

Robert Patton Leland

Department of Engineering, Computer Science, Physics and Mathematics
Oral Roberts University

Education

- Ph.D. Electrical Engineering UCLA, 1988.
Major field: Control Systems
Minor fields: Communication Systems, Applied Mathematics
- M.S. Control Systems, Department of System Science, UCLA, 1982.
- S.B. Computer Science and Engineering, MIT, 1978.

Professional Experience

Professor, Department of Engineering, Physics and Physical Sciences, Oral Roberts University.
2005 – Present. Promotion to Professor in August, 2009. Granted Tenure in 2014.

Associate Professor, Department of Electrical and Computer Engineering, University of Alabama.
1990 - 2005. Promotion to Associate Professor and Tenure in August, 1996.

Visiting Assistant Professor, Department of Electrical Engineering, University of Minnesota.
1989 - 1990.

Research Engineer, UCLA Flight Systems Research Laboratory, Summer 1996.
Analysis of ABLE ACE laser scattering data, supported by Philips Laboratory, Kirtland AFB.

NASA/ASEE Summer Faculty Fellow, Marshall Space Flight Center. Summers 1991, 1992.
Studied the feasibility of adaptive optics for laser Doppler wind velocity measurements and laser power beaming from Earth to a lunar base.

Post Doctoral Scholar, UCLA Center for Flight Systems Research. 1988 - 1989.
Developed models suitable for system identification algorithms to determine wind profiles from laser distortion measurements.

Teaching Assistant, Universities Space Research Association, 1986 - 1987.
Directed senior design teams at UCLA for the Advanced Aeronautics Design Program with NASA Ames-Dryden. Trajectory optimization, reconfigurable controls, expert systems and computer vision for the National Aerospace Plane.

Member Technical Staff, Dynamics Associates. 1978-1980.
Developed computer software tools for computer graphics, time series analysis and simulation.

Computer Programmer, MIT Automatic Programming Group. 1976.
Developed computer software for an automatic programming system.

Research Interests

Quantum Computing
Quantum Control
Microelectromechanical Systems (MEMS)
Linear and Nonlinear Stochastic Systems
Control of Distributed Parameter Systems
Stochastic Control

Quantum Stochastic Differential Equations
Engineering Education
Adaptive Control
Multi-Parameter Random Processes
Fuzzy Systems
Atmospheric Optics

Research Funding

“Mathematical Problem Solving for Engineering Students,” NSF (CCLI-EMD), \$69,998, 5/1/04 – 4/30/07, PI Robert Leland, Co-PI’s J. Richardson, T-Y. Lee. J. Richardson became PI 7/05. External Educational Evaluation Consultant John Dantzler. *Develop a mathematical problem solving course for engineering students.*

“UAMEMS: An Undergraduate Program in MEMS,” NSF \$99,959, 9/1/03 – 2/28/05, PI: R. P. Leland, Co-PI’s: T. Klein, S. Kotru, H. Stern, M. Weaver, Investigators: J. Jackson, R. K. Pandey. *Plan a multidisciplinary program in MEMS for undergraduate engineering students.*

“Low-Cost General Aviation Navigation Project: Phase III Enhancement,” FAA \$3,000,000 (R.P. Leland part \$330,000), 7/1/01- 5/15/05. *Develop an inertial grade MEMS gyroscope for general aviation.*

“Year 10 NSF Foundation Coalition – Core Competencies,” NSF \$30,488 (R.P. Leland part \$10,231), 10/1/02 – 9/30/03, PM R. Pimmell, Co-PI R. P. Leland. *Develop teaching modules incorporating active and cooperative learning for mainstream Engineering classes. R.P. Leland developed a module on the Nyquist Stability Test in a senior level controls class.*

“Year 9 NSF Foundation Coalition – EC2000a-k,” NSF \$72,786, 10/1/01-9/30/02, Co-PI’s R. P. Leland, J. Parker, M. Brown. *Disseminate teaching modules incorporating active and cooperative learning to address the skills component of the ABET EC2000 criteria.*

“Low Cost Precision Gyroscope for General Aviation: Phases II and III,” FAA \$3,643,650 (R.P. Leland part \$437,238), 1/1/00 - 6/29/02. *Develop an inertial grade MEMS gyroscope for general aviation.*

