

APPOINTMENTS

SURF Fellow, California Institute of Technology, advisors: Dr. Dimitri Mawet, Dr. Jason Wang, Jerry Xuan

Research Assistant, University of Texas at Austin, advisors: Dr. Brendan P. Bowler, Dr. Yifan Zhou

TIDES Research Fellow, University of Texas at Austin, advisors: Dr. Michael H. Montgomery, Dr. Zachary P. Vanderbosch

Research Assistant, University of Texas at Austin, advisor: Dr. William M.J. Best

Independent Researcher, University of Texas at Austin, advisor: Dr. Mark L. Daniels

EDUCATION

The University of Texas at Austin

Anticipated May 2023

Degrees: B.S. Astronomy (2023), B.S. Physics (2023)

GPA: 4.0/4.0

Honors: Distinguished College Scholar (top 4% in the College of Natural Sciences), CNS Second Year Excellence Award

Major Awards: NASA Texas Space Grant Consortium STEM Scholarship (2021), American Astronomical Society's Chambliss Astronomy Achievement Student Award (2021), Nancy and William McMinn Endowed Presidential Scholarship in Physics (2021), Emory and Ella Peterson Endowed Presidential Scholarship (2021)

PUBLICATIONS & PROPOSALS

Refereed/Under Review

- **Sanghi, A.**, Vanderbosch, Z. P., Montgomery, M. H., 2021. "Identifying Periodic Variable Stars and Eclipsing Binary Systems with Long-Term Las Cumbres Observatory Photometric Monitoring of ZTF J0139+5245." *Accepted to The Astronomical Journal, American Astronomical Society.* <https://arxiv.org/abs/2107.13548>
- **Sanghi, A.**, 2021. "Visualizing the Complex Roots of Quadratic and Cubic Polynomial Functions in Three Dimensions." *Accepted to the College Mathematics Journal, Mathematical Association of America.*

Observing Proposals

- **Co-Investigator**. "A Search for Accreting Protoplanets within Transition Disk Gaps." *Accepted HST Cycle-29 GO Proposal* (PI: Dr. Yifan Zhou; 30 orbits).

RESEARCH EXPERIENCE

Optimal RDI with the Keck-NIRC2 Vortex Coronagraph

June 2021 – Present

Dept. of Astronomy, California Institute of Technology

Dr. Dimitri Mawet, Dr. Jason Wang & Jerry Xuan

HST/WFC3 Reference Star Differential Imaging (RDI) of PDS 70

August 2020 – Present

Dept. of Astronomy, Univ. of Texas at Austin

Dr. Brendan P. Bowler & Dr. Yifan Zhou

- Demonstrated the applicability of RDI in space-based exoplanet imaging observations by conducting this method with F656N $H\alpha$ Hubble Space Telescope Wide Field Camera 3 (HST/WFC3) images of PDS 70.
- Compiled a reference PSF library from the HST/WFC3 archival PSF library provided by STScI and developed a set of morphology-significance criteria for pre-selection of reference stars to achieve optimal RDI subtraction.
- Detected the planet PDS 70b at an S/N of 5.3. Calibrated the astrometry and photometry of the detection of PDS 70b using a forward-modeling method and injection-recovery testing.
- Calculated the 5σ mass accretion rate and $H\alpha$ luminosity sensitivity levels for potential planets around select transition disk targets suitable for HST observations.

Variable Stars in LCO Photometric Data

January 2020 – May 2021

Dept. of Astronomy, Univ. of Texas at Austin

Dr. Michael H. Montgomery & Dr. Zachary P. Vanderbosch

- Performed aperture photometry and Fourier analysis on over 2000 stars across 1560 LCO images spanning 537 days to find 28 candidate BY Draconis variables, 3 candidate eclipsing binaries of type EA, and 7 candidate eclipsing binaries of type EW.
- Determined that the improved photometric precision per-exposure, due to the longer exposure time for LCO images, combined with lower noise levels, due to the greater time-sampling of LCO photometry, enables us to improve the total number of detections in our field-of-view.
- Demonstrated the applicability of the *Gaia* color-magnitude diagram (CMD) as a powerful classification tool for variable star studies.
- Submitted a first-author paper detailing our results to the American Astronomical Society's Astronomical Journal.

The Initial Mass Function and Birth History of Brown Dwarfs**September 2019 – Present***Dept. of Astronomy, Univ. of Texas at Austin**Dr. William M.J. Best*

- Utilized population synthesis analysis to obtain one of the most robust and strict constraints on the substellar IMF with a 25-pc volume limited sample of brown dwarfs identified using state-of-the-art parallax measurements.
- Simultaneously constrained the power law form of the initial mass function and tested multiple birth rate models such as the exponential, single-age, and Dupuy & Liu 2017 age distributions, as well as multiple evolutionary models such as those of Saumon & Marley (SM08), and the COND evolutionary models.
- Delivered proof-of-concept on utilizing a 25-pc volume-limited sample of main-sequence stars and brown dwarfs to constrain the Chabrier (2003) lognormal form of the IMF.

