YUN-TING CHENG

US Legal Permanent Resident (Green Card holder), Taiwan Citizenship
California Institute of Technology
M.C. 367-17, 1200 E California Blvd, Pasadena, CA 91125
https://yuntingcheng.github.io/
ycheng3@caltech.edu

PROFESSIONAL EXPERIENCE

California Institute of Technology/Jet Propulsion Laboratory
Research Scientist — Jan 2024 - present

Jet Propulsion Laboratory/California Institute of Technology
Postdoctoral Researcher (Advisor: Dr. Olivier Doré) — Oct 2021 - Jan 2024

EDUCATION

California Institute of Technology
Ph.D. in Physics (Advisor: Prof. Jamie Bock) — Jun 2021
Thesis: Cosmology and Astrophysics with Intensity Mapping

M.S. in Physics — Jun 2019

National Taiwan University
B.S. in Physics — Jun 2014

RESEARCH INTERESTS

analysis algorithms for cosmological surveys, observational cosmology, intensity mapping, large-scale structure, extragalactic background light, intra-halo light

RESEARCH EXPERIENCE

California Institute of Technology / Jet Propulsion Laboratory — Pasadena, CA

Research Scientist — Jan 2024 - Present

· **SPHEREx Mission**
- Cosmology and the extragalactic background light analysis for SPHEREx mission

Postdoctoral Researcher (Advisor: Dr. Olivier Doré) — Oct 2021 - Jan 2024

· **Data-driven Cosmology from 3D Light Cones**
(collaborators: Benjamin Wandelt, Olivier Doré, Tzu-Ching Chang)
- Developing a data-driven method to constrain cosmology with spectral imaging data

· **Galactic Extinction Modeling**
(collaborators: Brandon Hensley, Olivier Doré, Tzu-Ching Chang)
- Building Galactic dust extinction model from multi-wavelength datasets

· **Extragalactic Radio Dipole**
(collaborators: Adam Lidz, Tzu-Ching Chang)
- Modeling the radio dipole from extragalactic sources

· **Intra-halo Light Signal in the Extragalactic Background**
(collaborators: Jamie Bock)
- Modeling the non-linear clustering and the intro-halo light in the near-infrared background

Graduate Research Assistant (Advisor: Prof. Jamie Bock) — Sep 2015 - Jun 2021

· **Line Intensity Mapping**
- Developing analysis algorithms to solve the line blending problem in line intensity mapping
- Establishing the formalism of optimal mapping strategy for large-scale structure survey
- Modeling galaxy-intensity mapping cross correlation for SPHEREx

· **CIBER** (Cosmic Infrared Background Experiment)
- Building CIBER analysis pipeline and characterizing noise and systematic effects
- Studying intra-halo light with stacking analysis on CIBER images

· **TIME** (Tomographic Ionized Carbon Intensity Mapping Experiment)
- Simulating the signal and foregrounds for TIME analysis pipeline
- Developing foreground mitigation techniques
- Analyzing TIME instrument data
- Helping with instrument deployment at the ARO 12m telescope

Academia Sinica of Astronomy and Astrophysics (ASIAA) Taipei, Taiwan
Research Assistant (Advisor: Tzu-Ching Chang) May 2014 - Jul 2015
· Developing foreground mitigation technique for line intensity mapping
Summer Student (Advisor: Sheng-Yuan Liu, Yu-Nung Su, I-Ta Hsieh) Jul 2013 - Aug 2013
· Modeling the starless core with radiative transfer

TECHNICAL SKILLS

- Statistical Tools: Bayesian statistics, Markov Chain Monte Carlo, Fisher analysis, Sparse Reconstruction, convex optimization, Machine Learning (with experience in CNN and Machine Learning Explainability)
- Programming Languages: Python (Astropy, emcee, Pandas, scikit-learn, TensorFlow, Keras, seaborn), SQL, IDL, Matlab, C++, Fortran, Latex
- Instrumentation: SOLIDWORKS, machine shop trained

STUDENT ADVISING

Kailai Wang (Cornell University), JPL Summer Undergraduate Research Fellowship Jun 2023 - Present
Topic: Multi-line Inference in Line Intensity Mapping
Abby Williams (NYU/Caltech), Caltech Post-baccalaureate Student Jun 2023 - Present
Topic: Small-scale Nonlinear Effects in Cross Correlations

SERVICE AND OUTREACH

Caltech Cosmology Journal Club co-organizer Sep 2022 - present
237th AAS meeting oral session chair Jan 2021
Leading physics in-class activities at Gabrielino High School, CA Jan 2020 - Sep 2022
233rd AAS meeting poster judge Jan 2019