“Year 8 NSF Foundation Coalition,” NSF, \$254,000 (R.P. Leland part \$14,835), 10/1/00 - 9/30/01. *Develop and test teaching modules incorporating active and cooperative learning to address the skills component of the ABET EC2000 criteria.*

“Low Cost Precision Gyroscope Technology, Phase I,” FAA, \$356,059, (R.P. Leland part \$58,393), 3/16/99 - 9/30/99. *Develop an inertial grade MEMS gyroscope for general aviation.*

“Servo-Controlled Automated Consolidometers,” Alabama Department of Transportation, \$22,835, 6/13/95 - 7/31/97, PI W. Harris, Co-PI R. P. Leland. *Develop an automated soil consolidation test.*

“System Identification Methods for Optical Sensing of Wind Profiles,” NSF Research Initiation Award, \$89,085, 9/24/92 - 4/23/96. *Estimate the wind profile as an unknown function valued parameter in a stochastic distributed parameter system.*

“Adaptive Optics for Laser Power Beaming,” NASA/ASEE Summer Faculty Fellowship, Marshall Space Flight Center, \$11,000, 6/1/92 - 8/7/92. *Study the feasibility of using adaptive optics and high power lasers to beam power from earth to a lunar base.*

“Adaptive Optics for Coherent Lidar,” NASA/ASEE Summer Faculty Fellowship, Marshall Space Flight Center, \$10,000, 6/1/91 - 8/7/91. *Study the feasibility of using adaptive optics to improve the carrier-to-noise ratio in laser Doppler wind velocity measurements.*

Teaching Accomplishments

Incorporated pair programming into EGR 140 Engineering Graphics. After doing so, an improvement in freshman to sophomore year retention was seen.

Introduced computer aided structural analysis using SolidWorks finite element capabilities into EGR 321 Mechanics of Materials.

Organized weekly Graduate Seminar in Control Systems at U. Alabama.

Graduate courses developed at U. Alabama: Dynamics and Control of MEMS, Digital Control Systems, Kalman Filtering and Stochastic Control.

Finalist, Amoco Award for Outstanding Undergraduate Teaching, U. Alabama, 1994.

Redesigned undergraduate control system laboratory at U. Alabama. Experiments include modular workstations for dc servomechanisms, flexible beam, flexible link, linear actuator, and overhead crane.

Accreditation Activities

ePortfolio Subadministrator, Oral Roberts University, 2006 – Present.

ePortfolio is an online system used to collect student work for assessment of learning outcomes, which are used for ABET and Higher Learning Commission accreditation. Modified and expanded the items collected and proposed new assessment rubrics to better reflect the ABET Criterion 3 requirements.

Chair of Engineering Assessment Committee, Oral Roberts University, 2007 – Present

Led committee to evaluate student assessment data to implement a continuous improvement process for the engineering program to meet ABET requirements.

Student Recruiting and Retention Activities

Member, Retention Committee, Oral Roberts University, 2008 – Present.

Evaluated student survey data and consultant input to improve student retention.

Revised and improved our departmental PowerPoint presentation for prospective students. Made presentations to prospective students on College Weekend. Oral Roberts University, 2006 – Present.

Interviewer for Whole Person Scholarship.

Made presentation to students at Celia Clinton Elementary School, Tulsa, OK. Demonstrated a plasma arc using a high voltage ‘Jacob’s Ladder’.

Chair, College of Engineering Scholarship Committee, Electrical and Computer Engineering Scholarship Committee, University of Alabama.
Led committees that awarded scholarships to incoming and returning students.

Committee and University Service

Organized and coordinated Engineering students in tutoring mathematics at Tulsa Boys Home and Project Manna Girls Home, 2014 – Present.

President, College of Science and Engineering Faculty Assembly, 2014 – 2015.

ORU Missions Council, 2014 – Present.

President Elect, College of Science and Engineering Faculty Assembly, 2013 – 2014.

Chair, Dean's Selection Process Committee. Developing a policy for search and selection of the College of Science and Engineering dean, 2012 – 2015.

Engineering Physics Faculty Search Committee. 2013

Secretary, College of Science and Engineering Faculty Assembly, 2010 - 2011,

Professional Society Activities

Co-Chair, IEEE Green Technologies Conference, Tulsa, Oklahoma April, 2012.

