*, 8:1079–1084, 1987.
- GalJMS88**
- [GJMS88] K. Gallivan, W. Jalby, U. Meier, and A. H. Sameh. Impact of hierarchical memory systems on linear algebra algorithm design. *Internat. J. Supercomputing Applic.*, 2:12–48, 1988.

- [GK65] GolK65 G. H. Golub and W. Kahan. Calculating the singular values and pseudo-inverse of a matrix. *J. Soc. Indust. Appl. Math. Ser. B Numer. Anal.*, 2:205–224, 1965.
- [GK69] GohK69 I. C. Gohberg and M. G. Krein. *Introduction to the Theory of Linear Non-Self-Adjoint Operators*. American Mathematical Society, Providence, RI, USA, 1969.
- [GK82] GenK82 W. M. Gentleman and H. T. Kung. Matrix triangularization by systolic arrays. In *SPIE Proceedings*, volume 298, pages 19–26, 1982.
- [GKS76] GolKS76 G. H. Golub, V. Klema, and G. W. Stewart. Rank degeneracy and least squares problems. Technical Report TR-456, Computer Science, University of Maryland, College Park, MD, USA, 1976.
- [GL79] GolL79 G. H. Golub and C. F. Van Loan. Unsymmetric positive definite linear systems. *Linear Algebra Appl.*, 28:85–98, 1979.
- [GL80] GolL80 G. H. Golub and C. F. Van Loan. An analysis of the total least squares problem. *SIAM J. Numer. Anal.*, 17:883–893, 1980.
- [GL81a] GeoL81a J. A. George and J. W. Liu. *Computer Solution of Large Sparse Positive Definite Systems*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1981.
- [GL81b] GriL81b R. G. Grimes and J. G. Lewis. Condition number estimation for sparse matrices. *SIAM J. Sci. Statist. Comput.*, 2:384–388, 1981.
- [GL89] GolL89 G. H. Golub and C. F. Van Loan. *Matrix Computations*. The Johns Hopkins University Press, Baltimore, MD, USA, second edition, 1989.
- [GLO81] GolLO81 G. H. Golub, F. T. Luk, and M. Overton. A block Lanczos method for computing the singular values and corresponding singular vectors of a matrix. *ACM Trans. Math. Software*, 7:149–169, 1981.
- [GLR86] GohLR86 I. C. Gohberg, P. Lancaster, and L. Rodman. *Invariant Subspaces of Matrices With Applications*. John Wiley and Sons, New York, NY, USA, 1986.
- [GM76] GilM76 P. E. Gill and W. Murray. The orthogonal factorization of a large sparse matrix. In J. R. Bunch and D. J. Rose, editors, *Sparse*

- Matrix Computations*, pages 177–200. Academic Press, New York, NY, USA, 1976.
- [GM83] G. H. Golub and G. Meurant. *Résolution Numérique des Grands Systèmes Linéaires*, volume 49 of *Collection de la Direction des Etudes et Recherches de l'Electricité de France*. Eyolles, Paris, France, 1983.
- [GM86] G. H. Golub and C. D. Meyer. Using the QR factorization and group inversion to compute, differentiate, and estimate the sensitivity of stationary probabilities for Markov chains. *SIAM J. Algebraic Discrete Methods*, 7:273–281, 1986.
- [GMS75] P. E. Gill, W. Murray, and M. A. Saunders. Methods for computing and modifying the LDV factors of a matrix. *Math. Comp.*, 29:1051–1077, 1975.
- [GNL79] G. H. Golub, S. Nash, and C. Van Loan. A Hessenberg-Schur method for the matrix problem $AX + XB = C$. *IEEE Trans. Automat. Control*, AC-24:909–913, 1979.
- [GO88] G. H. Golub and M. Overton. The convergence of inexact Chebychev and Richardson iterative methods for solving linear systems. *Numer. Math.*, 53:571–594, 1988.
- [Gol65] G. H. Golub. Numerical methods for solving linear least squares problems. *Numer. Math.*, 7:206–216, 1965.
- [Gol69] G. H. Golub. Matrix decompositions and statistical computation. In R. C. Milton and J. A. Nelder, editors, *Statistical Computation*, pages 365–397. Academic Press, New York, NY, USA, 1969.
- [Gol73] G. H. Golub. Some modified matrix eigenvalue problems. *SIAM Rev.*, 15:318–344, 1973.
- [Gol74] G. H. Golub. Some uses of the Lanczos algorithm in numerical linear algebra. In J. J. H. Miller, editor, *Topics in Numerical Analysis*. Academic Press, New York, NY, USA, 1974.
- [Gol76] D. Goldfarb. Factorized variable metric methods for unconstrained optimization. *Math. Comp.*, 30:796–811, 1976.
- [Gou70] A. R. Gourlay. Generalization of elementary Hermitian matrices. *Comput. J.*, 13:411–412, 1970.

- [GP70] GalP70 G. Galimberti and V. Pereyra. Numerical differentiation and the solution of multidimensional Vandermonde systems. *Math. Comp.*, 24:357–364, 1970.
- [GP71] GalP71 G. Galimberti and V. Pereyra. Solving confluent Vandermonde systems of Hermite type. *Numer. Math.*, 18:44–60, 1971.
- [GP73] GolP73 G. H. Golub and V. Pereyra. The differentiation of pseudo-inverses and nonlinear least squares problems whose variables separate. *SIAM J. Numer. Anal.*, 10:413–432, 1973.
- [GP74] GibWP74 N. E. Gibbs and W. G. Poole, Jr. Tridiagonalization by permutations. *Comm. ACM*, 17:20–24, 1974.
- [GP76] GolP76 G. H. Golub and V. Pereyra. Differentiation of pseudo-inverses, separable nonlinear least squares problems and other tales. In M. Z. Nashed, editor, *Generalized Inverses and Applications*, pages 303–324. Academic Press, New York, NY, USA, 1976.
- [GPS76a] GibPS76a N. E. Gibbs, W. G. Poole, and P. K. Stockmeyer. An algorithm for reducing the bandwidth and profile of a sparse matrix. *SIAM J. Numer. Anal.*, 13:236–250, 1976.
- [GPS76b] GibPS76b N. E. Gibbs, W. G. Poole, and P. K. Stockmeyer. A comparison of several bandwidth and profile reduction algorithms. *ACM Trans. Math. Software*, 2:322–330, 1976.
- [GR70] GolR70 G. H. Golub and C. Reinsch. Singular value decomposition and least squares solutions. *Numer. Math.*, 14:403–420, 1970. Also in [WR71], pages 134–151].
- [GR84] GanR84 D. Gannon and J. Van Rosendale. On the impact of communication complexity on the design of parallel numerical algorithms. *IEEE Trans. Comput.*, C-33:1180–1194, 1984.
- [Gra86] Gra86 W. B. Gragg. The QR algorithm for unitary Hessenberg matrices. *J. Comput. Appl. Math.*, 16:1–8, 1986.
- [Gre52] Gre52 B. Green. The orthogonal approximation of an oblique structure in factor analysis. *Psychometrika*, 17:429–440, 1952.
- [Gre81] Gre81 A. Greenbaum. Behavior of the conjugate gradient algorithm in finite precision arithmetic. Technical Report UCRL 85752,

- Lawrence Livermore Laboratory, Livermore, CA, USA, 1981.
- [GT81] G. H. Golub and W. P. Tang. The block decomposition of a Vandermonde matrix and its applications. *BIT*, 21:505–517, 1981.
- [GU70] G. H. Golub and R. Underwood. Stationary values of the ratio of quadratic forms subject to linear constraints. *Z. Angew. Math. Phys.*, 21:318–326, 1970.
- [GU77] G. H. Golub and R. Underwood. The block Lanczos method for computing eigenvalues. In J. Rice, editor, *Mathematical Software III*, pages 364–377. Academic Press, New York, NY, USA, 1977.
- [Gup72] K. K. Gupta. Solution of eigenvalue problems by Sturm sequence method. *Internat. J. Numer. Methods Engrg.*, 4:379–404, 1972.
- [GUW72] G. H. Golub, R. Underwood, and J. H. Wilkinson. The Lanczos algorithm for the symmetric $Ax = \lambda Bx$ problem. Technical Report STAN-CS-72-270, Computer Science, Stanford University, Stanford, CA, USA, 1972.
- [GV61] G. H. Golub and R. S. Varga. Chebychev semi-iterative methods, successive over-relaxation iterative methods, and second-order Richardson iterative methods, parts I and II. *Numer. Math.*, 3:147–156, 157–168, 1961.
- [GV74] G. H. Golub and J. M. Varah. On a characterization of the best L_2 -scaling of a matrix. *SIAM J. Numer. Anal.*, 11:472–479, 1974.
- [GW66] G. H. Golub and J. H. Wilkinson. Note on the iterative refinement of least squares solution. *Numer. Math.*, 9:139–148, 1966.
- [GW69] G. H. Golub and J. H. Welsch. Calculation of Gauss quadrature rules. *Math. Comp.*, 23:221–230, 1969.
- [GW76] G. H. Golub and J. H. Wilkinson. Ill-conditioned eigensystems and the computation of the Jordan canonical form. *SIAM Rev.*, 18:578–619, 1976.
- [GWDF88] G. A. Geist, R. C. Ward, G. J. Davis, and R. E. Funderlic. Finding eigenvalues and eigenvectors of unsymmetric matrices using a hypercube multiprocessor. In G. Fox, editor, *The Third Conference on Hypercube Concurrent Computers and Applications, Vol. II, Applications*, pages 1577–1582. ACM Press, New York, NY, USA, 1988.

- [GWM76] R. F. Gunst, J. T. Webster, and R. L. Mason. A comparison of least squares and latent root regression estimators. *Technometrics*, 18:75–83, 1976. **GunWM76**
- [Hag84] W. Hager. Condition estimates. *SIAM J. Sci. Statist. Comput.*, 5: 311–316, 1984. **Hag84**
- [Hag88] W. Hager. *Applied Numerical Linear Algebra*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1988. **Hag88**
- [Hal58] P. Halmos. *Finite Dimensional Vector Spaces*. Van Nostrand, New York, NY, USA, 1958. **Hal58**
- [Ham74] S. Hammarling. A note on modifications to the Givens plane rotation. *J. Inst. Math. Appl.*, 13: 215–218, 1974. **Ham74**
- [Ham85] S. J. Hammarling. The singular value decomposition in multivariate statistics. *ACM SIGNUM Newslett.*, 20:2–25, 1985. **Ham85**
- [Han62] E. R. Hansen. On quasicyclic Jacobi methods. *J. Assoc. Comput. Mach.*, 9:118–135, 1962. **Han62**
- [Han63] E. R. Hanson. On cyclic Jacobi methods. *SIAM J. Appl. Math.*, 11:448–459, 1963. **Han63**
- [Han87] P. C. Hansen. The truncated SVD as a method for regularization. *BIT*, 27:534–553, 1987. **Han87**
- [Han88] P. C. Hansen. Reducing the number of sweeps in Hestenes method. In E. F. Deprettere, editor, *Singular Value Decomposition and Signal Processing*. North-Holland, 1988. **Han88**
- [Har82] V. Hari. On the global convergence of the Eberlein method for real matrices. *Numer. Math.*, 39: 361–370, 1982. **Har82**
- [Hea78] M. T. Heath. *Numerical Algorithms for Nonlinearly Constrained Optimization*. PhD thesis, Computer Science, Stanford University, Stanford, CA, USA, 1978. **Hea78**
- [Hea86] M. T. Heath, editor. *Proceedings of First SIAM Conference on Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1986. **Hea86**
- [Hea87] M. T. Heath, editor. *Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1987. **Hea87**

- [Hel68] Hel68 B. W. Helton. Logarithms of matrices. *Proc. Amer. Math. Soc.*, 19:733–736, 1968.
- [Hel76] Hel76 D. Heller. Some aspects of the cyclic reduction algorithm for block tridiagonal linear systems. *SIAM J. Numer. Anal.*, 13:484–496, 1976.
- [Hel78] Hel78 D. Heller. A survey of parallel algorithms in numerical linear algebra. *SIAM Rev.*, 20:740–777, 1978.
- [Hen58] Hen58 P. Henrici. On the speed of convergence of cyclic and quasi-cyclic Jacobi methods for computing the eigenvalues of Hermitian matrices. *SIAM J. Appl. Math.*, 6:144–162, 1958.
- [Hen62] Hen62 P. Henrici. Bounds for iterates, inverses, spectral variation, and fields of values of non-normal matrices. *Numer. Math.*, 4:24–40, 1962.
- [Hes80] Hes80 M. R. Hestenes. *Conjugate Direction Methods in Optimization*. Springer-Verlag, Berlin, Germany, 1980.
- [HH89] HigH89 N. J. Higham and D. J. Higham. Large growth factors in Gaussian elimination with pivoting. *SIAM J. Matrix Anal. Appl.*, 10:155–164, 1989.
- [HHP88] HenHP88 C. S. Henkel, M. T. Heath, and R. J. Plemmons. Cholesky downdating on a hypercube. In G. Fox, editor, *The Third Conference on Hypercube Concurrent Computers and Applications, Vol. II, Applications*, pages 1592–1598. ACM Press, New York, NY, USA, 1988.
- [HI83] HelI83 D. E. Heller and I. C. F. Ipsen. Systolic networks for orthogonal decompositions. *SIAM J. Sci. Statist. Comput.*, 4:261–269, 1983.
- [Hig85] Hig85 N. J. Higham. *Nearness Problems in Numerical Linear Algebra*. PhD thesis, University of Manchester, UK, 1985.
- [Hig86a] Hig86a N. J. Higham. Computing the polar decomposition with applications. *SIAM J. Sci. Statist. Comput.*, 7:1160–1174, 1986.
- [Hig86b] Hig86b N. J. Higham. Efficient algorithms for computing the condition number of a tridiagonal matrix. *SIAM J. Sci. Statist. Comput.*, 7:150–165, 1986.

