Curriculum Vitae
PATRICK J. LOUGHLIN
302 Benedum Hall
University of Pittsburgh
Pittsburgh, PA 15261
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TITLE: Professor and Associate Chair of Bioengineering; Professor of Electrical & Computer Engineering (secondary appointment)

INTERESTS: multi-sensory integration in motor control; haptics, vibrotactile feedback and sensory substitution; brain-computer interfaces; neural signal analysis; nonstationary signal processing, time-frequency analysis, and time-varying systems analysis and modeling; optimal signal design for active sensing (sonar, radar, ultrasound, bioimaging).

EDUCATION
Ph. D., 1992, Electrical Engineering, University of Washington, Seattle, WA
M.S., 1988, Bioengineering, University of Utah, Salt Lake City, UT
B.S. (Summa Cum Laude), 1985, Biomedical Engineering, Boston University, Boston, MA

PROFESSIONAL EXPERIENCE
1993-date: Faculty, University of Pittsburgh
    Dept. of Bioengineering
            2001-date: Professor (primary appointment since 2008)
            2015-date: Associate Chair
            1998-2001: Associate Professor (secondary appointment)
    Dept. of Electrical and Computer Engineering
            2001-2008: Professor
            2004-2005: Interim Chair
            1998-2001: Associate Professor
            1993-1998: Assistant Professor
2015-date: Faculty, CMU-Pitt Center for the Neural Basis of Cognition
1989-1992: Graduate Research Assistant, University of Washington (Seattle), Dept. of Electrical Engineering
1986-1988: Graduate Research Assistant, University of Utah, Dept. of Bioengineering

Visiting Appointments
2001-2002: Visiting Scholar, Applied Physics Laboratory, University of Washington (sabbatical)
Summer 2000: Visiting Scholar, Applied Physics Laboratory, University of Washington
Summer 1996: US Navy/ASEE Faculty Fellow, Naval Surface Warfare Center, Bremerton, WA

HONORS and AWARDS
- Fellow of the Institute of Electrical and Electronics Engineers (IEEE) [Elected 2011]
- Fellow of the American Institute for Medical and Biological Engineering (AIMBE) [Elected 2009]
- Fellow of the Acoustical Society of America (ASA) [Elected 2009]
- NSF Faculty Early Career Development (CAREER) Award, 1996
- ONR Young Investigator Award, 1998
- U.S. Navy-ASEE Summer Faculty Fellow, NSWC, 1996
- Invited participant, NAE 5th Annual Symposium on Frontiers of Engineering, 1999
- Fulton C. Noss Faculty Fellowship, School of Engineering, 1996-2002
- Board of Visitors Faculty Award, School of Engineering, 1998
- Chancellor's Distinguished Research Award, University of Pittsburgh, 1999
- William Kepler Whiteford Professorship, School of Engineering, 2002-2015
- Tau Beta Pi engineering honor society (inducted 1983)

PUBLICATIONS: Authored/co-authored over 75 journal papers. Complete bibliography begins on p. 5.

GRANTS
External

- National Institutes of Health (NICHD): R01HD090125, $1.67M total ($225K annual direct costs), 02/01/2017 – 01/31/2022. Role: PI (multi-PIs: Batista, Loughlin). ``Multisensory Integration in Action: a Multineuronal and Feedback-Control Approach.''

- National Institutes of Health (NINDS): 1UH3NS100541, $5.30M total, 9/25/2017 - 07/31/2022. Role: co-I (multi-PIs: Fisher, Weber). ``Spinal root stimulation for restoration of function in lower-limb amputees.''

- National Institutes of Health (NIA): R03 award AG042046, $149,862 ($100K total direct costs), 9/12-8/14. Role: PI (Co-I's: J. Furman, and P. Sparto).
"Subject-specific vibrotactile feedback for improving balance in older adults"

- Office of Naval Research: $364,677, 12/12-11/15. Role: PI
"Sonar Signal Processing and Feature Extraction for Automatic Target Recognition in Clutter"

- Pennsylvania Lions Hearing Research Foundation: $18,837, 08/11-07/12. Role: PI
"Evaluation of Vibrotactile Balance Prosthesis in Patients with Vestibular Impairment"

- National Institutes of Health (NIA): R01 award AG029546, $716,963 ($492K direct costs), 7/07-6/12. Role: PI (Co-I's: J.R. Jennings, J. Furman, M. Redfern and P. Sparto). "Modelling Sensory Integration and Attention in Postural Control of Older Adults."

- National Institutes of Health (NIA): R01 competing revision (ARRA award) AG029546-03S1, $65.1K (direct costs), 9/09-8/11. Role: PI (Co-I: T. Huppert). "Modelling Sensory Integration and Attention in Postural Control of Older Adults: cortical brain activity using NIRS imaging."

- Office of Naval Research: $329,634, 10/09-9/12. Role: PI
"Nonstationary Signal Processing Methods for Channel Characterization and Sonar Signal Classification in Varying and Uncertain Environments."

- Office of Naval Research: $11,238, 3/10-9/12. Role: PI
"Graduate Student Applied Summer Research Experience."

- Office of Naval Research: $300,305, 1/09-12/11. Role: PI
"Sonar Signal Analysis and Waveform Design for Enhanced Target Detection and Classification."

- Office of Naval Research: $409,992, 10/05-9/09. Role: PI
"Nonstationary Signal Processing Methods for Channel Characterization and Signal Classification."

- National Institutes of Health (NIA): R01 award, $1.25M ($175K annual direct costs), 6/03-5/08.
Role: Co-I (10% effort). PI: M. Redfern, "Postural Control in The Elderly: The Role of Attention."

- Office of Naval Research: $50,000, 12/06-12/07. Role: PI
``Time-Frequency Analysis and Feature Extraction for Broadband Mine Classification''

- Office of Naval Research: $338,565, 10/01-9/05. Role: PI
"Methods for Nonstationary Signal Analysis and Classification."

- Office of Naval Research: $5,495, 5/05-9/05. Role: PI
"Methods for Nonstationary Signal Analysis and Classification: Graduate Student Summer Research Experience at APL-UW."

- Office of Naval Research: $4,470, 5/04-9/04. Role: PI
"Methods for Nonstationary Signal Analysis and Classification: Graduate Student Summer Research Experience at APL-UW."

- National Institutes of Health (NIDCD): R01 award DC04435, $448,344, 4/00-3/04. Role: PI
(Co-I's: J. Furman and M. Redfern). "Time-Varying Characteristics of Human Postural Sway."

- Office of Naval Research, Young Investigator Award: $300,000, 6/98-9/01. Role: PI
"New Techniques for Analysis and Characterization of Acoustic Waves."

- National Science Foundation, CAREER Award: $205,000, 9/96-8/00. Role: PI
"Joint Density-Based Methods of Applied Nonstationary Signal Processing."

- Whitaker Foundation: $69,928, 11/99-10/00. Role: PI (Co-I's: J. Furman and M. Redfern)

"Time-Varying Properties of Human Postural Control."

- Whitaker Foundation: $207,036, 4/96-3/99. Role: PI (Co-I's: J. Furman and M. Redfern)
  "Time-Varying Properties of Human Postural Control."
- Office of Naval Research: $127,293, 5/96-9/98. Role: PI
  "Positive Time-Frequency Distributions: Development and Applications."
- Boeing Commercial Airplane: $84,978, 11/95-12/96. Role: PI
  "Monitoring Manufacturing Processes via Positive Time-Frequency Distributions."
- NATO Collaborative Research Grants Programme: $6,883, 7/96-6/98. Role: PI
  (Co-PI: J. Fonollosa, Barcelona, Spain)
  "Moments and Generalized Marginals of Time-Frequency Distributions."
- Alcoa Foundation: $7,500, 5/94-6/96. Role: PI

Internal

- ``Designing a vibrotactile balance prosthesis to achieve desired body sway reductions,'' Central Research Development Fund, $15,455, 7/11-6/13. Role: PI (co-I's: J. Furman, P. Sparto)
- "Structural MRI and Postural Control Modelling," Pittsburgh Claude D. Pepper Older Americans Independence Center (University center funded by NIH/NIA), $15,000, 6/1/08-5/31/09. Role: PI (co-I's: H. Aizenstein)
- "Modeling Sensory Integration and Attention in Balance of Elderly Subjects," Pittsburgh Claude D. Pepper Older Americans Independence Center (University center funded by NIH/NIA), $36,960, 6/1/05-5/31/06. Role: PI (co-I's: M. Redfern, J. Furman, P. Sparto)
- Hewlett International Grant Program, $2,000, 6/01-6/02.
- Central Research Development Fund, $13,400, 7/95-6/96.

PROFESSIONAL ACTIVITIES

- Associate Editor, Member of the Editorial Board, *IEEE Transactions on Biomedical Engineering*, 2005-2017.
- Associate Editor, *Journal of the Acoustical Society of America*, 2012-2016.
- Visiting Committee, Dept. of Biomedical Engineering, Boston University, 2009-current.
- Member of TechComm on Acoustic Signal Processing, Acoustical Society of America, 2000-2016.
- Special session co-organizer, and co-chair ``Applications and Methods of Time-Frequency Analysis,'' *21st International Congress on Acoustics & 165th Meeting of Acoust. Soc. Amer.* (joint meeting), Montreal, Quebec, June 2013.
- Special session co-organizer and co-chair, ``Sensory substitution and other aids for balance or gait dysfunction,'' *IEEE Engineering in Medicine and Biology Conference*, San Diego, CA, Aug 28 – Sep. 1, 2012.
- Special session co-organizer and co-chair, ``Restoring or augmenting impaired sensory function for balance and gait, Part I and II,'' *IEEE Engineering in Medicine and Biology Conference*, Boston, MA, Aug 30 – Sep. 3, 2011.
- Special session co-organizer and co-chair, ``Detection and Classification of Buried and Proud Targets I & II,'' *161st mtg Acoust. Soc. Amer.*, Seattle, WA, May 23-27, 2011.
- Guest associate editor for feature article ``The History of Noise'' in *IEEE Signal Processing Magazine*, Nov. 2005.
- NIH study sections:
  - SBIR study section, Development and Aging Small Business Grant, Nov. 2009.
  - SBIR study section, Development and Aging Small Business Grant, June 2010.
  - Special Emphasis Panel (SEP) ZRG1 BBBP-T (52), Basic Behavioral Research on Multisensory Processing (R21) March 2013.
  - Sensorimotor Integration (SMI) study section, Feb. 2017.
  - ZRG1 BDCN-W (02) Study Setion, July 2017.
  - DP5_ZRG1 RPHB-W (53) Study Section, Dec. 2017.
- NASA Sensory Motor Adaptation Review Panel, July 2004; Oct. 2003.

