

RESUME

Louis L. Scharf

Professor of Electrical and Computer Engineering
University of Colorado, Boulder, CO 80309

Personal Data:

Birthdate: August 5, 1941
Married, two children

Education:

1969 Ph.D., University of Washington, Seattle, WA
1966 M.S., University of Washington, Seattle, WA
1964 B.S., University of Washington, Seattle, WA

Academic Honors and Awards:

2000 IEEE Millenium Medal
1998 College Research Award, University of Colorado
1994 IEEE Signal Processing Society Technical Achievement Award
Distinguished Lecturer for Signal Processing Society, 1993–1994
Fellow of IEEE, 1986
Faculty Excellence Award from American Electronics Association, 1988
Administrative Excellence Award, College of Engineering, Univ of Rhode Island, 1984
Electrical Engineering Teaching Award, Colorado State University, 1971–1972
NDEA Title IV Fellow, 1967–1969

Professional Career:

2001–present Professor of Electrical and Computer Engineering, and Statistics,
Colorado State University, Ft. Collins, CO,
1985–2001 Professor of Electrical and Computer Engineering,
University of Colorado, Boulder, CO
1982–1985 Professor and Chairman of Electrical Engineering,
University of Rhode Island, Kingston, RI

1971–1982 Professor of Electrical Engineering and Statistics,
Colorado State University, Fort Collins, CO

1969–1971 Principal Development Engineer,
Honeywell, Inc., Marine Systems Center, Seattle, WA

1965–1969 NDEA Title IV Fellow (1967–1969),
Research and Teaching Assistant (1965–1967),
University of Washington, Seattle, WA

1964–1965 Engineer,
The Boeing Company, Seattle, WA

Visiting Positions and International Cooperation:

1998-1999 Visiting Professor
University of Wisconsin
Madison, WI

1992 Visiting Professor
EURECOM
Sophia-Antipolis, France

1985 Invited Lecturer
Les Houches Summer School on Signal Processing
Chamonix, France

1981 Visiting Professor
Ecole National Superieure des Telecommunications
Paris, France

1981 Visiting Professor
University of LaPlata
LaPlata, Argentina

1977–1978 Maitre de Conference
Universite de Paris-Sud and CNRS Laboratoire des Signaux et Systemes
Gif-sur-Yvette, France

1974–1975 Visiting Associate Professor
Duke University
Durham, NC

Society Memberships and Professional Activities:

Committees

Chair, IEEE Fellow Committee, IEEE Signal Processing Society

Member, Technical Committee for Theory and Methods, IEEE Signal Processing Society

Member, Technical Committee for Sensor Arrays and Multidimensional Signal Processing,
IEEE Signal Processing Society

Member, Editorial Board, European Association for Signal Processing

Fellow, Institute of Electrical and Electronics Engineers

Member, Eta Kappa Nu

Member, IEEE Professional Groups on Information Theory, Communications, and Signal
Processing

Past member, Administrative Committee, IEEE Society on Acoustics, Speech, and Signal
Processing (1984–1986)

Past Member, National Research Council Committee on Applied Mathematics Research
Alternatives for the Navy (1980–1986)

Member, National Research Council Committee on Sensors and Electron Devices, 2001 to
present

Member of NSF panels for Signal Processing Research, 1984, 1989, 1992, 1995, 1998, and
2001

Conferences

Technical Program Chairman, 1980 International Conference on Acoustics, Speech, and
Signal Processing, Denver, CO (1980)

Technical Program Committee, Asilomar '96

Steering Committee, ICASSP '95 and ICASSP '01

Tutorials Chair, ICASSP 2001

Technical Program Committee, MIT Lincoln Labs ASAP, 2000 and 2002

Technical Program Committee, IEEE Workshop on Sensors and Multichannel, 2002

Technical Program Chairman, Asilomar 2002

Lectureships

Distinguished Lecturer, IEEE Signal Processing Society (1993,1994)

Plenary Lecturer at Workshop on Statistical Signal and Array Processing (1989, 1992, 1995, 1998)

