Sanha Cheong | Curriculum Vitae

Physics Department, Stanford Universityasdf

sanha@stanford.edu • sanhacheong.github.io

Education

Stanford University Stanford, CA

- *Ph.D. in Physics (Adviser: Prof. Ariel Schwartzman)* September 2017 – Present[1]
  - Research on the ATLAS Experiment and the MAGIS Experiment
  - Teaching activities including designing, developing, and teaching a new course [2]

University of Rochester Rochester, NY

- *B.S. in Physics & Astronomy (Highest Distinction), B.A. in Mathematics* Class of 2017

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 – Present[1]
  - Searching for exotic decays of the Higgs boson into new (pseudo-)scalar particles in multi-photon final state ($h \to aa \to \gamma\gamma\gamma\gamma$)
  - Phase-II upgrade: thermal/electrical/DAQ testing of the ITk Inner System prototypes @ SLAC
  - 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

  MAGIS-100 Experiment @ Fermilab March 2021 – Present
  - Novel camera system for 3D-imaging mm-scale atom clouds: mechanical system design, testing with 3D printed prototypes, optical performance optimization
  - Precision quantum measurements, searches for ultra-light scalar dark matter

- **University of Rochester** November 2015 – May 2017
  - Studies of large-scale structures and baryon acoustic oscillations using SDSS-III BOSS data

[1] On an official leave of absence from August 2019 until March 2021, serving in the Republic of Korea Army
[2] PHYSICS 166/266 Statistical Methods in Experimental Physics

– 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[3] — *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*

[3] Designed, developed course materials (problem sets, solutions, tutorial codes, and mini-projects), and taught theoretical and live coding sections

Peer Adviser, *College Center for Advising Services* *August 2016 – May 2017*

Awards and Such

1. Janet Fogg Prize. *University of Rochester* May 2017
   - "Annual prize awarded to one student of the graduating class in recognition of his or her dedicated service, inside or outside the classroom, to the well-being of all students served by the Department of Physics and Astronomy."
2. Excellence in Undergraduate Teaching. *University of Rochester* May 2017
3. IB Scholarship ($16k / year). *University of Rochester* *August 2013 – May 2017*

Professional Memberships

American Astronomical Society (AAS)
American Physical Society (APS)
Phi Beta Kappa (ΦBK)
Society of Physics Students (SPS)
Sigma Pi Sigma (ΣΠΣ)

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
- LaTeX
- 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