

# Xiong Ding

☎ (+1) 678-882-9228 | ✉ xding@gatech.edu | 🏠 www.cns.gatech.edu/~xiong/ | 📄 https://github.com/dingxiong | 🔗 www.linkedin.com/in/xiong-ding

## Education

|  |                                 |                  |                       |
|--|---------------------------------|------------------|-----------------------|
| Ph.D. in Physics   | Georgia Institute of Technology | Atlanta, GA, USA | Aug. 2012 – May. 2017 |
| • adviser: Prof. Predrag Cvitanović • Research area : nonlinear dynamics, cycle expansion theory, complex Ginzburg-Landau equation |                                 |                  |                       |
| M.S. in Computer Science & Engineering   | Georgia Institute of Technology | Atlanta, GA, USA | Jan. 2016 – Jun. 2016 |
| • Interested area : High Performance Computing(HPC) • GPA: 3.86/4.0  |                                 |                  |                       |
| B.S. in Physics  | Wuhan University                | Wuhan, China     | Sep. 2008 - Jun. 2012 |

## Skills

**Programming :** **Proficient :** C/C++, Python, Matlab; **Familiar :** Java, Fortran  
**Tools :** Bash, Perl, Unix: Sed & Awk, Latex, Emacs  
**Libraries :** CUDA, Cilk, Boost.Python, Eigen, LAPACK, ARPACK, OpenMP, OpenMPI, FFTW, HDF5, Ploty  
**Web :** Django with Python, CSS, HTML

## Professional Experience

### Geometry of chaos

[www.chaosbook.org/course1](http://www.chaosbook.org/course1)

Role : Web developer & Teaching Assistant

2015 Spring

- **Achievement :** Design and implement online autograder & Design Homework for 16 weeks.
- **Core features:** Auto grade students' online submissions & Email back grades automatically & Provide a straightforward interface for the customer (the course instructor) to view the grades online.
- **Framework :** Django in Python, deployed in Heroku **Repository :** <https://github.com/dingxiong/phys7224>

### Center for Nonlinear Science, Georgia Institute of Technology

Atlanta, GA, USA

Role : Research Assistant Adviser : Prof. Predrag Cvitanović

**Research topic :** *Computation of Floquet vectors in Kuramoto-Sivashinsky system*

2013 – 2014

- **Main result:** The Floquet multipliers of Periodic orbits in high dimensional system usually spans a large orders of magnitudes. The periodic eigendecomposition is the right tool to obtain Floquet spectrum and vectors to high accuracy. See paper[2] for more detail.

**Research topic :** *Investigation of the local dimension of inertial manifolds in chaotic systems*

2014 – 2015

- **Main result:** By studying the shadowing cases of periodic orbits in Kuramoto-Sivashinsky system, we show strong evidence that the inertial manifold has dimension 8. see paper [1] for more details.

**Research topic :** *Symbolic dynamics in symmetry reduced 1-d Kuramoto-Sivashinsky system*

2015 – Present

- In the symmetry reduced state space, the attractor of 1-d Kuramoto-Sivashinsky system is low dimensional. By constructing appropriate Poincaré section, we propose to obtain the symbolic dynamics.

### School of Mathematics, Georgia Tech

Atlanta, GA, USA

Role : Cooperation with Prof. Sung Ha Kang from Math department

**Research topic :** *Integration of soliton explosion with local error control in cubic quintic Ginzburg-Landau system*

Sprint 2016

- **Main result:** Study the performance of exponential integrator in Ginzburg-Landau system, and add time step control into a few popular exponential integrators. See paper [3].

## Selected CS Projects

**Project :** Triangular Mesh

Gatech CS6491 Computer Graphics

Fall 2015

- **Achievement :** Represent a triangular mesh by **CSX** table & Implement navigating methods on the mesh, such as swing, opposite, left, right and so on & Solve 4 interesting problems: **geodesic path**, **Gaussian decay swirl**, **lasso deletion** and **mesh cut**.
- **Toolbox :** Processing **Repository :** <https://github.com/dingxiong/triangularMesh>
- **Demo :** <https://youtu.be/mWe0YO1bbZ4>

**Project :** RPC-Based Proxy Server

Gatech CS6210 Advanced Operating System

Spring 2015

- **Achievement:** Build a proxy server by remote procedure call(**RPC**) & test the performance of four different cache policies : no cache, Least Recent Used (LUR), random, and First in First out (FIFO). & RPC framework is provided by **Apache Thrift** library.
- **Language :** C++ **Repository :** <https://github.com/dingxiong/CS6210Project3>

**Project :** CPU and GPU optimization in finding initial condition for Kuramoto Sivashinsky equation

Gatech CSE6230 High Performance Computing : Tools and Applications

Fall 2013

- **Achievement:** **icc & Cilk** approach has the best performance of all multi CPU implementation & the GPU implementation has better performance if register usage is considerable.
- **Language :** C **Tools :** gcc, icc, OpenMP, Cilk, CUDA, SIMD(SSE2, SSE4)
- **Repository :** <https://bitbucket.org/dingxiong/project>

## Conferences & Talks

SIAM Conference on Application of Dynamical Systems

Snowbird, Utah, USA

**Talk :** Periodic Eigendecomposition and Its Application in Nonlinear Dynamics

May 2015

- Coauthor: Prof. P. Cvitanović

**Poster :** Lyapunov exponents, Floquet exponents and covariant vectors in Kuramoto-Sivashinsky equation

Jan. 2014

- Coauthor: Prof. P. Cvitanović

## Publications

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- [1] **X. Ding**, H. Chaté, P. Cvitanović, E. Siminos, and K. A. Takeuchi , *Estimating the dimension of an inertial manifold from unstable periodic orbits* , *Phys. Rev. Lett.* **117**, 024101 (2016)
- [2] **X. Ding** and P. Cvitanović , *Periodic Eigendecomposition and its application in Kuramoto-Sivashinsky system* , *SIAM J. Appl. Dyn. Syst.* **15**, 1434–1454 (2016)
- [3] **X. Ding** and S. H. Kang , *Adaptive time-stepping exponential integrators for cubic-quintic complex Ginzburg-Landau equations* , *arXiv:1703.09622* (2017)
- [4] **X. Ding** and P. Cvitanović , *Periodic orbit explosion and its symmetry reduced state space visualization* , *In preparation* (2016)
- [5] **X. Ding** and P. Cvitanović , *Symbolic dynamics and analysis of Kuramoto-Sivashinsky attractor* , *In preparation* (2016)