Plenary Lecture at SAM 2000 Workshop

Plenary Lecture at Symposium 2000 on Communication, Computing, and Signal Processing

Plenary Lecture at US-Australian Conference on Defence Applications of Signal Processing, 1997 and 2002

Plenary Lecture, “Statistical Signal Processing: A Geometric View,” Norwegian Signal Processing Conference, Tromso, Norway, Oct 2002

Editing and Reviewing

Past Associate Editor, *IEEE Transactions on Signal Processing* (1979–1981)

Past Member, Editorial Board for *Journal of Statistical Planning and Inference* (1992)

Reviewer, NSF Career Awards, 1999

Reviewer, *IEEE Trans on Information Theory*, *IEEE Trans on Signal Processing*, *IEEE Trans Communication*, *European Signal Processing*

Reviewer, Telecommunications Research Center at Arizona State University (July 1993)

NSF Reviewer for PYI and NYI panels, 1989, 1993

Educational Innovation:

Developed freshman seminar course

Developed freshman course in problem solving with MATLAB; wrote textbook

Supervised development of software for undergraduate course in signals and systems

Developed graduate courses in detection, estimation, and time series analysis; wrote textbook

Developed a Combined 5 Year BS/MS Program

Initiated Industrial Associates Program

Thesis Students:

PhD Students

- David C. Farden (1974), "Stochastic Approximation with Correlated Data," Ph.D. Dissertation, Colorado State University, Fort Collins
- Joe Perl (1976), "Covariance-Invariant Discrete-Time Systems," Ph.D. Dissertation, Colorado State University, Fort Collins
- A. A. (Louis) Beex (1980), "Covariance Sequence Approximation with Applications to Spectrum Analysis and Digital Filter Design," Ph.D. Dissertation, Colorado State University, Fort Collins
- Jean-Pierre Dugre (1982), "Parametric Spectrum Analysis of Stationary Random Sequences," Ph.D. Dissertation, Colorado State University, Fort Collins
- Christophe P. Rialan (1987), "Cellular and Vector Architectures for Implementing Projection Operators," Ph.D. Dissertation, University of Colorado, Boulder
- Cedric J. J. Demeure (1988), "Fast Algorithms for QR Factors of Near-to-Toeplitz Matrices," Ph.D. Dissertation, University of Colorado, Boulder
- Wayne P. Burleson (1989), "Efficient Computation in VLSI with Distributed Arithmetic," Ph.D. Dissertation, University of Colorado, Boulder
- Richard T. Behrens (1990), "Subspace Signal Processing in Structured Noise," Ph.D. Dissertation, University of Colorado, Boulder
- Michael P. Clark (1992), "Estimation Problems in Array Processing," Ph.D. Dissertation, University of Colorado, Boulder
- L. Todd McWhorter (1994), "Representations for Covariance Bounds and Time Series Estimators," Ph.D. Dissertation, University of Colorado, Boulder
- Mark Spurbeck (1994), "Analysis and Design Techniques for Filterbanks," Ph.D. Dissertation, University of Colorado, Boulder
- John Thomas (1996), "Matched Subspace Signal Processing," Ph.D. Dissertation, University of Colorado, Boulder
- Nelson Ueng-Teng (1996), "Isotropic Frames," Ph.D. dissertation, University of Colorado, Boulder
- Shawn Kraut (1999), "Adaptive Subspace Detectors," Ph.D., University of Colorado, Boulder
- Michael McCloud (2000), "Detection, Equalization, and Signal Design for Nonorthogonal Multipulse Modulation on Noncoherent Communication Channels," Ph.D. Dissertation, University of Colorado, Boulder (2001)

Gabriel Rodriguez-Yam (2002), "Gibbs Samplers for Hyperspectral Imaging and Multiuser Communication," Ph.D. Dissertation, Colorado State University, Ft. Collins

Peter Schreier (2003), "Detection and Estimation in Nonproper Gaussian Models for Communication," Ph.D. Dissertation, University of Colorado (jointly advised with C.T. Mullis)

Gabriel Rodriguez-Yam (2003), "Gibb's Samplers for Hyperspectral Imaging," Ph.D. Dissertation, University of Colorado (jointly advised with R.. Davis)

