

# Huanhuan Yang

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Central China Normal University  
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## Research Interests

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- Numerical Partial Differential Equations: *Computational fluid dynamics, Cardiac electrophysiology, Boundary integral equations, Climate modeling*
- Reduced Order Modeling: *POD, CVT, Greedy reduced basis, Approximated Lax pairs*
- PDE-constrained Optimization: *Parameter estimation, Optimal control, Experimental design*
- Others: *HPC, Uncertainty quantification*

## Education

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- Emory University, USA** *Aug 2010 – Sep 2015*  
- Ph.D. in Computational Mathematics  
- Advisor: *Alessandro Veneziani*
- Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences** *Sep 2007 – Jun 2010*  
- M.S. in Pure Mathematics  
- Advisor: *Fangwen Deng*
- Central China Normal University** *Sep 2003 – Jun 2007*  
- B.S. in Mathematics

## Employment

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- Associate Professor** at *Central China Normal University* *July 2023 – present*
- Associate Professor** at *Shantou University* *Aug 2017 – July 2023*
- Postdoctoral Research Associate** at *Florida State University* *Sep 2015 – Aug 2017*  
- Supervisor: *Max Gunzburger*
- Research Intern** at *Siemens Research Corporate, Princeton* *May – Aug 2014*  
- Mentor: *Tiziano Passerini, Tommaso Mansi*

## Research Grants

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- *Research on numerical problems of partial differential equations in cardiac electrophysiology and blood flow simulation*, Guangdong Natural Science Foundation Youth Promotion Program, Grant 2023A1515030199, RMB300,000, 2023.1-2025.12.
- *Research on model reduction algorithms for parametric partial differential equations in cardiac electrophysiology*, National Natural Science Foundation of China, Grant 11801348, RMB250,000, 2019.1-2021.12.

## Publications

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1. Nan Jiang and **Huanhuan Yang\***, *A second order ensemble algorithm for computing the Navier-Stokes equations*, **Journal of Mathematical Analysis and Applications**, 530(1)(2024):127674.
2. Nan Jiang and **Huanhuan Yang\***, *Unconditionally stable, second order, decoupled ensemble schemes for computing evolutionary Boussinesq equations*, **Applied Numerical Mathematics**, 192(2023):241-260.
3. Nan Jiang and **Huanhuan Yang\***, *Fast and accurate artificial compressibility ensemble algorithms for computing parameterized Stokes-Darcy flow ensembles*, **Journal of Scientific Computing**, 94(2023).
4. Ruonan Cao, Nan Jiang, and **Huanhuan Yang\***, *Three linear, unconditionally stable, second order decoupling methods for the Allen-Cahn-Navier-Stokes phase field model*, **Journal of Mathematical Analysis and Applications**, 519(2023):126792.
5. Wei Gong, Buyang Li, **Huanhuan Yang\***, *Optimal control in a bounded domain for wave propagating in the whole space: coupling through boundary integral equations*, **Journal of Scientific Computing**, 92(2022):91.
6. Nan Jiang and **Huanhuan Yang\***, *Artificial compressibility SAV ensemble algorithms for the incompressible Navier-Stokes equations*, **Numerical Algorithms**, 2022.
7. Nan Jiang and **Huanhuan Yang\***, *Numerical investigation of two second-order, stabilized SAV ensemble methods for the Navier-Stokes equations*, **Advances in Computational Mathematics** 48(2022):65.

