Xiong Ding

PHYSICS PH.D. · SOFTWARE ENGINEER

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Current Experience

Airbnb — Software Engineer — San Francisco, CA, USA — *May. 2017 – Present*

Infrastructure team

- Main responsibility:
  - Build and maintain Ebert (the review service) for *airbnb.com*.
  - Propose and build the next generation of review platform Ebert2.0
- Details:
  - Increase the performance of this service: P95 latency from 85ms to 45ms.
  - Setup **review Elasticsearch** cluster for full-text search on reviews on listing pages.
  - Cooperate with core-storage team to build **review pipeline** to serve review aggregated data, i.e, review count, review overall rating.
- Core metrics&features :
  - **QPS:** Average: 10K. Peak: 12K. Traffic comes from room description page, user profile page, checkout page and so on.
  - **Latency:** Overall, P95: ∼45ms; ∼P99: ∼80ms; P999: ∼250ms. Different endpoints have different latency.
  - **Features:** • Mcrouter cache enabled • Horizontal scalable • Accompanied by mutation publisher
- **Framework & tools:** Dropwizard, Chef, Airflow, Elasticsearch, Mcrouter Cache, Powergrid(multithreading)

Skills

Programming :	**Proficient :** Java; **Familiar :** C++
Domain knowledge :	Numerical PDE, Matrix analysis, Nonlinear dynamics
Libraries :	Boost.Python, Eigen, ARPACK, OpenMP, OpenMPI, FFTW

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 — *GPA: 3.86/4.0* — Georgia Institute of Technology — Atlanta, GA, USA — *Jan. 2016 – Jun. 2016*

B.S. in Physics — *GPA: 3.75/4.0* — Wuhan University — Wuhan, China — *Sep. 2008 - Jun. 2012*

Graduate Courses

- **Math:** Real analysis, Numerical methods for ODEs, Numerical linear algebra
- **Physics:** Nonlinear dynamics, Statistical mechanics, Quantum field theory
- **Computer science:** High Performance Computing (HPC), Computational data analysis, Computability&Algorithms

Research Experience

Center for Nonlinear Science, School of Physics, Georgia Institute of Technology — Atlanta, GA, USA — *Jun. 2013 – May. 2017*

- Research topic: *Computation of Floquet vectors in Kuramoto-Sivashinsky system*
  - main Result: Find the smallest eigenvalue of Floquet matrix to be order of 10^{-3000} with relative accuracy 10^{-14}.
  - tools/skills used: C++, Boost.Python, Boost.Numpy, HDF5, Arpack, Matrix decomposition, Eigen
- Research topic: *Investigation of the local dimension of inertial manifolds in chaotic systems*
  - main Result: We show strong evidence that the inertial manifold of 1-d Kuramoto-Sivashinsky system has dimension 8.
  - tools/skills used: C++, Matlab, Exponential integrators
- Research topic: *Symbolic dynamics in symmetry reduced 1-d Kuramoto-Sivashinsky system*
  - main Result: In the symmetry reduced state space, we propose to obtain the symbolic dynamics of 1-d KS equation by constructing appropriate Poincaré sections.
  - tools/skills used: C++, Matlab, Eigen, Cycle expansion theory

School of Mathematics, Georgia Institute of Technology — Atlanta, GA, USA — *Jan. 2016 – Jun. 2016*

- Research topic: *Time-step adaptive exponential integrator for soliton explosions in 1d and 2d cubic quintic Ginzburg-Landau systems*
  - main Result: Formulize a new time-step adaptive exponential integrator for complex GL equation.
  - tools/skills used: Numerical PDE, C++, Boost, Numpy, Matplotlib

Conferences & Talks

SIAM Conference on Application of Dynamical Systems — Snowbird, Utah, USA — *May 2015*
Talk: Periodic Eigendecomposition and Its Application in Nonlinear Dynamics — Coauthor: Prof. P. Cvitanović

Dynamics Days US — Atlanta, GA, USA — *Jan. 2014*
Poster: Lyapunov exponents, Floquet exponents and covariant vectors in Kuramoto-Sivashinsky equation — Coauthor: Prof. P. Cvitanović

Publications

[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)