

# YAN YU

65 Hamlet Woods Drive  
St. James, New York 11780  
(631)786-9285  
[flyannie@gmail.com](mailto:flyannie@gmail.com)

Dept. of Applied Mathematics & Statistics  
SUNY at Stony Brook, New York 11794  
(631)632-9360  
[yan2000@ams.sunysb.edu](mailto:yan2000@ams.sunysb.edu)

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## EDUCATION

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STATE UNIVERSITY OF NEW YORK – *Stony Brook, New York* December 2004  
**Ph. D., Applied Mathematics and Statistics** GPA: 3.9/4.0  
Advisor: Dr. James Glimm Thesis: Errors in Numerical Solutions of Shock Physics Problems

NANJING UNIVERSITY OF AREONAUTICS AND ASTRONAUTICS OF CHINA – *Nanjing, China* July 2000  
**Master of Engineering, Computational Fluid Dynamics** GPA: 3.85/4.0  
Advisor: Dr. Ning Zhao Thesis: Numerical Simulation Methods to Richtmyer-Meshkov Instabilities

NANJING UNIVERSITY OF AREONAUTICS AND ASTRONAUTICS OF CHINA – *Nanjing, China* July 1998  
**Bachelor of Engineering, Aerodynamics** GPA: 4.0/4.0

## WORK EXPERIENCE

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Research Assistant Professor – *Stony Brook University, New York* January 2005 – Present

Lab Director – *Stony Brook University, New York* February 2004 – Present

- Oversee day-to-day administration of the Galaxy supercomputer lab in the Department of Applied Mathematics & Statistics and the Seawulf supercomputer lab in the Stony Brook University. In charge of system operations, equipment maintenance, and staffing.
- Coordinate schedules for scientific use of lab for faculty and other national researchers

SPIR Coordinator – *Stony Brook University, New York* February 2004 – Present

- Hold honor as only student ever chosen as coordinator of Strategic Partnership for Industrial Resurgence (SPIR) in Stony Brook University

## RESEARCH EXPERIENCE

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- Scramjet project collaboration with Stanford University. Focused on the turbulent mixing for a jet in crossflow and turbulent combustion.
- Analyzing chaotic flow fields of turbulent mixing. Focused on parameterized subgrid models of mass and thermal diffusion, to define LES that replicate the micro features observed in the DNS.
- Simulation of Type Ia Supernova. Focusing on a 2D axisymmetric model of a type Ia supernova explosion, based on a front tracking sharp flame model.
- Stochastic analysis of turbulent mixing. Focusing on validation of closure hypotheses and the averaged equation based on analysis of the simulation data describing two dimensional Richtmyer-Meshkov mixing.
- Validation of a multiphase flow model for the unstable mixing of incompressible layered materials by considering a two-fluid problem with an intermediate layer added.
- Uncertainty quantification research study since June 2002. Using statistics tools to perform error analysis in numerical solutions of shock physics problems. Proposed robust and understandable error models for shock physics simulations. Formulate and validate a composition law to estimate errors in the solutions of complex problems in terms of the errors from simpler ones, in both planar geometry and spherical geometry.
- Code comparison analysis. Simulated Rayleigh-Taylor instability using front tracking FrontTier code and TVD (total variation diminishing) code, analyzed the bubble/spike height and growth rate, and helped perfecting the graphic visualization of output data.
- 7<sup>th</sup> CRSC Industrial Mathematics Modeling Workshop at North Carolina State University, July 2001. Worked with Michelin North America on a real life project: ring structure against rolling circular drum.
- Numerical simulations of interface instabilities when pursuing master's degree. Developed a new numerical algorithm to couple a tracked contact surface and an untracked strong shock wave. The new tracking algorithm reduces the complication of computation and maintains the sharp resolution of the contact surface. Implemented the algorithm in both Fortran and C language.

