Shihua Gong: Curriculum Vitae

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University of Bath
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Research Interests

numerical analysis; scientific computing and computer simulation; wave propagation; cardiovascular fluid-structure interaction; finite element methods; domain decomposition methods; multigrid methods; linear and nonlinear solvers

Career and Education

Department of Mathematical Sciences, University of Bath, Bath, UK
Research associate, Mar. 2019 – present, Mentors: Ivan G. Graham and Euan A. Spence
Project: Fast solvers for frequency-domain wave scattering problems

Department of Mathematics, Pennsylvania State University, State College, USA
Postdoctoral scholar, Aug. 2018 - Mar. 2019, Mentor: Jinchao Xu
Project: Discontinuous Galerkin methods for wave equations

Beijing International Center for Mathematical Research, Peking University, Beijing, China
PhD in Computational Mathematics, July 2018, Advisor: Jun Hu and Jinchao Xu
Thesis: Finite element discretization and fast solvers for elastic problems

Sun Yat-sen University, Guangzhou, China
BS in Information and Computational Science, June 2013 Advisor: Ying Jiang
Thesis: Accurate and fast Fourier transform using non-uniformly sampled data

Academic Visits

Mar. 2-7, 2020	Section de Mathématiques, Université de Genève.	Host: Martin J. Gander
Jan. 26-31, 2020	Depart. of Math. & Stat., University of Strathclyde.	Host: Victorita Dolean
Dec. 15-21, 2019	School of Math. Sci., Peking University.	Host: Shuonan Wu
Dec. 1-12, 2019	Depart. of Math., Chinese University of Hong Kong.	Host: Jun Zou
Nov. 2016 - Sep. 2017	Depart. of Comput. Sci., University of Colorado Boulder.	Host: Xiao-Chuan Cai
Sep. 2015 – Mar. 2016	Depart. of Math., Pennsylvania State University.	Host: Jinchao Xu

Publications

[1] Convergence of parallel overlapping domain decomposition methods for the Helmholtz equation. S. Gong, M. J. Gander, I. G. Graham, D. Lafontaine, E. A. Spence, submitted to *Numerische Mathematik*. arXiv:2106.05218 (2021)

[2] A variational interpretation of Restricted Additive Schwarz with impedance transmission condition for the Helmholtz problem. S. Gong, M. J. Gander, I. G. Graham, E. A. Spence, submitted to the proceeding of 26th Domain Decomposition Conference. arXiv:2103.11379 (2021).

[3] Domain-decomposition preconditioners for high-order discretizations of the heterogeneous Helmholtz equation. S. Gong, I. G. Graham, E. A. Spence, *IMA Journal of Numerical Analysis*, 2021; 41(3):2139-85.

[4] Helmholtz FEM with low-regularity boundary data: interior estimates and application to analysis of domain decomposition. S. Gong, I. G. Graham, E. A. Spence, in preparation.

[5] New hybridized mixed methods for linear elasticity and optimal multilevel solvers. S. Gong, S. Wu, and J. Xu. *Numerische Mathematik*, 141.2 (2019): 569-604.

[6] A nonlinear elimination preconditioned inexact Newton method for heterogeneous hyperelasticity. S. Gong, X.-C. Cai. *SIAM Journal on Scientific Computing* 41.5 (2019): S390-S408.

[7] Interior penalty mixed finite element methods of any order in any dimension for linear elasticity with strongly symmetric stress tensor. S. Wu, S. Gong, and J. Xu. *Mathematical Models and Methods in Applied Sciences,* 27.14 (2017): 2711-2743.

[8] A nonlinear elimination preconditioned Newton's method with applications in arterial wall simulation. S. Gong, X.-C. Cai. *International Conference on Domain Decomposition Methods.* Springer, 2017.

[9] A mathematical model of aortic aneurysm formation. W. Hao, S. Gong, S. Wu, J. Xu, M. R. Go, A. Friedman, and D. Zhu. *PloS one 12*, No. 2 (2017): e0170807.

Teaching Experiences

1. Tutor, Programming and discrete mathematics, University of Bath, Jan-May 2021
2. Teaching Assistant, Finite Element Methods, Pennsylvania State University, Aug. 2018 - Dec. 2018
3. Teaching Assistant, Introduction to Fluid Mechanics, Peking University, Mar. 2015 - Jul. 2015
4. Teaching Assistant, Functions of Real Variable and Functional Analysis, PKU, Sept. 2014 - Jan. 2015
5. Teaching Assistant, Linear Algebra, Peking University, Mar. 2014 - Jul. 2014

Skills

- **Programming**: Latex, C\C++, Matlab, MPI, Boost, **iFEM**, **FreeFEM++**, **FEniCS**, **PETSc**, Paraview, CMake, Gmesh, CUDA
- **Languages**: Cantonese, Mandarin, English

Presentations

- Contributed talk, SIAM Conference on Computational Science and Engineering, Online, Mar. 2021
- Contributed talk, the 26th International Domain Decomposition Conference, Online, Dec. 2020
- Invited talk, LSEC, CAS, Beijing, Dec. 2019
- Invited talk, CAM seminar, Peking University, Dec. 2019
- Contributed talk, DD26 Satellite Workshop, CUHK, Hong Kong, Dec. 2019
- Contributed talk, Parallel Solution Methods for Systems Arising from PDEs, CIRM, Luminy, Sept. 2019
- Contributed talk, WAVES 2019, TU Wien, Vienna, Aug. 2019
- Contributed talk, 28th Biennial Numerical Analysis Conference, University of Strathclyde, June, 2019
- Invited talk, Bath Numerical Analysis Seminar, University of Bath, Mar. 2019
- Joint Mathematics Meetings: Special Session on Numerical Methods for PDEs, Baltimore, Jan. 2019

- Invited talk, Inverse Problems and Analysis seminar, University of Delaware, Neward, Nov. 2018
- SIAM PP18: Highly Scalable Solvers for Computational PDEs. Waseda University, Tokyo. Mar. 2018
- Invited talk, High Performance Numerical Algorithms and Applications, TSIMF, Sanya, Jan. 2018
- The 15th Annual Meeting of CSIAM, Qindao, Oct. 2017
- Portable, Extensible Toolkit for Scientific Computation Annual Meetings, Boulder, USA, Jun. 2017
- The 18th Copper Mountain Conference on Multigrid Methods, Copper Mountain, USA, Mar. 2017
- The 9th National Finite Element Conference, E'mei, China, Aug. 2016
- The 14th Annual Meeting of CSIAM, Xiantan, Aug.2016
- Invited talk at LSEC, Chinese Academy of Sciences, Beijing, Mar. 2016
- Invited talk, CCMA PDEs and Numerical Methods Seminar, Penn State University, USA, Jan. 2016
- The 8th International Congress on Industrial and Applied Mathematics (ICIAM), Beijing, Aug. 2015

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