MS Students

Raymond C. Juras (1974), "Distribution Studies for Invariant Detectors," M.S. Thesis, Colorado State University, Fort Collins

Richard J. Kubischta (1974), "Performance Measures for Optimum Arrays," M.S. Thesis, Colorado State University, Fort Collins

James C. Luby (1978), "ARMA Digital Filter Design Using First and Second Order Information," M.S. Thesis, Colorado State University, Fort Collins

Helen M. Anderson (1980), "Frequency Estimation in Signal Plus Noise and Autoregressive Models," M.S. Thesis, Colorado State University, Fort Collins

Marwan Orfale (1981), "Dynamic Programming Algorithms for Frequency Tracking," M.S. Thesis, Colorado State University, Fort Collins

Timothy J. von Reyn (1982), "A Survey of Spectrum Estimation Techniques," M.S. Thesis, Colorado State University, Fort Collins

Sigurdur Sigurdsson (1982), "Fast Kalman Filtering for ARMA Processes: Fixed Point Implementation," M.S. Thesis, Colorado State University, Fort Collins

Gregory Fetzer (1982), "Dynamic Programming for Time Delay Estimation," M.S. Thesis, Colorado State University, Fort Collins

Cedric J. J. Demeure (1984), "Lattice Filters for Analysis and Synthesis of Stationary Time Series and Implementation of Fast Algorithms," M.S. Thesis, University of Rhode Island, Kingston

Michael J. Albaneze (1985), "Linear Prediction in the Frequency Domain and Homomorphic Signal Processing for Channel Identification," M.S. Thesis, University of Colorado, Boulder

Christophe P. Rialan (1985), "Modular Architectures for Implementing Projection Operators," M.S. Thesis, University of Colorado, Boulder

- James A. Girard (1986), “A Modular Architecture for Dynamic Programming on Markov Chains,” M.S. Thesis, University of Colorado, Boulder
- Philippe Tourtier (1986), “Maximum Likelihood Identification of Structured Correlation Matrices for Spectrum Analysis,” M.S. Thesis, University of Colorado, Boulder
- Suzanne E. Ronca (1987), “Statistical and Classical Methods of 2-D FIR Digital Filter Design,” M.S. Thesis, University of Colorado, Boulder
- Michael Dunn (1989), “Four UMP-Invariant Detectors,” MS Thesis, University of Colorado, Boulder
- Stephen D. Voran (1989), “Magnitude and Phase Quantizers that Minimize Mean-Squared Error,” M.S. Thesis, University of Colorado, Boulder
- Anthony Thorpe (1989), “Reduced Rank Methods for Solving Least Squares Problems,” M.S. Thesis, University of Colorado, Boulder
- Todd McWhorter (1991), “Cramer Bounds for Modal Analysis,” M.S. Thesis, University of Colorado, Boulder

Contracts & Grants:

- “Adaptive Array Studies,” Naval Undersea Research and Development Center, San Diego, CA, March 1972–February 1974, \$40,000, Principal Investigator
- “Communication Receiver Studies,” Naval Undersea Research and Development Center, San Diego, CA, October 1973–December 1975, \$41,000, Co-Principal Investigator
- “Stochastic Approximation in Adaptive Signal Processing,” Office of Naval Research, June 1973–December 1975, \$35,000, Principal Investigator
- “Viterbi Tracking of Randomly Phase Modulated Data,” Army Research Office, Research Triangle Park, October 1979–October 1982, \$173,000, Principal Investigator
- “HP Software Development Program,” Hewlett-Packard, Fort Collins, CO, January 1979–August 1980, \$30,000, Co-Principal Investigator
- “Stochastic Signal Processing,” Office of Naval Research, January 1975–January 1985, \$310,000, Principal Investigator
- “Detection, Estimation, and Coding of Waveforms,” Office of Naval Research, September 1985–April 1988, \$353,532, Principal Investigator
- “Chip- and Cell-Level Architectures for Signal Processing in VLSI,” Office of Naval Research, January 1984–January 1986, \$220,000, Principal Investigator
- “Algorithms and Architectures for Dynamic Programming in VLSI,” Office of Naval Research, June 1985–December 1988, \$320,000, Principal Investigator