Journal referee:
Astrophysical Journal (ApJ)
Astrophysical Journal Letters (ApJL)
Journal of Cosmology and Astroparticle Physics (JCAP)
Monthly Notices of the Royal Astronomical Society (MNRAS)

AWARDS AND HONORS

Balzan Cosmological Studies Travel Award Oct 2022
Taiwan-Caltech Ministry of Education Fellowship Sep 2015 - Aug 2019
Dean's Award of College of Science, National Taiwan University Jun 2014

REFERENCES

- **James J. (Jamie) Bock**
  Professor, California Institute of Technology/Jet Propulsion Laboratory
  jjb@astro.caltch.edu
- **Tzu-Ching Chang**
  Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
  tzu-ching.chang@jpl.nasa.gov/tzu@caltech.edu
- **Olivier P. Doré**
  Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
  olivier.p.dore@jpl.nasa.gov/odore@caltech.edu
- **Abigail T. Crites**
  Assistant Professor, Cornell University
  atc72@cornell.edu
- **Benjamin D. Wandelt**
  Professor, Institut dAstrophysique de Paris/Center for Computational Astrophysics, Flatiron Institute
  bwandelt@iap.fr

PRESENTATIONS

- Caltech ObsCos Seminar — Caltech, CA, Feb, 2024
- 243rd AAS Meeting — New Orleans, LA, Jan, 2024
- JPL Postdoc Seminar — JPL, Pasadena, CA, Nov, 2023
- Probing the Universe at High Resolution Conference — ASIAA, Taiwan, Nov, 2023
- ASIAA Seminar — ASIAA, Taiwan, Oct, 2023
- (**invited overview talk**) Line Intensity Mapping Workshop — MPA, Garching, Germany, Apr, 2023
- LAM Cafe Club — LAM, Marseille, France, Dec, 2022
- LAM CONCERTO Working Group Meeting — LAM, Marseille, France, Dec, 2022
- IAP Universe Seminar — IAP, Paris, France, Nov, 2022
- Caltech ObsCos Seminar — Caltech, CA, Oct, 2022
- Columbia Cosmology Group Seminar — Columbia, NY, Aug, 2022
- NYU CCPP Seminar — NYU, NY, Aug, 2022
- ICAP seminar — (virtual) IAP, Paris, France, Jun, 2022
- Cosmology from Home — (virtual), Jun, 2022
- ASIAA Seminar — ASIAA, Taiwan, May, 2022
- Cross Correlations with CHORD Workshop — (virtual), Oct, 2021
- SUBLIME Workshop — (virtual), Oct, 2021
- IRSIG Webminar — (virtual), Oct, 2021
- KICP Line Intensity Mapping Workshop — (virtual) Chicago, IL, Jul, 2021
- ASIAA Seminar — (virtual) ASIAA, Taiwan, Mar, 2021
- Caltech ObsCos Seminar — (virtual) Caltech, CA, Feb, 2021
- UChicago KICP Seminar — (virtual) Chicago, IL, Jan, 2021
- 237th AAS Meeting — (virtual), Jan, 2021
- Berkeley BCCP Seminar — (virtual) Berkeley, CA, Dec, 2020
- CCA Flatiron Institute Cosmology Group Meeting — (virtual) CCA, NY, Oct, 2020
- OSU CCAPP Seminar — (virtual) OSU, OH, Oct, 2020
- JHU Cosmology/GW Journal Club — (virtual) JHU, MD, Oct, 2020
- UPenn Astronomy Seminar — (virtual) UPenn, PA, Sep, 2020
- Caltech ObsCos Seminar — (virtual) Caltech, CA, Sep, 2020
- CCAT-prime Science Working Group Meeting — (virtual) Cornell, NY, Sep, 2020
- CCA Flatiron Institute Lunch Talk — (virtual) CCA, NY, Sep, 2020
- Caltech ObsCos Seminar — Caltech, CA, Feb, 2020
- L2S2 : Lines in the Large Scale Structure Conference — Marseille, France, Jul, 2019
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2019
- Caltech ObsCos Seminar — Caltech, CA, May, 2019
- 233rd AAS Meeting — Seattle, WA, Jan, 2019
- Taiwanese Theoretical Astrophysics Workshop — ASIAA, Taiwan, Sep, 2018
- ASIAA Seminar — ASIAA, Taiwan, Sep, 2018
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2018
- Cosmological Signals from Cosmic Dawn to the Present — Aspen, CO, Feb, 2018
- Caltech ObsCos Seminar — Caltech, CA, Dec, 2017
- Caltech ObsCos Seminar — Caltech, CA, Nov, 2016
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2016
- Opportunities and Challenges in Intensity Mapping Workshop — KIPAC, CA, Mar, 2016
- ASROC Annual Meeting (Taiwanese Astronomical Society) — Ilan, Taiwan, May, 2015

