

Karl JAEHNIG

CONTACT INFORMATION

Vanderbilt University
Department of Physics & Astronomy
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EDUCATION

Vanderbilt University, Nashville, Tennessee, USA
Ph.D, Astrophysics, Sept 2017 –
Thesis Advisor: Dr. Kelly Holley-Bockelmann

Fisk University, Nashville, Tennessee, USA
M.A., Physics, Aug 2015 – Aug 2017
Thesis: “Evidence for a decreasing spectroscopic binary fraction within the IN-SYNC sample.”
Thesis Advisor: Dr. Keivan G. Stassun

University of Florida, Gainesville, Florida, USA
B.S., Major: Astronomy – December 2011

RESEARCH EXPERIENCE

Flatiron Institute - Research Analyst (Aug 2021 – Jan 2022)
- Built probabilistic model using PyMC3 to fit binary orbital parameters
- Developed automated pipeline to process time-series TESS data
- Construct benchmark catalog of binary orbital parameters across Milky Way

Vanderbilt University - PhD Candidate (May 2018 –)
- Research different ML clustering algorithms to find co-moving stellar populations
- Develop automated frameworks to recover hundreds of open clusters using ML
- Use of extreme deconvolution in GMMs to achieve higher sensitivity in detecting stellar populations
- Implement ML methods to fit isochrones to stellar populations based on photometric+astrometric properties

Vanderbilt University - Graduate Teaching Assistant (Aug 2017 – Apr 2019)
- Teaching assistant for class of ~250 students
- Research radius inflation in low-mass star possibly originating from magnetic activity within convective layers
- Develop simulations of star clusters involving binary star dynamics, and stellar evolution to understand role of binary star perturbation in formation of blue straggler stars

Vanderbilt University - Graduate Research Assistant (Aug 2015 – Aug 2017)
- Discovered possible binaries in young nebulous clouds through analysis of RV variations
- Investigated raw binary fractions as a function of age in young star forming regions
- Developed Monte Carlo simulations to reconstruct true binary fractions using Bayesian Inference

University of Florida - Post-Baccalaureate Researcher (Aug 2013 – Jul 2015)
- Developed statistical algorithm, the *Angular Dispersion Parameter* (ADP) to quantify sub-structure in star forming clusters
- Applied ADP to Orion Nebula Cluster and older globular clusters to study systematics and biases
- Studied sub-structure of 20 young star forming regions within MYStIX survey using ADP

RESEARCH
INTERESTS

- Constructing pipelines for automated orbital analysis of spectroscopic eclipsing binaries
- Recovering open cluster populations with astrometry oriented machine-learning algorithms
- Utilizing machine-learning frameworks to fit isochrones to open cluster members
- Developing of python applications to facilitate teaching/learning in astronomy

PUBLICATIONS:
REFEREED

1. **Jaehnig, Karl O.**, Adrian Price-Whelan, and Dan Foreman-Mackey, A joint LC-RV probabilistic model for spectroscopic eclipsing binary orbital parameter estimation, 2022, **in-prep**
2. **Jaehnig, Karl O.**, Bird, Jon, and Holley-Bockelmann, Kelly, Membership lists for 431 open clusters in Gaia DR2 using extreme deconvolution gaussian mixture models, 2021, 19 pages, ApJ, 923, 129
3. **Jaehnig, Karl O.**, Somers, Garrett, and Stassun, Keivan G., Radius Inflation at Low Rossby Number in the Hyades Cluster, 2019, 12 pages, ApJ, 879, 39
4. **Jaehnig, Karl O.**, Bird, Jonathan C., Stassun, Keivan G., Da Rio, Nicola, Tan, Jonathan C., Cotaar, Michiel, and Somers, Garrett, IN-SYNC. VII. Evidence for a Decreasing Spectroscopic Binary Fraction (from 1 to 100 Myr) within the IN-SYNC Sample, 2017, 18 pages, ApJ, 851, 14
5. **Jaehnig, Karl O.**, Da Rio, Nicola, and Tan, Jonathan C., The Structural Evolution of Forming and Early Stage Star clusters, 2015, 7 pages, ApJ, 798, 126
6. Da Rio, Nicola, Tan, Jonathan C., and **Jaehnig, Karl O.**, The Structure, Dynamics, and Star Formation Rate of the Orion Nebula Cluster, 2014, 16 pages, ApJ, 795, 55

PRESENTED
TALKS

- Jan 2019* “Radius Inflation in the Hyades Cluster”
233rd American Astronomical Society Meeting, ID 420.06, Seattle, Washington State
- Jan 2016* “Binaries at Birth: Stellar Multiplicity in Embedded Clusters from Radial Velocity Variations in the INSYNC Survey”
227th American Astronomical Society Meeting, ID 404.02, Kissimmee, Florida

CONFERENCE
POSTERS &
ABSTRACTS

- “An Analysis of Bulk Cluster Rotation Signatures Present Within Open Clusters Using Gaia DR2 Data”
Jaehnig, Karl O., Holley-Bockelmann, Kelly
2019, 233rd American Astronomical Society Meeting, ID 266.04, Seattle, Washington State
- “Binaries at Birth: Stellar Multiplicity in Embedded Clusters from Radial Velocity Variations in the INSYNC Survey”
Jaehnig, Karl O., Bird, Jonathan, Stassun, Keivan G., and the INSYNC Survey Team
2016, Statistical Challenges in Modern Astronomy VI, Pittsburgh , PA
- “The Structural Evolution of Forming and Early Stage Star clusters”
Jaehnig, Karl O., Da Rio, Nicola, and Tan, Jonathan C.
2016, 47th Division of Dynamical Astronomy Meeting, Nashville, Tennessee

PROFESSIONAL
WORKSHOPS

- April 2018* Modest 18a Workshop, Leiden University, Netherlands
- Jan 2017* Graduate Student Professional Development Workshop, Vanderbilt University
- June 2016* Summer School in Statistics for Astronomers XII, Penn State University, State College

May 2016 Astro-Statistics Workshop, Vanderbilt University

PROFESSIONAL AND
ACADEMIC
AFFILIATIONS

- Sigma Xi Scientific Research Honor Society: 2016–2019
- Division of Dynamical Astronomy (DDA): 2016–2020
- American Astronomical Society (AAS): 2015–present

SCHOLARSHIPS,
FELLOWSHIPS, &
COMPETITIVE
AWARDS

- LSSTC Data Science Fellowship: 2018–2021
- Fisk-Vanderbilt Master’s to Ph.D Program Bridge Fellow: 2017–present