“NSF ERC for Optoelectronic Computing Systems,” National Science Foundation, May 1987–May 1997, \$14,580,000, Co-Principal Investigator from 1987-1990

“VLSI Chip,” Ball Brothers, Boulder, CO, January 1988–July 1988, \$42,000, Principal Investigator

“Statistical Signal Processing Algorithms and VLSI Architectures for Application in Radar and Image Processing,” Ball Brothers, Boulder, CO, August 1988–October 1989, \$25,000, Principal Investigator

“Signal Processing in the Linear Statistical Model,” Office of Naval Research, October 1988–November 1991, \$398,000, Principal Investigator

“Signal Analysis for the Identification of Power System Dynamics,” Bonneville Power Administration, May 1990–August 1992, \$178,521, Principal Investigator

“Signal Processing for Power System Analysis,” Bonneville Power Administration, August 1992–July 1994, \$202,000, Principal Investigator

“Matched Subspace Filtering for Detection, Estimation, and Time Series Analysis,” Office of Naval Research, December 1991–September 1994, \$407,000, Principal Investigator

“Detection and Estimation in Subspaces,” Office of Naval Research, October 1994–September 1997, \$430,000, Co-Principal Investigator

“Statistical Signal Processing and Communication within Subbands,” National Science Foundation, August 1996–July 1997, \$61,500, Co-Principal Investigator

“Matched and Adaptive Signal Processing in Subspaces,” Office of Naval Research, October 1997–September 2000, \$360,000, Principal Investigator

“Integrated Antennas; Receivers, and Networks for Wireless Communication,” National Science Foundation, October 1999–September 2002, \$390,000, Principal Investigator

“Architectures for Low-Rank Signal Processing in Passive and Active Sonar,” Office of Naval Research, October 1999–September 2002, \$285,000, Principal Investigator

“Hyperspectral Imaging” Colorado Advanced Software Institute, October 2001–September 2002, \$45,000, Principal Investigator

“Signal Processing and Channel Modelling in Low-Dimensional Subspaces for Wireless Communication in Multi-Antenna Systems,” National Science Foundation, October 2001–September 2004, \$285,000, Principal Investigator

Centers:

Founding Co-PI of NSF Center for Optoelectronic Computing Systems, May 1987, \$14,580,000.

Founding Member of Colorado Center for Information Storage, January 1998, \$550,000.

Books and Monographs:

- L. L. Scharf, *Statistical Signal Processing: Detection, Estimation, and Time Series Analysis*, (New York: Addison-Wesley Publishing Company, 1991).
- L. L. Scharf and R. T. Behrens, *A First Course in Electrical and Computer Engineering (with MATLAB Experiments)*, (New York: Addison-Wesley Publishing Company, 1990).
- L. L. Scharf, "The SVD and Reduced Rank Signal Processing," Chapter 1 in *The SVD and its Applications*, R. Vaccaro, ed., (Elsevier, 1991).
- C. T. Mullis and L. L. Scharf, "Quadratic Estimators of the Power Spectrum," Chapter One of *Advances in Spectrum Estimation*, Simon Haykin, ed., (Englewood Cliffs, NJ: Prentice Hall, 1990).
- L. L. Scharf, "Chapter 2: Topics in Statistical Signal Processing," *Signal Processing*, J. L. Lacoume, et al, eds. (Amsterdam: North-Holland, 1987) pp. 83–204.