- [Hig86c] Hig86c N. J. Higham. Newton's method for the matrix square root. *Math. Comp.*, 46:537–550, 1986.
- [Hig87a] Hig87a N. J. Higham. Computing real square roots of a real matrix. *Linear Algebra Appl.*, 88/89:405–430, 1987.
- [Hig87b] Hig87b N. J. Higham. Error analysis of the Björck-Pereyra algorithms for solving Vandermonde systems. *Numer. Math.*, 50:613–632, 1987.
- [Hig87c] Hig87c N. J. Higham. A survey of condition number estimation for triangular matrices. *SIAM Rev.*, 29:575–596, 1987.
- [Hig88a] Hig88a N. J. Higham. The accuracy of solutions to triangular systems. Technical Report 158, Mathematics, University of Manchester, UK, 1988.
- [Hig88b] Hig88b N. J. Higham. Computing a nearest symmetric positive semidefinite matrix. *Linear Algebra Appl.*, 103:103–118, 1988.
- [Hig88c] Hig88c N. J. Higham. Fast solution of Vandermonde-like systems involving orthogonal polynomials. *IMA J. Numer. Anal.*, 8:473–486, 1988.
- [Hig88d] Hig88d N. J. Higham. Fortran codes for estimating the one-norm of a real or complex matrix, with applications to condition estimation. *ACM Trans. Math. Software*, 14:381–396, 1988.
- [Hig88e] Hig88e N. J. Higham. Matrix nearness problems and applications. Technical Report 161, Mathematics, University of Manchester, UK, 1988. To appear in Proceedings of the IMA Conference on Applications of Matrix Theory, eds. S. Barnett and M. J. C. Gover.
- [Hig88f] Hig88f N. J. Higham. The symmetric Procrustes problem. *BIT*, 28:133–143, 1988.
- [Hig89] Hig89 N. J. Higham. Analysis of the Cholesky decomposition of a semi-definite matrix. In M. G. Cox and S. J. Hammarling, editors, *Reliable Numerical Computation*. Oxford University Press, 1989.
- [HJ88] HocJ88 R. W. Hockney and C. R. Jesshope. *Parallel Computers 2*. Adam Hilger, Bristol and Philadelphia, 1988.
- [HL69] HanL69 R. J. Hanson and C. L. Lawson. Extensions and applications of the Householder algorithm for

- solving linear least squares problems. *Math. Comp.*, 23:787–812, 1969.
- [HLPW86] M. T. Heath, A. J. Laub, C. C. Paige, and R. C. Ward. Computing the SVD of a product of two matrices. *SIAM J. Sci. Statist. Comput.*, 7:1147–1159, 1986.
- [HN81] R. J. Hanson and M. J. Norris. Analysis of measurements based on the singular value decomposition. *SIAM J. Sci. Statist. Comput.*, 2:363–374, 1981.
- [Hoa77] D. Hoaglin. Mathematical software and exploratory data analysis. In John Rice, editor, *Mathematical Software III*, pages 139–159. Academic Press, New York, NY, USA, 1977.
- [Hoc65] R. W. Hockney. A fast direct solution of Poisson’s equation using Fourier analysis. *J. Assoc. Comput. Mach.*, 12:95–113, 1965.
- [Hoc83] R. Hockney. Characterizing computers and optimizing the FACR(ℓ) Poisson solver on parallel unicomputers. *IEEE Trans. Comput.*, C-32:933–941, 1983.
- [Hot57] H. Hotelling. The relations of the newer multivariate statistical methods to factor analysis. *Brit. J. Math. Statist. Psych.*, 10:69–79, 1957.
- [Hou58] A. S. Householder. Unitary triangularization of a nonsymmetric matrix. *J. Assoc. Comput. Mach.*, 5:339–342, 1958.
- [Hou68] A. S. Householder. Moments and characteristic roots II. *Numer. Math.*, 11:126–128, 1968.
- [Hou74] A. S. Householder. *The Theory of Matrices in Numerical Analysis*. Dover Publications, New York, NY, USA, 1974.
- [HP78] W. Hoffmann and B. N. Parlett. A new proof of global convergence for the tridiagonal QL algorithm. *SIAM J. Numer. Anal.*, 15:929–937, 1978.
- [HR88] M. T. Heath and C. H. Romine. Parallel solution of triangular systems on distributed memory multiprocessors. *SIAM J. Sci. Statist. Comput.*, 9:558–588, 1988.
- [Hes52] M. R. Hestenes and E. Stiefel. Methods of conjugate gradients for solving linear systems. *J. Res. Nat. Bur. Standards*, 49:409–436, 1952.

- [HS66] T. E. Hull and J. R. Swenson. Tests of probabilistic models for propagation of roundoff errors. *Comm. ACM*, 9:108–113, 1966. **HulS66**
- [HS86] M. T. Heath and D. C. Sorensen. A pipelined method for computing the QR factorization of a sparse matrix. *Linear Algebra Appl.*, 77:189–203, 1986. **HeaS86**
- [HS88] N. J. Higham and R. S. Schreiber. Fast polar decomposition of an arbitrary matrix. Technical Report 88-942, Computer Science, Cornell University, Ithaca, NY 14853, 1988. **HigS88**
- [Hua75] C. P. Huang. A Jacobi-type method for triangularizing an arbitrary matrix. *SIAM J. Numer. Anal.*, 12:566–570, 1975. **Hua75**
- [Hua81] C. P. Huang. On the convergence of the QR algorithm with origin shifts for normal matrices. *IMA J. Numer. Anal.*, 1:127–133, 1981. **Hua81**
- [Huf87] S. Van Huffel. *Analysis of the Total Least Squares Problem and Its Use in Parameter Estimation*. PhD thesis, Electrical Engineering, Katholieke Universiteit Leuven, Leuven, Belgium, 1987. **Huf87**
- [Huf88] S. Van Huffel. Comments on the solution of the nongeneric total least squares problem. Technical Report ESAT-KUL-88/3, Department of Electrical Engineering, Katholieke Universiteit Leuven, Leuven, Belgium, 1988. **Huf88**
- [Huf87] S. Van Huffel and J. Vandewalle. Subset selection using the total least squares approach in collinearity problems with errors in the variables. *Linear Algebra Appl.*, 88/89:695–714, 1987. **HufV87**
- [HV88a] S. Van Huffel and J. Vandewalle. The partial total least squares algorithm. *J. Comput. Appl. Math.*, 21:333–342, 1988. **HufV88a**
- [HV88b] S. Van Huffel and J. Vandewalle. The partial total least squares algorithm. *J. Comput. Appl. Math.*, 21:333–342, 1988. **HufV88b**
- [HVH87] S. Van Huffel, J. Vandewalle, and A. Haegemans. An efficient and reliable algorithm for computing the singular subspace of a matrix associated with its smallest singular values. *J. Comput. Appl. Math.*, 19:313–330, 1987. **HufVH87**
- [HY81] L. A. Hageman and D. M. Young. *Applied Iterative Methods*. Academic Press, New York, NY, USA, 1981. **HagY81**

- [HZ68] HenZ68 P. Henrici and K. Zimmermann. An estimate for the norms of certain cyclic Jacobi operators. *Linear Algebra Appl.*, 1:489–501, 1968.
- [Ike79] Ike79 Y. Ikebe. On inverses of Hessenberg matrices. *Linear Algebra Appl.*, 24:93–97, 1979.
- [IP87] IseP87 A. Iserles and M. J. D. Powell, editors. *The State of the Art in Numerical Analysis*. Oxford University Press, 1987.
- [ISS86] IpsSS86 I. C. F. Ipsen, Y. Saad, and M. Schultz. Dense linear systems on a ring of processors. *Linear Algebra Appl.*, 77:205–239, 1986.
- [Jac46] Jac46 C. G. J. Jacobi. Über ein leichtes verfahren die in der theorie der säculärstörungen vorkommenden gleichungen numerisch aufzulösen. *Crelle's J.*, 30:51–94, 1846.
- [Jen72] Jen72 P. S. Jenson. The solution of large symmetric eigenproblems by sectioning. *SIAM J. Numer. Anal.*, 9:534–545, 1972.
- [Jen77a] Jen77a A. Jennings. Influence of the eigenvalue spectrum on the convergence rate of the conjugate gradient method. *J. Inst. Math. Appl.*, 20:61–72, 1977.
- [Jen77b] Jen77b A. Jennings. *Matrix Computation for Engineers and Scientists*. John Wiley and Sons, New York, NY, USA, 1977.
- [JH87a] JohH87 S. L. Johnsson and C. T. Ho. Algorithms for multiplying matrices of arbitrary shapes using shared memory primitives on a Boolean cube. Technical Report YALEU DCS RR-569, Computer Science, Yale University, New Haven, CT, USA, 1987.
- [JH87b] JohH87c S. L. Johnsson and C. T. Ho. Multiple tridiagonal systems, the alternating direction methods, and Boolean cube configured multiprocessors. Technical Report YALEU DCS RR-532, Computer Science, Yale University, New Haven, CT, USA, 1987.
- [JH88] JohH88 S. L. Johnsson and C. T. Ho. Algorithms for matrix transposition on Boolean N -cube configured ensemble architectures. *SIAM J. Matrix Anal. Appl.*, 9:419–454, 1988.
- [JMP83] JohMP83 O. G. Johnson, C. A. Micchelli, and G. Paul. Polynomial preconditioners for conjugate gradient calculations. *SIAM J. Numer. Anal.*, 20:362–376, 1983.