- Co-Guest Editor, *IEEE Engineering in Medicine and Biology Magazine*, special issue on postural control, vol. 22, no. 2, March/April 2003.
- Signal Processing Chapter Chair of the Pittsburgh Section IEEE, 1997-2001, 2002-2003.
- Technical Program Committee member, *IEEE Engineering in Medicine and Biology conference*, 2001.
- Member of NIST Standards Committee ISO TC 108/WG 27 "Signal Processing Methods for the Analysis of Non-Stationary Mechanical Vibration and Shock" and TC 108/WG 26 "Signal Processing Methods for the Analysis of Stationary Mechanical Vibration," 2000-2005.
- General Chair, IEEE Intl. Symp. Time-Frequency and Time-Scale Analysis, Pittsburgh, Oct. 1998.
- Guest Editor, *PROCEEDINGS of the IEEE,* special issue on "Time-Frequency Analysis: Biomedical, Acoustical and Industrial Applications," vol. 84, no. 9, Sep. 1996.
- Co-Guest Editor, *Multidimensional Systems and Signal Processing,* Special Issue on "New Developments in Time-Frequency Analysis," vol. 9, no. 4. Oct. 1998.
- Session Organizer and Chair, Applications of Time-Frequency Analysis in Acoustics, *138th Mtg. of the Acoustical Society of America,* Columbus, OH, Nov. 1-5, 1999.
- Session Co-Chair, Sonar Signal Processing III, *IEEE OCEANS*, Vancouver, BC, Oct. 1-4, 2007.
- Session Co-Chair, Time-Frequency and Time-Scale Analysis, *SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations VII-XVII*, 1997-2007.
- Session Chair, Time-Frequency Analysis and Wavelets, *1995 IEEE International Conference on Acoustics, Speech and Signal Processing,* Detroit, MI, May 9-12, 1995.

TEACHING
BioE 1320: Biological Signals and Systems (AY12-1, 13-1, 14-1, 15-1, 16-1, 17-1, 18-1, 19-1)
BioE 2900: Grant-writing & Fellowships workshop (AY16-1, 17-1, 19-1)
ENGR 2900: Grant-writing & Fellowships workshop (18-1)
BioE 1150: BioMethods Lab (AY11-2, 12-2, 14-2)
BioE 1580: Biomedical Applications of Signal Processing (AY10-1, 11-1, 13-2, 15-2, 17-2, 18-2)
EE/CoE 1896: Sr. Design Projects (08-1)
BioE/ECE 2695: Special Topics in Control – Human Postural Control (06-2)
EE/CoE 0031 - Linear Circuits and Systems 1 (00-1, 03-1, 04-2, 07-1)
EE 1552 - Signals and Systems Analysis (94-1, 94-2, 95-1, 95-2, 96-1, 96-2, 97-1, 98-1, 98-2, 99-2, 01-2, 03-2, 07-2, 08-2)
EE 2523 - Digital Signal Processing (95-2)
EE 2595 - Special Topics in Signal Processing (95-1, 04-1)
EE/BioE 3528 - Time-Frequency Signal Analysis (96-1, 97-2, 99-1, 01-1, 03-1, 05-2, 07-2, 09-1). This upper-level graduate course was developed by Prof. Loughlin

Ph.D./M.S. ADVISING
Jody Fordham, M.S., Dec. 1996. Project: Nonlinear (Order Statistic) Filtering
David Wozny, M.S., Dec. 1997. Thesis: "Human Postural Control Model"
Berkant Tacer, Ph.D., Dec. 1997.
    Dissertation: "Time-Frequency Analysis and Classification of Nonstationary Signals"
Mustafa Emresoy, Ph.D., April 1998 (co-advisor with Dr. El-Jaroudi)
    Dissertation: "New Techniques in Time-Frequency Analysis"
Keith Davidson, Ph.D. , Aug. 2000
    Dissertation: "Instantaneous Moments of a Signal"
Ferhat Cakrak, Ph.D., April 2001
    Dissertation: "Multiple Window Time-Varying Spectral Analysis"
Seong-cheol Jang, Ph.D. Dec. 2001
    Dissertation: "Adaptive Excision of AM-FM Interference in Spread Spectrum Communications"
Dami Aluko, M.S., Apr. 2004
    Thesis: "Underwater sound propagation analysis and modeling"
Aasma Walia, M.S., Apr. 2004

Thesis: "Identification and restoration of a class of aliased signals"
Arash Mahboobin, Ph.D. Dec. 2007
    Dissertation: "Computational and Robotic Models of Human Postural Control"
Benjamin Shelly, M.S. student
    Topic: Time-frequency analysis of heart-rate variability
Rebecca Ross, M.S., Dec. 2008
    Thesis: "Damping and Dispersion of Twisted-Pair Transmission Line and a Compensation Method to Improve Location of Impedance Discontinuities"
Greg Okopal, MS Dec. 2006, Ph.D. Aug. 2009
    MS Thesis: ``Implementation and Evaluation of Dispersion-Invariant Features for Signal Classification''
    PhD Dissertation: "Phase Space Analysis and Classification of Sonar Echoes in Shallow-Water Channels"
Massimo Cenciarini, Ph.D. Dec. 2010
    PhD Dissertation: "Effect of Aging on Human Postural Control and the Interaction with Attention"
Brandon Hamschin, M.S. Aug. 2011, Ph.D. Aug. 2015
    MS Thesis: "Waveform Design with Time and Frequency Constraints for Optimal Detection of Elastic Objects"
    PhD Dissertation: ``A Sequential Method for Passive Detection, Characterization, and Localization of Multiple Low-Probability-of-Intercept LFMCW Signals''
Vikram Thiruneermalai Gomatam, M.S. Dec. 2011, Ph.D. Dec. 2015
    MS Thesis: "Time-Frequency Approximation and Feature Extraction for Range-Dependent Underwater Sound Propagation"
    PhD Dissertation: ``Channel Characterization and Object Classification in Non-stationary and Uncertain Environments''
Nicole McClain, M.S. Dec. 2015
    Project: Patient-customized vibrotactile feedback (VTF) for balance, and modulated v. binary VTF.
    Undergraduate researcher, May 2012-May 2013. Project: Implementation and evaluation of customized vibrotactile balance feedback.
Stephen Kita, *undergraduate researcher*, BS 2014
    Project: Encoding vibrotactile feedback for BCI simulations and balance control, Jan. 2013-April 2014.
Jessi Mischel, Ph.D. Dec. 2016 (co-advisor: A. Batista)
    PhD Dissertation: `` Brain Computer Interfaces: Challenges to Clinical Viability Addressed in the Laboratory''

UNIVERSITY and DEPARTMENT SERVICE

Pitt Faculty Assembly, 2014-2017; 2018-date; Pitt Faculty Senate Commonwealth Relations Committee, 2014-2017; Pitt Faculty Senate Community Relations Committee, 2011-2014; School of Engineering Appointment, Promotion and Tenure Review Committee, 2006-2009, 2011-2012 (Chair 2008-09); School of Engineering Planning and Budgeting Committee, 2005-2009; 2010-2012; University Research Council, 2002-2005 (Chair of Science and Engineering CRDF Proposal Review subcommittee, 2004-2005); Search Committee for Associate Dean for Research, 1999-2000 (Chair); School Tenure and Promotion Policy Committee, 1999; School Committee on New Sources of Revenue, 1993-94.

Bioengineering Graduate Admissions Committee, 1997-2003, 2009-current (Chair); Bioengineering Graduate Program Committee, 2009-current; Bioengineering Graduate Program Assessment Committee, 2009-2010; Bioengineering Faculty Search Committee, 1996-97, 2011-2012, 2014-2015; 2016-2017 (chair), 2017-2018 (chair); Bioengineering Curriculum Development, 1995-97.

ECE Appointment, Promotion and Tenure Review Committee, 2006-2007; ECE Planning and Budgeting Committee, 2005-2008; Interim Chair, ECE department (2004-2005); EE Graduate Recruiting and Admissions Committee (2003-2004; Chair); EE Graduate Committee (2002-2003; Chair 03-1 semester); EE Faculty Search Committee, 1997-2001 (Chair 2000-2001); EE Graduate Recruiting Committee, 2000-2001; EE Graduate Research Review Organizing Committee, 1993-96 (Chair in 1996); EE Undergraduate Curriculum Committee, 1993-95, 1996-98; EE Graduate Curriculum Committee, 1995-96; EE Student/Faculty Committee, 1995-96; EE Retreat Planning Committee, 1994-95.

Assisted Freshman Program via recruitment activities, including phoning prospective students and visiting Sewickley Academy (1993-94), Frick Academy (1993-94) and Highlands Sr. High School (1996-97); service as a Faculty Mentor (1993-94); participation in Career Day 1995; participant in freshman seminar career discussions 1997; judge for Pittsburgh Regional Science and Engineering Fair, Duquesne University, 1998, 1999.

Faculty Advisor to HKN (1996-2003), Tau Beta Pi (1996-99) and Coop program (1996-2006).

Organized Grantsmanship Workshop for Assistant Profs. of the School, 1996.