8. Nan Jiang, Ying Li\*, **Huanhuan Yang**, *A second order ensemble method with different subdomain time steps for simulating coupled surface-groundwater flows*, **Numerical Methods for Partial Differential Equations**, 38(2022):1880-1907.
9. Nan Jiang, Ying Li, **Huanhuan Yang\***, *An artificial compressibility Crank-Nicolson leap-frog method for the Stokes-Darcy model and application in ensemble simulations*, **SIAM Journal on Numerical Analysis**, 59(2021):401-428.
10. Nan Jiang and **Huanhuan Yang\***, *Stabilized scalar auxiliary variable ensemble algorithms for parameterized flow problems*, **SIAM Journal on Scientific Computing**, 43(2021):A2869-A2896.
11. Nan Jiang and **Huanhuan Yang\***, *SAV decoupled ensemble algorithms for fast computation of Stokes-Darcy flow ensembles*, **Computer Methods in Applied Mechanics and Engineering**, 387 (2021):114150.
12. **Huanhuan Yang\***, Lili Ju, Max Gunzburger, *Fast spherical centroidal Voronoi mesh generation: A Lloyd-preconditioned LBFGS method in parallel*, **Journal of Computational Physics**, 367(2018):235-252.
13. Kui Du, Buyang Li\*, Weiwei Sun, **Huanhuan Yang**, *Electromagnetic scattering from a cavity embedded in an impedance ground plane*, **Mathematical Methods in the Applied Sciences**, 41(2018):7748-7765.
14. **Huanhuan Yang\*** and Max Gunzburger, *Algorithms and analyses for stochastic optimization for turbofan noise reduction using parallel reduced-order modeling*, **Computer Methods in Applied Mechanics and Engineering**, 319(2017):217-239.
15. **Huanhuan Yang\*** and Alessandro Veneziani, *Efficient estimation of cardiac conductivities via POD-DEIM model order reduction*, **Applied Numerical Mathematics**, 115(2017):180–199.
16. **Huanhuan Yang** and Alessandro Veneziani\*, *Estimation of cardiac conductivities in ventricular tissue by a variational approach*, **Inverse Problems**, 31(2015):115001.
17. **Huanhuan Yang\***, Tiziano Passerini, Tommaso Mansi, and Dorin Comaniciu, *Data-driven model reduction for fast, high fidelity atrial electrophysiology computations*, **Functional Imaging and Modeling of the Heart, Lecture Notes in Computer Science**, 9126(2015):466-474.
18. Lifang Xu\* and **Huanhuan Yang**, *On the generalizations of Denjoy-Wolff theorem*, **Acta Mathematica Sinica, English Series**, 32 (2012):1333-1337.

## US Patent

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- H. Yang, T. Passerini, B. Georgescu, T. Mansi, D. Comaniciu. *System and Method for Patient-Specific Image-Based Simulation of Atrial Electrophysiology*. **US Patent No. US10354758B2**, granted in 2019.

## Presentations

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- “Stabilized SAV ensemble algorithms for parameterized flow problems”, 20th Symposium on Numerical Methods in Fluid Mechanics, Nanjing, China, Mar. 31-Apr. 4, 2023.
- “An artificial compressibility CNLF method for the Stoke–Darcy model and application in ensemble simulations”, 2022 Annual Meeting of Guangdong Society of Computational Mathematics, Dec. 17-18, 2022.
- “An artificial compressibility CNLF method for the Stoke–Darcy model and application in ensemble simulations”, 2021 Academic Annual Meeting of China Mathematical Association, Kunming, China, Oct. 22-27, 2021.
- “Problems in patient-specific modeling of electrocardiology”, Youth Forum on Numerical Algorithms for Delay Systems and Related Problems, Wuhan, China, Oct. 25-28, 2019.
- “PDE-constrained Optimization in Electrocardiology”, China Annual Conference of Computational Mathematics, Haerbin, China, July 31-Aug. 4, 2019.
- “Electromagnetic scattering from a cavity embedded in an impedance ground plane”, China Annual Conference of Computational Mathematics, Haerbin, China, July 31-Aug. 4, 2019.
- “Optimal control in a bounded domain for wave propagating in the whole space”, The 28th Biennial Numerical Analysis Conference, Glasgow, UK, June 25-28, 2019.
- “Centroidal Voronoi mesh generation by a Lloyd-preconditioned LBFGS method”, International Conference on Mathematical Modeling and Numerical Methods, Qingdao, China, May 30-June 2, 2019.

- “Fast SCVT grid generation: a Lloyd-preconditioned LBFGS method in parallel”, 2017 All-Hands ACME PI Meeting, Maryland, US, Jun 5-7, 2017.
- “Stochastic optimal control for turbofan noise reduction with parallel reduced order modeling”, SIAM Conference on Computational Science and Engineering, Atlanta, US, February 27-March 3, 2017.
- “Model and solution reduction techniques for patient-specific parameter estimation in cardiovascular mathematics: failure and success”, Applied Inverse Problems Conference in 2015, Helsinki, Finland, May 25-29, 2015
- “Atrial Fibrillation Modeling and Data-Driven Cell Model Reduction”, group meeting of Imaging & Computer Vision at Siemens Corporate Research, Princeton, Aug 2014
- “Order Reduced Methods for Cardiac Conductivities Estimation”, 3rd International Conference on Computational & Mathematical Biomedical Engineering, Hong Kong, December 16-18, 2013
- “Variational Estimation of Cardiac Conductivities by a Data Assimilation Procedure”, 12th U.S. National Congress on Computational Mechanics, Raleigh, North Carolina, US, July 22-25, 2013
- “Conductivity Parameters Estimation for the Cardiac Bidomain Model”, 5th Annual JohnFest/SIAM Student Conference, Clemson, South Carolina, US, February 8-9, 2013