- [JO71] A. Jennings and D. R. L. Orr. Application of the simultaneous iteration method to undamped vibration problems. *Internat. J. Numer. Methods Engrg.*, 3:13–24, 1971. **JenO71**
- [JO74] L. S. Jennings and M. R. Osborne. A direct error analysis for least squares. *Numer. Math.*, 22:322–332, 1974. **JenO74**
- [JO77] A. Jennings and M. R. Osborne. Generalized eigenvalue problems for certain unsymmetric band matrices. *Linear Algebra Appl.*, 29:139–150, 1977. **JenO77**
- [Joh71] R. L. Johnston. Gershgorin theorems for partitioned matrices. *Linear Algebra Appl.*, 4:205–220, 1971. **Joh71**
- [Joh84] S. L. Johnsson. Odd-even cyclic reduction on ensemble architectures and the solution of tridiagonal systems of equations. Technical Report YALEU DCS RR-339, Computer Science, Yale University, New Haven, CT, USA, 1984. **Joh84**
- [Joh85] S. L. Johnsson. Solving narrow banded systems on ensemble architectures. *ACM Trans. Math. Software*, 11:271–288, 1985. **Joh85**
- [Joh86] S. L. Johnsson. Band matrix system solvers on ensemble architectures. In F. A. Matsen and T. Tajima, editors, *Supercomputers: Algorithms, Architectures, and Scientific Computation*, pages 196–216. University of Texas Press, Austin, TX, USA, 1986. **Joh86**
- [Joh87a] S. L. Johnsson. Communication efficient basic linear algebra computations on hypercube multiprocessors. *J. Parallel and Distrib. Comput.*, 4:133–172, 1987. **Joh87a**
- [Joh87b] S. L. Johnsson. Solving tridiagonal systems on ensemble architectures. *SIAM J. Sci. Statist. Comput.*, 8:354–392, 1987. **Joh87b**
- [Jor84] T. Jordan. Conjugate gradient preconditioners for vector and parallel processors. In G. Birkoff and A. Schoenstadt, editors, *Proceedings of the Conference on Elliptic Problem Solvers*. Academic Press, New York, NY, USA, 1984. **Jor84**
- [Jor87] H. Jordan. Interpreting parallel processor performance measurements. *SIAM J. Sci. Statist. Comput.*, 8:s220–s226, 1987. **Jor87**
- [JP71] J. Johnson and C. L. Phillips. An algorithm for the computation of **JohP71**

- the integral of the state transition matrix. *IEEE Trans. Automat. Control*, AC-16:204–205, 1971. [Kåg85] **Kag85**
- [JS75] A. Jennings and W. J. Stewart. Simultaneous iteration for the partial eigensolution of real matrices. *J. Inst. Math. Appl.*, 15:351–362, 1975. **JenS75**
- [JT87] J. E. Dennis Jr and K. Turner. Generalized conjugate directions. *Linear Algebra Appl.*, 88/89:187–209, 1987. [DenT87] **DenT87**
- [JW77] M. Jankowski and M. Wozniakowski. Iterative refinement implies numerical stability. *BIT*, 17:303–311, 1977. [JanW77] **JanW77**
- [JY83] K. C. Jea and D. M. Young. On the simplification of generalized conjugate gradient methods for nonsymmetrizable linear systems. *Linear Algebra Appl.*, 52/53:399–417, 1983. [JeaY83] **JeaY83**
- [Kåg77a] B. Kågström. Bounds and perturbation bounds for the matrix exponential. *BIT*, 17:39–57, 1977. [Kåg77a] **Kag77a**
- [Kåg77b] B. Kågström. Numerical computation of matrix functions. Technical Report UMINF-58.77, Information Processing, University of Umeå, Umeå, Sweden, 1977. [Kåg77b] **Kag77b**
- B. Kågström. The generalized singular value decomposition and the general $A-\lambda B$ problem. *BIT*, 24:568–583, 1985. **Kag85**
- B. Kågström. RGSVD: An algorithm for computing the Kronecker structure and reducing subspaces of singular $A-\lambda B$ pencils. *SIAM J. Sci. Statist. Comput.*, 7:185–211, 1986. [Kåg86] **Kag86**
- W. Kahan. Numerical linear algebra. *Canad. Math. Bull.*, 9:757–801, 1966. [Kah66] **Kah66**
- W. Kahan. Inclusion theorems for clusters of eigenvalues of Hermitian matrices. report, Computer Science, University of Toronto, Toronto, Canada, 1967. [Kah67] **Kah67**
- W. Kahan. Spectra of nearly Hermitian matrices. *Proc. Amer. Math. Soc.*, 48:11–17, 1975. [Kah75] **Kah75**
- S. Kaniel. Estimates for some computational techniques in linear algebra. *Math. Comp.*, 20:369–378, 1966. [Kan66] **Kan66**
- I. Karasalo. A criterion for truncation of the QR decomposition algorithm for the singular linear least squares problem. *BIT*, 14:156–166, 1974. [Kar74] **Kar74**

- [Kat66] Kat66 T. Kato. *Perturbation Theory for Linear Operators*. Springer-Verlag, New York, NY, USA, 1966.
- [Kau74] Kau74 L. Kaufman. The LZ algorithm to solve the generalized eigenvalue problem. *SIAM J. Numer. Anal.*, 11:997–1024, 1974.
- [Kau77] Kau77 L. Kaufman. Some thoughts on the QZ algorithm for solving the generalized eigenvalue problem. *ACM Trans. Math. Software*, 3: 65–75, 1977.
- [Kau79] Kau79 L. Kaufman. Application of dense Householder transformations to a sparse matrix. *ACM Trans. Math. Software*, 5:442–450, 1979.
- [Kau83] Kau83 L. Kaufman. Matrix methods for queueing problems. *SIAM J. Sci. Statist. Comput.*, 4:525–552, 1983.
- [Kau87] Kau87 L. Kaufman. The generalized Householder transformation and sparse matrices. *Linear Algebra Appl.*, 90:221–234, 1987.
- [KB84] KapB84 R. N. Kapur and J. C. Browne. Techniques for solving block tridiagonal systems on reconfigurable array computers. *SIAM J. Sci. Statist. Comput.*, 5:701–719, 1984.
- [KdV77] KatdV77 J. M. Van Kats and H. A. Van der Vorst. Automatic monitoring of Lanczos schemes for symmetric or skew-symmetric generalized eigenvalue problems. Technical Report TR 7, Academische Computer Centre, Utrecht, The Netherlands, 1977.
- [Ker82] Ker82 D. Kershaw. Solution of single tridiagonal linear systems and vectorization of the ICCG algorithm on the Cray-1. In G. Roderigue, editor, *Parallel Computation*. Academic Press, New York, NY, USA, 1982.
- [KF64] KubF64 V. N. Kublanovskaya and V. N. Fadeeva. Computational methods for the solution of a generalized eigenvalue problem. *Amer. Math. Soc. Transl.*, 2:271–290, 1964.
- [KG83] KauG83 J. Kautsky and G. H. Golub. On the calculation of Jacobi matrices. *Linear Algebra Appl.*, 52/53: 439–456, 1983.
- [Kie87] Kie87 A. Kielbasinski. A note on rounding error analysis of Cholesky factorization. *Linear Algebra Appl.*, 88/89:487–494, 1987.

- [KL88] KagL88 B. Kågström and P. Ling. Level 2 and 3 BLAS routines for the IBM 3090 VF/400: Implementation and experiences. Technical Report UMINF-154.88, Information Processing, University of Umeå, S-901 87 Umeå, Sweden, 1988.
- [KM86a] KriM86a A. S. Krishnakuma and M. Morf. Eigenvalues of a symmetric tridiagonal matrix: A divide and conquer approach. *Numer. Math.*, 48:349–368, 1986.
- [KM86b] KulM86b U. W. Kulisch and W. L. Miranker. The arithmetic of the digital computer. *SIAM Rev.*, 28:1–40, 1986.
- [KMN88] KahMN88 D. Kahaner, C. B. Moler, and S. Nash. *Numerical Methods and Software*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1988.
- [KNP87] KagNP87 B. Kågström, L. Nyström, and P. Poromaa. Parallel algorithms for solving the triangular Sylvester equation on a hypercube multiprocessor. Technical Report UMINF-136.87, Information Processing, University of Umeå, S-901 87 Umeå, Sweden, 1987.
- [KNP88] KagNP88 B. Kågström, L. Nyström, and P. Poromaa. Parallel shared memory algorithms for solving the triangular Sylvester equation. Technical Report UMINF-155.88, Information Processing, University of Umeå, S-901 87 Umeå, Sweden, 1988.
- [Knu81] Knu81 D. Knuth. *Seminumerical Algorithms*, volume 2 of *The Art of Computer Programming*. Addison-Wesley, Reading, MA, USA, second edition, 1981.
- [Kog55] Kog55 E. G. Kogbetliantz. Solution of linear equations by diagonalization of coefficient matrix. *Quart. Appl. Math.*, 13:123–132, 1955.
- [KP74] KahP74 W. Kahan and B. N. Parlett. An analysis of Lanczos algorithms for symmetric matrices. Technical Report ERL-M467, University of California, Berkeley, Berkeley, CA, USA, 1974.
- [KP76] KahP76 W. Kahan and B. N. Parlett. How far should you go with the Lanczos process? In J. Bunch and D. Rose, editors, *Sparse Matrix Computations*, pages 131–144. Academic Press, New York, NY, USA, 1976.
- [KP81] KouP81 S. Kourouklis and C. C. Paige. A constrained least squares approach to the general Gauss-Markov linear model. *J. Amer. Statist. Assoc.*, 76:620–625, 1981.

- [KPJ82] KahPJ82 W. Kahan, B. N. Parlett, and E. Jiang. Residual bounds on approximate eigensystems of non-normal matrices. *SIAM J. Numer. Anal.*, 19:470–484, 1982.
- [KR80a] KagR80a B. Kågström and A. Ruhe. Algorithm 560 JNF: An algorithm for numerical computation of the Jordan normal form of a complex matrix. *ACM Trans. Math. Software*, 6:437–443, 1980.
- [KR80b] KagR80b B. Kågström and A. Ruhe. An algorithm for numerical computation of the Jordan normal form of a complex matrix. *ACM Trans. Math. Software*, 6:398–419, 1980.
- [KR83] KagR83 B. Kågström and A. Ruhe, editors. *Proceedings of the Conference on Matrix Pencils, Pite Havsbad 1982*, volume 973 of *Lecture Notes in Mathematics*. Springer-Verlag, New York and Berlin, 1983.
- [Kub61] Kub61 V. N. Kublanovskaya. On some algorithms for the solution of the complete eigenvalue problem. *U. S. S. R. Comput. Math. and Math. Phys.*, 3:637–657, 1961.
- [Kun82] Kun82 H. T. Kung. Why systolic architectures? *IEEE Computer*, 15:37–46, 1982.
- [KW87] KagW87 B. Kågström and L. Westin. GSYLV- Fortran routines for the generalized Schur method with dif^{-1} estimators for solving the generalized Sylvester equation. Technical Report UMINF-132.86, Information Processing, University of Umeå, S-901 87 Umeå, Sweden, 1987.
- [Lan50] Lan50 C. Lanczos. An iteration method for the solution of the eigenvalue problem of linear differential and integral operators. *J. Res. Nat. Bur. Standards*, 45:255–282, 1950.
- [Lan70] Lan70 P. Lancaster. Explicit solution of linear matrix equations. *SIAM Rev.*, 12:544–566, 1970.
- [Lau81] Lau81 A. Laub. Efficient multivariable frequency response computations. *IEEE Trans. Automat. Control*, AC-26:407–408, 1981.
- [Lau85] Lau85 A. Laub. Numerical linear algebra aspects of control design computations. *IEEE Trans. Automat. Control*, AC-30:97–108, 1985.
- [LC88] LiC88 G. Li and T. Coleman. A parallel triangular solver for a distributed-memory multiprocessor. *SIAM J. Sci. Statist. Comput.*, 9:485–502, 1988.

- [Leh63] N. J. Lehmann. Optimale Eigenwerteschliessungen. *Numer. Math.*, 5:246–272, 1963. **Leh63**
- [Lem73] F. Lemeire. Bounds for condition numbers of triangular and trapezoid matrices. *BIT*, 15:58–64, 1973. **Lem73**
- [Leo80] S. J. Leon. *Linear Algebra with Applications*. Macmillan, New York, NY, USA, 1980. **Leo80**
- [Lev47] N. Levinson. The Weiner RMS error criterion in filter design and prediction. *J. Math. Phys.*, 25:261–278, 1947. **Lev47**
- [Lew77] J. Lewis. Algorithms for sparse matrix eigenvalue problems. Technical Report STAN-CS-77-595, Department of Computer Science, Stanford University, Stanford, CA, USA, 1977. **Lew77**
- [LH69] C. L. Lawson and R. J. Hanson. Extensions and applications of the Householder algorithm for solving linear least squares problems. *Math. Comp.*, 23:787–812, 1969. **LawH69**
- [LH74] C. L. Lawson and R. J. Hanson. *Solving Least Squares Problems*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1974. **LawH74**
- [LHKK79a] C. L. Lawson, R. J. Hanson, D. R. Kincaid, and F. T. Krogh. Algorithm 539: Basic linear algebra subprograms for Fortran usage. *ACM Trans. Math. Software*, 5:324–325, 1979. **LawHKK79a**
- [LHKK79b] C. L. Lawson, R. J. Hanson, D. R. Kincaid, and F. T. Krogh. Basic linear algebra subprograms for Fortran usage. *ACM Trans. Math. Software*, 5:308–323, 1979. **LawHKK79b**
- [Lin61] I. Linnik. *Method of Least Squares and Principles of the Theory of Observation*. Pergamon Press, New York, NY, USA, 1961. **Lin61**
- [LO83] E. Lusk and R. Overbeek. Implementation of monitors with macros: A programming aid for the HEP and other parallel processors. Technical Report 83-97, Argonne National Laboratory, Argonne, ILL, 1983. **LusO83**
- [Loa73] C. F. Van Loan. *Generalized Singular Values with Algorithms and Applications*. PhD thesis, University of Michigan, Ann Arbor, MI, USA, 1973. **Loa73**
- [Loa75a] C. F. Van Loan. A general matrix eigenvalue algorithm. *SIAM J. Numer. Anal.*, 12:819–834, 1975. **Loa75a**

