

# Dr. Yau Shu Wong

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## Education

- D. Phil. in Mathematics, Oxford University, England, 1978.
- M. Sc. in Mathematics, Oxford University, England, 1976.
- B. Sc. in Electrical Engineering, University of Southampton, England, 1975.

## Professional Experience

- 1984 - present: Professor, Department of Mathematical Sciences, University of Alberta, Edmonton, Alberta, Canada.
- 1984 - 1994: NSERC (Natural Sciences and Engineering Research Council of Canada) University Research Fellow, Department of Mathematical Sciences, University of Alberta, Edmonton, Alberta, Canada.
- 1982 - 1984: Visiting Assistant Professor, Department of Mathematics and Statistics, McGill University, Quebec, Canada.
- 1980 - 1982: Staff Scientist, Institute for Computer Applications in Sciences and Engineering(ICASE), NASA Langley Research Center, Hampton, Virginia, USA.
- 1978 - 1980: Postdoctoral Research Fellow, Department of Computer Science and the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, BC, Canada.

## Research Interests

- Theory and Practices of Numerical Analysis
- Scientific Computing for Real Problems in Sciences and Engineering

† Computational Aerodynamics and Aeroelasticity

- Nonlinear Dynamical Systems
- Neural Computing
- Data Mining

## Consulting Activities

- ICASE (Institute for Computer Applications in Sciences and Engineering), NASA Langley Research Center, USA, (1983).
- The De Havilland Aircraft of Canada, (1984).
- ICOMP (Institute for Computational Mechanics in Propulsion), NASA Lewis Research Center, USA, (1987-90).
- Alberta Research Council and Myrias Research Corporation, (1990).
- Department of National Defence of Canada, (1987-90).
- National Research Council of Canada, (1989-92, 1995-97).
- Trans Computing Inc., (1995).
- Bombardier - Canadair Inc., (1996-97).
- External examiner (Computing Mathematics), City University of Hong Kong, (2000-03).

## Selected Publications (1990 - present)

### Refereed Journal

- Nonlinear aeroelastic analysis using the point transformation method, Part II: Hysteresis models, (with L. Liu and B.H.K. Lee), to appear in Journal of Sound and Vibration, 2002.
- Nonlinear aeroelastic analysis using the point transformation method, Part I: Freeplay models, (with L. Liu and B.H.K. Lee), to appear in Journal of Sound and Vibration, 2002.
- Parameter extraction by parallel neural networks, (with B.H.K. Lee and T.K.S. Wong), Intelligent Data Analysis, vol. 5, 57-69, 2001.

- † Application of the centre manifold theory in nonlinear aeroelasticity, (with L. Liu and B.H.K. Lee), *Journal of Sound and Vibration*, vol. 234, 641-659, 2000.
- Nonlinear aeroelastic analysis of airfoils: bifurcation and chaos, (with B.H.K. Lee and S. Price), *Progress in Aerospace Sciences*, Elsevier Science Publishers, vol. 35, 205-334, 1999.
  - A preconditioning technique for steady Euler solutions, (with H. Li), *International Journal for Numerical Methods in Fluids*, vol. 30, 541-555, 1999.
  - Flutter of an airfoil with a cubic restoring force, (with B.H.K. Lee and L.Y. Jiang), *Journal of Fluids and Structure*, vol. 13, 75-101, 1999.
  - Neural network parameter extraction with application to flutter signals, (with B.H.K. Lee), *AIAA Journal of Aircraft*, vol. 35, No. 1, 165-168, 1998.
  - Dynamics of a coupled system of Duffing's equations, (with B.H.K. Lee and L. Gong), *Dynamics of Continuous, Discrete and Impulsive Systems*, vol. 4, 99-119, 1998.
  - Effects of structural nonlinearities in aeroelasticity, (with B.H.K. Lee and L. Gong), *Nonlinear Analysis, Theory, Methods & Applications*, vol. 30, No. 5, 2699-2709, 1997.
  - Analysis and computation of nonlinear dynamic response of a two-degree-of-freedom system and its application in aeroelasticity, (with B.H.K. Lee and L. Gong), *Journal of Fluids and Structure*, vol. 11, 225-246, 1997.
  - An initial-boundary value problem of a nonlinear Klein-Gordon equation, (with Q. Chang and L. Gong), *Applied Mathematics and Computation*, vol. 84, 77-93, 1997.
  - On the algebraic multigrid method, (with Q. Chang and H. Fu), *Journal of Computational Physics*, vol. 125, 279-292, 1996.
  - Numerical boundary conditions for unsteady transonic calculations, (with H. Jiang and B.H.K. Lee), *International Journal for Numerical Methods in Fluids*, vol. 18, 1121-1131, 1994.
  - A new approach for the algebraic multigrid method, (with Q. Chang), *International Journal of Computer Mathematics*, vol. 49, 197-206, 1993.
  - Transonic flutter analysis using time-linearization aerodynamics, (with B.H.K. Lee and H.S. Murty), *AIAA Journal of Aircraft*, vol. 30, 144-145, 1993.
  - Monotone iterations for numerical solutions of nonlinear elliptic partial differential equations, (with X. Liu and X. Ji), *Applied Mathematics and Computation*, vol. 50, 59-91, 1992.
  - On shooting algorithm for Sturm-Liouville eigenvalue problems with periodic and semi-periodic boundary conditions, (with X. Ji), *Applied Mathematics and Computation*, vol. 51, 87-104, 1992.