Journal Articles:

- S. Kraut, L.L. Scharf, L.T. McWhorter, and C.T. Mullis, "Capon redux: new formulas, geometries, and computational efficiencies," *IEEE Trans Signal Proc*, in preparation
- L.L. Scharf and T.J. Hu, "Two Channel Dimension Reduction for Noise Rejecting Quantizers and other Signal Processing Applications," *IEEE Trans Signal Proc*, in preparation
- N. Ueng and L.L. Scharf, "Variable Window Fourier Transforms for Numerical Laplace Transforms and Dispersion Transforms," *IEEE Trans Signal Proc*, in preparation
- L.L. Scharf, J. K. Thomas, and B.D. VanVeen, "Good Canonical Coordinates for Estimation are Bad Canonical Coordinates for Detection, and Vice-Versa," *IEEE Trans Signal Proc*, in preparation
- L.L. Scharf, B. Friedlander, and Alfred Hanssen, "The Hilbert Space Geometry of the Stochastic Rihaczek Distribution," *IEEE Trans Signal Proc*, in preparation
- A. Hanssen and L.L. Scharf, "A Theory of Time-Varying Polyspectra," *IEEE Trans Signal Proc*, in preparation
- L.T. McWhorter and L.L. Scharf, "Matched Subspace Detectors in the Stochastic Case," *IEEE Trans Signal Processing*, in preparation

- P.J. Schreier and L.L. Scharf, "Second-Order Analysis of Improper Complex Random Vectors and Processes," *IEEE Trans Signal Proc*, submitted Aug 2001
- L.L. Scharf and M.L. McCloud, "Blind Adaptation of Zero-Forcing Projections and Oblique Pseudo-Inverses for Detection and Estimation in Interference-Dominated Channels," *IEEE Trans Signal Proc*, to appear 2002
- J. Gubner and L.L. Scharf, "Detection of Power-Constrained Signals in Multiple Signal Subspaces in the Presence of Interference and Noise," *IEEE Trans Inform Th*, under review
- L.L. Scharf and H. Cox, "Covariance Invariance and the Discrete-Time Channel Model for Data Communication over the ISI Channel," *IEEE Trans Commun*, in preparation
- L. T. McWhorter and L. L. Scharf, "Quadratic Covariance Bounds," *IEEE Trans Signal Proc*, in review.
- M.L. McCloud and L.L. Scharf, "A New Subspace Identification Algorithm for High Resolution DOA Estimation," *IEEE Trans Ant and Prop*, to appear 2002.
- M.C. McCloud, L.L. Scharf, and M. Varanasi, "Beamforming, Diversity, and Interference Rejections for Communication over Fading Channels using a Receive Antenna Array," *IEEE Trans Commun*, to appear 2002
- L.L. Scharf and B. Friedlander, "Toeplitz and Hankel Kernels for Estimating Time-Varying Spectra of Discrete-Time Random Processes," *IEEE Trans Signal Proc*, vol 49, no 1, pp 179-189, Jan 2001
- M.L. McCloud and L.L. Scharf, "Asymptotic Analysis of the MMSE Multiuser Detector for Non-Orthogonal Multipulse Modulation," *IEEE Trans on Commun*, vol 49, no 1, pp 24-30, Jan 2001
- L. L. Scharf and C. T. Mullis, "Canonical Coordinates and the Geometry of Inference, Rate and Capacity," **48**, 3, pp 824-831, *IEEE Trans Signal Proc*, (March 2000).
- M. L. McCloud and L. L. Scharf, "Interference Estimation with Applications to Blind Multiple Access Communications over Fading Channels," *IEEE Trans Inform Th*, **46**, 3, pp 947-961, (May 2000).
- L. L. Scharf, L. T. McWhorter, and S. Kraut, "Adaptive Coherence Estimators for Detection," *Signal Processing* (European journal), to appear Dec 2000.
- S. Kraut, L. L. Scharf, and L. T. McWhorter, "Adaptive Subspace Detectors," *IEEE Trans Signal Proc*, vol 49, no 1, pp 1-16, Jan 2001
- S. Kraut and L. L. Scharf, "The CFAR Adaptive Subspace Detector is a Scale-Invariant GLRT," *IEEE Trans Signal Proc* **47**. 9, pp 2538-2541 September 1999.
- L. L. Scharf, and S. Kraut, "Geometries, Invariances, and SNR Interpretations of Matched and Adaptive Subspace Detectors," *Traitement du Signal*, **15**, 6, pp. 527-534 May 1999