- [Loa75b] C. F. Van Loan. A study of the matrix exponential. Technical Report 10, Numerical Analysis, University of Manchester, UK, 1975. **Loa75b**
- [Loa76] C. F. Van Loan. Generalizing the singular value decomposition. *SIAM J. Numer. Anal.*, 13:76–83, 1976. **Loa76**
- [Loa77a] C. F. Van Loan. On the limitation and application of the Padé approximation to the matrix exponential. In E. B. Saff and R. S. Varga, editors, *Padé and Rational Approximation*. Academic Press, New York, NY, USA, 1977. **Loa77a**
- [Loa77b] C. F. Van Loan. The sensitivity of the matrix exponential. *SIAM J. Numer. Anal.*, 14:971–981, 1977. **Loa77b**
- [Loa78a] C. F. Van Loan. Computing integrals involving the matrix exponential. *IEEE Trans. Automat. Control*, AC-23:395–404, 1978. **Loa78a**
- [Loa78b] C. F. Van Loan. A note on the evaluation of matrix polynomials. *IEEE Trans. Automat. Control*, AC-24:320–321, 1978. **Loa78b**
- [Loa82] C. F. Van Loan. Using the Hessenberg decomposition in control theory. In D. C. Sorensen and R. J. Wets, editors, *Algorithms and Theory in Filtering and Control*, number 18 in Mathematical Programming Study, pages 102–111. North-Holland, Amsterdam, The Netherlands, 1982. **Loa82**
- [Loa83] C. F. Van Loan. A generalized SVD analysis of some weighting methods for equality-constrained least squares. In B. Kågström and A. Ruhe, editors, *Proceedings of the Conference on Matrix Pencils*. Springer-Verlag, New York, NY, USA, 1983. **Loa83**
- [Loa84] C. F. Van Loan. A symplectic method for approximating all the eigenvalues of a Hamiltonian matrix. *Linear Algebra Appl.*, 61:233–252, 1984. **Loa84**
- [Loa85a] C. F. Van Loan. Computing the CS and generalized singular value decomposition. *Numer. Math.*, 46:479–492, 1985. **Loa85a**
- [Loa85b] C. F. Van Loan. How near is a stable matrix to an unstable matrix? *Contemp. Math.*, 47:465–477, 1985. **Loa85b**
- [Loa85c] C. F. Van Loan. On the method of weighting for equality con-

- strained least squares problems. *SIAM J. Numer. Anal.*, 22:851–864, 1985.
- [Loa87] C. F. Van Loan. On estimating the condition of eigenvalues and eigenvectors. *Linear Algebra Appl.*, 88/89:715–732, 1987. **Loa87**
- [Loi69] G. Loizou. Nonnormality and Jordan condition numbers of matrices. *J. Assoc. Comput. Mach.*, 16:580–584, 1969. **Loi69**
- [Loi72] G. Loizou. On the quadratic convergence of the Jacobi method for normal matrices. *Comput. J.*, 15:274–276, 1972. **Loi72**
- [Lot56] M. Lotkin. Characteristic values of arbitrary matrices. *Quart. Appl. Math.*, 14:267–275, 1956. **Lot56**
- [LPS87] S. Lo, B. Philippe, and A. Sameh. A multiprocessor algorithm for the symmetric tridiagonal eigenvalue problem. *SIAM J. Sci. Statist. Comput.*, 8:s155–s165, 1987. **LoPS87**
- [LS78] J. Larson and A. Sameh. Efficient calculation of the effects of roundoff errors. *ACM Trans. Math. Software*, 4:228–236, 1978. **LarS78**
- [LT85] P. Lancaster and M. Tismenetsky. *The Theory of Matrices*. Academic Press, New York, NY, USA, second edition, 1985. **LanT85**
- [Lue73] D. G. Luenberger. *Introduction to Linear and Nonlinear Programming*. Addison-Wesley, New York, NY, USA, 1973. **Lue73**
- [Luk78] F. T. Luk. *Sparse and Parallel Matrix Computations*. PhD thesis, Computer Science, Stanford University, Stanford, CA, USA, 1978. **Luk78**
- [Luk80] F. T. Luk. Computing the singular value decomposition on the ILLIAC IV. *ACM Trans. Math. Software*, 6:524–539, 1980. **Luk80**
- [Luk86a] F. T. Luk. A rotation method for computing the QR factorization. *SIAM J. Sci. Statist. Comput.*, 7:452–459, 1986. **Luk86a**
- [Luk86b] F. T. Luk. A triangular processor array for computing singular values. *Linear Algebra Appl.*, 77:259–274, 1986. **Luk86b**
- [LV75] J. Lambiotte and R. G. Voigt. The solution of tridiagonal linear systems on the CDC-STAR 100 computer. *ACM Trans. Math. Software*, 1:308–329, 1975. **LamV75**
- [Mad59] A. Madansky. The fitting of straight lines when both variables

- are subject to error. *J. Amer. Statist. Assoc.*, 54:173–205, 1959. **McK62**
- [Mah79] K. N. Mahindar. Linear combinations of Hermitian and real symmetric matrices. *Linear Algebra Appl.*, 25:95–105, 1979. **Mah79**
- [Mak75] J. Makhoul. Linear prediction: A tutorial review. *Proc. IEEE*, 63(4):561–580, 1975. **Mak75**
- [Man77] T. A. Manteuffel. The Tchebychev iteration for nonsymmetric linear systems. *Numer. Math.*, 28:307–327, 1977. **Man77**
- [Man79] T. A. Manteuffel. Shifted incomplete Cholesky factorization. In I. S. Duff and G. W. Stewart, editors, *Sparse Matrix Proceedings 1978*. SIAM Publications, Philadelphia, PA, USA, 1979. **Man79**
- [MC86] J. J. Modi and M. R. B. Clarke. An alternative Givens ordering. *Numer. Math.*, 43:83–90, 1986. **ModC86**
- [McC72] S. F. McCormick. A general approach to one-step iterative methods with application to eigenvalue problems. *J. Comput. System Sci.*, 6:354–372, 1972. **McC72**
- [McK62] W. M. McKeeman. Crout with equilibration and iteration. *Comm. ACM*, 5:553–555, 1962. **McK62**
- [MdV77] J. A. Meijerink and H. A. Van der Vorst. An iterative solution method for linear equations systems of which the coefficient matrix is a symmetric M -matrix. *Math. Comp.*, 31:148–162, 1977. **MdV77**
- [Mei83] J. Meinguet. Refined error analyses of Cholesky factorization. *SIAM J. Numer. Anal.*, 20:1243–1250, 1983. **Mei83**
- [Mel87] R. Melhem. Toward efficient implementation of preconditioned conjugate gradient methods on vector supercomputers. *Internat. J. Supercomputing Applic.*, 1:70–98, 1987. **Mel87**
- [Mer85] M. L. Merriam. On the factorization of block tridiagonals with storage constraints. *SIAM J. Sci. Statist. Comput.*, 6:182–192, 1985. **Mer85**
- [Meu84] G. Meurant. The block preconditioned conjugate gradient method on vector computers. *BIT*, 24:623–633, 1984. **Meu84**
- [Meu89] G. Meurant. Domain decomposition methods for partial differen-

- tial equations on parallel computers. *Internat. J. Supercomputing Applic.*, 1989. To appear.
- [MG76] J. Markel and A. Gray. *Linear Prediction of Speech*. Springer-Verlag, Berlin and New York, 1976.
- [Mil75] W. Miller. Computational complexity and numerical stability. *SIAM J. Comput.*, 4:97–107, 1975.
- [Mir55] L. Mirsky. *An Introduction to Linear Algebra*. Oxford University Press, London, UK, 1955.
- [Mir60] L. Mirsky. Symmetric gauge functions and unitarily invariant norms. *Quart. J. Math. Oxford Ser. (2)*, 11:50–59, 1960.
- [ML78] C. B. Moler and C. F. Van Loan. Nineteen dubious ways to compute the exponential of a matrix. *SIAM Rev.*, 20:801–836, 1978.
- [ML82] R. Montoye and D. Laurie. A practical algorithm for the solution of triangular systems on a parallel processing system. *IEEE Trans. Comput.*, C-31:1076–1082, 1982.
- [MLB87] C. B. Moler, J. N. Little, and S. Bangert. *PC-Matlab Users Guide*. 20 N. Main St., Sherborn, MA, USA, 1987.
- [MM64] M. Marcus and H. Minc. *A Survey of Matrix Theory and Matrix Inequalities*. Allyn and Bacon, Boston, MA, USA, 1964.
- [MM83] C. B. Moler and D. Morrison. Singular value analysis of cryptograms. *Amer. Math. Monthly*, 90:78–87, 1983.
- [Mod88] J. J. Modi. *Parallel Algorithms and Matrix Computation*. Oxford University Press, Oxford, UK, 1988.
- [Mol67] C. B. Moler. Iterative refinement in floating point. *J. Assoc. Comput. Mach.*, 14:316–371, 1967.
- [Mol80] C. B. Moler. MATLAB user's guide. Technical Report CS81-1, Computer Science, University of New Mexico, Albuquerque, NM, USA, 1980.
- [Mol86] C. B. Moler. Matrix computations on distributed memory multiprocessors. In M. T. Heath, editor, *Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1986.
- [MP74] M. A. Malcolm and J. Palmer. A fast method for solving a class

- of tridiagonal systems of linear equations. *Comm. ACM*, 17:14–17, 1974.
- [MP82] G. Miminis and C. C. Paige. An algorithm for pole assignment of time invariant linear systems. *Internat. J. Control*, 35:341–354, 1982.
- [MP85] J. J. Modi and J. D. Pryce. Efficient implementation of Jacobi’s diagonalization method on the DAP. *Numer. Math.*, 46:443–454, 1985.
- [MPW65] R. S. Martin, G. Peters, and J. H. Wilkinson. Symmetric decomposition of a positive definite matrix. *Numer. Math.*, 7:362–383, 1965. Also in [WR71, pages 9–30].
- [MPW66] R. S. Martin, G. Peters, and J. H. Wilkinson. Iterative refinement of the solution of a positive definite system of equations. *Numer. Math.*, 8:203–216, 1966. Also in [WR71, pages 31–44].
- [MPW70] R. S. Martin, G. Peters, and J. H. Wilkinson. The QR algorithm for real Hessenberg matrices. *Numer. Math.*, 14:219–231, 1970. Also in [WR71, pages 359–371].
- [MRK76] N. Madsen, G. Roderigue, and J. Karush. Matrix multiplication by diagonals of a vector parallel processor. *Inform. Process. Lett.*, pages 41–45, 1976.
- [MRW70] R. S. Martin, C. Reinsch, and J. H. Wilkinson. The QR algorithm for band symmetric matrices. *Numer. Math.*, 16:85–92, 1970. Also in [WR71, pages 266–272].
- [MS73a] C. McCarthy and G. Strang. Optimal conditioning of matrices. *SIAM J. Numer. Anal.*, 10:370–388, 1973.
- [MS73b] C. B. Moler and G. W. Stewart. An algorithm for generalized matrix eigenvalue problems. *SIAM J. Numer. Anal.*, 10:241–256, 1973.
- [MS78] W. Miller and D. Spooner. Software for roundoff analysis, II. *ACM Trans. Math. Software*, 4:369–390, 1978.
- [Mue66] D. Mueller. Householder’s method for complex matrices and Hermitian matrices. *Numer. Math.*, 8:72–92, 1966.
- [MvdV87] O. McBryan and E. F. van de Velde. Hypercube algorithms

MadRK76**MimP82****MarRW70****ModP85****McCS73a****MarPW65****MolS73b****MarPW66****MilS78****MarPW70****Mue66****MvdV87**

