

MINGHAN CHEN

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PROFESSIONAL OBJECTIVE

Use data mining, statistical analysis, machine learning, research, and programming skills to build models and find optimized solutions to quantitative problems.

EDUCATION

University of California, Santa Barbara Expected June 2024
Ph.D. in Physics, GPA 3.92/4.00

University of California, Santa Barbara Feb 2021
Master's in Physics

Carnegie Mellon University 2014 - 2018
B.Sc. Physics, GPA 3.96/4.00

RESEARCH EXPERIENCE

Exoplanet Imaging and Characterization Research Group, UCSB Sept 2018 - Present
Graduate Researcher *Santa Barbara, CA*

- Led the development of the CHARIS-pyKLIP Post-Processing Pipeline, a python software package that reduces high contrast spectral-photometric images of planetary systems.
- Led the development of image registration, spectral-photometric calibration, distortion correction, and a novel Expectation Maximization Principle Component Analysis (EM-PCA) algorithm for the Coronagraphic High Angular Resolution Imaging Spectrograph (CHARIS).
- Developed the algorithm to fit for accurate on-sky positions of blended sources, and measured the dynamical orbits of a planetary system, which produced the most precise and accurate mass measurements ever ($\sim 0.5\%$ precision) at the time of publication for all imaged brown dwarfs.
- Modeled brown dwarf evolution and provided important new insights on the physics of planet formation and cooling.
- Led the spectral-imaging analysis of the first ever simultaneous spectral-polarimetry imaging data of a proto-planetary disk, and simulated the dust scattering physics to produce ray traced images.

The McWilliams Center for Cosmology & Astrophysics, CMU Oct 2015 - Apr 2018
Student Researcher *Pittsburgh, PA*

- Trained a deep learning model using multi body simulation data and applied it on the Coma Cluster to yield a precise mass estimate that aligned with physical models. The findings are published in Nature Astronomy.
- Worked on imaging and spectroscopic surveys to detect galaxies using cross-correlation.

Geneva Observatory Jun 2017 - Aug 2017
Research Intern at École Polytechnique Fédérale de Lausanne (EPFL) *Lausanne, Switzerland*

- Worked with sparse signal processing and improved an algorithm that distinguishes different spectral energy distributions (SED) in multi-band images.

SKILLS

Programming	Python (pandas, scipy, numpy; object-oriented), SQL, C
Tools	Git, Linux/Unix, Emacs, Mathematica, LaTeX
Mathematics	Bayesian inference, MCMC, statistical modeling, PCA, calculus, image processing

PUBLICATIONS

- Precise Dynamical Masses of ϵ Indi Ba and Bb: Evidence of Slowed Cooling at the L/T Transition
Minghan Chen & Yiting Li et al. *The Astronomical Journal*, 163 288, 2022
- Post-processing CHARIS integral field spectrograph data with pyKLIP
Minghan Chen et al. *RAS Techniques and Instruments*, Volume 2, Issue 1, 2023
- Multiband polarimetric imaging of HD 34700 with SCEXAO/CHARIS
Minghan Chen et al. Submitted to *Monthly Notices of the Royal Astronomical Society*, 2024
- The dynamical mass of the Coma cluster from deep learning
Matt Ho et al. *Nature Astronomy*, 936-941, 2022
- Improved Dynamical Masses for Six Brown Dwarf Companions Using Hipparcos and Gaia EDR3
Mirek Brandt et al. *The Astronomical Journal*, 162 301, 2021
- Astrometric Accelerations as Dynamical Beacons: Discovery and Characterization of HIP 21152 B, the First T-dwarf Companion in the Hyades
Kyle Franson et al. *The Astronomical Journal*, 165 39, 2023
- Surveying Nearby Brown Dwarfs with HGCA: Direct Imaging Discovery of a Faint, High-Mass Brown Dwarf Orbiting HD 176535 A
Yiting Li et al. *Monthly Notices of the Royal Astronomical Society*, Volume 522, Issue 4, 2023

PRESENTATIONS

- Colloquium talk at National Autonomous University of Mexico (UNAM): Characterizing Exoplanets and Brown Dwarfs with High Contrast Imaging. Nov 2023

HONORS AND AWARDS

Carnegie Mellon University, Dean's List High Honors 2018

LEADERSHIP

Osterbrock Sierra Conference

Lead Organizer Feb 2020 - Sept 2021

- Organized an astrophysics graduate student conference that included 8 University of California campuses.
- Drafted conference proposal and secured conference funding from the Osterbrock Leadership Program.
- Worked with delegates from all campuses to book conference venue, coordinate transportation, and plan conference activities.

TEACHING AND MENTORING EXPERIENCE

Physics Department, UCSB

Teaching Assistant for physics and scientific programming Sept 2018 - Jun 2019, Mar - Jun 2023, Jan - Mar 2024

- Led programming sessions 4hrs/wk for 20 weeks. Taught lab sections 6 hrs/wk for 30 weeks.
- Designed practice problems for the Scientific Programming in Python course.

Mentor in the Physics Graduate Mentoring Program Sept 2021- Jun 2022

Physics Department, CMU

Undergraduate Teaching Assistant for lower division physics honor course Sept 2016 - May 2017

- Assisted undergraduate students in understanding physics concepts and solving practice problems.

Academic Development, CMU

Peer Tutor for lower division physics and calculus courses Sept 2015 - May 2016

- Level 3 CRLA certified, over 100 hours of tutoring completed.