- M. L. McCloud, L. L. Scharf, C. T. Mullis, "Lag-Windowed and Multiply-Data-Windowed Spectrum Estimators are Roughly Equivalent," *IEEE Trans Signal Proc* Vol **47**, 3, 00 839-843 March 1999.
- J. Scott Goldstein, I. S. Reed, and L. L. Scharf, "A Multistage Representation of the Wiener Filter Based on Orthogonal Projections," *IEEE Trans Inform Th* **44**, 7 (November 1998).
- L. L. Scharf and J. K. Thomas, "Wiener Filters in Canonical Coordinates for Transform Coding, Filtering, and Quantizing," *IEEE Trans Signal Proc* **46**:3, pp. 647-654 (March 1998).
- L. T. McWhorter and L. L. Scharf, "Multiwindow Estimators of Correlation," *IEEE Trans Signal Proc* **46**:2, pp. 440-448 (February 1998).
- E. M. Dowling, R. D. DeGroat, D. A. Linebarger, L. L. Scharf, and M. Vis, "Reduced Polynomial Order Linear Prediction," *IEEE Signal Proc Lett* **3**, pp. 92-94 (March 1996).
- L. T. McWhorter and L. L. Scharf, "Nonlinear Maximum Likelihood Estimation of Autoregressive Time Series," *IEEE Trans Signal Proc* **43**:12, pp. 1-11 (December 1995).
- J. Thomas, L. L. Scharf, and D. W. Tufts, "Probability of a Subspace Swap," *IEEE Trans Signal Proc* **43**:3, pp. 730-737 (March 1995).
- A. Thorpe and L. L. Scharf, "Data Adaptive Rank Shaping Methods for Solving Least Squares Problems," *IEEE Trans Signal Proc* **43**:7, pp. 1591-1601 (July 1995).
- M. L. Vis and L. L. Scharf, "A Note on Recursive Maximum Likelihood," *IEEE Trans Signal Proc* **SP-42**:10, pp. 2881-2883 (October 1994).
- L. L. Scharf and B. Friedlander, "Matched Subspace Detectors," *IEEE Trans Signal Proc* **SP-42**:8, pp. 2146-2157 (August 1994).
- M. P. Clark and L. L. Scharf, "Two-Dimensional Modal Analysis Based on Maximum Likelihood," *IEEE Trans Signal Proc* **SP-42**:6, pp. 1443-1452 (June 1994).
- R. T. Behrens and L. L. Scharf, "Signal Processing Applications of Oblique Projection Operators," *IEEE Trans Signal Proc* **42**:6, pp. 1413-1424 (June 1994).
- S. D. Voran and L. L. Scharf, "Polar Coordinate Quantizers," *IEEE Trans Signal Proc* **42**:6, pp. 1559-1563 (June 1994).
- L. T. McWhorter and L. L. Scharf, "Cramer-Rao Bounds for Deterministic Modal Analysis," *IEEE Trans Signal Proc* **41**, pp. 1847-1862 (May 1993).
- L. L. Scharf and L. T. McWhorter, "Geometry of the Cramer-Rao Bound," *Signal Processing* **31**:3, pp. 1-11 (April 1993).
- M. P. Clark and L. L. Scharf, "On the Complexity of IQML Algorithms," *IEEE Trans Signal Proc* **40**, pp. 1811-1813 (July 1992).