BIBLIOGRAPHY
Publications and Presentations

Refereed Journal Articles

1. R. Sala Mayato, P. Loughlin, L. Cohen, ``M-indeterminate distributions in quantum mechanics and the non-overlapping wave function paradox,'' *Phys. Lttrs. A* [accepted; in press].
2. K. Quick, J. Mischel, P. Loughlin, A. Batista, ``The Critical Stability Task requires continuous movements guided by sensory feedback," *J. Neurophysiology* [accepted, in press].
3. J.S. Ben-Benjamin, N.C. Dias, L. Cohen, P. Loughlin, and J.N. Prata, ``What is the Wigner function closest to a given square integrable function?,'' *SIAM J. Math. Anal.* [accepted, in press].
4. C-C. Lin, S. L. Whitney, P. J. Loughlin, J. M. Furman, M. S. Redfern, K. H. Sienko; P. J. Sparto, ``The Use of Vibrotactile Feedback During Dual-Task Standing Balance Conditions in People With Unilateral Vestibular Hypofunction,'' *Otology & Neurotology*. 39(5):e349–e356, 2018.
5. A. L. Rosso, M. Cenciarini, P. J. Sparto, P. J. Loughlin, J. M. Furman, T. J. Huppert. ``Neuroimaging of an attention demanding dual-task during dynamic postural control,'' *Gait and Posture*, v. 57, pp. 193-198, 2017.
6. L. Cohen, J.S. Ben-Benjamin and P. Loughlin, ``Phase space approach to wave propagation using windowed wave functions,'' *J. Modern Optics,* v. 63, issue 1, pp. 17-22, 2016.
7. B. Hamschin and P. Loughlin, ``Model-based waveform design for optimal detection: A multi-objective approach to dealing with incomplete *a priori* knowledge,'' *J. Acoust. Soc. Amer*., v. 138, pp. 3220-30, 2015.
8. J. S. Ben-Benjamin, L. Cohen and P. Loughlin, ``A phase space approach to wave propagation with dispersion,'' *J. Acoust. Soc. Amer*., v. 138, pp. 1122-1131, 2015.
9. C-C. Lin, S. Whitney, P. Loughlin, J. Furman, M. Redfern, K. Sienko, and P. Sparto, ``The effect of age on postural and cognitive task performance while using vibrotactile feedback,'' *J. Neurophysiology*, vol. 113 no. 7, 2127-2136, 2015.
10. H. Karim, P. Sparto, H. Aizenstein, J. Furman, T. Huppert, K. Erickson, P. Loughlin, ``Functional MR imaging of a simulated balance task,'' *Brain Research*, v. 1555, pp. 20-27, 2014.
11. L. Cohen and P. Loughlin, ``Bohmian and quantum phase space distribution expansions and approximations,'' *Phys. Lttrs. A*, v. 378, iss. 13, pp. 931–936, 2014.
12. B. Hamschin and P. Loughlin, ``Time and Frequency Constrained Sonar Signal Design for Optimal Detection of Elastic Objects,'' *J. Acoust. Soc. Amer.,* vol. 133, pp. 2169-2179, 2013.
13. Y.T. Tzen, D. Brienza, P. Karg and P. Loughlin, ``Effectiveness of local cooling for enhancing tissue ischemia tolerance in people with spinal cord injury," *J. Spinal Cord Medicine*, v. 36, no. 4, pp. 357-64, 2013.
14. L. Cohen and P. Loughlin, ``The conditional Weyl transform and its generalization,'' *J. Pseudo-Differ. Oper. Appl.*, v. 4, issue 1, pp. 1-12, 2013.
15. P. Loughlin and B. Hamschin, ``Detection with the Wigner distribution of a pulse propagating with dispersion and damping,'' *J. Mod. Optics,* Vol. 58, Issue 21, pp. 2043-2048, 2011.
16. G. Okopal and P. Loughlin, ``Propagation-invariant classification of sounds in channels with dispersion and absorption'', *J. Acoust. Soc. Amer.*, Vol. 128, Iss. 5, pp. 2888-2897, 2010.
17. P. Loughlin, ``Local duration-bandwidth product of propagating pulses,'' *J. Mod. Optics,* Vol. 57, Issue 19, pp. 1944 – 1948, 2010.
18. Y.T. Tzen, D. Brienza, P. Karg and P. Loughlin, "Effects of local cooling on sacral skin perfusion response to pressure: Implications for pressure ulcer prevention," *J. Tissue Viability*, vol. 19, no. 3, pp. 86-97, 2010.
19. M. Cenciarini, P. Loughlin, P. Sparto and M. Redfern, ``Stiffness and damping in postural control increases with age,'' *IEEE Trans. Biomed. Engr.,* vol. 57, no. 2, pp. 267-275, 2010.
20. G. Okopal and P. Loughlin, ``Moments of a pulse propagating with dispersion and damping: a phase space based approximation method,'' *J. Modern Optics*, vol. 56, no. 18, pp. 2133-2136, 2009.
21. A. Mahboobin, P. Loughlin, C. Atkeson and M. Redfern, ``A mechanism for sensory re-weighting in postural control,'' *Medical & Biological Engineering & Computing,* vol. 47, no. 9, pp. 921-929, 2009.
22. K. O'Connor, P. Loughlin, M. Redfern and P. Sparto, "Postural adaptations to repeated optic flow stimulation in older adults" *Gait and Posture,* vol. 28, no. 3, pp. 385-391, 2008.
23. A. Mahboobin, P. Loughlin, M. Redfern, S. Anderson, C. Atkeson, J. Hodgins, "Sensory adaptation in human balance control: Lessons for biomimetic robotic bipeds," *Neural Networks,* vol. 21, no. 4, pp. 621-627, 2008.

24. G. Okopal, P. Loughlin and L. Cohen, ``Dispersion-invariant features for classification,'' *J. Acoust. Soc. Amer.*, vol. 123, no. 2, pp. 832-841, 2008.
25. G. Okopal, P. Loughlin and J. Angell, ``Propagation-invariant classification of active impulsive sonar signals (U),'' *J. Underwater Acoustics*, vol. 58, no. 4, pp. 1063-1088, 2008. (Secret)
26. P. Loughlin and L. Cohen, ``Approximate wave function from approximate non-representable Wigner distributions,'' *J. Modern Optics*, vol. 55, no. 19/20, pp. 3379-3387, 2008.
27. L. Cohen, P. Loughlin and G. Okopal, ``Exact and approximate moments of a propagating pulse,'' *J. Modern Optics*, vol. 55, no. 19/20, pp. 3349-3358, 2008.
28. A. Mahboobin, P. Loughlin and M. Redfern, "A model-based approach to attention and sensory integration in postural control of older adults," *Neuroscience Letters*, vol. 429, pp. 147-151, 2007.
29. P. Loughlin, "Comments on 'The generalized Wiener process for colored noise'," *IEEE Signal Processing Letters*, vol. 14, no. 10, pp. 766-769, 2007.
30. J. Pitton, W. Kooiman, P. Loughlin and J. McLaughlin, "Environmental effects on classification of impulsive-source sonar echoes in shallow water (U)," *J. Underwater Acoustics,* vol. 56, no. 1, pp. 253-266, 2006. (Secret)
31. P. Loughlin, "Wigner distribution approximation for filtered signals and waves," *J. Modern Optics,* vol. 53, no. 16-17, pp. 2387 – 2397, 2006.
32. P. Loughlin, "Time-varying spectral approximation of filtered signals," *IEEE Signal Processing Letters*, vol. 13, no. 10, pp. 604-607, 2006.
33. M. Musolino, P. Loughlin, P. Sparto and M. Redfern "Spectrally similar periodic and non-periodic optic flows evoke different postural sway responses," *Gait & Posture*, vol. 23, iss. 2, pp. 180-188, 2006.
34. A. Mahboobin, P. Loughlin, M. Redfern, P. Sparto, "Sensory re-weighting in human postural control during moving-scene perturbations," *Exp Brain Res*, vol. 167, pp. 260-267, 2005.
35. P. Loughlin and L. Cohen, "A Wigner approximation method for wave propagation," *J. Acoust. Soc. Amer.,* vol. 118, no. 3, pp. 1268-1271, 2005.
36. P. Sparto, J. Jasko, P. Loughlin, "Detecting postural responses to sinusoidal sensory inputs: a statistical approach," *IEEE Trans. Neural Syst. And Rehab. Engr.*, vol. 12, no. 3, pp. 360-366, 2004.
37. P. Loughlin and L. Cohen, "The uncertainty principle: global, local or both?," *IEEE Trans. Sig. Process.,* vol. 52, no. 5, pp. 1218-1227, 2004.
38. R. Peterka and P. Loughlin, "Dynamic regulation of sensorimotor integration in human postural control," *J. Neurophysiol.*, vol. 91, pp. 410-423, 2004.
39. P. Loughlin and L. Cohen, "Current and quasi-probability phase-space distributions," *J. Mod. Optics,* vol. 50, pp. 2305-2329, 2003.
40. L. Cohen and P. Loughlin, "Author's Reply," *Signal Processing*, vol. 83, no. 8, pp. 1821-1822, 2003.
41. P. Loughlin and M. Redfern, "Analysis and modeling of human postural control," *IEEE Engineering in Medicine and Biology Magazine,* vol. 22, no. 2, p. 18, 2003 (editorial to special issue).
42. P. Loughlin, M. Redfern and J. Furman, "Nonstationarities of postural sway: The utility of time-frequency analysis in studying human balance," *IEEE Engineering in Medicine and Biology Magazine,* vol. 22, no. 2, pp. 69-75, 2003. --, "Errata – Nonstationarities of postural sway" *IEEE EMB Magazine*, vol. 22, no. 3, p. 14, 2003.
43. J. Pitton, P. Loughlin, J. Luby and J. McLaughlin, "Biologically-inspired feature extraction for classification of impulsive source sonar echoes (U)," *US Navy Journal of Underwater Acoustics* (Secret), vol. 52, no. 1, pp. 367-380, 2002.
44. P. Loughlin and L. Cohen, "Local properties of dispersive pulses," *J. Mod. Optics,* vol. 49, no. 14/15, pp. 2645-2655, 2002.
45. L. Cohen, L. Galleani, R. Hedges, D. Hughes, P. Loughlin and B. Suter, "Time–frequency analysis of a variable stiffness model for fault development," *Digital Signal Processing*, vol. 12, pp. 429-440, 2002.
46. L. Cohen and P. Loughlin, "Generalized Wigner distributions, moments, and conditional correspondence rules," *J. Mod. Optics,* vol. 49, no. 3/4, pp. 539-560, 2002.
47. S.-C. Jang and P. Loughlin, "AM-FM interference excision in spread spectrum communications via projection filtering," *EURASIP Journal on Applied Signal Processing,* vol. 2001, no. 4, pp. 239-248, 2001.
48. B. Tacer and P. Loughlin, "A training-based approach for robust classification of unknown transients with unknown arrival time and unknown Doppler shift," *J. Franklin Institute,* vol. 338, pp. 751-764, 2001.
49. P. Loughlin and K. Davidson, "Modified Cohen-Lee time-frequency distributions and instantaneous bandwidth of multicomponent signals," *IEEE Trans. Signal Process.,* vol. 49, no. 6, pp. 1153-1165, 2001.
50. F. Cakrak and P. Loughlin, "Multiple window time-varying spectrum with instantaneous bandwidth and frequency

constraints," *IEEE Trans. Sig. Process.,* vol. 49, no. 8, pp. 1656-1666, 2001.

