WANG LI-LIAN

Assistant Professor   ☎   65-6513-7669

Division of Mathematical Sciences, SPMS   ⓕⓐⓧ   65-6316-6984

Nanyang Technological University   ✉   lilian@ntu.edu.sg

Singapore, 637616   http://www.ntu.edu.sg/home/lilian

✵ Educational and Professional Experiences

- Assistant Professor, Division of Mathematical Sciences, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore. December 2005—Present.

- Visiting Assistant Professor, Department of Mathematics, Purdue University, USA. August 2003—December 2005.

- Postdoctoral Research Associate, Department of Mathematics, Purdue University, USA. August 2002—August 2003.
  Postdoctoral Mentor: Prof. Jie Shen.

- Assistant Professor, Department of Mathematics, Shanghai Normal University, China. July 2000—July 2002.

- Ph.D. Computational Mathematics, Shanghai University, China. April, 2000.
  Thesis Advisor: Prof. Ben-yu Guo.

- B.S. Mathematics Education, Xiangtan Normal University (becomes a component of Hunan University of Science and Technology since 2003), China. July, 1995.

☕ Research Interests

Numerical analysis and scientific computing:

- Efficient and stable spectral methods for PDEs in unbounded domains, particularly, including Helmholtz equation and Maxwell systems in exterior domains.

- Triangular spectral-element methods for PDEs in complex geometries.

- Numerical analysis and simulation of phase-field equations and incompressible flows.

✍ Recent Publications

❶ Papers published or to be published in refereed journals

1. Integration process of ordinary differential equations based on Laguerre-Radau interpolations (with Benyu Guo, Zhongqing Wang, Hongjiong Tian). To appear in *Math. Comp.*

2. Legendre and Chebyshev dual-Petrov-Galerkin methods for hyperbolic equations (with Jie Shen). *Computer Methods in Applied Mechanics and Engineering.* DOI: 10.1016/j.cma.2006.10.031 (2007, online).

3. Fourierization of the Legendre-Galerkin method and a new space-time spectral method (with Jie Shen). *Appl. Numer. Math.* Vol. 57, pp. 710-720 (2007).

4. Error analysis of spectral method on a triangle (with Benyu Guo). *Adv. Comput. Math.* Vol. 26, No. 4, pp. 473-496 (2007).

5. Laguerre and composite Legendre-Laguerre dual-Petrov-Galerkin methods for third-order equations (with Jie Shen). *Discrete and Continuous Dynamical Systems-B.* Vol. 6, No. 6, pp. 1381-1402 (2006).

6. Modified Laguerre pseudospectral method refined by multidomain Legendre pseudospectral approximation (with Benyu Guo). *J. Comput. Appl. Math.* Vol. 190, Issues 1-2, pp. 304-324 (2006).

7. Optimal spectral-Galerkin methods using generalized Jacobi polynomials (with Benyu Guo and Jie Shen). *J. Sci. Comput.* Vol. 27, No. 1-3, pp. 305-322 (2006).

8. Stair Laguerre pseudospectral method for differential equations on the half line (with Benyu Guo). *Adv. Comput. Math.* Vol. 25, pp. 305-322 (2006).

9. Generalized Laguerre interpolation and pseudospectral method for unbounded domains (with Benyu Guo and Zhongqing Wang). *SIAM J. Numer. Anal.* Vol. 43, No. 6, pp. 2567-2589 (2006).

10. Mixed Fourier-Jacobi spectral method (with Benyu Guo). *J. Math. Anal. Appl.* Vol. 315, Issue 1, 8-28 (2006).

11. Spectral approximation of the Helmholtz equation with high wave numbers (with Jie Shen). *SIAM J. Numer. Anal.* Vol. 43, 623-644 (2005).

12. Error analysis for mapped Jacobi spectral methods (with Jie Shen). *J. Sci. Comput.* Vol. 24, No. 2, 183-218 (2005).

13. Jacobi approximations in non-uniformly Jacobi-weighted Sobolev spaces (with Benyu Guo). *J. Approx. Theor.,* Vol. 128, No. 1, pp. 1-41 (2004).

14. Error analysis for mapped Legendre spectral and pseudospectral methods (with Jie Shen). *SIAM J. Numer. Anal.* Vol. 42, pp. 326-349 (2004).

15. Non-isotropic Jacobi spectral methods for unbounded domains (with Benyu Guo). *Numer. Math.-JCU, English Series*, Vol. 13 No. 2, pp. 204-224 (2004).

16. Jacobi spectral methods for multiple-dimensional singular differential equations (with Benyu Guo). *Journal of Computational Mathematics*, Vol. 21, No. 3, pp. 325-338 (2003).

17. A rational spectral method for singular differential equations (with Benyu Guo and Zhongqing Wang). *Numer. Math. JCU, English Series*, Vol. 12, No. 2, pp. 121-128 (2003).

