CHEONG, Chi-Kit (Patrick)

Curriculum Vitae. Last updated: August 19 2022

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Professional experience

Oct 2022 – present	**N3AS post-doctoral fellow** *Network for Neutrinos, Nuclear Astrophysics, and Symmetries (N3AS)* *University of California, Berkeley, USA*
Oct 2021 – Oct 2022	**Research associate** *Department of Physics,* *The Chinese University of Hong Kong, Shatin, N. T., Hong Kong* MENTOR: Prof. Tjonnie Guang Feng LI

Education

Aug 2017 – Sep 2021	**Doctor of Philosophy** *Department of Physics,* *The Chinese University of Hong Kong, Shatin, N. T., Hong Kong* SUPERVISOR: Prof. Tjonnie Guang Feng LI 🆔 THESIS TITLE: Numerical Methods for General-relativistic Astrophysics
Sep 2012 – Jun 2016	**Bachelor of Science** *Department of Electrophysics (Program of Photonics and Nano-Sciences),* *National Chiao Tung University, Hsinchu 300, Taiwan, ROC.* **Bachelor of Science** *The Undergraduate Honours Program of Interdisciplinary Science,* *National Chiao Tung University, Hsinchu 300, Taiwan, ROC.*

Honours and Awards

2016	**Scholarship Award**, Overseas Community Affairs Council Republic of China (Taiwan), 2016 **Outstanding Undergraduate Thesis and Poster Prize**, Department of Electrophysics, National Chiao Tung University, 2016
2014	**Academic Achievement Award (Spring 2014)**, National Chiao Tung University, 2014 **Academic Achievement Award (Fall 2013)**, National Chiao Tung University, 2014
2011	*Fourth Place Award* in the Engineering: Electrical and Mechanical category, Intel International Science and Engineering Fair (Intel ISEF), 2011

Publications

[1] **Patrick Chi-Kit Cheong**, David Yat Tung Pong, Anson Ka Long Yip, and Tjonnie Guang Feng Li. "An Extension of Gmunu: General-relativistic Resistive Magnetohydrodynamics Based on Staggered-meshed Constrained Transport with Elliptic Cleaning". In: ApJS 261.2, 22 (Aug. 2022), p. 22. DOI: 10.3847/1538-4365/ac6cec. arXiv: 2110.03732 [astro-ph.IM].

[2] **Patrick Chi-Kit Cheong**, Alan Tsz-Lok Lam, Harry Ho-Yin Ng, and Tjonnie Guang Feng Li. "Gmunu: paralleled, grid-adaptive, general-relativistic magnetohydrodynamics in curvilinear geometries in dynamical space-times". In: MNRAS 508.2 (Dec. 2021), pp. 2279–2301. DOI: 10.1093/mnras/stab2606. arXiv: 2012.07322 [astro-ph.IM].

[3] Harry Ho-Yin Ng, **Patrick Chi-Kit Cheong**, Lap-Ming Lin, and Tjonnie Guang Feng Li. "Gravitational-wave Asteroseismology with f-modes from Neutron Star Binaries at the Merger Phase". In: ApJ 915.2, 108 (July 2021), p. 108. DOI: 10.3847/1538-4357/ac0141.

[4] **Patrick Chi-Kit Cheong**, Lap-Ming Lin, and Tjonnie Guang Feng Li. "Gmunu: toward multigrid based Einstein field equations solver for general-relativistic hydrodynamics simulations". In: *Classical and Quantum Gravity* 37.14, 145015 (July 2020), p. 145015. DOI: 10.1088/1361-6382/ab8e9c. arXiv: 2001.05723 [gr-qc].

[5] **Patrick Chi-Kit Cheong** and Tjonnie Guang Feng Li. "Numerical studies on core collapse supernova in self-interacting massive scalar-tensor gravity". In: Phys. Rev. D 100.2, 024027 (July 2019), p. 024027. DOI: 10.1103/PhysRevD.100.024027. arXiv: 1812.04835 [gr-qc].