Co-Chair, IEEE Region 5 Business Meeting and Student Competitions, April, 2012.

Associate Editor, *Multidimensional Systems and Signal Processing*, 1994 - 2012.

Faculty Advisor, Engineers With a Mission, Oral Roberts University, 2011 – 2013.

Faculty Advisor, Society of Hispanic Professional Engineers, Oral Roberts University, 2007 - 2013.

Faculty Advisor, IEEE Student Chapter, Oral Roberts University, 2011 – Present

Faculty Advisor, IEEE Student Chapter, University of Alabama, 1993 - 1995.

Publicity Chairman, 1993 IEEE Southeastern Symposium on System Theory.

Technical Program Organizer 1992 IEEE SOUTHEASTCON.

Frequently have served as a session chair at the IEEE Conference on Decision and Control and the American Control Conference.

Reviewer for IEEE Trans. on Automatic Control, Automatica, IEEE Trans. on Signal Processing, Multidimensional Systems and Signal Processing, Fuzzy Sets and Systems, IEEE Trans. on Fuzzy Systems, IEEE Trans. on Systems, Man and Cybernetics, IEEE Conference on Decision and Control, American Control Conference, IEE Proc. – Control Theory and Applications, Journal of Guidance, Control and Dynamics, Optimal Control and Mechanics, Optimal Control Applications and Methods, International Journal of Uncertainty, Fuzziness, and Knowledge-Based Systems.

Publications

Books

Leland, R.P. *Stochastic Models For Laser Propagation in Atmospheric Turbulence*, Lecture Notes in Control and Information Sciences 133, Springer-Verlag, Berlin, 1989.

Book Chapters

Leland, R.P., "A White Noise Approach to Modeling Laser Propagation in Atmospheric Turbulence," *Distributed Parameter Control Systems, New Trends and Applications*, University of Minnesota, August 4-11, 1989, G. Chen, E. B. Lee, W. Littman, L. Markus eds., Marcel Dekker, New York, p. 419-444, 1990. *Also listed under invited presentations.*

Refereed Journal Publications

1. Leland, R. P., "Using Pair Programming to Teach CAD Based Engineering Graphics," *Engineering Design Graphics Journal*, Vol. 74, No. 1, p. 8-16, Winter 2010.
2. Watanabe, A., Olcmen, S. M., Leland, R. P., Whitaker, K. W., Trevino, L. C., "Soft Computing Applications on a SR-30 Turbojet Engine," *Fuzzy Sets and Systems*, Vol. 157, No. 22, p. 3007 – 3024, Nov. 16, 2006.
3. Leland, R. P., "Adaptive Control of a MEMS Gyroscope Using Lyapunov Methods," *IEEE Transactions on Control Systems Technology*, Vol. 14, No. 2, p. 278 – 283, March, 2006.
4. Leland, R. P., "Mechanical Thermal Noise in MEMS Gyroscopes," *IEEE Sensors Journal*, Vol. 5, No. 3, p. 493 – 500, June, 2005.
5. Leland, R.P., "Adaptive Mode Tuning for Vibrational Gyroscopes," *IEEE Transactions on Control Systems Technology*, Vol. 11, p. 242-247, March 2003.
6. Leland, R.P., "Fuzzy Multiresolution Signal Representation," *Fuzzy Sets and Systems*, Vol. 130, p. 125-135, July 15, 2002.
7. Leland, R.P., "Gradient of the Log-likelihood Ratio for Infinite Dimensional Stochastic Systems," *IEEE Transactions on Automatic Control*, Vol. 45, p. 1770-1774, Sept. 2000.
8. Leland, R.P., "An Approximate Predictor Approach to Reduced Order Models and Controllers for Distributed Parameter Systems," *IEEE Transactions on Automatic Control*, Vol. 44, p. 623-627, March 1999.
9. Leland, R.P., "Reduced Order Models and Controllers for Continuous Time Stochastic Systems: An Information Theory Approach," *IEEE Transactions on Automatic Control*, Vol. 44, p. 1714-1719, Sept. 1999.
10. Koppang, P., Leland, R.P., "Linear Quadratic Stochastic Control of Atomic Hydrogen Masers," *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, Vol. 46, p. 517-522, May, 1999.
11. Song, Q., Leland, R.P., "An Optimal Control Model of Neural Networks for Constrained Optimization Problems," *Optimal Control, Applications and Methods*, Vol. 19, p. 371-376, Sept./Oct. 1998.

