NGOC-CUONG NGUYEN

CONTACT INFORMATION

Title:	Research Scientist	**Address:**	Department of Aeronautics & Astronautics
Email:	cuongng@mit.edu		Building 37, Room 37-471
Web:	http://mit.edu/∼cuongng		Massachusetts Institute of Technology
Phone:	+1-617-253-3208		77 Massachusetts Avenue
Fax:	(617) 258-5143		Cambridge, MA 02139

RESEARCH INTEREST

My research interest focuses on efficient methods for simulation of multi-scale and multi-physics phenomena across disciplines and on uncertainty quantification techniques for inverse/design problems in engineering. I am particularly interested in the development of discontinuous Galerkin methods, multiscale finite element methods, certified reduced basis methods, and probabilistic and deterministic inverse methods. I am also interested in developing simulation softwares to solve important problems in interdisciplinary areas.

EDUCATION

2001–2005 **National University of Singapore**
Ph.D. in **High Performance Computation for Engineered Systems** under the program between the Massachusetts Institute of Technology and the National University of Singapore.
Dissertation Title: *Reduced basis approximation and a posteriori error bounds for nonaffine and nonlinear partial differential equations: Application to inverse analysis.*
Advisors: Professor A. T. Patera (MIT) and Professor G. R. Liu (NUS).

1996–2001 **Ho Chi Minh City, University of Technology**
BE in **Aeronautical Engineering** (First Class Honors).

APPOINTMENT

Since 2008 **Massachusetts Institute of Technology**
Research scientist in the Department of Aeronautics & Astronautics and Center for Computational Engineering, School of Engineering.

2005–2008 **Massachusetts Institute of Technology**
Post-doctoral associate in the Department of Aeronautics & Astronautics.

AWARDS

- Co-awarded the first **Springer Computational Science and Engineering Prize**, 2009. The award amount is $10,000.
- Singapore-MIT Alliance (SMA) Research Graduate Fellowship, 2001.

TEACHING EXPERIENCE

- Invited lecturer at the Aachen-MIT Spring School, RWTH Aachen University, Aachen, Germany, March 2009. Invitation by Professor Markus J. Buehler of the Department of Civil and Environmental Engineering, MIT.

- Guest lecturer in Advanced Topics in Numerical Methods for PDEs, MIT graduate course 16.930 (Spring 2009).
- Co-instructor in Advanced Topics in Numerical Methods for PDEs, MIT graduate course 16.930 (Spring 2007).
- Guest lecturer in Numerical Methods for Partial Differential Equations, MIT graduate course 2.097/6.339/16.920 (Fall 2006).

PROFESSIONAL SERVICE

- Co-organizer of a mini-symposium on the reduced basis methods at the International Conference on Spectral and High Order Methods, Trondheim, Norway, June 2009.
- Society membership: American Institute of Aeronautics and Astronautics, AIAA member since 2007, and American Society for Industrial and Applied Mathematics, SIAM member since 2007.
- Referee for Journal of Computational Physics, Computer Methods in Applied Mechanics and Engineering, International Journal of Numerical Methods in Engineering, AIAA Journal, SIAM Journal of Scientific Computing, Applied Numerical Mathematics, and ESAIM: Mathematical Modelling and Numerical Analysis.