## TEACHING EXPERIENCE

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**Instructor:** SUNY at Stony Brook, New York

- Applied Linear Algebra (undergraduate course), Fall 2012
- Numerical Analysis III (graduate course), Spring 2012
- Elements of Statistics (undergraduate course), Spring/Summer 2006
- Applied Linear Algebra (undergraduate course), Spring/Fall 2005
- Research in Applied mathematics (undergraduate course), Spring/Fall 2004, Spring/Fall 2005
- Fundamentals of Computing (graduate course), Fall 2003

**Teaching Assistant:** SUNY at Stony Brook, New York

- Finite Mathematical Structures (undergraduate course), Spring 2001
- Applied Linear Algebra (undergraduate course), Fall 2000

## TECHNICAL SKILLS

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**Mathematics:** Statistical data analysis, Scientific computing, Numerical analysis, Algorithm development

**Operating Systems:** UNIX, Windows NT/2000/XP

**Programming Languages:** C/C++, Fortran77/90, SAS, Shell script, Perl, HTML

**Software:** SAS, LaTeX, Tecplot, Maple, Matlab, R, Mathematica, Microsoft Office

## PUBLICATIONS

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- Atomic Scale Mixing for High Reynolds Number Turbulence (J. Melvin, P. Rao, R. Kaufman, H. Lim, Y. Yu, J. Glimm and D.H. Sharp, Submitted to *High Energy Density Physics*, 2012)
- Stochastic Convergence and the Software Tool W\* (Ryan Kaufman, Tulin Kaman, Yan Yu and James Glimm, Submitted to *Proceeding Book of International Conference to honour Professor E.F. Toro*, 2011)
- Recent Progress in Turbulent Mixing (T. Kaman, J. Melvin, P. Rao, R. Kaufman, H. Lim, Y. Yu, and J. Glimm, D.H. Sharp, Submitted to *Physica Scripta*, 2011)
- A Mathematical Theory for LES Convergence (H. Lim, T. Kaman, Y. Yu, V. Mahadeo, Y. Xu, H. Zhang and J. Glimm, S.Dutta, D. H. Sharp and B. Plohr, Submitted to *Acta Mathematica Scientia*, 2011)
- A Numerical Method for the Simulation of Turbulent Mixing and its Basis in Mathematical Theory (T. Kaman, H. Lim, Y. Yu, D. Wang, Y. Hu, J.-D. Kim, Y. Li, L. Wu, J. Glimm, X. Jiao, X.-L. Li, R. Samulyak, Submitted to *Turbulent Mixing and Beyond Theme Issue of the Philosophical Transactions of the Royal Society*, 2011)
- Mathematical, Physical and Numerical Principles Essential for Models of Turbulent Mixing (H. Lim, Y. Yu, J. Glimm, D. H. Sharp, *IMA Volumes in Mathematics and its Application: Nonlinear Conservation Laws and Applications*, 153(2011))
- Verification and Validation for Turbulent Mixing (H. Lim, J. Iwerks, Y. Yu, J. Glimm, D. H. Sharp, *Physica Scripta*, In press, 2010)
- Nearly Discontinuous Chaotic Mixing (H. Lim, Y. Yu, J. Glimm, D. H. Sharp, *High Energy Density Physics*, 6(2010), pp. 223-226)
- Subgrid Models for Mass and Thermal Diffusion in Turbulent Mixing (H. Lim, Y. Yu, J. Glimm, X.-L. Li, D. H. Sharp, *Physica Scripta*, In press, 2010)
- Subgrid Models for Turbulent Mixing (H. Lim, Y. Yu, J. Glimm, X.-L. Li, D. H. Sharp, *Astronomical Society of the Pacific (ASP) Conference Series*, 406(2008), pp. 42)
- Chaos, Transport, and Mesh Convergence for Fluid Mixing (H. Lim, Y. Yu, J. Glimm, X.-L. Li, D. H. Sharp, *Acta Math. Applicatae Sinica*, 24(2008), pp.355-368)
- Multi Scale Models for Fluid Mixing (H. Lim, Y. Yu, H. Jin, D. Kim, H. Lee, J. Glimm, X.-L. Li, D. H. Sharp, *CMAME special issue on Stochastic Modeling*, 197 (2008), pp. 3435–3444)
- Multi Phase Closure Models (W.Bo, H. Jin, D. Kim, X. Liu, H. Lee, N. Pestieau, Y. Yu, J. Glimm, J. W. Grove, *Computers & Mathematics with Applications*, 56 (2008), pp. 1291–1302)
- On validation of turbulent mixing simulations for Rayleigh-Taylor instability (H. Lee, H. Jin, Y. Yu, J. Glimm, *Phys. Fluids*, 20(2008), pp. 1-8)
- A Multifluid Mix Model for the Layered Incompressible Materials (B. Cheng, J. Glimm, D. H. Sharp, Y. Yu, *Physica Scripta*, T132(2008), pp. 14-16)

