

# Bao-Shan WANG      Ph.D. Student

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## Education

🎓 **Ph.D.** in Marine Mathematical Technology, Sept. 2018 – June 2022 (expected)

College of Oceanic and Atmospheric Sciences, OUC.

Supervisor: Prof. Wai Sun Don

🎓 **M.Sc.** in Computational Mathematics, Sept. 2015 – June 2018

School of Mathematical Sciences, OUC.

Thesis Title: *Radial Basis Function Based Discontinuities Detection Algorithm and Its Application in High Order Hybrid Scheme*

Supervisors: Prof. Zhen Gao and Prof. Wai Sun Don

🎓 **B.Sc.** in Mathematics and Applied Mathematics, Sept. 2011 – June 2015

School of Mathematical Sciences, OUC.

Thesis Advisor: Prof. Shengshan Cao

## Research Interests

- ✓ High order methods for hyperbolic conservation laws (PDEs):  
WENO schemes, DG methods, Spectral methods, Hybrid schemes with high order shock detectors,  
Well-balanced schemes, Radial basis function methods
- ✓ Data-driven, Machine learning, Reduced order model, Reduced basis method
- ✓ Numerical methods for PDEs on complex surfaces
- ✓ Multi-phase/multi-material flows
- ✓ Theoretical analysis and numerical simulations of mathematical models
- ✓ High performance parallel scientific computing

## Publications Under Review/Preparation

- [1] Bao-Shan Wang, *My Mathematical Experiments on MATLAB*, in preparation. (Book In Chinese)
- [2] *Second-Order Central-Upwind Finite Difference Scheme and ENO Interpolation based Closest Point Method for Nonlinear Scalar Hyperbolic Conservation Laws on One-Dimensional Manifolds*, in preparation.
- [3] Yinghua Wang, Wai Sun Don, Bao-Shan Wang, *Fifth Order AWENO Finite Difference Scheme with Adaptive Numerical Diffusion*, in preparation.

- [4] Wai Sun Don, Leevan Ling, Zhen Gao, Bao-Shan Wang, Jie Xu, *WENO Reconstruction and ENO Interpolation based Closest Point Method for Hyperbolic Conservation Laws on Manifolds I: Scalar Equations*, in preparation.
- [5] Kang-Bo Tian, Wai Sun Don, Bao-Shan Wang, *Dual Order WENO-Za Finite Difference Scheme with Adaptive Ideal Weights for Hyperbolic Conservation Laws*, in preparation.
- [6] Peng Li, Bao-Shan Wang, Wai Sun Don, *Sensitivity parameter-independence well-balanced finite volume WENO scheme for the Euler equations under gravitational fields*, Journal of Scientific Computing, 2020, under review.
- [7] Wai Sun Don, Run Li, Bao-Shan Wang, Yinghua Wang, *Scale invariant WENO scheme with modified Z-type nonlinear weights for solving hyperbolic conservation laws*, Journal of Computational Physics, 2020, under review.
- [8] Bao-Shan Wang, Wai Sun Don, Naveen Kumar Garg, Alexander Kurganov, *Fifth-Order A-WENO Finite Difference Schemes Based on a New Adaptive Diffusion Central Numerical Flux*, SIAM Journal on Scientific Computing, 2020, under revision.
- [9] Zhen Gao, Qi Liu, Jan S. Hesthaven, Bao-Shan Wang, Wai Sun Don, Xiao Wen, *Non-intrusive reduced order modeling of convection dominated flows using artificial neural networks with application to Rayleigh-Taylor instability*, Communications in Computational Physics, 2020, under revision.

## Publications

- [1] Yang Yang, Wai Sun Don, Zhen Gao, Bao-Shan Wang, *Hybrid Compact-WENO Scheme with RBF-FD Based Discontinuity Detection Method for Hyperbolic Conservation Laws*, Journal on Numerical Methods and Computer Applications, 2020, **41**(3), 232–245. (In Chinese)
- [2] Peng Li, Xiqiang Zhao, Zhen Gao, Bao-Shan Wang, *High Order Hybrid Weighted Compact Nonlinear Schemes for Hyperbolic Conservation Laws*, Advances in Applied Mathematics and Mechanics, 2020, **12**(4), 972–991.
- [3] Zhen Gao, Li-Li Fang, Bao-Shan Wang, Yinghua Wang, Wai Sun Don, *Seventh and ninth orders alternative WENO finite difference schemes for hyperbolic conservation laws*, Computers and Fluids, 2020, **202**, 104519.
- [4] Jie Xu, Zhen Gao, Wai Sun Don, Bao-Shan Wang, *Order-Preserving Sixth-Order WENO Finite Difference Scheme in the Presence of High Order Critical Points*, Journal on Numerical Methods and Computer Applications, 2020, **41**(1), 68–82. (In Chinese)
- [5] Wai Sun Don, Dong-Mei Li, Zhen Gao, Bao-Shan Wang, *A characteristic-wise alternative WENO-Z finite difference scheme for solving the compressible multicomponent non-reactive flows in the overestimated quasi-conservative form*, Journal of Scientific Computing, 2020, **82**(2), 27.
- [6] Yinghua Wang, Bao-Shan Wang, Wai Sun Don, *Generalized Sensitivity Parameter Free Fifth Order WENO Finite Difference Scheme with Z-Type Weights*, Journal of Scientific Computing, 2019, **81**(3), 1329–1358.
- [7] Bao-Shan Wang, Peng Li, Zhen Gao, Wai Sun Don, *An improved fifth order alternative WENO-Z finite difference scheme for hyperbolic conservation laws*, Journal of Computational Physics, 2018, **374**, 469–477.
- [8] Bao-Shan Wang, Wai Sun Don, Zhen Gao, Yinghua Wang, Xiao Wen, *Hybrid Compact-WENO finite difference scheme with radial basis function based shock detection method for hyperbolic conservation laws*, SIAM Journal on Scientific Computing, 2018, **40**(6), A3699–A3714.