PUBLICATIONS

Refereed Journal Papers

1. M. Barrault, Y. Maday, N.C. Nguyen, A.T. Patera, An empirical interpolation method: Application to efficient reduced basis discretization of partial differential equations, *C. R. Acad. Sci. Paris, Ser.* I 339 (2004) 667–672.
2. S. Sen, K. Veroy, D.B.P. Huynh, S. Deparis, N.C. Nguyen, A.T. Patera, Natural norm a posteriori error estimators for reduced basis approximations. *Journal of Computational Physics*, 217 (2006) 37–62.
3. M.A. Grepl, Y. Maday, N.C. Nguyen, A.T. Patera, Efficient reduced basis treatment of nonaffine and nonlinear partial differential equations. *ESAIM-Mathematical Modeling and Numerical Analysis (M2AN)*, 41 (2007) 575–605.
4. N.C. Nguyen, A multiscale reduced-basis method for parametrized elliptic partial differential equations with multiple scales. *Journal of Computational Physics*, 227 (2007) 9807–9822.
5. N.C. Nguyen, A posteriori error estimation and basis adaptivity for reduced basis approximation of nonaffine-parametrized linear elliptic partial differential equations. *Journal of Computational Physics*, 227 (2007) 983–1006.
6. N.C. Nguyen, A. T. Patera, J. Peraire, A best points interpolation method for efficient approximation of parametrized functions. *International Journal of Numerical Methods in Engineering*, 73 (2008) 521–543.
7. N.C. Nguyen, J. Peraire, An efficient reduced-order modeling approach for nonlinear parametrized partial differential equations. *International Journal of Numerical Methods in Engineering*, 76 (2008) 27–55.
8. Y. Maday, N.C. Nguyen, A.T. Patera, G.S.H. Pau, A general, multipurpose interpolation procedure: the magic points. *Communications on Pure and Applied Analysis*, 8 (2009) 384–404. A special issue on A tribute to Professor P. G. Ciarlet on his 70th birthday.
9. N.C. Nguyen, J. Peraire, B. Cockburn, An implicit high-order hybridizable discontinuous Galerkin method for linear convection-diffusion equations. *Journal of Computational Physics*, 228 (2009) 3232–3254.

10. N.C. Nguyen, G. Rozza, A. T. Patera, Reduced Basis Approximation and A Posteriori Error Estimation for the Time-Dependent Viscous Burgers Equation. *Calcolo*, 46 (2009) 157–185.
11. S. Boyaval, C. Le Bris, Y. Maday, N.C. Nguyen, A. T. Patera, A Reduced Basis Approach for Variational Problems with Stochastic Parameters: Application to Heat Conduction with Variable Robin Coefficient. *Computer Methods in Applied Mechanics and Engineering*, 198 (2009) 3187–3206.
12. N.C. Nguyen J. Peraire, B. Cockburn, An implicit high-order hybridizable discontinuous Galerkin method for nonlinear convection-diffusion equations. *Journal of Computational Physics*, 228 (2009) 8841–8855.
13. N.C. Nguyen J. Peraire, B. Cockburn, A hybridizable discontinuous Galerkin method for Stokes flow. *Computer Methods in Applied Mechanics and Engineering*, 2009. In Press.

Book Chapters

1. N.C. Nguyen, K. Veroy, A.T. Patera, Certified real-time solution of parametrized partial differential equations. *Handbook of Material Modeling*, pp. 1523-1558. Springer 2005.
2. M.A. Grepl, N.C. Nguyen, K. Veroy, A.T. Patera, G.R. Liu, Certified rapid solution of partial differential equations for real-time parameter estimation and optimization. *Real-Time PDE-Constrained Optimization*, pp. 197212. SIAM Book Series 2007.
3. E. Cancès, C. Le Bris, Y. Maday, N.C. Nguyen, A.T. Patera, G.S.H. Pau, Feasibility and competitiveness of a reduced basis approach for rapid electronic structure calculations in quantum chemistry. *High-dimensional Partial Differential Equations in Science and Engineering*, pp. 1547. AMS, CRM proceedings series, volume 41, 2007.
4. N.C. Nguyen, G. Rozza, D.B.P. Huynh, A. T. Patera, Reduced Basis Approximation and A Posteriori Error Estimation for Parametrized Parabolic PDEs; Application to Real-Time Bayesian Parameter Estimation. In Biegler, Biros, Ghattas, Heinkenschloss, Keyes, Mallick, Tenorio, van Bloemen Waanders, and Willcox (Eds). Computational Methods for Large Scale Inverse Problems and Uncertainty Quantification, John Wiley & Sons, UK, 2009. Submitted.

Papers in Review

1. N.C. Nguyen, An uncertainty quantification method for parameter estimation in elliptic partial differential equations. Submitted to *Computer Methods in Applied Mechanics and Engineering*.
2. N.C. Nguyen, J. Peraire, B. Cockburn, A comparison of HDG methods for Stokes flow. Submitted to *Journal of Scientific Computing*, 2009.
3. D. J. Knezevic, N.C. Nguyen, A.T. Patera, Reduced basis approximation and *a posteriori* error estimation for the parametrized unsteady Boussinesq equations. Submitted to *Mathematical Models and Methods in Applied Sciences*, 2009.
4. B. Cockburn, J. Gopalakrishnan, F. Li, N.C. Nguyen, J. Peraire, Hybridization and postprocessing techniques for mixed eigenfunctions. Submitted to *SIAM Numerical Analysis*, 2009.
5. B. Cockburn, J. Gopalakrishnan, N.C. Nguyen, J. Peraire, F.-J. Sayas, Analysis of HDG methods for Stokes flow. Submitted to *Mathematics of Computation*, 2009.
6. H. Men, N.C. Nguyen, R.M. Freund, P.A. Parrilo, J. Peraire., Band Gap Optimization of Two-Dimensional Photonic Crystals Using Semidefinite Programming and Subspace Methods. Submitted to *Journal of Computational Physics*, 2009.