- and implementations. *SIAM J. Sci. Statist. Comput.*, 8:s227–s287, 1987. **MarW68c**
- [MW31] F. D. Murnaghan and A. Wintner. A canonical form for real matrices under orthogonal transformations. *Proc. Nat. Acad. Sci. U. S. A.*, 17:417–420, 1931. **MurW31**
- [MW65] R. S. Martin and J. H. Wilkinson. Symmetric decomposition of positive definite band matrices. *Numer. Math.*, 7:355–361, 1965. Also in [WR71, pages 50–56]. **MarW65**
- [MW67] R. S. Martin and J. H. Wilkinson. Solution of symmetric and unsymmetric band equations and the calculation of eigenvalues of band matrices. *Numer. Math.*, 9:279–301, 1967. Also in [WR71, pages 70–92]. **MarW67**
- [MW68a] R. S. Martin and J. H. Wilkinson. Householder’s tridiagonalization of a symmetric matrix. *Numer. Math.*, 11:181–195, 1968. Also in [WR71, pages 212–226]. **MarW68a**
- [MW68b] R. S. Martin and J. H. Wilkinson. The modified LR algorithm for complex Hessenberg matrices. *Numer. Math.*, 12:369–376, 1968. Also in [WR71, pages 396–403]. **MarW68b**
- [MW68c] R. S. Martin and J. H. Wilkinson. Reduction of the symmetric eigenproblem $Ax = \lambda Bx$ and related problems to standard form. *Numer. Math.*, 11:99–110, 1968. **MarW68c**
- [MW68d] R. S. Martin and J. H. Wilkinson. Similarity reduction of a general matrix to Hessenberg form. *Numer. Math.*, 12:349–368, 1968. Also in [WR71, pages 339–358]. **MarW68d**
- [Nan85] T. Nanda. Differential equations and the QR algorithm. *SIAM J. Numer. Anal.*, 22:310–321, 1985. **Nan85**
- [Nas75] J. C. Nash. A one-sided transformation method for the singular value decomposition and algebraic eigenproblem. *Comput. J.*, 18:74–76, 1975. **Nas75**
- [Nas76] M. Z. Nashed. *Generalized Inverses and Applications*. Academic Press, New York, NY, USA, 1976. **Nas76**
- [ND77] B. Noble and J. W. Daniel. *Applied Linear Algebra*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1977. **NobD77**
- [Nic74] R. A. Nicolaides. On a geometrical aspect of SOR and the theory of consistent ordering for positive **Nic74**

- definite matrices. *Numer. Math.*, 23:99–104, 1974. **Opp78**
- [NV75] A. Noor and R. Voigt. Hypermatrix scheme for the STAR-100 computer. *Comput. & Structures*, 5:287–296, 1975. **NooV75**
- [NV83] W. Niethammer and R. S. Varga. The analysis of k -step iterative methods for linear systems from summability theory. *Numer. Math.*, 41:177–206, 1983. **NieV83**
- [O’L76] D. P. O’Leary. *Hybrid Conjugate Gradient Algorithms*. PhD thesis, Computer Science, Stanford University, Stanford, CA, USA, 1976. **OLe76**
- [O’L80a] D. P. O’Leary. The block conjugate gradient algorithm and related methods. *Linear Algebra Appl.*, 29:293–322, 1980. **OLe80a**
- [O’L80b] D. P. O’Leary. Estimating matrix condition numbers. *SIAM J. Sci. Statist. Comput.*, 1:205–209, 1980. **OLe80b**
- [OP64] W. Oettli and W. Prager. Compatibility of approximate solutions of linear equations with given error bounds for coefficients and right hand sides. *Numer. Math.*, 6:405–409, 1964. **OetP64**
- [Opp78] A. V. Oppenheim. *Applications of Digital Signal Processing*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1978. **Opp78**
- [Ort88] J. M. Ortega and C. H. Romine. The ijk forms of factorization methods II: Parallel systems. *Parallel Comput.*, 7:149–162, 1988. **OrtR88**
- [Ort72] J. M. Ortega. *Numerical Analysis: A Second Course*. Academic Press, New York, NY, USA, 1972. **Ort72**
- [Ort88] J. M. Ortega. *Matrix Theory: A Second Course*. Plenum Press, New York, NY, USA, 1988. **Ort88**
- [OS81] D. P. O’Leary and J. A. Simmons. A bidiagonalization - regularization procedure for large scale discretizations of ill-posed problems. *SIAM J. Sci. Statist. Comput.*, 2:474–489, 1981. **OLeS81**
- [OS85] D. P. O’Leary and G. W. Stewart. Data flow algorithms for parallel matrix computations. *Comm. ACM*, 28:841–853, 1985. **OLeS85**
- [OS86] D. P. O’Leary and G. W. Stewart. Assignment and scheduling in parallel matrix factoriza- **OLeS86**

- tion. *Linear Algebra Appl.*, 77: 275–300, 1986.
- [Osb60] E. E. Osborne. On preconditioning of matrices. *J. Assoc. Comput. Mach.*, 7:338–345, 1960.
- [OV85] J. M. Ortega and R. G. Voigt. Solution of partial differential equations on vector and parallel computers. *SIAM Rev.*, 27:149–240, 1985.
- [Paa71] M. H. C. Paardekooper. An eigenvalue algorithm for skew symmetric matrices. *Numer. Math.*, 17:189–202, 1971.
- [Pai70] C. C. Paige. Practical use of the symmetric Lanczos process with reorthogonalization. *BIT*, 10:183–195, 1970.
- [Pai71] C. C. Paige. *The Computation of Eigenvalues and Eigenvectors of Very Large Sparse Matrices*. PhD thesis, London University, London, UK, 1971.
- [Pai73] C. C. Paige. An error analysis of a method for solving matrix equations. *Math. Comp.*, 27:355–359, 1973.
- [Pai74a] C. C. Paige. Bidiagonalization of matrices and solution of linear equations. *SIAM J. Numer. Anal.*, 11:197–209, 1974.
- [Pai74b] C. C. Paige. Eigenvalues of perturbed Hermitian matrices. *Linear Algebra Appl.*, 8:1–10, 1974.
- [Pai76] C. C. Paige. Error analysis of the Lanczos algorithm for tridiagonalizing a symmetric matrix. *J. Inst. Math. Appl.*, 18:341–349, 1976.
- [Pai79a] C. C. Paige. Computer solution and perturbation analysis of generalized least squares problems. *Math. Comp.*, 33:171–184, 1979.
- [Pai79b] C. C. Paige. Fast numerically stable computations for generalized linear least squares problems. *SIAM J. Numer. Anal.*, 16: 165–171, 1979.
- [Pai80] C. C. Paige. Accuracy and effectiveness of the Lanczos algorithm for the symmetric eigenproblem. *Linear Algebra Appl.*, 34:235–258, 1980.
- [Pai81] C. C. Paige. Properties of numerical algorithms related to computing controllability. *IEEE Trans. Automat. Control*, AC-26: 130–138, 1981.

- [Pai84] C. C. Paige. A note on a result of Sun J.-Guang: Sensitivity of the CS and GSV decompositions. *SIAM J. Numer. Anal.*, 21:186–191, 1984. **Pai84**
- [Pai85] C. C. Paige. The general linear model and the generalized singular value decomposition. *Linear Algebra Appl.*, 70:269–284, 1985. **Pai85**
- [Pai86] C. C. Paige. Computing the generalized singular value decomposition. *SIAM J. Sci. Statist. Comput.*, 7:1126–1146, 1986. **Pai86**
- [Pan84] V. Pan. How can we speed up matrix multiplication? *SIAM Rev.*, 26:393–416, 1984. **Pan84**
- [Par65] B. N. Parlett. Convergence of the QR algorithm. *Numer. Math.*, 7:187–193, 1965. Correction in *Numerische Mathematik* 10, pp. 163–164. **Par65**
- [Par66] B. N. Parlett. Singular and invariant matrices under the QR algorithm. *Math. Comp.*, 20:611–615, 1966. **Par66**
- [Par67] B. N. Parlett. Canonical decomposition of Hessenberg matrices. *Math. Comp.*, 21:223–227, 1967. **Par67**
- [Par68] B. N. Parlett. Global convergence of the basic QR algorithm on Hessenberg matrices. *Math. Comp.*, 22:803–817, 1968. **Par68**
- [Par71] B. N. Parlett. Analysis of algorithms for reflections in bisectors. *SIAM Rev.*, 13:197–208, 1971. **Par71**
- [Par74a] B. N. Parlett. Computation of functions of triangular matrices. Memorandum ERL-M481, Electronics Research Laboratory, College of Engineering, University of California, Berkeley, Berkeley, CA, USA, 1974. **Par74a**
- [Par74b] B. N. Parlett. The Rayleigh quotient iteration and some generalizations for nonnormal matrices. *Math. Comp.*, 28:679–693, 1974. **Par74b**
- [Par76] B. N. Parlett. A recurrence among the elements of functions of triangular matrices. *Linear Algebra Appl.*, 14:117–121, 1976. **Par76**
- [Par80a] B. N. Parlett. A new look at the Lanczos algorithm for solving symmetric systems and linear equations. *Linear Algebra Appl.*, 29:323–346, 1980. **Par80a**
- [Par80b] B. N. Parlett. *The Symmetric Eigenvalue Problem*. Prentice-

- Hall, Englewood Cliffs, NJ, USA, 1980. **Ple74**
- [PD86] C. C. Paige and P. Van Dooren. On the quadratic convergence of Kogbetliantz's algorithm for computing the singular value decomposition. *Linear Algebra Appl.*, 77:301–313, 1986. **PaiD86** [Ple74]
- [Pea01] K. Pearson. On lines and planes of closest fit to points in space. *Philos. Mag.*, 2:559–572, 1901. **Pea01**
- [Phi71] J. L. Phillips. The triangular decomposition of Hankel matrices. *Math. Comp.*, 25:599–602, 1971. **Phi71** [PNO85]
- [PJ84] N. Patel and H. Jordan. A parallelized point rowwise successive over-relaxation method on a multiprocessor. *Parallel Comput.*, 1: 207–222, 1984. **PatJ84** [PO87]
- [PJV87] A. Pothén, S. Jha, and U. Vemagulati. Orthogonal factorization on a distributed memory multiprocessor. In M. T. Heath, editor, *Hypercube Multiprocessors*. SIAM Publications, Philadelphia, PA, USA, 1987. **PotJV87** [PP73]
- [PL81] C. C. Paige and C. Van Loan. A Schur decomposition for Hamiltonian matrices. *Linear Algebra Appl.*, 41:11–32, 1981. **PaiL81** [PR68]
- R. J. Plemmons. Linear least squares by elimination and MGS. *J. Assoc. Comput. Mach.*, 21: 581–585, 1974. **Ple86**
- R. J. Plemmons. A parallel block iterative scheme applied to computations in structural analysis. *SIAM J. Algebraic Discrete Methods*, 7:337–347, 1986. **ParNO85**
- B. N. Parlett and B. Nour-Omid. The use of a refined error bound when updating eigenvalues of tridiagonals. *Linear Algebra Appl.*, 68:179–220, 1985. **PooO87**
- E. L. Poole and J. M. Ortega. Multicolor ICCG methods for vector computers. *SIAM J. Numer. Anal.*, 24:1394–1418, 1987. **ParP73**
- B. N. Parlett and W. G. Poole. A geometric theory for the QR, LU, and power iterations. *SIAM J. Numer. Anal.*, 10:389–412, 1973. **PowR68**
- M. J. D. Powell and J. K. Reid. On applying Householder's method to linear least squares problems. In *Proceedings IFIP Congress*, pages 122–126, 1968. **ParR69**
- B. N. Parlett and C. Reinsch. Balancing a matrix for calcula-

- tion of eigenvalues and eigenvectors. *Numer. Math.*, 13:292–304, 1969. Also in [WR71, pages 315–326].
- [PR70] B. N. Parlett and J. K. Reid. On the solution of a system of linear equations whose matrix is symmetric but not definite. *BIT*, 10:386–397, 1970.
- [PR81] B. N. Parlett and J. K. Reid. Tracking the progress of the Lanczos algorithm for large symmetric eigenproblems. *IMA J. Numer. Anal.*, 1:135–155, 1981.
- [Pry84] J. D. Pryce. A new measure of relative error for vectors. *SIAM J. Numer. Anal.*, 21:202–221, 1984.
- [Pry85] J. D. Pryce. Multiplicative error analysis of matrix transformation algorithms. *IMA J. Numer. Anal.*, 5:437–445, 1985.
- [PS73] M. S. Paterson and L. J. Stockmeyer. On the number of non-scalar multiplications necessary to evaluate polynomials. *SIAM J. Comput.*, 2:60–66, 1973.
- [PS75] C. C. Paige and M. A. Saunders. Solution of sparse indefinite systems of linear equations. *SIAM J. Numer. Anal.*, 12:617–629, 1975.
- [PS78] C. C. Paige and M. A. Saunders. A bidiagonalization algorithm for sparse linear equations and least squares problems. Technical Report SOL 78-19, Operations Research, Stanford University, Stanford, CA, USA, 1978.
- [PS79] B. N. Parlett and D. S. Scott. The Lanczos algorithm with selective orthogonalization. *Math. Comp.*, 33:217–238, 1979.
- [PS81] C. C. Paige and M. Saunders. Towards a generalized singular value decomposition. *SIAM J. Numer. Anal.*, 18:398–405, 1981.
- [PS82a] C. C. Paige and M. A. Saunders. Algorithm 583 LSQR: Sparse linear equations and least squares problems. *ACM Trans. Math. Software*, 8:195–209, 1982.
- [PS82b] C. C. Paige and M. A. Saunders. LSQR: An algorithm for sparse linear equations and sparse least squares. *ACM Trans. Math. Software*, 8:43–71, 1982.
- [PSS82] B. N. Parlett, H. Simon, and L. M. Stringer. On estimating the largest eigenvalue with the Lanczos algorithm. *Math. Comp.*, 38:153–166, 1982.