Presentations

17. *Dynamical evolution and oscillation of highly magnetised compact objects*
Plasma Astrophysics Seminar at the Department of Mathematics, KU Leuven, Belgium.
May. 12, 2022

16. *Introduction of Gmunu*
Presentation at the Numerical Relativity community calls, SXS collaboration.
Dec. 6, 2021

15. *Simulating Physics at the Extremes: The Birth and Behaviour of Compact Objects*
Presentation at the 2020-21 Science Faculty Postgraduate Research Day on Faculty of Science, The Chinese University of Hong Kong, Hong Kong.
Jan. 8, 2021

14. *Gmunu: Toward multigrid based Einstein field equations solver for general-relativistic hydrodynamics simulations*
Seminar at the Institute of Physics, Academia Sinica, Taipei, Taiwan, ROC.
Oct. 14, 2019

13. *Gmunu: Toward multigrid based Einstein field equations solver for general-relativistic hydrodynamics simulations*
Parallel Presentation at the 16th International Conference on Topics in Astroparticle and Underground Physics, Toyama, Japan.
Sep. 12, 2019

12. *Multigrid methods for solving Einstein field equations and general-relativistic hydrodynamics simulations*
Presentation at the 31st IUPAP Conference on Computational Physics (CCP2019), Hong Kong.
Aug. 1, 2019

11. *Multigrid methods for solving Einstein field equations and general-relativistic hydrodynamics simulations*
Stellar house seminar at the Max-Planck-Institute for Astrophysics (MPA) , Garching, Germany.
Jul. 25, 2019

10. *Multigrid methods for solving Einstein field equations and general-relativistic hydrodynamics simulations*
Seminar at the Max-Planck-Institute for Gravitational Physics in Potsdam, Potsdam, Germany.
Jul. 23, 2019

9. *Multigrid methods for solving Einstein field equations and general-relativistic hydrodynamics simulations*
AstroCoffee Seminar at the Institute for Theoretical Physics of the University of Frankfurt, Frankfurt, Germany.
Jul. 15, 2019

8. *Multigrid methods for solving Einstein field equations and general-relativistic hydrodynamics simulations*
Presentation in Numerical Relativity session at 22nd International Conference on General Relativity and Gravitation and 13th Edoardo Amaldi Conference on Gravitational Waves (GR22-Amaldi 13), Valencia, Spain.
Jul. 9, 2019

7. *Numerical Studies on Core-Collapse Supernova in Self-interacting Massive Scalar-Tensor Gravity*
Presentation at Mini-workshop on gravitational waves and multi-messenger astronomy, Hong Kong
May. 20, 2019

6. *General Relativistic Hydrodynamics simulations*
Presentation at Mini-Workshop on Supernova, Hong Kong
Feb. 28, 2019

5. *Introduction on General relativistic hydrodynamic simulations*
Invited talk at 2019 TGWG workshop on gravitational wave data analysis, Taipei, Taiwan, ROC.
Jan. 21, 2019

4. *Numerical-Relativity simulations of stellar collapse in Massive Scalar-Tensor gravity*
Presentation at The Eighth East Asian Numerical Astrophysics Meeting (EANAM 2018), Tainan, Taiwan, ROC.
Oct. 23, 2018

3. *Numerical-Relativity simulations of stellar collapse in Massive Scalar-Tensor gravity*
Astronomy colloquium at the Institute of Astronomy in National Tsing Hua University, Taiwan, ROC.
Oct. 19, 2018

2. *Numerical-Relativity simulations of stellar collapse in Massive Scalar-Tensor gravity*
Seminar at High Energy Physics Group in National Taiwan Normal University, Taipei, Taiwan, ROC.
Oct. 18, 2018

1. *Numerical-Relativity simulations of stellar collapse in Massive Scalar-Tensor gravity*
Poster presentation at Deciphering multi-Dimensional nature of core-collapse SuperNovae via Gravitational-Wave and neutrino signatures (SNeGWv2018), Toyama, Japan.
Oct. 8, 2018