- L. L. Scharf, "The SVD and Reduced-Rank Signal Processing," *Signal Processing* **24**, pp. 111–130 (November 1991).
- W. P. Burleson and L. L. Scharf, "A VLSI Design Methodology for Distributed Arithmetic," *Journ VLSI Signal Proc* **2**, pp. 235–252 (1991).
- B. D. Van Veen and L. L. Scharf, "Estimation of Structured Covariance Matrices and Multiple Window Spectrum Analysis," *IEEE Trans ASSP* **38**:8, pp. 1467–1472 (August 1990).
- C. J. Demeure and L. L. Scharf, "Sliding Windows and Lattice Algorithms for Computing QR Factors in the Least Squares Theory of Linear Prediction," *IEEE Trans ASSP* **ASSP-38**:4, pp. 721–725 (April 1990).
- J. F. Hauer, C. J. Demeure, and L. L. Scharf, "Initial Results in Prony Analysis of Power System Response Signals," *IEEE Trans Power Sys* **PS-5**:1, pp. 80–90 (February 1990).
- C. P. Rialan and L. L. Scharf, "Fixed-Point Error Analysis of the Lattice and the Schur Algorithms for the Autocorrelation Method of Linear Prediction," *IEEE Trans ASSP* **ASSP-37**:12, pp. 1950–1957 (December 1989).
- W. P. Burleson and L. L. Scharf, "A VLSI Design Methodology for Distributed Arithmetic," *IEEE Trans Computers*, special issue on Computer Arithmetic (October 1989).
- W. G. Bliss and L. L. Scharf, "Algorithms and Architectures for Dynamic Programming on Markov Chains," *IEEE Trans ASSP* **ASSP-37**:6, pp. 900–912 (June 1989).
- W. P. Burleson and L. L. Scharf, "A Systolic VLSI Chip for Implementing Orthogonal Transforms," Special Issue on Custom IC Technologies, *IEEE Journ Solid State Circuits* **SC-24** (April 1989).
- C. P. Rialan and L. L. Scharf, "Fast Algorithms for QR and Cholesky Factors of Toeplitz Operators," *IEEE Trans ASSP* **ASSP-36**:11, pp. 1740–1748 (November 1988).
- L. L. Scharf and B. D. Van Veen, "Low Rank Detectors for Gaussian Random Vectors," *IEEE Trans ASSP*, **ASSP-35**:11, pp. 1579–1582 (November 1987).
- C. P. Rialan and L. L. Scharf, "Cellular Architectures for Implementing Projection Operators," *IEEE Trans ASSP*, **ASSP-35**:11, pp. 1619–1617 (November 1987).
- L. L. Scharf and D. W. Tufts, "Rank Reduction for Modeling Stationary Signals," *IEEE Trans ASSP*, **ASSP-35**:3, pp. 350–355 (March 1987).
- C. J. Demeure and L. L. Scharf, "Linear Statistical Models for Stationary Sequences and Related Algorithms for Cholesky Factorization of Toeplitz Matrices," *IEEE Trans ASSP*, **ASSP-35**:1, pp. 29–42 (January 1987).