51. F. Cakrak and P. Loughlin, "Multiple window time-varying spectral analysis," *IEEE Trans. Sig. Process.*, vol. 49, no. 2, pp. 448-453, 2001.
52. P. Loughlin and M. Redfern, "Spectral characteristics of visually-induced postural sway in healthy elderly and healthy young subjects," *IEEE Trans. Rehab. Engr.,* vol. 9, no. 1, pp. 24-30, 2001.
53. K. Davidson and P. Loughlin, "Instantaneous spectral moments," *J. Franklin Institute,* vol. 337, pp. 421-436, 2000.
54. P. Loughlin, F. Cakrak and L. Cohen, "Conditional moments analysis of transients with application to helicopter fault data," *Mech. Syst. Sig. Process.,* vol. 14, no. 4, pp. 511-522, 2000.
55. S. Shah, A. El-Jaroudi, P. Loughlin and L. Chaparro, "Signal synthesis and positive time-frequency distributions," *J. Franklin Institute,* vol. 337, pp. 317-328, 2000.
56. P. Loughlin and K. Davidson, "Instantaneous kurtosis," *IEEE Signal Process. Lttrs.*, vol. 7, no. 6, pp. 156-159, 2000.
57. K. Davidson and P. Loughlin, "Compensating for window effects in the calculation of spectrographic instantaneous bandwidth," *IEEE Trans. Biomed. Engr.,* vol. 47, no. 4, pp. 556-558, 2000.
58. L. Cohen, P. Loughlin and D. Vakman, "On an ambiguity in the definition of the amplitude and phase of a signal," *Signal Processing,* vol. 79, no. 3, pp. 301-307, 1999.
59. W. Nho and P. Loughlin, "When is instantaneous frequency the average frequency at each time?," *IEEE Sig. Process. Lttrs.,* vol. 6, no. 4, pp. 78-80, 1999.
60. M. Emresoy and P. Loughlin, "Weighted least squares Cohen-Posch time-frequency distributions with specified conditional and joint moment constraints," *IEEE Trans. Sig. Process.,* vol. 47, no. 3, pp. 893-900, 1999.
61. P. Loughlin, "Spectrographic measurement of instantaneous frequency and the time-dependent weighted average instantaneous frequency," *J. Acoust. Soc. Amer.,* vol. 105, no. 1, pp. 264-274, 1999.
62. P. Loughlin, "Do bounded signals have bounded amplitudes?," *Multidim. Syst. Sig. Process.,* vol. 9, no. 4, pp. 419-424, 1998.
63. B. Tacer and P. Loughlin, "Nonstationary signal classification using the joint moments of time-frequency distributions," *Pattern Recognition,* vol. 31, no. 11, 1998.
64. M. Emresoy and P. Loughlin, "Weighted least squares Cohen-Posch time-frequency distributions," *IEEE Trans. Sig. Process.,* vol. 46, no. 3, pp. 753-757, 1998.
65. P. Loughlin, "Cohen-Posch (positive) time-frequency distributions: development and applications," *Applied Sig. Process.,* vol. 4, pp. 122-130, 1997.
66. P. Loughlin and B. Tacer, "Instantaneous frequency and the conditional mean frequency of a signal," *Sig. Process.,* vol. 60, no. 2, pp. 153-162, 1997.
67. P. Loughlin and G. Bernard, "Cohen-Posch (positive) time-frequency distributions and their application to machine vibration analysis," *Mech. Syst. Sig. Process.,* vol. 11, no. 4, pp. 561-576, 1997.
68. S. Shah, P. Loughlin, L. Chaparro and A. El-Jaroudi, "Informative priors for minimum cross-entropy positive time-frequency distributions," *IEEE Sig. Process. Lttrs.,* vol. 4, no. 6, pp. 176-177, 1997.
69. P. Loughlin and B. Tacer, "Comments on the interpretation of instantaneous frequency," *IEEE Sig. Process. Lttrs.,* vol. 4, no. 5, pp. 123-125, 1997.
70. P. Loughlin, M. Redfern and J. Furman, "Time-varying characteristics of visually-induced postural sway," *IEEE Trans. Rehab. Engr.,* vol. 4, no. 4, pp. 416-424, 1996.
71. P. Loughlin and B. Tacer, "On the amplitude- and frequency-modulation decomposition of signals," *J. Acoust. Soc. Amer.,* vol. 100, no. 3, pp. 1594-1601, 1996.
72. B. Tacer and P. Loughlin, "Time-scale energy density functions," *IEEE Trans. Sig. Process.,* vol. 44, no. 5, pp. 1310-1314, 1996.
73. P. Loughlin, "Scanning the Special Issue on Time-Frequency Analysis," *Proceedings of the IEEE*, Volume 84, Issue 9, p. 1195, Sept. 1996 (editorial to special issue).
74. P. Loughlin, "Comments on scale invariance of time-frequency distributions," *IEEE Sig. Process. Lttrs.,* vol. 2, no. 12, pp. 217-218, 1995.
75. P. Loughlin, J. Pitton and B. Hannaford, "Approximating time-frequency density functions via optimal combinations of spectrograms," *IEEE Sig. Process. Lttrs.,* vol. 1, no. 12, pp. 199-202, 1994.
76. P. Loughlin, J. Pitton and L. Atlas, "Construction of positive time-frequency distributions," *IEEE Trans. Sig. Process.,* vol. 42, no. 10, pp. 2697-2705, 1994.
77. J. Pitton, L Atlas and P. Loughlin, "Applications of positive time-frequency distributions to speech processing," *IEEE Trans. Speech and Audio Process.,* vol. 2, no. 4, pp. 554-566, 1994.
78. P. Loughlin, J. Pitton and L. Atlas, "Bilinear time-frequency representations: New insights and properties," *IEEE*

Trans. Sig. Process., vol. 41, no. 2, pp. 750-767, 1993.
79. P. Loughlin, W. Bowes and D. Westenskow, "An oil-based model of inhalation anesthetic uptake and elimination," *Anesthesiology,* vol. 71, no. 2, pp. 278-282, 1989.

Edited Books and Book Chapters

1. P. Loughlin, "Denoising and Time-Frequency Analysis of Signals," in L. Cohen, V. Poor and M. Scully (eds.), Classical, Semi-classical and Quantum Noise, Springer, 2012.
2. L. Cohen and P. Loughlin, ``Dispersion, its effects, and compensation," in F. Sadjadi (ed.), Physics of Automatic Target Recognition, Springer, 2007.
3. P. Loughlin and L. Cohen, "Positive Time-Frequency Distributions," in A. Papandreaux (ed.), Applications in Time-Frequency Signal Processing, Ch. 3, pp. 121-162, CRC Press, 2003.
4. D. Groutage, D.Bennink, P. Loughlin, and L. Cohen, "Positive Time-Frequency Distributions and Acoustic Echoes," in A. Papandreaux (ed.), Applications in Time-Frequency Signal Processing, Ch. 4, pp. 163-178, CRC Press, 2003.
5. P. Loughlin, L. Atlas and J. Pitton, "Advanced time-frequency representations for speech processing," in M. Cooke et al. (eds.), Visual Representations of Speech Signals, John Wiley & Sons, Ltd., Chichester, England, 1993, pp. 27-53.
6. L. Atlas, P. Loughlin and J. Pitton, "Signal analysis with cone-kernel time-frequency representations and their application to speech," in B. Boashash (ed.), Time-Frequency Signal Analysis: Methods and Applications, Longman Cheshire, Sydney, Australia, 1992, pp. 375-388.
7. D. Westenskow and P. Loughlin, "Quantitative anesthesia with the help of closed-loop control," in K. Van Ackern et al. (eds.), Quantitative Anaesthesia, Springer-Verlag, W. Germany, 1987, pp. 111-119.

Conference Proceedings

1. V. T. Gomatam and P. Loughlin, ``Enhanced target versus clutter discrimination using time-frequency (LTV) filters,'' *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXV*, Baltimore, MD, April 2015.
2. P. Loughlin, ``Misconceptions about instantaneous frequency, and complex signal representations through pole-zero manipulations,'' *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXV*, Baltimore, MD, April 2015.
3. K. Quick, N. Card, S. Whaite, J. Mischel, P. Loughlin, A. Batista,``Assessing Vibrotactile Feedback Strategies by Controlling a Cursor with Unstable Dynamics,'' *36th IEEE EMBS conference*, Chicago, IL, August 2014.
4. P. Loughlin and V. T. Gomatam, ``Time-frequency filtering for classifying targets in nonstationary clutter,'' *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXIV*, Baltimore, MD, May 2014.
5. P. Loughlin, ``Instantaneous frequency and the Wigner-Gabor signal,'' *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXIV*, vol. 9090, Baltimore, MD, May 2014.
6. V. T. Gomatam and P. Loughlin, ``Sonar signal feature extraction for target recognition in range-dependent environments,'' *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXIII*, 8744-11, Baltimore, MD, May 2013.
7. V. T. Gomatam and P. Loughlin, "A Wigner phase space approximation for range-dependent propagation," *Proc. European Conf. on Underwater Acoustics (ECUA)*, Edinburgh, Scotland, July 2012.
8. V. T. Gomatam and P. Loughlin, "Dispersion-invariant features for classification of objects from their acoustic backscatter in a range-dependent channel," *Proc. SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXII*, Baltimore, MD, April 2012.
9. P. Loughlin, A. Mahboobin and J. Furman, "Designing Vibrotactile Balance Feedback For Desired Body Sway Reductions." *Proc. IEEE Eng. Med. Biol. Conf.*, Boston, MA, 2011.
10. A. Mahboobin, M. Cenciarini, M. Redfern, P. Loughlin , ``Model-based investigation of ankle stiffness control versus active feedback control during quiet standing,'' *Proc. ASME 2011 Summer Bioengineering Conference*, Farmington, PA , June 2011.
11. V. T. Gomatam and P. Loughlin, "Impact of Range Dependent Propagation on Classification of Underwater Objects by Their Sonar Backscatter," *Proc. SPIE Defense, Security and Sensing Symp.*, Orlando, FL, 2011.
12. B. Hamschin and P. Loughlin, "Waveform Design with Time and Frequency Constraints for Optimal Detection of Elastic Objects," *Proc. SPIE Defense, Security and Sensing Symp.*, Orlando, FL, 2011.
13. B. Hamschin and P. Loughlin, "Buried Target Detection and Classification Based on Linear Time-Varying Filtering," *IEEE OCEANS '10 Seattle,* August 2010.
14. B. Hamschin and P. Loughlin, "Sonar waveform design for optimum target detection: the impact of object burial

state," *IEEE OCEANS '10 Sydney*, May 2010.