- [9] Bao-Shan Wang, Wai Sun Don, Zhen Gao, Yu-Hu Chen, *Vortex identification based multi-resolution analysis for Hybrid Compact-WENO scheme*, Periodical of Ocean University of China, 2018, **48**(Sup. II), 198–202. (In Chinese)
- [10] Wai Sun Don, Bao-Shan Wang, Zhen Gao, *Fast Iterative Adaptive Multi-Quadric Radial Basis Function Method for Edges Detection of Piecewise Functions—I: Uniform Mesh*, Journal of Scientific Computing, 2018, **75**(2), 1016–1039.

## Academic Experiences

**2019** Visiting Prof. Alexander Kurganov at Department of Mathematics, Southern University of Science and Technology, Shenzhen, China, March 27 – April 1, Sept. 15 – 19, Dec. 17 – 20.

## Conferences/Workshops/Seminars

**2020** Int'l Conference on Computational Mathematics & Scientific Computing, Chinese Academy of Sciences, Beijing, Aug. 17 – 20.

Lectures Series on High-Order Numerical Methods, University of Science and Technology of China, China, July 27 – Aug. 14.

Workshop on Computation & Applications of PDEs Based on Machine Learning, Tianyuan Mathematical Center in Northeast China, Jilin University, July 13 – 15.

Tianyuan Symposia & Int'l Conference: Advanced basic theory & efficient numerical methods for computational fluid dynamics, Xi'an, China, July 10 – 25.

Summer Workshop on Computational Mathematics, School of Mathematical Sciences, OUC, July 2.

**2019** **Poster**, Int'l Joint Conference on AI & Data Science: Mathematics & Applications, Suwon, Korea, Nov. 4 – 5.

**Poster**, The 11th Int'l Conference on Computational Physics, Hangzhou, China, June 23 – 28.

**Speaker**, Workshop on Applied and Computational Mathematics, Shijiazhuang, China, April 20 – 21.

Annual Meeting of China SIAM, Annual Meeting of Chinese Mathematical Society.

**2018** **Speaker**, Numerical Simulation on Ablative Rayleigh-Taylor Instability, Institute of Applied Physics and Computational Mathematics, Dec. 7.

The Fourth Int'l Workshop on the Development & Application of High-Order Numerical Methods, Nanjing, China, May 31 – June 4.

Annual Meeting of China SIAM.

**2017** **Speaker**, The 18th National Symposium on Numerical Methods in Fluids, Huaihua, Hunan, China, Aug. 12 – 15.

Annual Meeting of China SIAM, China Parallel Application Challenge on Domestic CPU.

**2015** The Third Summer Workshop in Advanced in Applied Mathematics & Scientific Computing at the School of Mathematical Sciences of Ocean University of China, July 1 – Aug. 20.

## Professional Services

### Journal Reviewer:

- ☒ Applied Numerical Mathematics
- ☒ Computers and Fluids

### Teaching Experiences:

- ☒ Teaching, *Spectral Methods for Time-Dependent Problems* for Master students, Mar. 1 – July 8, 2020.
- ☒ Teaching, *Research Skills Training* (e.g., MATLAB, Fortran, LaTeX, Tecplot, Linux, vi/vim) for first-year Master students, Sept. 2017 – present.
- ☒ Teaching Assistant, *Mathematical Experiments on MATLAB*, Sept. 1, 2015 – July 14, 2016.

### Memberships:

- ☒ China SIAM member, July 3, 2018 – present.
- ☒ Science Manager of the Research Center in Applied Mathematics and Scientific Computing at OUC, Sept. 2017 – present.

### Conference Services:

- ☒ Annual Meeting of Shandong Society of Computational Mathematics, Qingdao, China, 2019.
- ☒ Int'l Conference on Mathematical Modeling & Numerical Methods, Qingdao, China, 2019.
- ☒ Workshop on High Accuracy Schemes & Conservative Schemes for PDEs, Qingdao, China, 2018.
- ☒ Int'l Workshop on Computational Mathematics & Scientific Computing, Qingdao, China, 2017.

## Honors/Awards

**2020** Excellent Master Degree Dissertation of Shandong Province.

**2019** The Third Excellent Master Degree Dissertation at OUC.

**2018** Outstanding Master Degree Graduates of Shandong Province.

**2017** China National Scholarship for Graduate Students.

**2016** National Post-Graduate Mathematical Contest in Modeling: First Prize and Outstanding Paper.

**2015** National Post-Graduate Mathematical Contest in Modeling: Second Prize.

**2014** China Undergraduate Mathematical Contest in Modeling: Second Prize.