- J. P. Dugré, L. L. Scharf, and C. Gueguen, "Exact Likelihood for Stationary Vector Autoregressive Moving Average Processes," *Signal Processing*, **11**:2, pp. 105–118 (September 1986).
- R. Kumaresan, L. L. Scharf, and A. K. Shaw, "An Algorithm for Pole-Zero Modeling and Spectral Analysis," *IEEE Trans ASSP*, **ASSP-34**:3, pp. 637–640 (June 1986).
- N. Judell and L. Scharf, "A Simple Derivation of Lloyd's Classical Result for the Optimum Scalar Quantizer," *IEEE Trans Inform Th*, **IT-32**:2, pp. 326–328 (March 1986).
- L. L. Scharf and S. Sigurdsson, "Fixed-Point Implementation of Fast Kalman Predictors," *IEEE Trans Autom Contr*, **AC-29**:9, pp. 850–852 (September 1984).
- R. Kumaresan, D. W. Tufts, and L. L. Scharf, "A Prony Method for Noisy Data: Choosing the Signal Components and Selecting the Order in Exponential Signal Models," *Proc IEEE*, **72**:2, pp. 230–233 (February 1984).
- L. L. Scharf and H. Elliott, "Aspects of Dynamic Programming in Signal and Image Processing," *IEEE Trans Autom Contr*, **AC-26**:5, pp. 1018–1029 (October 1981).
- A. A. Beex and L. L. Scharf, "Covariance Sequence Approximation for Parametric Spectrum Modeling," *IEEE Trans ASSP*, **ASSP-29**:5, pp. 1040–1051 (October 1981).
- O. Macchi and L. L. Scharf, "A Dynamic Programming Algorithm for Phase Estimation and Data Decoding on Random Phase Channels," *IEEE Trans Inform Th*, **IT-27**:5, pp. 581–595 (September 1981).
- A. A. Beex and L. L. Scharf, "Recursive Digital Filter Design via Covariance Sequence Approximation," *IEEE Trans ASSP*, **ASSP-29**:1, pp. 51–57 (February 1981).
- L. L. Scharf, D. D. Cox, and C. J. Masreliez, "Modulo- 2π Phase Sequence Estimation," *IEEE Trans Inform Th*, **IT-26**:5, pp. 615–620 (September 1980).
- J. P. Dugre, A. A. Beex, and L. L. Scharf, "Generating Covariance Sequences and the Calculation of Quantization and Rounding Error Variances in Digital Filters," *IEEE Trans ASSP*, **ASSP-28**:1, pp. 102–104 (February 1980).
- L. L. Scharf and J. C. Luby, "Statistical Design of Autoregressive Moving Average Digital Filters," *IEEE Trans ASSP*, **ASSP-27**:3, pp. 240–247 (June 1979).
- J. F. Kinkel, J. Perl, L. L. Scharf, and A. R. Stubberud, "A Note on Covariance-Invariant Digital Filter Design and Autoregressive Moving Average Spectrum Analysis," *IEEE Trans ASSP*, **ASSP-27**:2, pp. 200–202 (April 1979).
- H. Clergeot and L. L. Scharf, "Connections between Classical and Statistical Methods of FIR Digital Filter Design," *IEEE Trans ASSP*, **ASSP-26**:5, pp. 463–465 (October 1978).
- L. L. Scharf and D. L. Alspach, "Nonlinear State Estimation in Observation Noise of Unknown Covariance," *Int J Control*, **27**:2, pp. 293–304 (February 1978).

- J. Perl and L. L. Scharf, "Covariance-Invariant Digital filtering," *IEEE Trans ASSP*, **ASSP-25**:2, pp. 143–152 (April 1977).
- L. L. Scharf and L. W. Nolte, "Likelihood Ratios for Sequential Hypothesis Testing on Markov Sequences," *IEEE Trans Inform Th*, **IT-23**:1, pp. 101–109 (January 1977).
- L. L. Scharf and P. H. Moose, "Information Measures and Performance Bounds for Array Processors," *IEEE Trans on Inform Th*, **IT-22**:1, pp. 11–21 (January 1976).
- D. C. Farden and L. L. Scharf, "Authors' Reply to 'Comments on Statistical Design of Nonrecursive Digital Filters'," *IEEE Trans ASSP*, **ASSP-23**:5, pp. 495–497 (October 1975).
- R. L. Swarts and L. L. Scharf, "Note on Acoustic Scattering from Random Amplitude/Random Phase Sinusoidal Sea Surfaces," *J Acoust Soc Am*, **56**:2, pp. 686–687 (August 1974).
- D. C. Farden and L. L. Scharf, "Statistical Design of Nonrecursive Digital Filters," *IEEE Trans ASSP*, **ASSP-22**:3, pp. 188–196 (June 1974).
- L. L. Scharf and R. L. Swarts, "Acoustic Scattering from a Stochastic Sea Surface," *J Acoust Soc Am*, **55**:2, pp. 247–253 (February 1974).
- D. L. Alspach, L. L. Scharf, and A. Abiri, "A Bayesian Solution to the Problem of State Estimation in an Unknown Noise Environment," *Int J Control*, **19**:2, pp. 265–287 (February 1974).
- L. L. Scharf and D. W. Lytle, "Stability of Parameter Estimates for a Gaussian Process," *IEEE Trans Aerospace and Electronic Systems*, **AES-6**, pp. 847–851 (November 1973).
- R. D. Martin and L. L. Scharf, "Simulation of Processes with Non-Separable Covariances," *IEEE Trans Autom Contr*, **AC-18**:5, pp. 546–547 (October 1973).
- L. L. Scharf, "State Model of a Pseudo-Innovations Process," *IEEE Trans Autom Contr*, **AC-18**:5, pp. 547–548 (October 1973).
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