- [PT57] PopT57 D. A. Pope and C. Tompkins. Maximizing functions of rotations: Experiments concerning speed of diagonalization of symmetric matrices using Jacobi's method. *J. Assoc. Comput. Mach.*, 4:459–466, 1957.
- [PW69] PetW69 G. Peters and J. H. Wilkinson. Eigenvalue of $Ax = \lambda Bx$ with band symmetric A and B . *Comput. J.*, 12:398–404, 1969.
- [PW70a] PetW70a G. Peters and J. H. Wilkinson. $Ax = \lambda Bx$ and the generalized eigenproblem. *SIAM J. Numer. Anal.*, 7:479–492, 1970.
- [PW70b] PetW70b G. Peters and J. H. Wilkinson. The least squares problem and pseudo-inverses. *Comput. J.*, 13:309–316, 1970.
- [PW71] PetW71 G. Peters and J. H. Wilkinson. The calculation of specified eigenvectors by inverse iteration. In J. H. Wilkinson and C. Reinsch, editors, *Handbook for Automatic Computation Vol. 2: Linear Algebra*, pages 418–439. Springer-Verlag, New York, NY, USA, 1971.
- [PW79] PetW79 G. Peters and J. H. Wilkinson. Inverse iteration, ill-conditioned equations, and Newton's method. *SIAM Rev.*, 21:339–360, 1979.
- [Rat82] Rat82 W. Rath. Fast Givens rotations for orthogonal similarity. *Numer. Math.*, 40:47–56, 1982.
- [RB68] ReiB68 C. Reinsch and F. L. Bauer. Rational QR transformations with Newton's shift for symmetric tridiagonal matrices. *Numer. Math.*, 11:264–272, 1968. Also in [WR71, pages 257–265].
- [Rei67] Rei67 J. K. Reid. A note on the least squares solution of a band system of linear equations by Householder reductions. *Comput. J.*, 10:188–189, 1967.
- [Rei71a] Rei71a J. K. Reid. A note on the stability of Gaussian elimination. *J. Inst. Math. Appl.*, 8:374–375, 1971.
- [Rei71b] Rei71b J. K. Reid. On the method of conjugate gradients for the solution of large sparse linear equations. In J. K. Reid, editor, *Large Sparse Sets of Linear Equations*, pages 231–254. Academic Press, New York, NY, USA, 1971.
- [Rei72] Rei72 J. K. Reid. The use of conjugate gradients for systems of linear equations possessing property A. *SIAM J. Numer. Anal.*, 9:325–332, 1972.

- [Ric66a] J. R. Rice. Experiments on Gram-Schmidt orthogonalization. *Math. Comp.*, 20:325–328, 1966. **Ric66b**
- [Ric66b] J. R. Rice. A theory of condition. *SIAM J. Numer. Anal.*, 3: 287–310, 1966. **Ric66a**
- [Ric81] J. R. Rice. *Matrix Computations and Mathematical Software*. Academic Press, New York, NY, USA, 1981. **Ric81**
- [Rin55] R. F. Rinehart. The equivalence of definitions of a matrix function. *Amer. Math. Monthly*, 62: 395–414, 1955. **Rin55**
- [Ris73] J. Rissanen. Algorithms for triangular decomposition of block Hankel and Toeplitz matrices with application to factoring positive matrix polynomials. *Math. Comp.*, 27:147–154, 1973. **Ris73**
- [RO88] C. H. Romine and J. M. Ortega. Parallel solution of triangular systems of equations. *Parallel Comput.*, 6:109–114, 1988. **RomO88**
- [Rob77] H. H. Robertson. The accuracy of error estimates for systems of linear algebraic equations. *J. Inst. Math. Appl.*, 20:409–414, 1977. **Rob77**
- [Rod73] G. Rodrigue. A gradient method for the matrix eigenvalue problem $Ax = \lambda Bx$. *Numer. Math.*, 22:1–16, 1973. **Rod73**
- [Rod82a] G. Roderigue, editor. *Parallel Computations*. Academic Press, New York, NY, USA, 1982. **Rod82a**
- [Rod82b] G. Roderigue, editor. *Parallel Computations*. Academic Press, New York, NY, USA, 1982. **Rod82b**
- [Ros69] D. J. Rose. An algorithm for solving a special class of tridiagonal systems of linear equations. *Comm. ACM*, 12:234–236, 1969. **Ros69**
- [Ruh67] A. Ruhe. On the quadratic convergence of the Jacobi method for normal matrices. *BIT*, 7:305–313, 1967. **Ruh67**
- [Ruh68] A. Ruhe. On the quadratic convergence of a generalization of the Jacobi method to arbitrary matrices. *BIT*, 8:210–231, 1968. **Ruh68**
- [Ruh69a] A. Ruhe. An algorithm for numerical determination of the structure of a general matrix. *BIT*, 10:196–216, 1969. **Ruh69a**

- [Ruh69b] **Ruh69b** A. Ruhe. The norm of a matrix after a similarity transformation. *BIT*, 9:53–58, 1969.
- [Ruh70a] **Ruh70a** A. Ruhe. Perturbation bounds for means of eigenvalues and invariant subspaces. *BIT*, 10:343–354, 1970.
- [Ruh70b] **Ruh70b** A. Ruhe. Properties of a matrix with a very ill-conditioned eigenproblem. *Numer. Math.*, 15:57–60, 1970.
- [Ruh74] **Ruh74** A. Ruhe. SOR methods for the eigenvalue problem with large sparse matrices. *Math. Comp.*, 28:695–710, 1974.
- [Ruh75] **Ruh75** A. Ruhe. On the closeness of eigenvalues and singular values for almost normal matrices. *Linear Algebra Appl.*, 11:87–94, 1975.
- [Ruh78] **Ruh78** A. Ruhe. A note on the efficient solution of matrix pencil systems. *BIT*, 18:276–281, 1978.
- [Ruh79] **Ruh79** A. Ruhe. Implementation aspects of band Lanczos algorithms for computation of eigenvalues of large sparse symmetric matrices. *Math. Comp.*, 33:680–687, 1979.
- [Ruh83] **Ruh83** A. Ruhe. Numerical aspects of Gram-Schmidt orthogonalization of vectors. *Linear Algebra Appl.*, 52/53:591–602, 1983.
- [Ruh87] **Ruh87** A. Ruhe. Closest normal matrix found! *BIT*, 27:585–598, 1987.
- [Rut58] **Rut58** H. Rutishauser. Solution of eigenvalue problems with the WR transformation. In *Applied Mathematics Series*, volume 49, pages 47–81. National Bureau of Standards, 1958.
- [Rut66] **Rut66** H. Rutishauser. The Jacobi method for real symmetric matrices. *Numer. Math.*, 9:1–10, 1966. Also in [WR71, pages 202–211].
- [Rut69] **Rut69** H. Rutishauser. Computation aspects of F.L. Bauer’s simultaneous iteration method. *Numer. Math.*, 13:4–13, 1969.
- [Rut70] **Rut70** H. Rutishauser. Simultaneous iteration method for symmetric matrices. *Numer. Math.*, 16:205–223, 1970. Also in [WR71, pages 284–302].
- [RW72a] **RosW72a** D. J. Rose and R. A. Willoughby, editors. *Sparse Matrices and Their Applications*. Plenum

- Press, New York, NY, USA, 1972.
- [RW72b] A. Ruhe and T. Wiberg. The method of conjugate gradients used in inverse iteration. *BIT*, 12: 543–554, 1972.
- [RW84a] G. Roderigue and D. Wolitzer. Preconditioning by incomplete block cyclic reduction. *Math. Comp.*, 42:549–566, 1984.
- [RW84b] G. Roderigue and D. Wolitzer. Preconditioning by incomplete block cyclic reduction. *Math. Comp.*, 42:549–566, 1984.
- [Saa80] Y. Saad. On the rates of convergence of the Lanczos and the block Lanczos methods. *SIAM J. Numer. Anal.*, 17:687–706, 1980.
- [Saa81] Y. Saad. Krylov subspace methods for solving large unsymmetric linear systems. *Math. Comp.*, 37: 105–126, 1981.
- [Saa82] Y. Saad. The Lanczos biorthogonalization algorithm and other oblique projection methods for solving large unsymmetric systems. *SIAM J. Numer. Anal.*, 19: 485–506, 1982.
- [Saa84] Y. Saad. Practical use of some Krylov subspace methods for solving indefinite and nonsymmetric linear systems. *SIAM J. Sci. Statist. Comput.*, 5:203–228, 1984.
- [Saa86] Y. Saad. On the condition number of some Gram matrices arising from least squares approximation in the complex plane. *Numer. Math.*, 48:337–348, 1986.
- [Saa87] Y. Saad. On the Lanczos method for solving symmetric systems with several right hand sides. *Math. Comp.*, 48:651–662, 1987.
- [Sam71] A. Sameh. On Jacobi and Jacobi-like algorithms for a parallel computer. *Math. Comp.*, 25:579–590, 1971.
- [SB79] S. Serbin and S. Blalock. An algorithm for computing the matrix cosine. *SIAM J. Sci. Statist. Comput.*, 1:198–204, 1979.
- [SBI⁺70] B. T. Smith, J. M. Boyle, Y. Ikebe, V. C. Klema, and C. B. Moler. *Matrix Eigensystem Routines: EISPACK Guide*. Springer-Verlag, New York, NY, USA, second edition, 1970.
- [Sch09] I. Schur. On the characteristic roots of a linear substitution with an application to the theory of integral equations. *Math. Ann.*, 66: 488–510, 1909. German.

- [Sch64] A. Schonage. On the quadratic convergence of the Jacobi process. *Numer. Math.*, 6:410–412, 1964. **Sch64**
- [Sch66] P. Schoenemann. A generalized solution of the orthogonal Procrustes problem. *Psychometrika*, 31:1–10, 1966. **Sch66**
- [Sch68] H. R. Schwartz. Tridiagonalization of a symmetric band matrix. *Numer. Math.*, 12:231–241, 1968. Also in [WR71, pages 273–283]. **Sch68**
- [Sch74] H. R. Schwartz. The method of coordinate relaxation for $(A - \lambda B)x = 0$. *Numer. Math.*, 23:135–152, 1974. **Sch74**
- [Sch79] A. Schonage. Arbitrary perturbations of Hermitian matrices. *Linear Algebra Appl.*, 24:143–149, 1979. **Sch79**
- [Sch86] R. Schreiber. Solving eigenvalue and singular value problems on an undersized systolic array. *SIAM J. Sci. Statist. Comput.*, 7:441–451, 1986. **Sch86**
- [Sch87] W. Schönauer. *Scientific Computing on Vector Computers*. North-Holland, Amsterdam, The Netherlands, 1987. **Sch87**
- [Sco78] D. S. Scott. Analysis of the symmetric Lanczos process. Technical Report M78/40, UCB-ERL, University of California, Berkeley, Berkeley, CA, USA, 1978. **Sco78**
- [Sco79a] D. S. Scott. Block Lanczos software for symmetric eigenvalue problems. Technical Report ORNL/CSD-48, Oak Ridge National Laboratory, Oak Ridge, TN, USA, 1979. **Sco79a**
- [Sco79b] D. S. Scott. How to make the Lanczos algorithm converge slowly. *Math. Comp.*, 33:239–247, 1979. **Sco79b**
- [Sco84] D. S. Scott. Computing a few eigenvalues and eigenvectors of a symmetric band matrix. *SIAM J. Sci. Statist. Comput.*, 5:658–666, 1984. **Sco84**
- [Sco85] D. S. Scott. On the accuracy of the Gershgorin circle theorem for bounding the spread of a real symmetric matrix. *Linear Algebra Appl.*, 65:147–155, 1985. **Sco85**
- [Sea69] J. J. Seaton. Diagonalization of complex symmetric matrices using a modified Jacobi method. *Comput. J.*, 12:156–157, 1969. **Sea69**

