

# Zhen Zhang

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<https://zzhang222.github.io>

## Education

### Brown University

*Ph.D. Student, Applied Mathematics, 4.0/4.0*

Relevant coursework: Deep Learning, Real/Functional Analysis, Probability Theory, Partial Differential Equations, Discontinuous Galerkin Methods, Stochastic Control, Dynamical Systems, Interacting Particle Systems, Spectral Methods

Providence, RI

2018–Present

### Brown University

*Sc.M., Applied Mathematics*

Providence, RI

2018–2019

### City University of Hong Kong

*B.Sc., Computing Mathematics, Minor in Computing, 4.08/4.3*

Dean's List every semester

Hong Kong

2014–2018

### University of Toronto

*Exchange, Mathematics, 4.0/4.0*

Toronto, Canada

2017–2017

## Research Interests

- Physics informed neural networks
- Interpretable scientific machine learning
- Time series modeling

## Honors & Awards

Fellowship for graduate students

Brown University

HKSAR Government Scholarship

HKSAR

Joseph Lau Student Exchange Awards

City University of Hong Kong

## Publications

1. Jin, Pengzhan\*, **Zhang, Zhen\*** (Co-first author), Zhu, Aiqing, Tang, Yifa and George Em Karniadakis. *SympNets: Intrinsic structure-preserving symplectic networks for identifying Hamiltonian systems*. *Neural Networks* **132**. 166–179 (2020).
2. Zhang, Sheng\*, Joan, Ponce\*, **Zhang, Zhen\*** (Co-first author), Guang Lin and George, Karniadakis. *An integrated framework for building trustworthy data-driven epidemiological models: Application to the COVID-19 outbreak in New York City*. (Accepted by PLOS Computational Biology.)
3. Jin, Pengzhan, **Zhang, Zhen**, Yannis, Kevrekidis, and George Em Karniadakis. *Learning Poisson systems and trajectories of autonomous systems via Poisson neural networks*. (Submitted to IEEE Transactions on Neural Networks and Learning Systems.)
4. Ehsan Kharazmi, Min Cai, Xiaoning Zheng, **Zhen Zhang**, Guang Lin, and George Em Karniadakis. *Identifiability and predictability of integer- and fractional-order epidemiological models using physics-informed neural networks*. (Submitted to Nature Computational Science.)
5. **Zhang, Zhen**, Yeonjong Shin, and George Em Karniadakis. *GENERIC formalism informed neural networks*.

(Submitted to Proceedings of the Royal Society A)

## Research Experience

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**Brown University** 2019-Present

*Graduate Student Researcher*

Currently I am working on two projects: Predicting blood pressure using machine learning tools; Symmetry-preserving neural networks.

**City University of Hong Kong** 2017-2018

*Final Year Project*

Study theoretical aspect of Deep Neural Network. Run numerical simulations on image classification problems to verify the approximation properties of Convolutional Neural Networks.

**Liu Bie Ju Center for Mathematical Sciences** 2017-2017

*Summer Research Opportunity*

Systematically studied asymptotic analysis and Painleve Equations under Dr. Wang's guidance. Gave series solution to a group of ODEs, and tried to give a closed form solution based on well-known special functions. Reviewed Prof. Wong's work on second order linear difference equations.

**University of Tennessee & Oak Ridge National Laboratory** 2016-2016

*Research for Undergraduates (REU)*

Received training on high performance computing in Oak Ridge National Laboratory. Implemented dasymetric mapping algorithm in GIS and proposed a parallel version of the algorithm. The new method effectively improved running efficiency.

## Teaching Experience

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◦ **APMA 1170:** Introduction to Computational Linear Algebra, head teaching assistant (Fall 2019)

◦ **APMA 1660:** Statistical Inference II, head teaching assistant (Spring 2020)

## Mentoring Experience

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**APMA undergraduate-graduate mentoring program** 2020-2021

*Graduate Mentor*

Give undergraduate students advice on course selection, preparing for research with faculty, preparing for graduate school and applying to internships and jobs.

**CityU Student Mentoring Program** 2017-2018

*PALSI leader*

Organized orientation and give new students help in academics.

**Math Help Center** 2017-2018

*Discussion Leader*

Organized discussions and answered questions related to engineering mathematics.

**Peer-Assisted Learning Scheme using Supplemental Instruction** 2016-2017

*Student Mentor*

Gave freshmen tutorials on Calculus and organized discussion groups.

## Conferences & Presentations

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**NUMDIFF-16** Sep, 2021

*SympNet & PNN: structure-preserving networks for identifying Hamiltonian & Poisson systems*

**Crunch Seminar** Apr, 2020

*Symplectic networks: Intrinsic structure-preserving networks for identifying Hamiltonian systems*

## Programming Skills

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**Languages:** Python, Java, C/C++, MATLAB, Linux Command, LaTeX.

**Packages:** TensorFlow, PyTorch.

## Outreach & Services

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**CityU Choir Committee**

**2015-2016**

*Membership Secretary of Bass*

Organized annual performance and conducted regular training of bass section.