18. Non-isotropic Jacobi spectral method (with Benyu Guo). *Contemporary Math.*, Vol. 329, pp. 157-169 (2003).

19. Jacobi pseudospectral methods for the Klein-Godorn equation on the half line. *Journal of Shanghai Normal University*, Vol. 31, No. 4, 1-7 (2002).

20. A generalized Gauss-type quadrature formula and its applications to pseudospectral method (with Benyu Guo and ZhongqingWang). *Numer. Math. JCU, English Series*, Vol. 11, No. 2, pp. 179-196 (2002).

21. Jacobi interpolation approximations and their applications to singular differential equations (with Benyu Guo). *Adv. Comput. Math.*, Vol. 14, No. 3, pp. 227-276 (2001).

22. An algorithm for global minimization based on discrete mean values and level sets (with Xu, Mengjie and Zhang, Liansheng). *Journal of Systems Science and Mathematical Sciences* (in Chinese), Vol. 21, No. 2, pp. 141-146 (2001).

23. A family of interesting exact solutions of sine-Gordon equation (with Huang Debin and Liu Zengrong), *Chinese Physics Letter*, Vol. 1, pp. 1-3 (2000).

24. Numerical methods for solving a hydrodynamical system of equations including quark flavor effect (with Xu Mengjie and Li Panlin), *Chinese Journal of Computational Physics*, Vol.1, pp. 94-98 (1999).

25. J/Ψ suppression and Quark flavor kinetics (with Xu Mengjie and Li Panlin), *Chinese Physics Letter*, Vol. 6, pp. 800-802 (1999).

❷ Papers in review

1. Analysis of a spectral-Galerkin approximation to the Helmholtz equation in exterior domains (with Jie Shen, in revision with positive referee reports under *SIAM J. Numer. Anal.*).

2. GLLB interpolation approximations and a new collocation method for Neumann problems (with Benyu Guo).

3. A triangular spectral element method using fully tensorial rational basis functions (with Jie Shen and Huiyuan Li).

❸ **Papers in Proceedings**

- Pseudospectral method based on the Gauss-Birkhoff quadrature formula (with Benyu Guo). *Proceeding of the sixth conference of China Society for Industrial and Applied Mathematics, Eds. Li Daqian, Zhang Xiangsun and Yuan Yaxiang, Research Information Ltd,* pp. 318-324 (2002).

❹ **Book in Preparation**

- Jie Shen, Tao Tang and Li-Lian Wang. *Spectral Methods: Algorithms, Analysis and Applications* (a 400-page version has been submitted for review).

☛ Talks

1. Finite Element Circus, Pittsburgh, University of Pittsburgh, Apr. 16, 2004.

2. ICOSAHOM04, Brown University, June 21-25, 2004.

3. AMS meeting, Northwestern University, August, 24-25, 2004.

4. 8th US National Congress on Computational Mechanics, University of Texas at Austin, Texas. July 24-28, 2005.

5. Department of Mathematics, National University of Singapore (NUS), March, 2006.

6. International Conference on Multiscale Analysis and Applications, Nanyang Technological University, Singapore. Dec. 18-22, 2006.

7. Department of Mathematics, Shanghai University, China, April, 2007.

☞ Contributed Poster

- IMA workshop "Future Challenges in Multiscale Modelling and Simulations", University of Minnesota, November 18-20, 2004.
  Title: "Efficient spectral methods using generalized Jacobi polynomials".

Research Grants

1. NTU Start-Up Grant (M 58110022). Development of efficient spectral methods for unbounded/exterior domains with applications to wave scattering, 2006-2008.

2. NSF of China (N. 10471095). Numerical methods for singular problems and unbounded domains, 2004-2006, PIs: Ben-yu Guo, Zhong-qing Wang and Li-Lian Wang.

3. NSF of Shanghai (N. 01QN85). Numerical methods for unbounded and exterior domains, 2001-2003. PI: Li-Lian Wang.

4. Shanghai Key Project for Basic Research (N. 00JC14057). Theory and Applications of Large Scale Computational Methods in Science, Engineering and Economics," 2000-2003.

5. Excellent Youth Teacher of Shanghai Normal University, 2001-2003.

☺ Courses Taught

- Jan. 2006–Present: Nanyang Technological University.

  Courses for undergraduates:

  MAS314—Numerical Analysis I;
  MAS281—Complex Methods for the Sciences.

  Courses for graduates:

  MAS592—Seminars on Scientific Computing I.

- Aug., 2003–Dec. 2005: Purdue University.

  Courses for undergraduates:

  MA265—Linear Algebra;
  MA262—Differential Equations and Linear Algebra;
  MA173—Calculus.

- July, 2000–July, 2002: Shanghai Normal University.

  Courses for undergraduates:

  "Mathematical Analysis";
  "Numerical Analysis".

  Courses for graduates:

  "Spectral Methods and Their Applications";
  "Sobolev Spaces";
  "Advanced Numerical Analysis".

---------------------- *Last Modified on April 22, 2007* ----------------------