12. Leland, R.P., "Feedback Linearization Control Design for Systems with Fuzzy Uncertainty," *IEEE Transactions on Fuzzy Systems*, Vol. 6, p. 492-503, Nov. 1998.
13. Song, Q., Leland, R.P., "Fuzzy Stochastic Fuzzy Time Series and its Models," *Fuzzy Sets and Systems*, Vol. 88, p. 333-341, 1997.
14. Leland, R.P., "An Alternate Calculation of the Discrete Time Kalman Filter Gain and Riccati Equation Solution," *IEEE Transactions on Automatic Control*, Vol. 41, p. 1817-1819, Dec., 1996.
15. Leland, R.P. "An Improved Log-Likelihood Gradient for Continuous Time Stochastic Systems with Deterministic Input," *IEEE Transactions on Automatic Control*, Vol. 41, p. 1207-1210, Aug. 1996.
16. Song, Q., Leland, R.P., "Adaptive Learning Defuzzification Techniques and Applications," *Fuzzy Sets and Systems*, Vol. 81, p. 321-329, 1996.
17. Leland, R.P., "Shape Estimation of a Circular Antenna From Observations on the Boundary," *Multidimensional Systems and Signal Processing*, Vol. 7, p. 53-63, January, 1996.
18. Leland, R.P. "A New Formula for the Log-Likelihood Gradient for Continuous Time Stochastic Systems," *IEEE Transactions on Automatic Control*, Vol. 40, p. 1295-1300, July, 1995.
19. Leland, R.P. "Fuzzy Differential Systems and Malliavin Calculus," *Fuzzy Sets and Systems*, Vol. 70, p. 59-73, 1995.
20. Leland, R.P. "Poisson LQR Design for Multirate Asynchronous Controllers," *IEEE Transactions on Automatic Control*, Vol. 40, p. 115-118, January, 1995.
21. Song, Q., Leland, R.P., Chissom, B.S., "A New Fuzzy Time-Series Model of Fuzzy Number Observations," *Fuzzy Sets and Systems*, Vol. 73, p. 341-348, 1995.
22. Leland, R.P., "White Noise in Atmospheric Optics," *Acta Mathematicae Applicandae*, Vol. 35, p. 103-130, April, 1994.
23. Leland, R.P., "Stability of Asynchronous Systems with Poisson Transitions," *IEEE Transactions on Automatic Control*, Vol. 39, p. 182 - 185, January, 1994.
24. Leland, R.P., "Simulation of Continuous Sample Paths of Random Fields Using Trigonometric Series," *Journal of Multidimensional Systems and Signal Processing*, Vol. 2, p. 23-43, 1991.

Conference Publications

1. Leland, R. P., "Pair Programming in a CAD Based Engineering Graphics Course," *Proceedings of the 2009 ASEE Annual Conference, Houston, TX*, Available at www.asee.org/conferences, 2009.
2. Leland, R. P., "Adaptive Control of a MEMS Resonator Thermometer," *Proceedings of the 2008 IEEE Multi-conference on Systems and Control, Sept. 3-5, 2008, San Antonio, TX*, 2008.
3. Dong, L., Leland, R. P., "The Adaptive Control System of a MEMS Gyroscope with Time-varying Rotation Rate," *Proceedings of the 2005 American Control Conference, Portland OR, June 8-10, 2005*, p. 2592-2597, 2005.

