

# YIQI GU

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## Education

- **Purdue University, West Lafayette, IN, United States**
  - Ph.D. in Mathematics, Aug. 2014 - Aug. 2019
  - Concentration: applied mathematics
  - Dissertation: spectral methods in complex geometry
  - Dissertation Advisor: Jie Shen
- **University of Washington, Seattle, WA, United States**
  - M.Sc. in Applied Mathematics, Sep. 2012 - Mar. 2014
- **Zhejiang University, Hangzhou, Zhejiang Province, China**
  - B.Sc. in Information & Computing Science, Sep. 2008 - Jun. 2012
  - Thesis: numerical methods for defect modes localization
  - Thesis Advisor: Xiaoliang Cheng

## Research Interest

- Numerical methods for partial differential equations; computational fluid dynamics; data science and machine learning

## Research Experience

- **Numerical methods for defect mode localization**
  - Designed efficient approaches for defect mode localization in inhomogeneous medium.
  - Combined the newly developed approaches and the classical gradient method to overcome the stagnation phenomenon in the optimization.
- **Spectral methods for PDEs in complex domains**
  - Developed spectral-Galerkin methods for partial differential equations in 2D or 3D, simply or non-simply connected complex domains.
  - Solved a wide range of problems including elliptic equations, Helmholtz equations, Stokes equations, fractional Laplace equations.
- **Numerical schemes for porous medium equations**
  - Put forward effective first and second order time-discretized schemes for porous medium equations, which is semi-implicit, logarithm-linear, uniquely solvable and positivity preserving.
  - Derived the energy stability and H1 error estimate for the first-order scheme, that is demonstrated by numerical simulations.

- **Collaborative filtering methods for recommending systems**
  - Proposed fast and effective latent factor models for matrix completion and rating prediction problems, which preserves robustness in noised environment.
  - Obtained lower mean squared error for both of the real-world and artificially produced datasets by our newly developed weighted models.
- **Neural network-based methods for PDEs**
  - Developed a novel SelectNet model to obtain better speed of convergence than then traditional residual model.
  - Performed experiments successfully on linear/nonlinear elliptic, parabolic and hyperbolic PDEs of high dimensions up to 20.

## Employment History

- **Purdue University**
  - Teaching assistant, Aug. 2014 - Jan. 2017
  - Research assistant, Jan. 2016 - Aug. 2018
  - Graduate student instructor on Calculus II, Jan. 2019 - May. 2019
- **National University of Singapore**
  - Research Fellow, Aug. 2019 - Aug. 2021
- **Purdue University**
  - Visiting Assistant Professor, Jan. 2020 - May. 2020

## Selected Awards

- China National Scholarship, 2011-2012
- Purdue Research Foundation Grant, 2017-2018

## Conferences/Presentations

- Presentation at Graduate Research Day, Purdue University, United States, Nov.19 2016
- Poster Presentation at Conference on Scientific Computing and Approximation, Purdue University, United States, Mar.30 2018
- Mini-symposium Presentation at SIAM Conference on Computational Science and Engineering(CSE19), Spokane, United States, Feb.25 2019
- Presentation at a Departmental Seminar, Zhejiang University, China, Mar.12 2019
- Presentation at Spring 2019 Finite Element Circus, Purdue University, United States, Mar.23 2019

## Relevant Skills

- Programming Language: C, C++, Java, Python, etc.

- Scientific Computing Software: Matlab, Maple, etc.

## Publications

- Y. GU AND X. CHENG, *A numerical approach for defect modes localization in an inhomogeneous medium*, SIAM Journal on Applied Mathematics, 73 (2013), pp. 2188–2202.
- Y. GU AND J. SHEN, *Accurate and efficient spectral methods for elliptic PDEs in complex domains*, Journal of Scientific Computing, 83 (2020), <https://doi.org/10.1007/s10915-020-01226-9>
- Y. GU AND J. SHEN, *Spectral-Galerkin methods and circular embedding for elliptic PDEs in complex domains*, preprint.
- Y. GU, X. YANG, M. PENG AND G. LIN, *Robust weighted SVD-type latent factor models for rating prediction*, Expert Systems With Applications, 141 (2020), pp. 112885
- Y. GU AND J. SHEN, *Bound preserving and energy dissipative schemes for porous medium equations*, Journal of Computational Physics, 410 (2020).
- Y. GU, H. YANG AND C. ZHOU, *SelectNet: Self-paced learning for high-dimensional partial differential equations*, submitted.
- Y. GU, C. WANG AND H. YANG, *Structure probing neural network deflation*, preprint.