PUBLICATIONS

See ADS, Google Scholar, and INSPIRE for the complete publication list

First-author papers (8 published/accepted)

1. *"Is the Radio Source Dipole from NVSS Consistent with the CMB and ΛCDM?"*
   Y.-T. Cheng, T.-C. Chang, and Adam Lidz; 2023, ApJ accepted; arXiv:2309.02490
2. *"Data-driven Cosmology from Three-dimensional Light Cones"*
   Y.-T. Cheng, B. D. Wandelt, T.-C. Chang, and O. Doré; 2023, ApJ, 944, 151; arXiv:2210.10052
3. *"Near-infrared Extragalactic Background Light Fluctuations on Nonlinear Scales"*
   Y.-T. Cheng, and J. J. Bock; 2022; ApJ 940, 115; arXiv:2207.13712
4. *"Cosmic Near-Infrared Background Tomography with SPHEREx Using Galaxy Cross-Correlations"*
   Y.-T. Cheng, and T.-C. Chang; 2022, ApJ 925, 136; arXiv:2109.10914
5. *"Probing Intra-Halo Light with Galaxy Stacking in CIBER Images"*
   Y.-T. Cheng, et al. (CIBER Collaboration); 2021, ApJ, 919, 69; arXiv:2103.03882
6. *"Phase-Space Spectral Line De-confusion in Intensity Mapping"*
   Y.-T. Cheng, T.-C. Chang, and J. J. Bock; 2020, ApJ, 901, 142; arXiv:2005.05341
7. *"Optimally Mapping Large-Scale Structures with Luminous Sources"*
   Y.-T. Cheng, R. de Putter, T.-C. Chang, and O. Doré; 2019, ApJ, 877, 86; arXiv:1809.06384
8. *"Spectral Line De-Confusion in an Intensity Mapping Survey"*
   Y.-T. Cheng, T.-C. Chang, J. J. Bock, C. M. Bradford, and A. R. Cooray; 2016, ApJ, 832, 165; arXiv:1604.07833

Co-author papers

1. *"Inferred Measurements of the Zodiacal Light Absolute Intensity through Fraunhofer Absorption Line Spectroscopy with CIBER"*
   P. M. Korngut, et al., 2022, ApJ, 926, 133; arXiv:2104.07104
2. *"Probing Cosmic Reionization and Molecular Gas Growth with TIME"*
   G. Sun, T.-C. Chang, et al., 2021, ApJ, 915, 33; arXiv:2012.09160
3. *"Superresolution Reconstruction of Severely Undersampled Point-spread Functions Using Point-source Stacking and Deconvolution"*
   T. Symons, M. Zemcov, et al., 2021, ApJS, 252, 24; arXiv:2102.01094
4. *"Hafnium Films and Magnetic Shielding for TIME, A mm-Wavelength Spectrometer Array"*
   J. Hunacek, et al., 2018, JLTP, 193, 893
5. *"A Foreground Masking Strategy for [C II] Intensity Mapping Experiments Using Galaxies Selected by Stellar Mass and Redshift"*
   G. Sun, L. Moncelsi, M. P. Viero, et al., 2018, ApJ, 856, 107; arXiv:1601.10095
6. *"Design and fabrication of tes detector modules for the time-pilot [cii] intensity mapping experiment"*
   J. Hunacek, et al., 2016, JLTP, 184, 733

Non-refereed review papers / white papers

1. *"PRIMA General Observer Science Book"*
   A. Moullet, et al., 2023, arXiv:2310.20572 (contributing a line intensity mapping science case for PRIMA)
2. *"Tomography of the Cosmic Dawn and Reionization Eras with Multiple Tracers"*
   T.-C. Chang, et al., 2019, Astro2020 White Paper, arXiv:1903.11744
3. *"Line-Intensity Mapping: 2017 Status Report"*
   E. D. Kovetz, M. P. Viero, et al., 2017, arXiv:1709.09066

Conference proceedings

1. *"A status update on TIME: a mm-wavelength spectrometer designed to probe the Epoch of Reionization"*
   A. Crites, et al., 2020, SPIE, 114530G
2. *"Detector modules and spectrometers for the TIME-Pilot [CII] intensity mapping experiment"*
   J. Hunacek, et al., 2016, SPIE, 99140L