

# 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.