# Huanhuan Yang

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## Research Interests

- PDE-constrained Optimization: *Parameter estimation, Optimal control, Experimental design*
- Reduced Order Modeling: *POD, CVT, Greedy reduced basis, Approximated Lax pairs*
- Engineering: *Cardiac electrophysiology, Climate modeling, Computational fluid dynamics, Acoustic modeling*
- Others: *Stochastic PDEs, Uncertainty quantification, CVT algorithms, HPC, Galerkin methods*

## Education

**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

**Central China Normal University**                                                  *Sep 2003 – Jun 2007*
- B.S. in Mathematics

## Research Experience

**Postdoctoral Research Associate** at *Florida State University*              *Sep 2015 – present*
- Stochastic optimal control using the conditional value-at-risk measure, Parallel reduced order modeling
- Fast CVT grid generation and its application to ocean modeling (current project)
- Supervisor: *Max Gunzburger*

**Research Intern** at *Siemens Research Corporate*, Princeton                       *May – Aug 2014*
- Atrial electrophysiology modeling and its extension to whole heart modeling
- Data-driven atrial cell model reduction for fast and high-fidelity electrophysiology computations
- Mentor: *Tiziano Passerini, Tommaso Mansi*

**Graduate Research Assistant** at *Emory University*                          *Aug 2012 – Sep 2015*
- Conductivity parameter estimation of the cardiac bidomain model by a data assimilation procedure
- Computational cost reduction by the discrete empirical interpolation method, POD technique and the greedy reduced basis method
- Advisor: *Alessandro Veneziani*

## Papers Prepared

- H. Yang, M. Gunzburger, L. Ju. **Fast Spherical Centroidal Voronoi Mesh Generation: A Lloyd-preconditioned LBFGS Method in Parallel**, to be submitted.

- T. Cheng, H. Yang and S. Yang. **Beltrami system and 1-quasiconformal embedding in higher dimensions**, to be submitted.

- H. Yang and M. Gunzburger. **Algorithms and analyses for stochastic optimization for turbofan noise reduction using parallel reduced-order modeling**, Computer Methods in Applied Mechanics and Engineering, Volume 319, 2017, Pages 217–239.

- H. Yang and A. Veneziani. **Efficient estimation of cardiac conductivities via POD-DEIM model order reduction**, Applied Numerical Mathematics, Volume 115, 2017, Pages 180–199.

- H. Yang and A. Veneziani, **Estimation of cardiac conductivities in ventricular tissue by a variational approach**, Inverse Problems 31 (2015), no. 11, 115001.

- H. Yang, T. Passerini, T. Mansi, and D. Comaniciu, **Data-driven model reduction for fast, high fidelity atrial electrophysiology computations**, Functional Imaging and Modeling of the Heart, Lecture Notes in Computer Science, vol. 9126, 2015, pp. 466–474.

- L. Xu and H. Yang, **On the generalizations of Denjoy-Wolff theorem**. Acta Math. Sci. Ser. B Engl. Ed. 32 (2012), no.4 1333-1337.

## Projects in Progress

- **Conservative Exponential Time Differencing scheme for ocean modeling**, in progress.

- M. Gunzburger, J. Wang, H. Yang. **Method and Analysis of reduced order modeling for time fractional differential equations**, in progress.

- H. Yang, A. Veneziani. **A posteriori error estimate for the greedy reduced basis approach on the cardiac monodomain model**, in progress.

- A. Barone, A. Veneziani, H. Yang, F. Fenton, A. Gizzi, S. Filippi. **Estimation of cardiac conductivities by a variational data assimilation approach: analysis and validation**, in progress.

## US Patent Application

- H. Yang, T. Passerini, B. Georgescu, T. Mansi, D. Comaniciu. **System and Method for Patient-Specific Image-Based Simulation of Artial Electrophysiology**. Patent App. No. US20160058520

## 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.

## Talks

- "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

- "Variational estimation of cardiac conductivities: Numerical issues, sensitivity analysis, computational cost reduction", 2nd International Workshop on Latest Advances in Cardiac Modeling, Munich, Germany, March 2015 (abstract)

- "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

## Teaching Activities

- **Course Lecturer** at Emory University

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| Math 111 Calculus I | *Summer 2015* |
| Math 107 Intro. Probability and Statistics | *Fall 2014* |
| Math 111 Calculus I | *Fall 2013* |
| Math 111 Calculus I | *Spring 2012* |

- **Lab Lecturer** at Emory University

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| Math 116 Life Sciences Calculus II | *Spring 2015* |
| Math 116 Life Sciences Calculus II | *Spring 2013* |
| Math 115 Life Sciences Calculus I | *Fall 2012* |

- **Grader** at Emory University

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  |---|---|
  | Math 351 Partial Differential Equations, Math 352 PDEs in Action | *Spring 2014* |
  | Math 221 Linear Algebra | *Fall 2011* |
  | Math 212 Differential Equations | *Spring 2011* |
  | Math 318 Complex Variables | *Fall 2010* |

- **Volunteer Lecturer** at Emory University

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  |---|---|
  | Math 351 Partial Differential Equations | for *Prof. Alessandro Veneziani* |
  | Math 315 Numerical Analysis | for *Prof. Michele Benzi* |

## Honors & Awards

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| Chris Schoettle Graduate Research Award, *Emory University* | *2015* |
| Triple-A student, *Chinese Academy of Sciences* | *2009* |
| Graduate Scholarship, *Chinese Academy of Sciences* | *2008* |
| Outstanding Graduate, *Central China Normal University* | *2007* |
| Outstanding Students' Union Leader, *Central China Normal University* | *2005* |
| Triple-A student, *Central China Normal University* | *2004, 2005, 2006* |
| National First Class Scholarship, *China* | *2004* |

## Computer Skills

- Programming:

  - Operating systems: Linux (Ubuntu, Mint), Windows

  - Programming languages: C/C++, Java, Python

  - 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)

  - Expert user of the Trilinos, Suitesparse libraries.

- Scientific Tools: LifeV, FreeFem++, MFEM, Paraview, Netgen, Gmsh, Matlab, R, Mathematica

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