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### Conference Minisymposium Organizer

- H. Yang, K. Pieper. **Stochastic optimization with differential equations: methods and applications** (minisymposium), SIAM Conference on Computational Science and Engineering, February 27–March 3, 2017.
- L. Bertagna, H. Yang, A. Veneziani. **Inverse problems in cardiovascular mathematics** (minisymposium), 3rd International Conference on Computational & Mathematical Biomedical Engineering, Hong Kong, December 16–18, 2013.

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### Honors & Awards

- Excellent Instructor Award of the 2019 National Undergraduate Mathematical Modeling Contest Guangdong Branch, *Department of Education of Guangdong Province, China Association of Industry and Applied Mathematics* 2019
- Excellent Instructor Award of the 2018 National Undergraduate Mathematical Modeling Contest Guangdong Branch, *Department of Education of Guangdong Province, China Association of Industry and Applied Mathematics* 2018
- Chris Schoettle Graduate Research Award, *Emory University* 2015

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### Computer Skills

- Programming:
  - Operating systems: Linux (Ubuntu, Mint), Windows
  - Programming languages: C/C++, Python, Fortran, Java
  - Parallel computing: Message Passing Interface (MPI), CUDA (GPU)
  - Version control software tool: Git, TortoiseSVN
  - Build automation tools: CMake, Visual Studio
  - Software debug/profiling: Gdb, Valgrind
- Scientific Computing Libraries:
  - Developer of the finite element library LifeV ([www.lifev.org](http://www.lifev.org))
  - Expert user of the Trilinos, Suitesparse libraries.
- Scientific Tools: LifeV, FreeFem++, MFEM, Paraview, Netgen, Gmsh, Matlab, R, Mathematica

## Teaching Activities

Location	Time	Course	Students	Teaching Style	Review
Shantou U	Fall 2022	Linear Algebra and Analytic Geometry I	Fremen		94.98
Shantou U	Fall 2022	Numerical PDEs	Master,PhD	English textbook	—
Shantou U	Spring 2022	Function of Real Variable	Junior		97
Shantou U	Spring 2022	Numerical Linear Algebra	Master,PhD	English textbook	—
Shantou U	Fall 2021	Linear Algebra and Analytic Geometry I	Fremen	Bilingual	93.58
Shantou U	Fall 2021	Numerical PDEs	Master,PhD	English textbook	—
Shantou U	Spring 2021	Calculus C-II	Fremen		96.07
Shantou U	Spring 2021	Linear Algebra and Analytic Geometry II	Fremen	Bilingual	98.10
Shantou U	Spring 2020	Numerical PDEs	Master,PhD	English textbook	—
Shantou U	Spring 2020	Linear Algebra and Analytic Geometry II	Fremen	Bilingual	96.56
Shantou U	Fall 2019	Advanced Calculus	Sophomore		96.49
Shantou U	Fall 2019	Mathematical Modeling in Practice	Junior		96.79
Shantou U	Spring 2019	Numerical Methods for Inverse Problems	PhD	English textbook	—
Shantou U	Spring 2019	Mathematical Models	Sophomore		94.17
Shantou U	Fall 2018	Advanced Calculus	Sophomore		95.96
Shantou U	Fall 2018	Mathematical Modeling in Practice	Junior		97.67
Shantou U	Spring 2018	Function of Real Variable	Junior		96.49
Shantou U	Spring 2018	Mathematical Models	Sophomore		94.03
Shantou U	Fall 2017	Function of Complex Variable	Sophomore		91.13
Emory U	Summer 2015	Calculus I	Freshmen	in English	—
Emory U	Fall 2014	Intro. Probability and Statistics	Freshmen	in English	—
Emory U	Fall 2013	Calculus I	Freshmen	in English	—
Emory U	Spring 2012	Calculus I	Freshmen	in English	—
Emory U	Spring 2015	Life Sciences Calculus II	Freshmen	Lab Instructor	—
Emory U	Spring 2013	Life Sciences Calculus II	Freshmen	Lab Instructor	—
Emory U	Fall 2012	Life Sciences Calculus I	Freshmen	Lab Instructor	—

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