4. Leland, R. P., Lee, T-Y., Richardson, J., Dantzler, J., "Mathematical Problem Solving for Engineering Students," *2005 ASEE Annual Conference, Portland, OR*, Available at www.asee.org/conferences, 2005.
5. Leland, R. P., Lee, T-Y., Richardson, J., Dantzler, J., "Teaching Freshman Engineering Students to Solve Hard Problems," *2005 ASEE Annual Conference, Portland, OR*, Available at www.asee.org/conferences, 2005.
6. Watanabe, A., Olcmen, S., Leland, R., Whitaker, K., Trevino, L. C., "Soft Computing Applications on SR-30 Turbojet Engine," *Proceedings of the AIAA 1st Intelligent Systems Technical Conference, Chicago, IL, Sept. 20-22, 2004*.
7. Dong, L., Leland, R. P., "An Adaptive Controller for a MEMS Gyroscope with A Time-Varying Parameter," *Proceedings of the International Conference on Computing, Communications and Control Technologies, Austin, TX, Aug. 14-17, 2004*, p. 163-168, 2004.
8. Dong, L., Leland, R. P., "An Adaptive Controller for a Second-Order Linear Time-Varying System," *Proceedings of the 8th Annual Conference on Systematics, Cybernetics and Informatics, July 18-21, 2004, Orlando, FL*, p. 212-217, 2004.
9. Leland, R. P., "Self-Explanation in an Introductory Electrical Circuits Course To Enhance Problem Solving," *Proceedings of the 2004 ASEE Annual Conference and Exposition, Salt Lake City, UT, June 20-23, 2004*. Available at www.asee.org/conferences, 2004
10. Leland, R.P., "A Teaching Module for the Nyquist Stability Test Using Cooperative Learning," *Proceedings of the 2003 ASEE Annual Conference, Nashville, TN, June 22-25*, available at www.asee.org/conferences, 2003.
11. Leland, R. P., Lipkin, Y., Highsmith, A., "Adaptive Oscillator Control for a Vibrational Gyroscope," *Proceedings of the 2003 American Control Conference, Denver, CO, June 4-6*, p. 3347-3352, 2003.
12. Leland, R.P., "Lyapunov Based Adaptive Control of a MEMS Gyroscope," *Proceedings of the 2002 American Control Conference, Anchorage, AK, May 8-10*, p. 3765-3770, 2002.
13. Leland, R.P., Arnold, D., Wiest, J., "Teaching Modules for the Technical Skills Component of ABET 2000", *Proceedings of the ASEE Southeastern Section Conference, Gainesville, FL, April 7-9, 2002*.
14. Pimmel, R., Leland, R., Stern, H., "Student Evaluation of Instructional Modules on EC 2000 Criteria 3 (a) – (k) Skills," *Proceedings of the 2002 ASEE Annual Conference, Montreal, June 16-19*, Available at www.asee.org/conferences, 2002.
15. Pimmel, R., Leland, R., Stern, H., "Changes in Student Confidence Resulting from Instruction with Modules on EC 2000 Skills," *Proceedings of the 2002 ASEE Annual Conference, Montreal, June 16-19*, Available at www.asee.org/conferences, 2002.
16. Leland, R.P., "Adaptive Tuning for Vibrational Gyroscopes," *Proceedings of the 40th IEEE Conference on Decision and Control*, p. 3447-3452, 2001.
17. Leland, R.P. "Mechanical-Thermal Noise in Vibrational Gyroscopes," *Proceedings of the 2001 American Control Conference*, p. 3256-3261, 2001.