15. B. Hamschin and P. Loughlin, "Optimal time and frequency domain waveform design for target detection," *Proc. SPIE, Automatic Target Recognition XX, Defense, Sensing and Security Symposium,* vol. 7696, Apr. 2010.

16. Y.-T. Tzen, D. Brienza, P. Karg, P. Loughlin, M. Geyer, "Effectiveness of Local Fast and Slow Cooling on Pressure Induced Reactive Hyperemia (RH) in Adult Human Participants" *Proc. Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) 33rd Int. Conf. on Technology and Disability*, Las Vegas, NV, 2010.

17. M. Cenciarini, P. Loughlin, P. Sparto and M. Redfern, ``Medial-lateral postural control in older adults exhibits increased stiffness and damping,'' *IEEE Engineering in Medicine and Biology Conference*, pp. 7006-9, Minneapolis, MN, Sep. 2-6, 2009.

18. Y.-T. Tzen, P. Loughlin, and D. Brienza, ``Analyzing the Mechanisms of Local Cooling on Pressure Induced Reactive Hyperemia by Applying Short-Time Fourier Transform (STFT), *Proc. Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)*, 2009.

19. G. Okopal and P. Loughlin, ``Moment feature variability in uncertain propagation channels,'' *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XIX,* vol. 7444, 2009.

20. P. Loughlin, ``Conditional and joint positive time-frequency distributions: A brief review,'' *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XIX,* vol. 7444, 2009.

21. G. Okopal and P. Loughlin, ``Moments of a wave propagating with dispersion and damping,'' *Proc. SPIE Defense & Security Symp.*, vol. 7335, paper # 7335-07, 2009.

22. G. Okopal and P. Loughlin, ``A phase space view of dispersive propagation, moment variability, and environmentally-invariant features for classification,'' *Proc. 3rd Intl. Conf. Underwater Acoustic Measurements*, pp. 475-482, Nafplia, Greece, June 21-25, 2009.

23. L. Cohen and P. Loughlin, ``Simple approximation scheme for dispersive pulse propagation, with comparison to the stationary phase approximation,'' *Proc. 3rd Intl. Conf. Underwater Acoustic Measurements*, pp. 1531-1536, Nafplia, Greece, June 21-25, 2009.

24. L. Cohen and P. Loughlin, ``Phase space approach and approximations for wave propagation," *IEEE OCEANS'07,* paper # 070508-008, pp. 1-5, Vancouver, BC, Oct. 1-4, 2007.

25. G. Okopal and P. Loughln, "Propagation-Invariant Classification of Signals in Channels with Dispersion and Damping," *IEEE OCEANS'07,* paper # 070508-007, pp. 1-8, Vancouver, BC, Oct. 1-4, 2007.

26. G. Okopal and P. Loughlin, "Propagation-Invariant Classification of Shallow Water Sonar Signals," *Intl. Conf. On Detection and Classification of Underwater Targets*, Edinburgh, UK, 18-19 Sep. 2007.

27. L. Cohen, P. Loughlin and K. Davidson, "Construction of time-frequency representations from moments," *Proc. SPIE Advanced Signal Processing Algorithms*, vol. 6697, Aug. 26-28, 2007.

28. L. Cohen, K. Davidson and P. Loughlin, ``Constructing densities from moments," *Proc. SPIE Defense & Security Symp.,* vol. 6566, April 9-13, 2007.

29. G. Okopal and P. Loughlin, ``Feature extraction for classification of signals propagating in channels with dispersion and dissipation," *Proc. SPIE Defense & Security Symp.,* vol. 6566, April 9-13, 2007.

30. P. Loughlin, "Time-frequency approximations, with applications to filtering, modulation and propagation," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XVI,* vol. 6313, pp. 63130S-1 – 63130S-9, 2006.

31. A. Mahboobin, P. Loughlin and M. Redfern, "Modeling attention and sensory integration in postural control of older adults," *Amer. Soc. Biomech. mtg*, Sept 6-9, Blacksburg, VA, pp. 39-40, 2006.

32. K. O'Connor, P. Loughlin, M. Redfern and P. Sparto, "Influence of change in surface support on standing postural sway in older adults," *Amer. Soc. Biomech. mtg*, Sept 6-9, Blacksburg, VA, pp. 182-183, 2006.

33. A. Mahboobin, P. Loughlin and M. Redfern, "A model-based approach to attention and sensory integration in postural control of older adults," *Proc. 28th IEEE EMBS Conf.,* Aug 30-Sep 3, NYC, pp. 1315-1318, 2006.

34. G. Okopal, P. Loughlin and L. Cohen, "Recognition of propagating vibrations, and invariant features for classification,'' *Proc. SPIE Defense & Security Symposium*, vol. 6234, pp. 623415-1 – 623415-14, 2006.

35. P. Loughlin, "Effect of convolution and modulation on the time-varying spectrum of a signal, with application to target recognition," *Proc. SPIE Defense & Security Symposium*, vol. 6234, pp. 62340K-1 – 62340K-8, 2006.

36. P. Loughlin and L. Cohen, ``Wigner approximation for filtered random functions," *Proc. 26th Intl. Colloquium on Group Theoretical Methods in Physics*, CUNY Graduate Center, June 26-30, 2006.

37. P. Loughlin and A. Walia, "A method to identify and restore a class of aliased signals," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XIV,* vol. 5559, pp. 184-191, 2004.

38. P. Loughlin and L. Cohen, "Phase-space approach to wave propagation with dispersion and damping," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XIV,* vol. 5559, pp. 221-231, 2004.

39. J. Pitton, W. Kooiman, J. McLaughlin and P. Loughlin, "Classification of impulsive source sonar echoes in the presence of dispersion (U)," *Proc. 33rd Annual Meeting of the Technical Cooperation Program* (Secret), Oct. 18-21, Newport, RI, 2004.

40. L. Cohen and P. Loughlin, "A joint distribution approach to wave propagation and array processing," *Proc. IEEE Sensor and Array Multichannel Signal Processing (SAM) workshop*, paper S12_10, Barcelona, Spain, July, 2004.

41. L. Cohen and P. Loughlin, "Sationary phase approximation: a modification," *Proc. SPIE Defense & Security Symp.*, Automatic Target Recognition XIV, vol. 5426, pp. 227-233, 2004.

42. P. Loughlin and L. Cohen, "Moment features invariant to dispersion," *Proc. SPIE Defense & Security Symp.*, Automatic Target Recognition XIV, vol. 5426, pp. 234-246, 2004.

43. J. Jasko, P. Loughlin, M. Redfern, P. Sparto, "The role of central and peripheral vision in the control of upright posture during anterior-posterior optic flow," *Proceedings of the 27th Annual Meeting of the American Society for Biomechanics*, Toledo, OH, September 25-27, 2003.

44. M. Musolino, P. Loughlin, M. Redfern, "Effects of 'tone-in-noise' moving visual scenes on postural sway," *Proceedings of the 27th Annual Meeting of the American Society for Biomechanics*, Toledo, OH, September 25-27, 2003.

45. L. Cohen and P. Loughlin, "The marginals and time-frequency distributions," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XIII,* vol. 5205, pp. 59-74, Aug. 2003.

46. A. Mahboobin, C. Beck, M. Moeinzadeh, P. Loughlin, ``Analysis and validation of a human postural control model,'' *Proceedings American Control Conference*, Alaska, May 8-10, 2002, vol.5, pp 4122 –4128.

47. P. J. Loughlin, "Local spectral and spatial frequency moments of shallow-water sound propagation," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XII,* vol. 4791, pp. 51-56, 2002.

48. M. French, P. Loughlin and L. Cohen, "Cross time-frequency spectra applied to automotive brake noise," *Proc. Intl. Modal Analysis Conference XX,* Los Angeles, CA, pp. 457-460,Feb. 2002.

49. P. J. Loughlin, "What are the time-frequency moments of a signal?," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations XI,* vol. 4474, pp. 35-44, Aug. 2001.

50. S-C. Jang and P. Loughlin, "Projection filtering technique for AM-FM interference excision in DSSS communication systems," *Proc. IEEE conf. on Nonlinear Signal and Image Processing,* Baltimore, MD, June 2001.

51. P. Loughlin, "Time-frequency moments, 'eyelets' and machine faults," *Proc. SPIE Wavelet Applications VIII*, vol. 4391, pp. 44-50, 2001.

52. D. Nelson, P. Loughlin, G. Cristobal and L. Cohen, "Time-frequency methods for biological signal estimation," *IEEE 15th Intl. Conf. Pattern Recognition,* Barcelona, Spain, Sep. 2000.

53. S.-C. Jang and P. Loughlin, "Use of instantaneous bandwidth for AM-FM jammer excision in spread spectrum communication systems," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations X,* vol. 4116, pp. 80-90, Aug. 2000.

54. P. Loughlin and K. Davidson, "Instantaneous spectral skew and kurtosis," *Proc. 10th IEEE Workshop SSAP,* pp. 574-578, Aug. 2000.

55. S.-C. Jang and P. Loughlin, "Effect and suppression of wideband AM-FM interference in DSSS communication systems," *Proc. Intl. Conf. Telecommunications,* pp. 1162-1166, Acapulco, Mexico, May 2000.

56. F. Cakrak and P. Loughlin, "A new multi-window time-frequency approach yielding accurate low-order conditional moments," *Proc. 30th IEEE Asilomar Conf. on Sigs., Syst. and Comps.,* pp. 1652-1656, Oct. 1999.