- [Sea86] M. K. Seager. Parallelizing conjugate gradient for the Cray X-MP. *Parallel Comput.*, 3:35–47, 1986. **Sea86**
- [Ske80] R. D. Skeel. Iterative refinement implies numerical stability for Gaussian elimination. *Math. Comp.*, 35:817–832, 1980. **Ske80**
- [Ser80] S. Serbin. On factoring a class of complex symmetric matrices without pivoting. *Math. Comp.*, 35:1231–1234, 1980. **Ser80**
- [Ske81] R. D. Skeel. Effect of equilibration on residual size for partial pivoting. *SIAM J. Numer. Anal.*, 18:449–455, 1981. **Ske81**
- [She55] J. W. Sheldon. On the numerical solution of elliptic difference equations. *Math. Tables Aids Comput.*, 9:101–112, 1955. **She55**
- [SL89] R. Schreiber and C. Van Loan. A storage efficient WY representation for products of Householder transformations. *SIAM J. Sci. Statist. Comput.*, 10:53–57, 1989. **SchL89**
- [SHW86] D. S. Scott, M. T. Heath, and R. C. Ward. Parallel block Jacobi eigenvalue algorithms using systolic arrays. *Linear Algebra Appl.*, 77:345–356, 1986. **ScoHW86**
- [SLN75] A. Sameh, J. Lermitt, and K. Noh. On the intermediate eigenvalues of symmetric sparse matrices. *BIT*, 12:543–554, 1975. **SamLN75**
- [Sim84] H. Simon. Analysis of the symmetric Lanczos algorithm with reorthogonalization methods. *Linear Algebra Appl.*, 61:101–132, 1984. **Sim84**
- [Smi67] R. A. Smith. The condition numbers of the matrix eigenvalue problem. *Numer. Math.*, 10:232–240, 1967. **Smi67**
- [SK78] A. Sameh and D. Kuck. On stable parallel linear system solvers. *J. Assoc. Comput. Mach.*, 25:81–91, 1978. **SamK78**
- [Smi70] F. Smithies. *Integral Equations*. Cambridge University Press, Cambridge, UK, 1970. **Smi70**
- [Ske79] R. D. Skeel. Scaling for numerical stability in Gaussian elimination. *J. Assoc. Comput. Mach.*, 26:494–526, 1979. **Ske79**
- [Sor85] D. Sorensen. Analysis of pairwise pivoting in Gaussian elimination. *IEEE Trans. Comput.*, C-34:274–278, 1985. **Sor85**

- [SP87] R. Schreiber and B. N. Parlett. Block reflectors: Theory and computation. *SIAM J. Numer. Anal.*, 25:189–205, 1987. **SchP87**
- [SS73] P. N. Swarztrauber and R. A. Sweet. The direct solution of the discrete Poisson equation on a disk. *SIAM J. Numer. Anal.*, 10:900–907, 1973. **SwaS73**
- [SS76] B. Singer and S. Spilerman. The representation of social processes by Markov models. *Amer. J. Sociology*, 82:1–54, 1976. **SinS76**
- [SS79] K. Schittkowski and J. Stoer. A factorization method for the solution of constrained linear least squares problems allowing for subsequent data changes. *Numer. Math.*, 31:431–463, 1979. **SchS79**
- [SS85a] Y. Saad and M. H. Schultz. Data communication in hypercubes. Technical Report YALEU DCS RR-428, Computer Science, Yale University, New Haven, CT, USA, 1985. **SaaS85a**
- [SS85b] Y. Saad and M. H. Schultz. Topological properties of hypercubes. Technical Report YALEU DCS RR-389, Computer Science, Yale University, New Haven, CT, USA, 1985. **SaaS85b**
- [SS86] Y. Saad and M. Schultz. GMRES: A generalized minimal residual algorithm for solving nonsymmetric linear systems. *SIAM J. Sci. Statist. Comput.*, 7:856–869, 1986. **SaaS86**
- [SS87] G. Shroff and R. Schreiber. Convergence of block Jacobi methods. Technical Report 87-25, Computer Science, Rensselaer Polytechnic Institute, Troy, NY, USA, 1987. **ShrS87**
- [ST86] R. Schreiber and W. P. Tang. On systolic arrays for updating the Cholesky factorization. *BIT*, 26:451–466, 1986. **SchT86**
- [Ste69] G. W. Stewart. Accelerating the orthogonal iteration for the eigenvectors of a Hermitian matrix. *Numer. Math.*, 13:362–376, 1969. **Ste69**
- [Ste70] G. W. Stewart. Incorporating origin shifts into the QR algorithm for symmetric tridiagonal matrices. *Comm. ACM*, 13:365–367, 1970. **Ste70**
- [Ste71] G. W. Stewart. Error bounds for approximate invariant subspaces of closed linear operators. *SIAM J. Numer. Anal.*, 8:796–808, 1971. **Ste71**

- [Ste72] Ste72 G. W. Stewart. On the sensitivity of the eigenvalue problem $Ax = \lambda Bx$. *SIAM J. Numer. Anal.*, 9: 669–686, 1972.
- [Ste73a] Ste73a G. W. Stewart. Conjugate direction methods for solving systems of linear equations. *Numer. Math.*, 21:284–297, 1973.
- [Ste73b] Ste73b G. W. Stewart. Error and perturbation bounds for subspaces associated with certain eigenvalue problems. *SIAM Rev.*, 15:727–764, 1973.
- [Ste73c] Ste73c G. W. Stewart. *Introduction to Matrix Computations*. Academic Press, New York, NY, USA, 1973.
- [Ste74] Ste74 G. W. Stewart. The numerical treatment of large eigenvalue problems. In *Proceedings IFIP Congress 74*, pages 666–672. North-Holland, 1974.
- [Ste75a] Ste75a G. W. Stewart. The convergence of the method of conjugate gradients at isolated extreme points in the spectrum. *Numer. Math.*, 24: 85–93, 1975.
- [Ste75b] Ste75b G. W. Stewart. Gershgorin theory for the generalized eigenvalue problem $Ax = \lambda Bx$. *Math. Comp.*, 29:600–606, 1975.
- [Ste75c] Ste75c G. W. Stewart. Methods of simultaneous iteration for calculating eigenvectors of matrices. In J. H. Miller, editor, *Topics in Numerical Analysis II*, pages 185–196. Academic Press, New York, NY, USA, 1975.
- [Ste76a] Ste76a G. W. Stewart. Algorithm 406 HQR3 and EXCHNG: Fortran subroutines for calculating and ordering and eigenvalues of a real upper Hessenberg matrix. *ACM Trans. Math. Software*, 2:275–280, 1976.
- [Ste76b] Ste76b G. W. Stewart. A bibliographical tour of the large sparse generalized eigenvalue problem. In J. R. Bunch and D. J. Rose, editors, *Sparse Matrix Computations*. Academic Press, New York, NY, USA, 1976.
- [Ste76c] Ste76c G. W. Stewart. The economical storage of plane rotations. *Numer. Math.*, 25:137–138, 1976.
- [Ste76d] Ste76d G. W. Stewart. Simultaneous iteration for computing invariant subspaces of non-Hermitian matrices. *Numer. Math.*, 25:12–36, 1976.

- [Ste77a] Ste77a G. W. Stewart. On the perturbation of pseudo-inverses, projections, and linear least squares problems. *SIAM Rev.*, 19:634–662, 1977.
- [Ste77b] Ste77b G. W. Stewart. Perturbation bounds for the QR factorization of a matrix. *SIAM J. Numer. Anal.*, 14:509–518, 1977.
- [Ste77c] Ste77c G. W. Stewart. Sensitivity coefficients for the effects of errors in the independent variables in a linear regression. Technical Report TR-571, Computer Science, University of Maryland, College Park, MD, USA, 1977.
- [Ste78] Ste78 G. W. Stewart. Perturbation theory for the generalized eigenvalue problem. In C. de Boor and G. H. Golub, editors, *Recent Advances in Numerical Analysis*. Academic Press, New York, NY, USA, 1978.
- [Ste79a] Ste79a G. W. Stewart. The effects of rounding error on an algorithm for downdating a Cholesky factorization. *J. Inst. Math. Appl.*, 23:203–213, 1979.
- [Ste79b] Ste79b G. W. Stewart. A note on the perturbation of singular values. *Linear Algebra Appl.*, 28:213–216, 1979.
- [Ste79c] Ste79c G. W. Stewart. Perturbation bounds for the definite generalized eigenvalue problem. *Linear Algebra Appl.*, 23:69–86, 1979.
- [Ste80] Ste80 G. W. Stewart. The efficient generation of random orthogonal matrices with an application to condition estimators. *SIAM J. Numer. Anal.*, 17:403–409, 1980.
- [Ste81a] Ste81a D. Stevenson. A proposed standard for binary floating point arithmetic. *IEEE Computer*, 14:51–62, March 1981.
- [Ste81b] Ste81b G. W. Stewart. On the implicit deflation of nearly singular systems of linear equations. *SIAM J. Sci. Statist. Comput.*, 2:136–140, 1981.
- [Ste83] Ste83 G. W. Stewart. A method for computing the generalized singular value decomposition. In B. Kågström and A. Ruhe, editors, *Matrix Pencils*, pages 207–220. Springer-Verlag, New York, NY, USA, 1983.
- [Ste84a] Ste84a G. W. Stewart. On the asymptotic behavior of scaled singular value and QR decompositions. *Math. Comp.*, 43:483–490, 1984.

- [Ste84b] Ste84b
 G. W. Stewart. On the invariance of perturbed null vectors under column scaling. *Numer. Math.*, 33,34:61–66, 1984.
- [Ste84c] Ste84c
 G. W. Stewart. Rank degeneracy. *SIAM J. Sci. Statist. Comput.*, 5: 403–413, 1984.
- [Ste84d] Ste84d
 G. W. Stewart. A second order perturbation expansion for small singular values. *Linear Algebra Appl.*, 56:231–236, 1984.
- [Ste85] Ste85
 G. W. Stewart. A Jacobi-like algorithm for computing the Schur decomposition of a nonhermitian matrix. *SIAM J. Sci. Statist. Comput.*, 6:853–862, 1985.
- [Ste87] Ste87
 G. W. Stewart. Collinearity and least squares regression. *Statist. Sci.*, 2:68–100, 1987.
- [Sto73] Sto73
 H. S. Stone. An efficient parallel algorithm for the solution of a tridiagonal linear system of equations. *J. Assoc. Comput. Mach.*, 20:27–38, 1973.
- [Sto75a] Sto75a
 H. Stone. Parallel tridiagonal equation solvers. *ACM Trans. Math. Software*, 1:289–307, 1975.
- [Sto75b] Sto75b
 H. S. Stone. Parallel tridiagonal equation solvers. *ACM Trans. Math. Software*, 1:289–307, 1975.
- [Str69] Str69
 V. Strassen. Gaussian elimination is not optimal. *Numer. Math.*, 13:354–356, 1969.
- [Str88] Str88
 G. Strang. *Linear Algebra and Its Applications*. Academic Press, New York, NY, USA, third edition, 1988.
- [Sun82] Sun82
 J. Guang Sun. A note on Stewart’s theorem for definite matrix pairs. *Linear Algebra Appl.*, 48: 331–339, 1982.
- [Sun83] Sun83
 J. Guang Sun. Perturbation analysis for the generalized singular value problem. *SIAM J. Numer. Anal.*, 20:611–625, 1983.
- [SW80] SymW80
 H. J. Symm and J. H. Wilkinson. Realistic error bounds for a simple eigenvalue and its associated eigenvector. *Numer. Math.*, 35: 113–126, 1980.
- [Swa79] Swa79
 P. N. Swarztrauber. A parallel algorithm for solving general tridiagonal equations. *Math. Comp.*, 33:185–199, 1979.

