

CHAN, LIK CHUN

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RESEARCH INTERESTS

I study how populations of neurons encode and process sensory information using computational approaches that integrate information theory, statistical physics, machine learning, and dynamical systems. My work focuses on understanding the computational principles underlying brain functions.

Keywords: Computational Neuroscience, Spiking Neurons, Information Theory

EDUCATION

Stony Brook University

Ph.D. in Neuroscience

2024–Present

Supervisor: Prof. Siwei Wang

The Chinese University of Hong Kong (CUHK)

M.Phil. in Physics

2022–2024

Supervisor: Prof. Emily S.C. Ching

B.Sc. in Physics

2017–2021

Second Class Honors, Upper Division

PUBLICATIONS

Emergence of a dynamical state of coherent bursting with power-law distributed avalanches from collective stochastic dynamics of adaptive neurons

Chan, L. C., Kok, T. F., & Ching, E. S. C. (2025). *PRX Life*, 3(1), 013013.

Temporal stimulus segmentation by reinforcement learning in populations of spiking neurons

Le Donne, L., **Chan, L. C.**, Urbanczik, R., Senn, W., & La Camera, G. (2025). *bioRxiv*.

RESEARCH EXPERIENCE

Lab Rotations, Program in Neuroscience

2024–2025

Stony Brook University

Temporal stimulus segmentation by reinforcement learning in populations of spiking neurons

- Identified statistical differences in cortical and surrogate datasets that account for disparities in learning curves for non-relevant stimuli
- Demonstrated superior performance and biological advantages over conventional approaches such as K-means, Poisson HMM and STDP-based models in temporal segmentation tasks

Memory capacity of networks of stochastic spiking neurons

- Developed a network model of spiking neurons that stores patterns of activity using a Hopfield-network-like mechanism
- Showed that stochastic spiking networks achieve a storage capacity of 0.2~0.25 across different network sizes

Adaptation in population activity in efficient balanced networks

- Implemented computational models of adaptive excitatory-inhibitory balanced networks that optimize efficiency-accuracy trade-offs in stimulus decoding
- Revealed how the efficiency-accuracy trade-off shapes underlying neuronal dynamics

RESEARCH EXPERIENCE (CONTINUES)

M.Phil. Research

2022–2024

The Chinese University of Hong Kong

Different dynamical states of spontaneous activity in networks of spiking neurons with adaptation

- Explored numerically the spontaneous dynamics of a network of neurons using biologically plausible neuron and synapse models
- Identified three distinct dynamical states across the excitatory-inhibitory coupling strength parameter space: (I) irregular and independent spiking, (II) coherent bursting, and (III) incoherent fast spiking
- Established that state (II) with power-law distributed neuronal avalanches and optimal stimulus response can arise from the interplay of stochasticity and coherent oscillatory dynamics

Undergraduate Final Year Project

Aug–Nov 2021

& Research Assistant (continuing)

Feb–Aug 2022

The Chinese University of Hong Kong

Numerical study of response of networks of neurons to modifications of synaptic weights

- Demonstrated that neurons could exhibit opposing responses to uniform synaptic suppression and enhancement through numerical studies of networks of spiking neurons
- Developed efficient programs for numerical simulation in C and Python, resulting in a 70% reduction in computation time

Undergraduate Summer Research Internship

May–Nov 2019

The Chinese University of Hong Kong

Developing lightweight dish telescope panels using thermoforming techniques

- Prototyped lightweight dish telescope panels made of styrofoam materials

POSTER PRESENTATIONS

Poster Title: Different dynamical states of spontaneous activity in a network of neurons

Presented at:

- | | |
|---|-------------------|
| - Joint Annual Conference of Physical Societies in Guangdong-HK-Macao | 30 Jul–1 Aug 2024 |
| - Science Faculty Postgraduate Research Day, CUHK | 8 May 2024 |
| - StatPhys28 Satellite Meeting, Hong Kong Baptist University | 2–5 Aug 2023 |

TEACHING EXPERIENCE & OUTREACH

Teaching Assistant

2022–2025

Stony Brook University & The Chinese University of Hong Kong

Led weekly recitation sections, held office hours, and graded assignments for 30-50 students

Course Taught:

- BIO 332: Computational Modeling of Physiological Systems, Stony Brook University
- BIO 347: Introduction to Neural Computation, Stony Brook University
- PHYS 1111B: Introduction to Mechanics, Fluids, and Waves, CUHK
- PHYS 2051: Quantitative Methods for Basic Physics, CUHK
- PHYS 3051: Methods in Theoretical Physics I, CUHK

Student Ambassador

2022–2024

The Chinese University of Hong Kong

- Demonstrated experiments and explained underlying principles to students and visitors

SKILLS

Programming: Python, MatLab, C/C++, Parallel Computing (MPI), High-Performance Computing

Theory: Information Theory, Dynamical Systems

Language: Cantonese (native); English and Mandarin (professional proficiency)

HONORS & AWARDS

Best Poster Award, Joint Annual Conference of Physical Societies in Guangdong-HK-Macao	2024
Best Poster Award, Science Faculty Postgraduate Research Day, CUHK	2024
Dean's Postgraduate Conference Award, Science Faculty Postgraduate Research Day, CUHK	2024
College Head's List, CUHK	2023
Yasumoto International Exchange Scholarship, CUHK	2020
Shaw College Scholarship for Outgoing Exchange Students, CUHK	2019
Shaw College Certificate of Academic Merit, CUHK	2018
Study Improvement Award for Physics Students, CUHK	2018