Students and Mentoring

1. **Ng, Ho Yin (Harry)** ⓘ
   (a) UNDERGRADUATE RESEARCH PROJECTS
      i. FINAL YEAR PROJECT 1:   Sep 2018 – Dec 2018
         Investigation of The First Shock of Core-Bounce of Electron Capture Core-collapse Supernova in 3D Simulation
      ii. FINAL YEAR PROJECT 2:   Jan 2019 – May 2019
         Pulsation modes of uniformly and differentially rotating neutron stars with fixed spacetime Conformal Flatness Condition metric in the Cowling Approximation
   (b) MPHIL STUDIES   Jul 2019 – Jul 2021
      THESIS TITLE: *Numerical simulations for General-Relativistic Astrophysics: Probing Extreme Matter From the Birth of Neutron Star to Neutron Star Binary Through Numerical Relativity Simulations*
2. **Lam, Tsz Lok (Alan)** ⓘ
   (a) UNDERGRADUATE RESEARCH PROJECTS
      i. FINAL YEAR PROJECT 1:   Sep 2018 – Dec 2018
         Spherically Symmetric Core Collapse Supernova in Scalar-Gauss-Bonnet Gravitational Theories
      ii. FINAL YEAR PROJECT 2:   Jan 2019 – May 2019
         Numerical Study on Radial Oscillation of Scalar-Gauss-Bonnet Neutron Stars
   (b) MPHIL STUDIES   Jul 2019 – Jul 2021
      THESIS TITLE: *New Approach of Numerical Relativity: Implementation, Tests and Applications*
3. **Leung, Man Yin (Emily)** ⓘ
   (a) UNDERGRADUATE RESEARCH PROJECTS
      i. FINAL YEAR PROJECT 1:   Dec 2020 – Sep 2021
         A Numerical Simulation Study of Oscillation Modes of Highly Magnetized Neutron Stars
4. **Yip, Ka Long (Anson)**
   (a) PHD STUDIES   Jul 2020 – ongoing

5. **Yeow, Liiyung**
   (a) PHD STUDIES   Jul 2021 – ongoing

6. **Long, Si-Nan**
   (a) SUMMER PROJECT   Jul 2018 – Aug 2018
      Numerical Study of TOV equations with Self-interacting Massive Scalar-Tensor Theory
7. **Fung, Siu Yin**, and **Tang, Yat To**
   (a) SUMMER PROJECT   Mag 2019 – Aug 2019
      Numerical studies on relativistic compact stars

Skills

- Languages
  1. Cantonese (native)
  2. Taiwanese Mandarin or National language of the Republic of China (native)
  3. Taiwanese Hokkien (native)
  4. English
- Programming skills

1. Fortran
2. Python
3. Large scale computing
- Computational Astrophysics
  1. Computational (Realtivistic) (Magneto-) hydrodynamics
  2. Numerical relativity

Teaching Experience

Sep 2017 – May 2021 **Teaching assistant** at Department of Physics, The Chinese University of Hong Kong

- PHYS1122 University Physics II	Jan 2021 – May 2021
- PHYS3041 Electromagnetic Theory I	Sep 2020 – Dec 2020
- PHYS1122 University Physics II	Jan 2020 – May 2020
- PHYS3041 Electromagnetic Theory I	Sep 2019 – Dec 2019
- UGEB2401E Astronomy	Jan 2019 – May 2019
- PHYS3041 Electromagnetic Theory I	Sep 2018 – Dec 2018
- PHYS1122 University Physics II	Jan 2018 – May 2018
- PHYS1110C Engineering Physics: Mechanics & Thermodynamics	Sep 2017 – Dec 2017

Sep 2016 – Jun 2017 **Teaching assistant** at Department of Physics, National Tsing Hua University Sep 2016 – Jun 2017
- General Physics (course for year 1 physics students)

Tutor at Counselling Centre, National Tsing Hua University   Nov 2016 – Jun 2017
- Provide 1 to 1 physics tutorial every week for students who are physically or mentally disabled.