- [Swe74] **Swe74**
 R. A. Sweet. A generalized cyclic reduction algorithm. *SIAM J. Numer. Anal.*, 11:506–520, 1974.
- [Swe77] **Swe77**
 R. A. Sweet. A cyclic reduction algorithm for solving block tridiagonal systems of arbitrary dimension. *SIAM J. Numer. Anal.*, 14:706–720, 1977.
- [TA61] **TurA61**
 H. W. Turnbull and A. C. Aitken. *An Introduction to the Theory of Canonical Matrices*. Dover Publications, New York, NY, USA, 1961.
- [TG81] **TanG81**
 W. P. Tang and G. H. Golub. The block decomposition of a Vandermonde matrix and its applications. *BIT*, 21:505–517, 1981.
- [Tre64] **Tre64**
 W. F. Trench. An algorithm for the inversion of finite Toeplitz matrices. *J. SIAM*, 12:515–522, 1964.
- [Tre74] **Tre74**
 W. F. Trench. Inversion of Toeplitz band matrices. *Math. Comp.*, 28:1089–1095, 1974.
- [TS87] **TreS87**
 L. N. Trefethen and R. S. Schreiber. Average case stability of Gaussian elimination. Technical Report 88-3, Numerical Analysis, Department of Mathematics, MIT, MA, 1987.
- [Tsa75] **Tsa75**
 N. K. Tsao. A note on implementing the Householder transformation. *SIAM J. Numer. Anal.*, 12:53–58, 1975.
- [TW70] **ThoW70**
 G. L. Thompson and R. L. Weil. Reducing the rank of $A - \lambda B$. *Proc. Amer. Math. Soc.*, 26:548–554, 1970.
- [TW72] **ThoW72**
 G. L. Thompson and R. L. Weil. Roots of matrix pencils $Ay = \lambda By$: Existence, calculations, and relations to game theory. *Linear Algebra Appl.*, 5:207–226, 1972.
- [Uhl73] **Uhl73**
 F. Uhlig. Simultaneous block diagonalization of two real symmetric matrices. *Linear Algebra Appl.*, 7:281–289, 1973.
- [Uhl76] **Uhl76**
 F. Uhlig. A canonical form for a pair of real symmetric matrices that generate a nonsingular pencil. *Linear Algebra Appl.*, 14:189–210, 1976.
- [Und75] **Und75**
 R. Underwood. An iterative block Lanczos method for the solution of large sparse symmetric eigenproblems. Technical Report STAN-CS-75-496, Computer Science, Stanford University, Stanford, CA, USA, 1975.

- [Van71] J. Vandergraft. Generalized Rayleigh methods with applications to finding eigenvalues of large matrices. *Linear Algebra Appl.*, 4:353–368, 1971. **Van71**
- [Van72] J. M. Varah. On the solution of block-tridiagonal systems arising from certain finite-difference equations. *Math. Comp.*, 26:859–868, 1972. **Var72**
- [Var61] R. S. Varga. On higher-order stable implicit methods for solving parabolic partial differential equations. *J. Math. Phys.*, 40:220–231, 1961. **Var61**
- [Var62] R. S. Varga. *Matrix Iterative Analysis*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1962. **Var62**
- [Var68a] J. M. Varah. The calculation of the eigenvectors of a general complex matrix by inverse iteration. *Math. Comp.*, 22:785–791, 1968. **Var68a**
- [Var68b] J. M. Varah. Rigorous machine bounds for the eigensystem of a general complex matrix. *Math. Comp.*, 22:793–801, 1968. **Var68b**
- [Var70a] J. M. Varah. Computing invariant subspaces of a general matrix when the eigensystem is poorly determined. *Math. Comp.*, 24:137–149, 1970. **Var70a**
- [Var70b] R. S. Varga. Minimal Gershgorin sets for partitioned matrices. *SIAM J. Numer. Anal.*, 7:493–507, 1970. **Var70b**
- [Var73] J. M. Varah. On the numerical solution of ill-conditioned linear systems with applications to ill-posed problems. *SIAM J. Numer. Anal.*, 10:257–267, 1973. **Var73**
- [Var75] J. M. Varah. A lower bound for the smallest singular value of a matrix. *Linear Algebra Appl.*, 11:1–2, 1975. **Var75**
- [Var76] R. S. Varga. On diagonal dominance arguments for bounding $\|A^{-1}\|$. *Linear Algebra Appl.*, 14:211–217, 1976. **Var76**
- [Var79] J. M. Varah. On the separation of two matrices. *SIAM J. Numer. Anal.*, 16:216–222, 1979. **Var79**
- [vdS69] A. van der Sluis. Condition numbers and equilibration matrices. *Numer. Math.*, 14:14–23, 1969. **vdS69**
- [vdS70] A. van der Sluis. Condition, equilibration, and pivoting in linear algebraic systems. *Numer. Math.*, 15:74–86, 1970. **vdS70**

- [vdS75a] vdS75a A. van der Sluis. Perturbations of eigenvalues of nonnormal matrices. *Comm. ACM*, 18:30–36, 1975.
- [vdS75b] vdS75b A. van der Sluis. Stability of the solutions of linear least squares problem. *Numer. Math.*, 23:241–254, 1975.
- [vdSdV86] vdSV86 A. van der Sluis and H. A. Van der Vorst. The rate of convergence of conjugate gradients. *Numer. Math.*, 48:543–560, 1986.
- [vdSV79] vdSV79 A. van der Sluis and G. W. Veltkamp. Restoring rank and consistency by orthogonal projection. *Linear Algebra Appl.*, 28:257–278, 1979.
- [Vet75] Vet75 W. J. Vetter. Vector structures and solutions of linear matrix equations. *Linear Algebra Appl.*, 10:181–188, 1975.
- [vK66] vK66 H. P. M. van Kempen. On quadratic convergence of the special cyclic Jacobi method. *Numer. Math.*, 9:19–22, 1966.
- [Wac66] Wac66 E. L. Wachpress. *Iterative Solution of Elliptic Systems*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1966.
- [WAC+88] WalAC+88 D. W. Walker, T. Aldcroft, A. Cisneros, G. Fox, and W. Furmanski. LU decomposition of banded matrices and the solution of linear systems on hypercubes. In G. Fox, editor, *The Third Conference on Hypercube Concurrent Computers and Applications, Vol. II, Applications*, pages 1635–1655. ACM Press, New York, NY, USA, 1988.
- [Wal88] Wal88 H. F. Walker. Implementation of the GMRES method using Householder transformations. *SIAM J. Sci. Statist. Comput.*, 9:152–163, 1988.
- [War75] War75 R. C. Ward. The combination shift QZ algorithm. *SIAM J. Numer. Anal.*, 12:835–853, 1975.
- [War77] War77 R. C. Ward. Numerical computation of the matrix exponential with accuracy estimate. *SIAM J. Numer. Anal.*, 14:600–614, 1977.
- [War81] War81 R. C. Ward. Balancing the generalized eigenvalue problem. *SIAM J. Sci. Statist. Comput.*, 2:141–152, 1981.
- [Wat73] Wat73 G. A. Watson. An algorithm for the inversion of block matrices of Toeplitz form. *J. Assoc. Comput. Mach.*, 20:409–415, 1973.

- [Wat82] D. S. Watkins. Understanding the QR algorithm. *SIAM Rev.*, 24:427–440, 1982. [Wat82]
- [Wat88] G. A. Watson. The smallest perturbation of a submatrix which lowers the rank of the matrix. *IMA J. Numer. Anal.*, 8:295–304, 1988. [Wat88]
- [Wed72] P. Å. Wedin. Perturbation bounds in connection with the singular value decomposition. *BIT*, 12:99–111, 1972. [Wed72]
- [Wed73a] P. Å. Wedin. On the almost rank-deficient case of the least squares problem. *BIT*, 13:344–354, 1973. [Wed73a]
- [Wed73b] P. Å. Wedin. Perturbation theory for pseudo-inverses. *BIT*, 13:217–232, 1973. [Wed73b]
- [WG78] R. C. Ward and L. J. Gray. Eigensystem computation for skew-symmetric and a class of symmetric matrices. *ACM Trans. Math. Software*, 4:278–285, 1978. [WG78]
- [Wid78] O. Widlund. A Lanczos method for a class of nonsymmetric systems of linear equations. *SIAM J. Numer. Anal.*, 15:801–812, 1978. [Wid78]
- [Wil61] J. H. Wilkinson. Error analysis of direct methods of matrix inversion. *J. Assoc. Comput. Mach.*, 10:281–330, 1961. [Wil61]
- [Wil63] J. H. Wilkinson. *Rounding Errors in Algebraic Processes*. Prentice-Hall, Englewood Cliffs, NJ, USA, 1963. [Wil63]
- [Wil65a] J. H. Wilkinson. *The Algebraic Eigenvalue Problem*. Clarendon Press, Oxford, UK, 1965. [Wil65a]
- [Wil65b] J. H. Wilkinson. Convergence of the LR, QR, and related algorithms. *Comput. J.*, 8:77–84, 1965. [Wil65b]
- [Wil68a] J. H. Wilkinson. Almost diagonal matrices with multiple or close eigenvalues. *Linear Algebra Appl.*, 1:1–12, 1968. [Wil68a]
- [Wil68b] J. H. Wilkinson. Global convergence of tridiagonal QR algorithm with origin shifts. *Linear Algebra Appl.*, 1:409–420, 1968. [Wil68b]
- [Wil68c] J. H. Wilkinson. A priori error analysis of algebraic processes. In *Proceedings International Congress Math. (Moscow: Izdat. Mir)*, pages 629–639, 1968. [Wil68c]

- [Wil71] J. H. Wilkinson. Modern error analysis. *SIAM Rev.*, 14:548–568, 1971. **Wil71**
- [Win68] S. Winograd. A new algorithm for inner product. *IEEE Trans. Comput.*, C-17:693–694, 1968. **Win68**
- [Wil72] J. H. Wilkinson. Note on matrices with a very ill-conditioned eigenproblem. *Numer. Math.*, 19:176–178, 1972. **Wil72**
- [Woz80] H. Wozniakowski. Roundoff error analysis of a new class of conjugate gradient algorithms. *Linear Algebra Appl.*, 29:507–529, 1980. **Woz80**
- [Wil77] J. H. Wilkinson. Some recent advances in numerical linear algebra. In D. A. H. Jacobs, editor, *The State of the Art in Numerical Analysis*, pages 1–53. Academic Press, New York, NY, USA, 1977. **Wil77**
- [WR71] J. H. Wilkinson and C. Reinsch, editors. *Linear Algebra*, volume 2 of *Handbook for Automatic Computation*. Springer-Verlag, New York, NY, USA, 1971. **WilR71**
- [Wra73] A. Wragg. Computation of the exponential of a matrix I: Theoretical considerations. *J. Inst. Math. Appl.*, 11:369–375, 1973. **Wra73**
- [Wil78] J. H. Wilkinson. Linear differential equations and Kronecker’s canonical form. In C. de Boor and G. H. Golub, editors, *Recent Advances in Numerical Analysis*, pages 231–265. Academic Press, New York, NY, USA, 1978. **Wil78**
- [Wra75] A. Wragg. Computation of the exponential of a matrix II: Practical considerations. *J. Inst. Math. Appl.*, 15:273–278, 1975. **Wra75**
- [Wil79] J. H. Wilkinson. Kronecker’s canonical form and the QZ algorithm. *Linear Algebra Appl.*, 28:285–303, 1979. **Wil79**
- [WZ72] H. Wimmer and A. D. Ziebur. Solving the matrix equation $\sum f_p(A)Xg_p(A)$. *SIAM Rev.*, 14:318–323, 1972. **WimZ72**
- [Wil84] J. H. Wilkinson. On neighboring matrices with quadratic elementary divisors. *Numer. Math.*, 44:1–21, 1984. **Wil84**
- [YJ80] D. M. Young and K. C. Jea. Generalized conjugate gradient acceleration of nonsymmetrizable iterative methods. *Linear Algebra Appl.*, 34:159–194, 1980. **YouJ80**

Yoh79

- [Yoh79] J. M. Yohe. Software for interval arithmetic: A reasonable portable package. *ACM Trans. Math. Software*, 5:50–63, 1979.

You70

- [You70] D. M. Young. Convergence properties of the symmetric and unsymmetric over-relaxation methods. *Math. Comp.*, 24:793–807, 1970.

You71

- [You71] D. M. Young. *Iterative Solution of Large Linear Systems*. Academic Press, New York, NY, USA, 1971.

You72

- [You72] D. M. Young. Generalization of property A and consistent ordering. *SIAM J. Numer. Anal.*, 9:454–463, 1972.

Zoh69

- [Zoh69] S. Zohar. Toeplitz matrix inversion: The algorithm of W.F. Trench. *JACM*, 16:592–601, 1969.