57. P. Loughlin, M. Redfern and J. Furman, "Time-frequency analysis of visually-induced postural sway of healthy young and elderly subjects," *Proc. 3rd Intl. Workshop on Biosignal Interpretation,* pp. 230-233, June 1999.

58. P. Loughlin and K. Davidson, "Instantaneous bandwidth of multicomponent signals," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations IX,* vol. 3807, pp. 610-624, July 1999.

59. M. French, L. Cohen and P. Loughlin, "Application of time-frequency methods to sound quality analysis in automobiles," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations IX,* vol. 3807, pp. 546-551, July 1999.

60. D. Nelson, G. Cristobal, V. Kober, F. Cakrak, P. Loughlin and L. Cohen, "Denoising using time-frequency and image processing methods," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations IX,* vol. 3807, pp. 564-581, July 1999.

61. M. French, P. Loughlin, L. Cohen and F. Cakrak, "Time-frequency analysis of automobile road data," *Proc. IMAC XVII* conference, pp. 391-396, 1999.

62. P. Loughlin, "Moments and maximum entropy densities in time-frequency," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations VIII,* v. 3461, pp. 110-119, 1998.

63. P. Loughlin, ``Local spectral and temporal characterizations of a wave,'' *Proc. SPIE Conf. Automatic Target Recognitions VIII,* v. 3371, pp. 552-559, 1998

64. P. Loughlin, "The time-dependent weighted average instantaneous frequency," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 97-100, Oct. 1998.

65. P. Loughlin and K. Davidson, "Positive local variances of time-frequency distributions and local uncertainty," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 541-544, Oct. 1998.

66. M. Emresoy and P. Loughlin, "Weighted least-squares implementation of Cohen-Posch time-frequency distributions with specified conditional and joint moment constraints," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 305-308, Oct. 1998.

67. F. Cakrak and P. Loughlin, "Instantaneous frequency estimation of polynomial phase signals," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 549-552, Oct. 1998.

68. F. Cakrak and P. Loughlin, "Multiple window nonlinear time-varying spectral analysis," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'98,* vol. 4, pp. 2409-2412, May 1998.

69. S. Shah, A. El-Jaroudi, P. Loughlin and L. Chaparro, "Signal synthesis and positive time-frequency distributions," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 17-20, Oct. 1998.

70. B. Tacer and P. Loughlin, "A training-based approach to classification of transients with unknown arrival time and Doppler shift," *Proc. 31st IEEE Asilomar Conf. on Sigs., Syst. and Comps.,* pp. 887-891, Nov. 1997.

71. P. Loughlin, "Applications and recent developments in Cohen-Posch time-frequency distribution analysis," *Proc. IEEE UK Symp. Appl. Time-Frequency and Time-Scale Methods,* Coventry, UK, pp. 57-64, August 1997.

72. P. Loughlin, "Time-varying frequencies of a signal," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations VII,* vol. 3162, pp. 109-122, July 1997.

73. P. Loughlin and G. Bernard, "The applicability of time-frequency analysis to machine- and process-monitoring," *Proc. SAE Aerospace Manufacturing Technology Conf.,* pp. 243-252, June 1997.

74. P. Loughlin, D. Groutage and R. Rohrbaugh, "Time-frequency analysis of acoustic transients," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'97,* vol. 3, pp. 2125-2128, April 1997.

75. B. Tacer and P. Loughlin, "Time-frequency based classification," *Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations VI*, v. 2846, pp. 186-192, Aug. 1996.

76. P. Loughlin, M. Redfern and B. Tacer, "Time-varying characteristics of postural sway are different for patients and healthy controls," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'96,* vol. 3, pp. 1439-1442, May 1996.

77. B. Tacer and P. Loughlin, "What are the joint time-frequency moments of a signal?," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'96,* vol. 3, pp. 1427-1430, May 1996.

78. P. Loughlin, L. Atlas, G. Bernard and J. Pitton, "Application of time-frequency analysis to the monitoring of machining processes," *Proc. 49th Meeting of the Machinery Failure Prevention Technology Society,* (publ.: Vibration Institute, IL), pp. 305-314, April 1995.

79. B. Tacer and P. Loughlin, "Instantaneous frequency and time-frequency distributions," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'95,* vol.2, pp. 1013-1016, May 1995.

80. P. Loughlin, J. Pitton and B. Hannaford, "Fast approximations to positive time-frequency distributions, with applications," *Proc. IEEE Int. Conf. Acous., Speech and Sig. Process.'95,* vol. 2, pp. 1009-1012, May 1995.

81. P. Loughlin, T. Schumann, M. Redfern, J. Furman, L. Chaparro and A. El-Jaroudi, "Time-frequency analysis of postural sway," *Proc. 28th IEEE Asilomar Conf. on Sigs., Syst. and Comps.,* pp. 378-382, Nov. 1994.

82. B. Tacer and P. Loughlin, "Positive time-scale distributions," *Proc. IEEE-SP Intl. Symp. Time-Frequency and Time-Scale Analysis,* pp. 201-204, Oct. 1994.

83. C. Detka, P. Loughlin and A. El-Jaroudi, "On combining evolutionary spectral estimates," *Proc. Seventh IEEE SP Workshop on Statistical Signal and Array Processing,* pp. 243-246, 1994.

84. J. Pitton, L. Atlas and P. Loughlin, "Deconvolution for positive time-frequency distributions," *Proc.27th IEEE Asilomar Conf. on Sigs., Syst. and Comps.,* pp. 1450-1454, 1993.

85. J. Pitton, P. Loughlin and L. Atlas, "Positive time-frequency distributions via maximum entropy deconvolution of the evolutionary spectrum," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'93,* vol. IV, pp. 436-439, 1993.

86. P. Loughlin, J. Pitton and L. Atlas, "Proper time-frequency energy distributions and the Heisenberg uncertainty principle," *Proc. IEEE-SP Intl. Symp. on Time-Frequency and Time-Scale Analysis,* pp. 151-154, 1992.

87. P. Loughlin, J. Pitton and L. Atlas, "An information-theoretic approach to positive time-frequency distributions," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'92,* vol. V, pp. 125-128, 1992.

88. W. Music, W. Fox, P. Loughlin, L. Atlas and J. Pitton, "Shift-keyed signal identification using time-frequency processing," *Proc. 25th IEEE Asilomar Conf. on Sigs., Sys. and Comps.,* pp. 846-850, 1991.
89. L. Atlas, J. Fang, P. Loughlin and W. Music, "Resolution advantages of quadratic signal processing," *Proc. SPIE,* San Diego, CA, July 1991.
90. P. Loughlin, J. Pitton and L. Atlas, "New properties to alleviate interference in time-frequency representations," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'91,* pp. 3205-3208, 1991.
91. L. Atlas, P. Loughlin and J. Pitton, "Truly nonstationary techniques for the analysis and display of voiced speech," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'91,* pp. 433-436, 1991.
92. L. Atlas, P. Loughlin and J. Pitton, "A theory of desirable properties for preprocessors for speech recognizers," *Proc. IEEE Pac. Rim Conf. on Comm., Comps. and Sig. Process.,* pp. 803-806, 1991.
93. J. Pitton, W. Fox, L. Atlas, J. Luby and P. Loughlin, "Range-Doppler processing with the cone-kernel time-frequency representation," *Proc. IEEE Pac. Rim Conf. on Comm., Comps. and Sig. Process.,* pp. 799-802, 1991.
94. W. Fox, J. Luby, J. Pitton, P. Loughlin and L. Atlas, "Sonar and range-Doppler processing using a cone-shaped kernel time-frequency representation," *Proc. 24th IEEE Asilomar Conf. on Sigs., Sys. and Comps.,* pp. 1079-1083, 1990.
95. P. Loughlin, J. Pitton and L. Atlas, "A new time-frequency representation for speech and range-Doppler processing," *The 1990 Digital Signal Processing Workshop,* New Paltz, NY, Sep. 16-19, 1990, pp. 3.13.1-2.
96. L. Atlas, P. Loughlin, J. Pitton and W. Fox, "Applications of cone-shaped kernel time-frequency representations to speech and sonar analysis," *2nd Intl. Symp. on Sig. Proc. and its Applications,* pp. 882-885, Gold Coast, Queensland Australia, Aug. 27-31, 1990.
97. L. Atlas, W. Kooiman, P. Loughlin and R. Cole, "New nonstationary techniques for the analysis and display of speech transients," *Proc. IEEE Intl. Conf. Acous., Speech and Sig. Process.'90,* pp. 385-388, 1990.
98. P. Loughlin and D. Westenskow, "A mechanical model to simulate uptake and elimination of inhalation anesthetics," *Proc. IEEE Engr. in Med. and Biol. Soc., 10th Ann. Conf.,* pp. 589-590, 1988.
99. P. Loughlin and D. Westenskow, "A closed-loop controller for end-tidal anesthetic concentration," *Proc. IEEE Engr. in Med. and Biol. Soc., 9th Ann. Conf.,* pp. 433-434, 1987.