- † New interpolation formulas of using geometric assumptions in the algebraic multigrid method, (with Q. Chang and Z. Li), *Applied Mathematics and Computation*, vol. 50, 223-254, 1992.
- On monotone iterative techniques for mildly nonlinear partial differential equations, (with X. Ji), *Applied Mathematics Letters*, vol. 4, 81-83, 1991.
- A parallel alternating direction implicit preconditioning method, (with H. Jiang), *Journal of Computational and Applied Mathematics*, vol. 36, 209-226, 1991.
- Numerical simulations for transonic aerodynamic flows, (with H. Jiang), *Computer Physics Communications*, vol. 65, 310-319, 1991.
- Purfer method for periodic and semi-periodic Sturm-Liouville eigenvalue problems, (with X. Ji), *International Journal of Computer Mathematics*, vol. 39, 109-123, 1991.
- Absorbing boundary conditions for second-order hyperbolic equations, (with H. Jiang), *Journal of Computational Physics*, vol. 88, 205-231, 1990.

## Conference Proceedings

- A neural network approach for nonlinear aeroelastic analysis, (with O. Voitcu), accepted for the 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Material Conference, Denver, USA, April 2002.
- A nonlinear statistical approach for aeroelastic response prediction, (with C.A. Popescu), accepted for the 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Material Conference, Denver, USA, April 2002.
- Dynamical analysis of nonlinear aeroelastic system with hysteresis, (with L. Liu and B.H.K. Lee), *Proceedings of the International Forum on Aeroelasticity and Structural Dynamics 2001*, Madrid, Spain, vol. 2, 307-319, 2001.
- Frequency and amplitude prediction of limit cycle oscillations of an airfoil containing concentrated structural nonlinearities, (with L. Liu and B.H.K. Lee), *Proceeding of the 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Material Conference, USA*, vol. 2, 825-839, AIAA paper 2001-1293, 2001
- Nonlinear dynamic prediction and feature extraction, (with C.A. Popescu and O. Voitcu), *Proceeding of the 48th Annual Conference of Canadian Aeronautics and Space Institute*, Toronto, 97-106, 2001.
- The dynamic response of a two-dimensional airfoil with bilinear structural nonlinearity, (with L. Liu and B.H.K. Lee), *Proceeding of the Second International Workshop on Scientific Computing and Applications*, Kananaskis, Canada, 2000.

