

Sanha Cheong | Curriculum Vitae

Physics Department, Stanford University

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Education

Stanford University

Stanford, CA

◦ *Ph.D. in Physics (Adviser: Prof. Ariel Schwartzman)*

September 2017 – Present¹

- Working on the ATLAS Experiment at the LHC
- Working on the MAGIS Experiment
- Teaching activities including: designing, developing, and teaching a new course²

University of Rochester

Rochester, NY

◦ *B.S. in Physics & Astronomy (Highest Distinction), B.A. in Mathematics*

Class of 2017

- Overall GPA: 3.92/4.00, major GPA 3.99/4.00, elected to Phi Beta Kappa (ΦBK)
- International Baccalaureate Scholarship, \$16k per year

Yew Chung International School of Shanghai

Shanghai, China

◦ International Baccalaureate (IB) Diploma

Class of 2013

Research Activities

Current research interests:

Higgs (exotic decays), dark matter, long-lived particles, QCD and jet physics, fundamental physics with atom interferometry, machine learning applications in physics, novel data-analysis methods

◦ Stanford University & SLAC National Accelerator Laboratory

ATLAS Experiment @ CERN

August 2017 – Present¹

- Searching for exotic decays of the Higgs boson into new (pseudo-)scalar particles in multi-photon final state ($h \rightarrow aa \rightarrow \gamma\gamma\gamma\gamma$)
- Machine learning techniques within ATLAS—reconstruction of exotic signatures, jet calibration using neural networks (Generalized Numerical Inversion), etc.
- Simulation & trigger studies for long-lived particle searches using timing information
- Hardware upgrade: electrical (data read-out) testing of the ITk Inner System prototypes

MAGIS-100 Experiment @ Fermilab

March 2021 – Present

- Building a novel camera system for 3D-imaging mm-scale atom clouds
- Precision quantum measurements, searches for ultra-light scalar dark matter

¹On an official leave of absence from August 2019 until March 2021, serving in the Republic of Korea Army

²PHYSICS 166/266 Statistical Methods in Experimental Physics

○ **University of Rochester**

November 2015 – May 2017

- Studies of large-scale structures and baryon acoustic oscillations using SDSS-III BOSS data
- Development of a novel analysis algorithm accelerating the computation of galaxy 2-point correlation functions with an alternative background-subtraction method

Research Publications

ATLAS publications with significant contributions:

1. **ATLAS Collaboration**. “Simultaneous Jet Energy and Mass Calibrations with Neural Networks.” *ATLAS PUB Note*, ATL-PHYS-PUB-2020-001. [CDS Link](#)

Independent publications:

1. **S. Cheong**, A. Cukierman, B. Nachman, M. Safdari, A. Schwartzman. “Parametrizing the Detector Response with Neural Networks”. *Journal of Instrumentation*, **15** P01030, January 2020. [arXiv:1910.03773 \[physics.data-an\]](#)
2. R. Demina, **S. Cheong**, S. BenZvi, O. Hindrichs. “A Computationally Efficient Approach for Calculating Galaxy Two-point Correlations”. *Monthly Notices of the Royal Astronomical Society*, Vol. 480, Issue 1, p. 49-56, sty1812, October 2018. [arXiv:1611.09892 \[astro-ph.CO\]](#)

Oral & Poster Presentations

1. **S. Cheong**. “Introduction to Deep Learning for Mathematicians by a Physicist (Capabilities of Neural Networks: Mathematical and Empirical Perspectives)”. *Department of Mathematics Graduate Seminars*, Sogang University, Seoul, South Korea, July 16, 2018.
2. **S. Cheong**, J. Pearkes, A. Cukierman. “Merged Di-photon Identification for the ATLAS Experiment at the Large Hadron Collider”. *CS 231N Project Poster Session, Spring 2018*, Stanford, CA, June 12, 2018.
3. **S. Cheong**. “Modification to the Calculation of a Two-point Correlation Function”. *APS April Meeting 2017 (Q2C: Quarks to Cosmos)*, Washington, DC, January 28-31, 2017.
4. **S. Cheong**. “Introduction to Baryon Acoustic Oscillations (BAO)”. *University of Rochester Summer REU Presentation*, Rochester, NY, August 5, 2016.