Abstracts

1. E. Oby, K. Quick, J. Mischel, C. Hsieh, P. Loughlin, A. Batista, `` Probing sensory signals in motor cortex using a virtual balancing task,'' *2018 Meeting of the Society for the Neural Control of Movement*, Santa Fe, NM, May 2018.
2. K. Quick, J. Mischel, P. Loughlin, A. Batista, ``Monkeys can use continuous haptic feedback to stabilize an unstable cursor,'' *Society for Neuroscience annual meeting*, Chicago, Illinois, October 2015.
3. J. Ben-Benjamin, L. Cohen, P. Loughlin, ``An approximation method for dispersive wave propagation,'' *169th Meeting of the Acoustical Society of America*, Pittsburgh, PA, May 2015.
4. P. Loughlin, ``Phase space approximation for dispersive pulse propagation,'' Princeton mtg., March 2014.
5. C-C Lin, P.J. Sparto, F.M. Joseph, P.J. Loughlin, M.S. Redern, K. Sienko, S.L. Whitney, ``The effects of vibrotactile feedback on postural sway under dual-task conditions in people with unilateral vestibular hypofunction.'' *The Combined Sections Meeting of American Physical Therapy Association*, Las Vegas, NV, USA, Feb 3-6, 2014.
6. Chia-Cheng Lin, Susan Whitney, Patrick Loughlin, Joseph Furman, Mark Redfern, Kathleen Sienko, Patrick Sparto. ``Does aging impact the response to vibrotactile feedback (VTF) during balance task?,'' *Association for Research in Otolaryngology*, Baltimore, Maryland, USA, Feb 16-20, 2013.
7. C-C Lin, S. Whitney, P. Sparto, J. Furman, P. Loughlin, M. Redfern, G. Marchetti, K. Sienko, ``The effect of vibrotactile feedback on reaction times during dual-task balance performance in different age groups,'' *The Combined Sections Meeting of American Physical Therapy Association*, San Diego, CA, USA, Jan 21-24, 2013.
8. P. Loughlin, A. Mahboobin, P. Sparto, J. Furman, ``Patient-customized vibrotactile feedback for postural control,'' *Proc. Intl. Soc. Posture & Gait Research*, June 2012.
9. B. Hamschin and P. Loughlin, `` MaxMin sonar signal design for optimal detection of elastic targets in signal-dependent noise,'' *Proc. Underwater Acoustic Signal Processing workshop*, West Greenwich, RI, 2011.
10. B. Hamschin and P. Loughlin, ``Improving classification of underwater objects by optimal signal design,'' *J. Acoust. Soc. Am.*, Vol. 129, No. 4, Pt. 2, p, 2664, 2011.
11. B. Hamschin and P. Loughlin, ``Sonar transmit and receiver design for detection of underwater objects in nonstationary environments,'' *J. Acoust. Soc. Am.,* Vol. 128, Issue 4, p. 2432, 2010.
12. B. Hamschin and P. Loughlin, ``Sonar waveform design for detection of elastic objects,'' *J. Acoust. Soc. Am*. Vol.

127, Issue 3, p. 2026, 2010.

13. P. Loughlin and L. Cohen, ``Wavelets: A comparison with the spectrogram and other methods for time-frequency analysis,'' *J. Acoust. Soc. Am*. Vol. 127, Issue 3, p. 1936, 2010.
14. P. Loughlin, ``Time-frequency and position-wavenumber acoustic signal analysis,'' *J. Acoust. Soc. Am.*, vol. 126, p. 2206, 2009.
15. P. Loughlin, ``A time-frequency approach for studying propagation effects on underwater sound,*'' J. Acoust. Soc. Am.*, vol. 126, p. 2165, 2009.
16. P. Loughlin and G. Okopal, ``Environmentally invariant features for classification of active sonar signals.'' *J. Acoust. Soc. Am*., vol. 125, p. 2704, 2009.
17. L. Cohen and P. Loughlin, ``Joint position/wave number and time/frequency features of signals,'' *J. Acoust. Soc. Am.*, vol. 125, p. 2699, 2009.
18. M. Cenciarini, P. Loughlin, P. Sparto and M. Redfern, ``Older Adults Exhibits Increased Stiffness and Damping for Medial-Lateral Postural Control,'' *Biomedical Engineering Society (BMES) Annual Fall Scientific Meeting*, Pittsburgh, PA, Oct. 7-10, 2009.
19. P. Loughlin, ``Pulse propagation and classification in time/frequency and position/wavenumber phase space,'' *157th mtg. Acous Soc Am,* Portland, OR, May 18-22, 2009.
20. M. Cenciarini, P. Loughlin, P. Sparto M. Redfern, `` Active Stiffness and Damping Increase with Age in Postural Control,'' *Intl. Soc. Posture & Gait Research,* June 2009.
21. P. Loughlin, ``Local phase space moments of a pulse propagating with dispersion and damping,'' *Abstracts of the 39th Winter Colloquium on the Physics of Quantum Electronics (PQE-2009)*, p. 173, Jan. 2009.
22. P. Loughlin and G. Okopal, "Features for propagation-invariant classification of underwater targets," *Acoustics'08* conference (joint 155th ASA – Euronoise), Paris, France, June 29 – July 4, 2008.
23. L. Cohen and P. Loughlin, "Exact and approximate moments for dispersive pulse propagation," *Acoustics'08* conference (joint 155th ASA – Euronoise), Paris, France, June 29 – July 4, 2008.
24. M. Cenciarini, P. Loughlin, P. Sparto, M. Redfern, ``Active stiffness for standing postural control increases with age,'' *Soc. for Neural Control of Movement 18th Annual Meeeting*, Naples, FL, May 2008.
25. P. Loughlin and G. Okopal, "Propagation-invariant classification of sonar signals,'' *154th mtg. Acoustical Soc. Amer*, New Orleans, LA, Nov. 27-30, 2007.
26. P. Loughlin and G. Okopal, "Propagation-invariant Classification," *Underwater Acoustic Signal Processing Workshop*, Univ. Rhode Island, Alton Jones Campus, Oct. 17-19, 2007.
27. P. Loughlin, G. Okopal and L. Cohen, ``Position-waveenumber approximation for propagation in random dispersive channels," *Pacific Rim Underwater Acoustics Conference 2007,* Vancouver, BC, Oct. 4-5, 2007 (2-page extended abstract).
28. A. Mahboobin, P. Loughlin, and M. Redfern. "Modeling attentional influence on postural control in young and older adults." *International Conf. Society for Gait and Posture*, Burlington, Vermont, July 14th – 18th, 2007 (2-page extended abstract).
29. P. Loughlin, "Wigner approximation for filtered random functions and wave propagation," *153rd mtg. Acous Soc Am,* SLC, June 4-8, 2007 (invited).
30. P. Loughlin, "A time-frequency approximation with applications in target recognition," *151st mtg. Acoustical Society of America*, Providence, RI, June 5-9, 2006.
31. P. Loughlin and L. Cohen, "Wigner and Ambiguity Function Approximation Methods for Acoustic Propagation," *IEEE Underwater Acoustic Signal Processing workshop*, West Greenwich, RI, Oct. 5-7, 2005.
32. M. Musolino, P. Loughlin and M. Redfern, "Postural sway responses to predictable and unpredictable moving visual scenes, *Proceedings of the 28th ASB,* Abstract #289, Portland, Oregon, 2004.
33. A. Mahboobin, P. Loughlin, M. Redfern and P. Sparto, "Sensory re-weighting in human postural control during moving-scene perturbations," *Abstracts of the 27th Annual Midwinter Meeting of the Association for Research in Otolaryngology,* #81, p. 37, Daytona Beach, FL, Feb. 2004.
34. J. Jasko, P. Sparto, M. Redfern and P. Loughlin, "The role of central and peripheral optic flow in the control of upright posture within a mixed-frequency visual environment," *Abstracts of the 27th Annual Midwinter Meeting of the Association for Research in Otolaryngology,* #66, p. 32, Daytona Beach, FL, Feb. 2004.
35. P. Loughlin, "Local characteristics of dispersive pulse propagation," *J. Acoust. Soc. Amer.*, vol. 114, no. 4, p. 2447, 2003.
36. P. Loughlin, "Time-frequency analysis and conditional moments of shallow-water sound propagation," *J. Acoust. Soc. Amer.*, vol. 111, no. 5, p. 2407, 2002.

37. R. Peterka and P. Loughlin, "Oscillatory body sway following support surface transitions: A reflection of adapting sensory gain in postural control," *Abstracts of the 25th Annual Midwinter Meeting of the Association for Research in Otolaryngology,* p. 234, St. Petersburg Beach, FL, Jan. 2002.
38. S-Y. Yoo, P. Loughlin, J. Furman and M. Redfern, "Adaptation and Habituation in Visually-Induced Postural Sway," *Abstracts of the 24th Annual Midwinter Meeting of the Association for Research in Otolaryngology,* p. 116, St. Petersburg Beach, FL, Feb. 2001.
39. P. Loughlin, "Methods and applications of time-frequency analysis," *J. Acoust. Soc. Amer.*, vol. 107, no. 5, p. 2827, 2000.
40. S-Y. Yoo, P. J. Loughlin, M. S. Redfern and J. M. Furman, ``Postural sway responses to chirp moving scene perturbations,'' *Proceedings of the 1st Joint BMES/EMBS Conference*, p. 973, Atlanta, GA, Oct. 1999.
41. P. Loughlin and F. Cakrak, "Time-varying coherent AM-FM demodulation and denoising of acoustic signals," *J. Acoust. Soc. Amer.*, vol. 106, no. 4, p. 2157, 1999.
42. P. Loughlin, "Time-frequency analysis: A tutorial review," *J. Acoust. Soc. Amer.*, vol. 106, no. 4, p. 2129, 1999.
43. P. Loughlin and B. Tacer, "Maximum entropy time-frequency analysis," *J. Acoust. Soc. Amer.*, vol. 104, no. 3, p. 1760, 1998.
44. C. Wallroth, P. Loughlin, and D. Westenskow, "Feedback control for anesthesia workstations," *Anesthesiology,* vol. 87, p. A468, 1997.
45. P. Loughlin and M. Redfern, "Time-varying characteristics of postural sway in the elderly," *Annals of Biomed. Engr.,* p. S-111, 1995.
46. C. Wallroth, D. Westenskow, and P. Loughlin, "Computer control of fresh gas flow to an anesthesia breathing circuit," *Anesthesiology,* vol. 81, no. 3A, p. A573, 1994.
47. D. Westenskow, P. Loughlin and C. Wallroth, "Automatic control of the induction of inhalation anesthesia," *Anesthesiology,* vol. 81, no. 3A, p. A482, 1994.
48. L. Atlas, J. Pitton and P. Loughlin, "Proper time-frequency distributions for speech," *J. Acoust. Soc. Amer.,* vol. 93, no. 4, Pt. 2, p. 2318, 1993.
49. P. Loughlin and D. Westenskow, "A mechanical model to simulate uptake and elimination of inhalation anesthetics," *Anesthesiology,* vol. 69, no. 3A, p. A276, 1988.

Patents

- P. Loughlin, D. Westenskow and C. Wallroth, U.S. pat. 5,094,235, "Anesthetic ventilating apparatus having a breathing circuit and control loop for anesthetic component," 1992.

- P. Loughlin, D. Westenskow, H. Wied, B. Schwartau and C. Wallroth, U.S. pat. 4,878,388, "Method for simulating and demonstrating gas exchange during mandatory or assisted ventilation...," 1989.

