JOSEPH WICK

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EDUCATION

Department of Applied Mathematics, UC Santa Cruz — Santa Cruz, California
M.Sc. in Scientific Computing & Applied Mathematics — 2022 - 2023

Department of Physics, UC Santa Cruz — Santa Cruz, California
B.Sc. in Physics (Astrophysics) — 2018 - 2022

RESEARCH EXPERIENCE

Argonne National Lab | Post-Masters Researcher — 2023.10 - 2024.10

Advisor: Matthew R. Becker

- Develop CUDA and SYCL kernels for computation of cosmological summmary statistics over a halo catalog using multiple GPUs per MPI rank.
- Scale and optimize MPI + GPU code across thousands of GPUs for NVIDIA and Intel architecture using ANL supercomputers Polaris (petascale) and Aurora (exascale).
- Implement gradient aware optimization and inference codes to fit a parametric model of the stellar to halo mass connection to observed cosmological data.

UCSC Astronomy & Astrophysics | Graduate Researcher — 2022.09 - 2023.08

Advisor: Alexie Leauthaud

- Analyze Keck spectral data for signs of feedback driven breathing modes and compare to hydrodynamic codes.
- Analyze and compare results of FIRE and Romulus based galaxy simulations for signs of feedback driven breathing modes.

Southern California Earthquake Center | SOURCES Intern — 2021.06 - 2022.06

Advisor: Valère Lambert

- Implement hierarchical matrices into simulations of earthquakes and aseismic slip (SEAS) code using Matlab & C++.
- Present scientific and computational scaling results at the Seismological Society of America and Southern California Earthquake Center annual conferences.

UCSC Astronomy & Astrophysics | Undergraduate Researcher — 2020.09 - 2022.06

Advisor: Alexie Leauthaud

- Quantify residuals of preliminary Merian survey data to validate reduction pipelines and explore prominence of star forming regions in observed dwarf galaxies.
- Reduce Keck spectral data and develop tools for automation of future reduction.
- Observe remotely using Blanco DECam and Keck DEIMOS.
- Implement quality assurance tools into a pipeline for generating telescope pointings.

HPC TRAINING

- **Argonne Training Program for Extreme Scale Computing** — 2024

  2 week, 80 hour training in programming methodologies for exascale computing including computer architecture, profiling, and GPU optimization.

- **AI-driven Science on Supercomputers** — 2024

  Hands on training in the use of AI for science and distributed training methods using Python libraries including PyTorch and HuggingFace.

TEACHING EXPERIENCE	**TA** | UCSC Computer Science Department	2024.01 - 2024.06

TA \| UCSC Computer Science Department   2024.01 - 2024.06
- Create and grade assignments for undergraduate C language and data structures course.
- Lead discussion sections to aid computer science students with course material and assignments, as well as the setup of proper development environments.

TA \| UCSC Physics Department   2023.07 - 2023.12
- Teach undergraduate lower division physics laboratory course for non-physics majors.
- Review mechanics concepts and teach proper use of lab equipment.

PUBLICATIONS

1. **Wick, J.**, Becker M. R. & Hearin A. Differentiable Modeling of the Galaxy-Halo Connection. *Manuscript in Prep.*

   My contribution: Optimization of summary statistic codes, development of pipeline for optimization and inference of the differentiable model.

2. Luo Y., **Wick J.**, Leauthaud, A., Wetzel A., Jones T., El-Badry K., Huang S., Chen X., Zhou C. Testing the Stellar Feedback-driven Breathing Mode in Low-mass Galaxies with Gas Kinematics. *Manuscript in Prep.*

   My contribution: Data reduction pipeline of Keck spectra, partial development of breathing mode test metrics.

3. Danieli S., Kado-Fong E., Huang S., Luo Y., Li T. S., Kelvin L. S., Leauthaud A., Greene J E., Mintz A., Lin X., Li J., Baldassare V., Banerjee A., Bhattacharyya J., Blanco D., Brooks A., Cai Z., Chen X., Cruz A., Geda R., Guan Runquan., Johnson S., Kannawadi A., Li Mingyu., Lupton R., Mace C., Medina G. E., Pan Y., Peter A. H. G., Read J. I., Córdova Rosado R., Seifert A., Wasleske E. J., **Wick J.** Merian: A Wide-Field Imaging Survey of Dwarf Galaxies at z $\sim$ 0.06 - 0.10. *Submitted to ApJ August 2024.*

   My contribution: Remote observation, QA of observing pointings, QA of reduction pipeline

4. Luo Y., Leauthaud A., Greene J., Huang S., Kado-Fong E., Danieli S., Li T. S., Li J., Wasleske E., **Wick, J.**, Mintz A., Guan R., Peter A. H. G., Badassare V., Brooks A., Banerjee A., Bhattacharyya J., Cai Z., Chen X., Gunn J., Johnson S. D., Kelvin L. S., Li M., Lin X., Lupton R., Mace C., Medina G. E. Read J., Córdova Rosado R., Seifert A. The Merian Survey: Design, Construction, and Characterization of a Filter Set Optimized to find Dwarf Galaxies and Measure their Dark Matter Halo Properties with Weak Lensing. *MNRAS, June 2024* https://doi.org/10.1093/mnras/stae925

   My contribution: Remote observation, QA of observing pointings, QA of reduction pipeline

5. **Wick J.** Analyzing the Effects of Stellar Feedback on Gas Dynamics in FIRE, Romulus, and Observed Low Redshift Dwarf Galaxies. *UCSC Master's Thesis, August 2023*

PRESENTATIONS
- "Differentiable Summary Statistics with GPUs" *Presentation at 2024 Argonne INCITE Hackathon*
- "Efficient Quasi-Dynamic Simulations of Earthquakes and Aseismic (slow) Slip Including Off-Fault Viscoelastic Deformation Using Hierarchical Matrices" *Poster Presentation at 2022 Seismological Society of America Annual Meeting*
- Group Meeting at UCSC & Argonne
- "Optimizing Numerical Simulations of Earthquake Sequences Including Off-Fault Viscoelastic Deformation using Hierarchical Matrices" *Poster Presentation at 2021 Southern California Earthquake Center Annual Meeting*

University Involvement

Race Director | UC Santa Cruz Cycling Team   2022.09 - 2023.06
- Coordinate race course and general logistics with university police, traffic service and USA Cycling officials.
- Manage day of organization of road closures and placement of volunteers and university traffic officers to ensure a safe race course.
- Manage expenses of race planning and participant entrance fees.

Undergraduate Mentor | UC Santa Cruz Mentor Collective   2021.09 - 2022.06
- Connect with and advise first and second year undergraduates on academics, adjusting to university life, and connecting with student organizations and groups.

President | UC Santa Cruz Triathlon Team   2019.09 - 2022.06
- Organize and plan team races, events, training, and recruitment.
- Coordinate with university staff to create a facility and system of loaner bikes.
- Write applications and give presentations to university organizations for funding.