Conference Papers

1. N.C. Nguyen, J. Peraire, B. Cockburn, Hybridizable discontinuous Galerkin methods. Submitted to the ICOSAHOM proceedings in a special volume of the book series Lecture Notes in computational Science and Engineering, 2009.

2. N.C. Nguyen, P.O. Persson, J. Peraire, RANS Solutions using high order discontinuous Galerkin methods. *In Proceedings of the 45th AIAA Aerospace Sciences Meeting and Exhibit*, AIAA-2007-0914, Reno, NV, January 2007.
3. N.C. Nguyen, J. Peraire, An interpolation method for the reconstruction and recognition of face images. *In Proceedings of the 2nd International Conference on Computer Vision Theory and Applications*, pp. 91–96, Barcelona, Spain, March 2007.
4. G. Rozza, D.B.P. Huynh, N.C. Nguyen, A.T. Patera, Real-Time Reliable Simulation of Heat Transfer Phenomena. *ASME Summer Heat Transfer Conference*, San Francisco, California, July 19-23, 2009.
5. G. Rozza, N.C. Nguyen, S. Deparis, A.T. Patera, Reduced Basis Methods and A Posteriori Error Estimators for Heat Transfer Problems. *ASME Summer Heat Transfer Conference*, San Francisco, California, July 19-23, 2009.

PRESENTATIONS

1. Band Gap Optimization of Two-Dimensional Photonic Crystals Using Semidefinite Programming and Subspace Methods. The 10th US National Congress on Computational Mechanics in Columbus, Ohio, on July 16-19, 2009.
2. Reduced basis approximation and a posteriori error estimation for parametrized parabolic problems. The International Conference on Spectral and High Order Methods. June 2226, 2009, Trondheim, Norway.
3. A hybridizable discontinuous Galerkin method for incompressible flow. The International Conference on Spectral and High Order Methods. June 2226, 2009, Trondheim, Norway.
4. A hybridizable discontinuous Galerkin method for incompressible flow. The fifth MIT conference on Computational Fluid Dynamics, MIT, June 2009.
5. A hybridizable discontinuous Galerkin method for Stokes flow. ACDL Seminar, 2009.
6. Hybridizable discontinuous Galerkin methods. MIT-Aachen Spring School, March 2009.
7. Hybridizable discontinuous Galerkin methods — Singapore-MIT Alliance symposium, Singapore, January 2009.
8. Reduced order modeling for nonlinear parametrized PDEs — ASME - IMECE Conference, Boston, USA, November, 2008.
9. Hybridized discontinuous Galerkin methods for time-dependent convection-diffusion Equations — Division of Applied Mathematics, Brown University, May 2008.
10. An efficient reduced order approach for nonlinear PDEs: Application to real-time optimization — Singapore-MIT Alliance symposium, Singapore, January 2007
11. Reduced basis output bound method for parametrized parabolic PDEs: Application to Bayesian estimation — Sandia Workshop, Santa Fe, New Mexico, September 2007.
12. An interpolation method for the reconstruction and recognition of face images — the 2nd VISAPP conference, Barcelona, Spain, March 2007.
13. An uncertainty region reduced basis approach to parameter estimation for linear parabolic PDEs: Application to Nondestructive Testing — SIAM Conference on Computational Science and Engineering, Costa Mesa, California, February 2007.
14. RANS solutions using the Spalart-Allmaras turbulence model and a high-order discontinuous Galerkin method — WCCM VII, Los Angeles, California, USA, July 2006.
15. Certified rapid solution of parametrized linear elliptic noncoercive equations: Application to parameter estimation — Sixth International Conference on Spectral and High-Order Methods, Brown University, RI, USA, June 2004.