Invited presentations

- ``Instantaneous frequency and time-frequency analysis: myths, misconceptions and mysteries,'' IEEE Baltimore Section mtg, National Electronics Museum, Baltimore, MD, April 2016.

- ``Instantaneous frequency and time-frequency analysis: myths, misconceptions and mysteries,'' Johns Hopkins Applied Physics Laboratory, Baltimore, MD, April 2015.

- ``Enhanced target versus clutter discrimination using time-frequency (LTV) filters,'' *SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXV*, Baltimore, MD, April 2015.

- ``Ambiguities of instantaneous frequency, and complex signal representations through pole-zero manipulations,'' *SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXV*, Baltimore, MD, April 2015.

- ``Sensory Substitution and Vibrotactile Feedback for Balance,'' Cancer Survivorship Scholars Speaker Series, School of Nursing, Univ. Pittsburgh, Nov. 2014.

- ``Time-frequency filtering for classifying targets in nonstationary clutter,'' *SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXIV*, Baltimore, MD, May 2014.

- ``The Wigner-Hilbert transform,'' *SPIE Defense, Security and Sensing Symp., Automatic Target Recognition XXIV*, Baltimore, MD, May 2014.

- ``Phase space approximation for dispersive pulse propagation,'' Princeton Univ., March 2014.

- ``Time-frequency analysis: Theory and Applications,'' tutorial lecture (with L. Cohen), Acoustical Soc. of America mtg., San Francisco, Dec. 2013.

- ``Customizing vibrotactile feedback for balance,'' Carnegie Mellon University, Robotics Institute, Feb. 1, 2013.
- ``A Wigner phase space approximation for range-dependent propagation,'' *European Conf. Underwater Acoustics (ECUA)*, Edinburgh, Scotland, July 6, 2012.
- ``MaxMin sonar signal design for optimal detection of elastic targets in signal-dependent noise,'' *Underwater Acoustic Signal Processing workshop*, Univ. Rhode Island, Alton Jones Campus, Oct. 14, 2011.
- ``Designing vibrotactile balance feedback for desired body sway reductions,'' *IEEE Engineering in Medicine and Biology conference,* Boston, MA, Aug. 31, 2011.
- ``Sonar waveform design for detection of elastic objects,'' *159th mtg. Acoust. Soc. Am.,* Baltimore, MD, Apr. 19-23, 2010.
- `Wavelets: A comparison with the spectrogram and other methods for time-frequency analysis,'' *159th mtg. Acoust. Soc. Am.,* Baltimore, MD, Apr. 19-23, 2010.
- ``Time-frequency and position-wavenumber acoustic signal analysis,'' *158th mtg. Acous. Soc. Am.,* San Antonio, TX, Oct. 26-30, 2009.
- ``A time-frequency approach for studying propagation effects on underwater sound,'' *158th mtg. Acous. Soc. Am.,* San Antonio, TX, Oct. 26-30, 2009.
- "Nonstationary signal processing methods for channel characterization and propagation-invariant classification," ONR Underwater Signal Processing Program Review, Seattle, WA, Aug. 4-6, 2009.
- ``Environmentally invariant features for classification of active sonar signals,'' *157th mtg. Acous Soc Am,* Portland, OR, May 18-22, 2009.
- ``Joint position/wave number and time/frequency features of signals'' *157th mtg. Acous Soc Am,* Portland, OR, May 18-22, 2009.
- ``Time-Frequency Approach and Approximation to Range-Dependent Pulse Propagation,'' Underwater Acoustic Signal Processing Workshop, Univ. Rhode Island, Alton Jones Campus, Oct. 14-16, 2009.
- "Nonstationary signal processing methods for channel characterization and propagation-invariant classification," ONR Underwater Signal Processing Program Review, Seattle, WA, Aug. 5-7, 2008.
- "A phase space approach to pulse propagation and classification," Middleton meeting on classical, semi-classical and quantum noise, Princeton University, Nov. 2-3, 2007.
- "Propagation-invariant Classification," Underwater Acoustic Signal Processing Workshop, Univ. Rhode Island, Alton Jones Campus, Oct. 17-19, 2007.
- "Nonstationary signal processing methods for channel characterization and propagation-invariant classification," ONR Underwater Signal Processing Program Review, Seattle, WA, Aug. 21-23, 2007.
- "Wigner approximation for filtered random functions and wave propagation," 153rd mtg. Acous Soc Am*, SLC, June 4-8, 2007.
- "Time-frequency analysis and feature extraction for broadband mine classification," Office of Naval Research, April 26, 2007.
- "Effect of filtering on the time-varying spectrum of a signal, with application to target recognition," University of Washington, ONR Underwater Signal Processing Program Review, Seattle, WA, Aug. 23, 2006.
- "Methods and applications of time-varying spectral analysis," The Ohio State University, April 28, 2006.
- "Methods and applications of time-varying spectral analysis," University of Massachussetts at Amherst, April 5, 2006.
- "Time-frequency analysis, modeling and classification of nonstationary underwater signals," Office of Naval Research, March 21, 2006.
- "Wigner distribution approximation for filtered signals and waves," 36th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, Jan. 6, 2006.
- "Methods for Nonstationary Signal Analysis and Classification," Naval Research Laboratory, ONR Active Sonar Program Review, Aug. 31, 2005.

- "New Approximations in Dispersive Wave Propagation," Applied Physics Laboratory, University of Washington, Oct. 7, 2004

- "New Approximations in Dispersive Wave Propagation," Naval Undersea Warfare Center, Newport, RI, ONR Active Sonar Program Review, Aug. 2004; and MIT Lincoln Laboratory, ONR Passive Sonar Program Review, Sep. 2004.

- "Methods and Applications of Time-Frequency Analysis," Temple University, April 2004.

- "Modal features of underwater sound propagation that are invariant to dispersion," Applied Physics Laboratory, Johns Hopkins University, Baltimore, MD, ONR Passive Sonar Program Review, Sep. 9-11, 2003.

- "Local Characteristics of Dispersive Underwater Sound Propagation, with Application to Active Sonar Echoes," Applied Physics Laboratory, Univ. of Washington, Seattle, WA, ONR Active Sonar Program Review, Aug. 19-21, 2003.

- "Methods and Applications of Time-Frequency Analysis," Lehigh University, April 2003.

- "Dispersion and the Wigner distribution," The Wigner Symposium, New York, NY, May 2003.

- "Instantaneous frequency, quantum mechanical current, and phase-space distributions," 33rd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, Jan. 2003.

- "Local Spatial and Temporal Moments of Acoustic Signals and Classification of Impulsive-Source Sonar Signals," SPAWAR Systems Center, San Diego, CA, ONR Passive Sonar Program Review, Sep. 10-12, 2002.

- "Application of the Wigner distribution to shallow-water sound propagation," 32nd Winter Colloquium on The Physics of Quantum Electronics, Snowbird, Utah, Jan. 2002.

- "Analysis and characterization of nonstationary signals, with applications to experimental data," Applied Research Laboratory, University of Texas, Austin, TX, ONR Passive Sonar Program Review, Oct. 23-25, 2001.

- "Instantaneous Spectral Moments," Dept. of Electrical Engineering, University of Washington, Seattle, WA, Oct. 9, 2001.

- "Adaptation and Habituation to Moving Scenes, and the Influence of Attentional Tasks," Neurological Sciences Institute, OHSU, Beaverton, OR, Aug. 7, 2001.

- "Generalized Wigner Distribution Analysis of Human Balance" 31st Winter Colloquium on The Physics of Quantum Electronics, Snowbird, Utah, Jan. 7-11, 2001.

- "Instantaneous spectral moments," Naval Undersea Warfare Center, Newport, RI, ONR Passive Sonar Program Peer Review, Oct. 3-5, 2000.

- "Methods and Applications of Time-Frequency Analysis," Penn State University, Sep 28, 2000.

- "Applications of Time-Frequency Analysis," 139th Mtg. of the Acoustical Society of America, Atlanta, GA, May 30 - June 3, 2000.

- "Local values of generalized Wigner distributions," 30th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, January 9-12, 2000.

- "Time-Frequency Distributions: A tutorial review," 138th Mtg. of the Acoustical Society of America, Columbus, OH, Nov. 1-5, 1999.

- "Positive Wigner-type distributions in signal analysis," 29th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, January 3-6, 1999.

- "Maximum entropy time-frequency analysis," 136th Mtg. of the Acoustical Society of America, Norfolk, VA, Oct. 13, 1998.

- "Moments and transients," Naval Underwater Warfare Center, Newport, RI, July 9, 1998.

- "Multiwindow and maximum entropy methods in time-frequency analysis," Los Alamos National Lab, May 5, 1998."

- "Time-frequency analysis: New developments and applications," 2nd IEEE UK Symposium on Applications of Time-Frequency and Time-Scale Methods, Coventry, UK, Aug. 27-29, 1997.

- "Maximum entropy methods in time-frequency analysis, and time-varying frequencies of a signal," DOD, April 11,

1997.

- "Positive time-frequency distributions: Development and applications," ONR Workshop on Time-Frequency and Time-Scale Analysis, March 18-20, 1996.
- "Application of time-frequency analysis to the monitoring of machining processes," NSF/ONR Workshop on Signal Processing for Manufacturing and Machine Monitoring, March 13-15, 1996
- "Positive time-frequency distributions and their applications," NASA-Lewis Research Center, Aug. 11, 1995.
- "Positive time-frequency distributions and their applications," Ohio State University, May 30, 1995.
- "Time-frequency analysis of postural sway," 28th Annual Asilomar Conf. on Sigs., Syst. and Comps., Pacific Grove, CA, Oct. 31-Nov. 2, 1994.
- "Application of time-frequency analysis to postural sway," Brooks Air Force Base, Aug. 19, 1994.
- "Time-frequency energy density functions: Theory and synthesis," MIT Lincoln Labs, Jan. 26, 1993.
- "The short-time Fourier transform and beyond: A tutorial on time-frequency methods," *IEEE Int. Symp. on Time-Frequency / Time-Scale Analysis*, Victoria, B.C., Oct. 4-6, 1992.
- "Advanced time-frequency representations for speech processing," AT&T Bell Labs, May 20, 1992.
- "Advanced time-frequency representations for speech processing," *European Speech Communication Association Workshop*, Sheffield, England, April 7-9, 1992.

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