18. Leland, R.P. "The Kullback-Leibler Information Divergence for Continuous Time Systems Using White Noise Theory," *Proceedings of the 38th IEEE Conference on Decision and Control*, p. 1903-1907, 1999.
19. Leland, R.P. "The Log-Likelihood Gradient for Infinite Dimensional Stochastic Systems," *Proceedings of the 38th IEEE Conference on Decision and Control*, p. 4337-4342, 1999.
20. Liu, Y., Wu, X., Song, G., Patten, W.N., Leland, R.P., "Modeling of Seated Human Body Response to Low Frequency Vibrations," *Proceedings of the 31st IEEE Southeastern Symposium on System Theory*, p. 41-45, 1999.
21. Leland, R.P., "Reduced Order Models and Controllers for Distributed Parameter Systems Using the Kullback-Leibler Information Divergence," *Proceedings of the 1998 IEEE Conference on Decision and Control*, p. 2207-2208, 1998.
22. Leland, R.P., "Approximate Maximum Likelihood Parameter Estimates for Stochastic Distributed Parameter Systems," *Proceedings of the 1997 American Control Conference, Albuquerque, NM*, p. 3693 - 3697, 1997.
23. Leland, R.P., "Robust Feedback Linearization in the Presence of Fuzzy Uncertainty," *Proceedings of the 1997 American Control Conference, Albuquerque, NM*, p. 3751-3755, 1997.
24. Leland, R.P., "An Improved Log-Likelihood Gradient Formula for Continuous Time Stochastic Systems with Deterministic Input," *Proceedings of the 34th IEEE Conference on Decision and Control*, p. 3687-3688, 1995.
25. Koppang, P., Leland, R.P., "Steering of Frequency Standards by the Use of Stochastic Linear Quadratic Gaussian Control Theory," *Proceedings of the 27th Annual Precise Time Interval (PTTI) Applications and Planning Meeting*, p. 257-268, 1995.
26. Leland, R.P., "A New Log-Likelihood Gradient Formula for Continuous Time Stochastic Systems With Uncertain A Matrix," *Proceedings of the 33rd IEEE Conference on Decision and Control*, p. 2170-2175, 1994.
27. Leland, R.P., "A Stochastic Model for Laser Propagation Along Folded Paths," *Proceedings of the 32nd IEEE Conference on Decision and Control*, p. 1553-1558, 1993.
28. Leland, R.P., "Stochastic Convergence of Asynchronous Parallel Computations for Solving Systems of Linear Equations," *Proceedings of the 32nd IEEE Conference on Decision and Control*, p. 3604-3605, 1993.
29. El-Sayed, S.L., Leland, R.P., "A Study of Kalman Filtering and Maximum Likelihood Estimates of Wind Profiles Using Simulated Laser Distortion Data," *Proceedings of the 25th Southeastern Symposium on System Theory*, p. 296-300, 1993.
30. Leland, R.P., "Convergence of Probability Measures for Continuous Sample Paths of Multidimensional Random Field Simulations Using Trigonometric Series," *Proceedings of the 1993 IEEE International Symposium on Information Theory*, p. 314, 1993.
31. Leland, R.P., "A Dynamic Stochastic Model for Refractive Turbulence in Wind Shear for Wind Profile Measurement," *Atmospheric Propagation and Remote Sensing II, SPIE Vol. 1968*, p. 626-635, 1993.

32. Leland, R.P., "Requirements and Models for Adaptive Optics in Coherent Lidar Wind Measurements," *Proceedings of the 31st IEEE Conference on Decision and Control*, p. 3540-3541, 1992.
33. Leland, R.P., "Estimation of Boundary Value Processes Applied to Shape Determination of a Circular Antenna from Observations on the Boundary," *Proceedings of the 30th IEEE Conference on Decision and Control*, p. 2396-2397, 1991.
34. Leland, R.P., "Laser Propagation in Atmospheric Turbulence, Stochastic Models and Simulation," *Proceedings of the 14th IFIP Conference on System Modeling and Optimization*, Lecture Notes in Control and Information Sciences 147, H. Sebastian and K. Tammer eds., Springer Verlag, New York, p. 659 - 668, 1990.

Invited Presentations

1. Leland, R.P., "A Log-Likelihood Gradient for Continuous Time Stochastic Systems Using Finitely Additive White Noise Theory," Stochastic Filtering Theory Workshop, University of North Carolina-Chapel Hill, June 25-28, 1994.
2. Leland, R.P., "A White Noise Model for Laser Propagation Along Folded Paths," *Proceedings of the NASA-UCLA Workshop on Laser Propagation in Atmospheric Turbulence, UCLA Center for Flight Systems Research, Feb. 1-3, 1994*, p 119-133, 1994.
3. Leland, R.P., "White Noise Models in Atmospheric Optics," IFIP WG 7/1 Workshop in White Noise Models and Stochastic Systems, Enschede, Netherlands, 1992.
4. Leland, R.P., "A Hilbert Space Valued White Noise Model for Laser Propagation in Atmospheric Turbulence," Semester on Stochastic Analysis, Stefan Banach Center, Warsaw, Poland, 1990.
5. Leland, R.P., "A White Noise Approach to Modeling Laser Propagation in Atmospheric Turbulence," *Distributed Parameter Control Systems, New Trends and Applications, University of Minnesota, August 4-11, 1989*, G. Chen, E. B. Lee, W. Littman, L. Markus eds., Marcel Dekker, New York, p. 419-444, 1990. *Also listed under book chapters. The abstract of this paper was requested and published in:*

Leland, R.P., Abstract of "A White Noise Approach to Modeling Laser Propagation in Atmospheric Turbulence," *Zentralblatt fur Mathematik/Mathematics Abstracts*, 1992.