- † Parameter estimation in flutter analysis by wavelet and neural network, (with B.H.K. Lee and T.K.S. Wong), CEAS/AIAA/ICASE/NASA Langley International Forum on Aeroelasticity and Structural Dynamics 1999, NASA /CP-1999-209136/PT 1, 245-254, 1999.
- Application of the centre manifold theory in nonlinear aeroelasticity, (with L. Liu and B.H.K. Lee), CEAS/AIAA/ICASE/NASA Langley International Forum on Aeroelasticity and Structural Dynamics 1999, NASA /CP-1999-209136/PT 2, 533-542, 1999.
  - Flutter of an airfoil with a cubic nonlinear restoring force, (with B.H.K. Lee and L.Y. Jiang), Proceedings of the 39th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Material Conference, USA, AIAA paper 98-1725, 1998.
  - Wavelet feature extraction for discrimination tasks, (with N. Intrator, Q.Q. Huynh and B.H.K. Lee), Proceedings of the Fifth Canadian Workshop on Information Theory, Toronto, 83-86, 1997.
  - A preconditioning approach for hyperbolic systems, (with H. Li), Proceedings of the Fifth Annual Conference of the Computational Fluid Dynamics Society of Canada, Victoria, 3-43: 3-47, 1997.
  - Computation of unsteady transonic flows for elastic wing-body configurations, (with J. Su and B.H.K. Lee), Proceedings of the Fifth Annual Conference of the Computational Fluid Dynamics Society of Canada, Victoria, 16-9: 16-13, 1997.
  - Effects of structural nonlinearities in aeroelasticity, (with B.H.K. Lee and L. Gong), Proceedings of the Second World Congress of Nonlinear Analysis, Elsevier Science Publishers, 1996.
  - Analysis and computation of nonlinear dynamic response of a two-degree-of-freedom system and its application in aeroelasticity, (with B.H.K. Lee and L. Gong), Proceedings of AIAA Dynamics Specialists Conference, USA, AIAA paper 96-1248, 1996.
  - Dynamic response of a two-degree-of-freedom system with a cubic nonlinearity, (with B.H.K. Lee and L. Gong), Proceedings of the Third International Conference on Computational Physics, Chung-Li, Taiwan, 1995.
  - Numerical solutions for large sparse matrix problems arising from the applications of unstructured grids, (with Q. Chang and H. Li), Proceedings of the First Asian Computational Fluid Dynamics Conference, Hong Kong, 1995.
  - Algebraic multigrid method and its application to Euler equations, (with Q. Chang and F. Fu), Proceedings of the Second International Conference on Computational Physics, World Scientific Publishers, 1993.
  - Algebraic multigrid method in CFD, (with Q. Chang), Proceedings of the Conference of the CFD Society of Canada, 1993.

- † Recent developments in algebraic multigrid methods, (with Q. Chang), Proceedings of Copper Mountain Conference on Iterative Methods, 1992.
- A note on CGS method, (with H. Li), Proceedings of Copper Mountain Conference on Iterative Methods, 1992.
  - A finite difference domain decomposition for the heat equation in cylindrical coordinates, (with H.Li and Y. Lin), Proceedings of the Seventh IMACS International Conference on Computing Methods for Partial Differential Equations, in ADVANCES IN COMPUTER METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS, Ed. by R. Vichnevetsky, et.al., IMACS, 1992.
  - A time-linearization approach for unsteady transonic flows, (with B.H.K. Lee and H.S. Murty), Proceedings of AGARD Specialists' Meeting on Transonic Unsteady Aerodynamics and Aeroelasticity, in AGARD-CP-507, NATO-AGARD Publications, France, 1992.
  - Computational techniques for transonic aerodynamics, (with H. Jiang), Proceedings of the IMACS First International Conference on Computational Physics, 1990.
  - Development of a three dimensional unsteady transonic aerodynamics computer code for flutter analysis, (with B.H.K. Lee), Proceedings of the 17th Congress of the International Council of the Aeronautical Sciences, Sweden, 1990.

## Government Reports

- Modification of a store separation model computer code for software design of a captive trajectory system, (with J. Su), NRC (National Research Council) Contractor Report, Canada, 1997.
- Development of nonlinear methods for flutter analysis, NRC (National Research Council) Contractor Report, Canada, 1996.
- Development of a transonic aerodynamics computer code for flutter analysis, (with J. Su and H. Jiang), NRC Contractor Report, Canada, 1996.
- Development of a transonic aerodynamics computer code, NRC Contractor Report, Canada, 1992.
- Development of a three dimensional unsteady transonic aerodynamics computer code for flutter analysis on an isolated wing, (with H. Jiang), DND (Department of National Defence) Contractor Report, Canada, 1990.
- Transonic aerodynamics code development, (with R.J. Tait and W. Allegretto), NRC Contractor Report, Canada, 1990.