- Uncertainty Quantification for Chaotic Computational Fluid Dynamics (Y. Yu, M. Zhao, T. Lee, N. Pestieau, W. Bo, J. Glimm, J. W. Grove, *J. Comp. Phys.*, 217(2006), pp. 200-216)
- Recent Progress in the Stochastic Analysis of Turbulent Mixing (W. Bo, B. Cheng, J. Du, B. Fix, E. George, J. Glimm, J. W. Grove, X. Jia, H. Jin, H. Lee, Y. Li, X. Li, X. Liu, L. Wu, Y. Yu, *Contemporary Mathematics*, 429(2007), pp. 33-44)
- A Multiphase Flow Model for the Unstable Mixing of Layered Incompressible Materials (B. Cheng, J. Glimm, D. Sharp, Y. Yu, *Physics of Fluids*, vol. 17, issue 8 (2005))
- Errors in Numerical Solutions of Shock Physics Problems (Y. Yu, PhD thesis, SUNY at Stony Brook, December 2004)
- Error Analysis of Composite Shock Interaction Problems (Y. Yu, T. Lee, M. Zhao, J. Glimm, X. Li, K. Ye, *Proceeding of PMC 2004, Albuquerque, New Mexico*)
- Shock Wave Interactions in Spherical and Perturbed Spherical Geometries (S. Dutta, E. George, J. Glimm, T. Lee, Y. Yu, M. Zhao, *Nonlinear Analysis*, 63(2005), pp. 644-652)
- Errors in numerical solutions of spherically symmetric shock physics problem (J. Glimm, J. W. Grove, Y. Kang, T. Lee, X. Li, D. H. Sharp, Y. Yu, K. Ye, M. Zhao, *Contemporary Mathematics*, 371(2005), pp. 167-179)
- Statistical Riemann problems and a composition law for errors in numerical solutions of shock physics problems (J. Glimm, J. W. Grove, Y. Kang, T. Lee, X. Li, D. H. Sharp, Y. Yu, K. Ye, M. Zhao, *SISC special issue on Uncertainty Quantification*, 26(2004), pp. 666-697)
- Numerical Simulation Methods to Richtmyer-Meshkov Instabilities (Y. Yu, N. Zhao, W. Tang, *Mathematica Numerica Sinica*, Vol. 23, No.4, pp. 477-490, November 2001)

#### **PRESENTATIONS**

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- Uncertainty Quantification for Shock Physics Problems
  - 2005 SIAM Annual Meeting, New Orleans, Louisiana , July 2005
- Errors in Numerical Solutions of Shock Physics Problems
  - 9th Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability, Albuquerque, New Mexico, July 2004
  - Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, Newark, New Jersey, May 2004 (poster presentation)
  - Conference on Analysis, Modeling and Computation of PDE and Multiphase Flow, Stony Brook, New York, August 2004 (poster presentation)
- Error Analysis of Composite Shock Interaction Problems
  - SUNY at Stony Brook, Applied Mathematics Seminar, October 2004

#### **PROFESSIONAL ORGANIZATIONS**

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Member of the Society for Industrial and Applied Mathematics (SIAM)

Member of the Association for Women in Mathematics (AWM)