

# Xiong Ding

PH.D. STUDENT · PHYSICS RESEARCHER

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## Education

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|--|---------------------------------|------------------|-----------------------|
| Ph.D. in Physics   | Georgia Institute of Technology | Atlanta, GA, USA | Aug. 2012 – Aug. 2017 |
| <ul style="list-style-type: none"><li>• adviser: Prof. Predrag Cvitanović</li><li>• Research area : nonlinear dynamics, cycle expansion theory, bifurcation theory, complex Ginzburg-Landau equation</li></ul> |                                 |                  |                       |
| M.S. in Computer Science & Engineering   | Georgia Institute of Technology | Atlanta, GA, USA | Jan.2016 – Jun. 2016  |
| <ul style="list-style-type: none"><li>• Interested area : High Performance Computing(HPC)</li><li>• GPA: 3.86/4.0</li></ul>  |                                 |                  |                       |

## 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  
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* Spring 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 , *Integration of a cubic-quintic complex Ginzburg–Landau exploding soliton* , *In preparation* (2016)
- [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)