Schools & Workshops Attended

1. *US ATLAS Hadronic Final State Forum 2018*, Berkeley, CA, December 10 - 14, 2018.
2. *APS Bridge Program and National Mentoring Community Conference*, Google Sunnyvale Campus & Stanford University, CA, November 16 - 18, 2018.
3. *46th SLAC Summer Institute (The Standard Model at 50: Successes & Challenges)*, Menlo Park, CA, July 30 - August 10, 2018.

Teaching Experiences

- **Stanford University** Stanford, CA
 - Teaching Assistant
 - PHYSICS 152/252 Introduction to Particle Physics Spring 2019
 - PHYSICS 166/266 Statistical Methods in Experimental Physics Winter 2019
 - PHYSICS 41 Mechanics Winter 2018
 - Teaching Mentor, *Vice Provost for Teaching & Learning* June 2018 – June 2019
- **University of Rochester** Rochester, NY
 - Teaching Assistant
 - PHY 227 Thermodynamics & Statistical Mechanics Spring 2017
 - PHY 142 Electricity & Magnetism (Honors) Fall 2016
 - PHY 143 Waves and Modern Physics (Honors) Spring 2016
 - PHY 122 Electricity & Magnetism Fall 2015
 - MTH 172 Honors Calculus II Spring 2015
 - MTH 171 Honors Calculus I Fall 2014
 - Physics GRE Tutor, *Society of Physics Students (SPS)* August 2016 – May 2017

Leadership & Representative Positions

- **Stanford University** Stanford, CA
 - Recruitment Chair & First-year Mentoring Chair,
Graduate Students in Applied Physics & Physics (GSAPP) June 2018 – June 2019
 - SASS Czar (Organizer), *SLAC Association for Student Seminars* June 2018 – June 2019
- **University of Rochester** Rochester, NY
 - Business Manager, *SPS UR Chapter* June 2016 – May 2017
 - Student Representative, *Physics & Astronomy Undergraduate Curriculum Committee* September 2016 – May 2017

Advising, Outreach, and Other Services

- **Stanford University** Stanford, CA
 - Graduate Coordinator, *Physics Undergraduate Summer Research* June 2018 – August 2018
 - Graduate Research Mentor, *Stanford Undergraduate Research Association* January 2018 – June 2019
- **University of Rochester** Rochester, NY
 - Alumni Interviewer, *Office of Admissions* November 2017 – May 2019
 - Peer Adviser, *College Center for Advising Services* August 2016 – May 2017

Awards and Such

1. Janet Fogg Prize. *University of Rochester*, May 2017.
2. Excellence in Undergraduate Teaching. *University of Rochester*, May 2017.

Professional Memberships

American Astronomical Society (AAS)
American Physical Society (APS)
Phi Beta Kappa (Φ BK)
Society of Physics Students (SPS)
Sigma Pi Sigma (Σ ΠΣ)

Computer & Hardware Skills

Data Analysis

- Experiences in big data analysis for physics & astronomy research
- Developing new statistical analysis algorithms and applying machine learning techniques

Programming Languages

- PYTHON, C, C++, ROOT, JAVA, MATHEMATICA
- UNIX shell (BASH) scripting

Document Editing and Productivity Software

- L^AT_EX
- GitHub, Microsoft Office, Google Docs
- Basic web-design using HTML, CSS, JAVASCRIPT, and JEKYLL

Hardware Skills

- Radioactivity work training
- Basic machine shop training, circuit design (Protel DXP), printed circuit boards

Languages

English (fluent), Korean (fluent), Mandarin (conversational)

Citizenship

Republic of Korea