Visualizing the Complex Roots of Quadratic and Cubic Functions**September 2019 – December 2019***Dept. of Mathematics, Univ. of Texas at Austin**Dr. Mark L. Daniels*

- Developed a dimensionality reduction technique to visualize the complex roots of quadratic and cubic polynomials using interactive 3D plots in MATLAB.
- This novel visualization method enhances classroom learning, stimulates original thinking, and offers unique perspectives on topics in undergraduate mathematics.
- Submitted a first-author paper describing the technique and its application to the Mathematical Association of America's (MAA) College Mathematics Journal.

HONORS & AWARDS**Scholarships & Fellowships**

NASA Texas Space Grant Consortium STEM Scholarship (\$2000) — NASA Space Grant Consortium	07/2021
Nancy and William McMinn Endowed Presidential Scholarship in Physics (\$3175) — Dept. of Physics, UT Austin	06/2021
Emory and Ella Peterson Endowed Presidential Scholarship (\$2500) — University of Texas at Austin	05/2021
Summer Undergraduate Research Fellowship (\$6320) — Dept. of Astronomy, California Institute of Technology	04/2021
Carl Stone Benedict Scholarship (\$1000) — College of Natural Sciences, UT Austin	07/2020
John W. Cox Endowment Award for Advanced Studies in Astronomy (\$4320) — Dept. of Astronomy, UT Austin	05/2020
Harwood Family Endowed Scholarship in Natural Sciences (\$1500) — College of Natural Sciences, UT Austin	05/2020

Awards

Best Poster Design (\$500) — Longhorn Research Poster Session, Office of Undergraduate Research, UT Austin	04/2021
CNS Second Year Excellence Award — College of Natural Sciences, University of Texas at Austin	03/2021
Distinguished College Scholar — University of Texas at Austin	03/2021
Honorable Mention Research Communication Video — Texas Research Showdown, University of Texas at Austin	03/2021
Chambliss Astronomy Achievement Student Award — American Astronomical Society	01/2021
Conference Travel Award (\$200) — Dept. of Astronomy, University of Texas at Austin	11/2020

TEACHING, LEADERSHIP & SERVICE**Astronomy Students Association, University of Texas at Austin****August 2019 – Present***Active Outreach Volunteer in Astronomy and Physics**Austin, TX*

- Involved in regular outreach efforts to bring astronomy to a wide audience.
- Communicated my research on brown dwarfs to 40 astronomy students at Kealing Middle School through simplified explanations aided by an interactive PowerPoint presentation utilizing simulations and graphs.
- Explained concepts in physics and astronomy to elementary school students attending “Hot Science – Cool Talks” at the Jackson Geoscience Building using a Doppler Ball demonstration, a Rainbow Wheel, a Supernova Bounce demonstration, a Mars Globe, and a Star Map.
- Set-up a public telescope viewing of Jupiter and Saturn at the Bullock Texas State History Museum.

Sanger Learning Center, University of Texas at Austin**August 2020 – Present***Student Educator and Sanger Learning Center Tutor**Austin, TX*

- Work as a trained tutor at the Sanger Learning Center at UT Austin helping students, one-on-one, understand concepts, principles underlying questions, and problems covered in physics, astronomy, and calculus courses.
- Contribute to the University's core purpose and mission by fostering independent learning using active learning techniques rooted in education research.

Student Leadership Team, Leadership and Ethics Institute (LEI)**January 2020 – December 2020***LEAP Mentor and Advanced Leader**Austin, TX*

- Led a 7-week workshop on ethical, inclusive, collaborative and value-based leadership as a part of the Leadership Education and Progress (LEAP) program.
- Mentored 12 UT students and helped them formulate their personal definition of leadership, by translating their goals into an action plan to guide them as they progress through college.
- Worked as part of the larger Student Leadership Team at LEI to promote leadership development, diversity, equity, and inclusion across campus.

- Guided a dedicated three-person team in remote tutoring incoming students at UT Austin in college preparatory mathematics.
- Organized new-student orientation programs, shared key strategies on securing research opportunities and scholarships, and served as their go-to support during the COVID-19 pandemic.

CONFERENCES & PRESENTATIONS

Conference & Workshop Attendance

Sagan Summer Virtual Workshop, “Circumstellar Disks and Young Planets,” NExSci, July 19-23, 2021.

Code/Astro Virtual Workshop, “Software Engineering in Astronomy,” Heising-Simons Foundation, June 21-25, 2021.

American Astronomical Society’s 237th Virtual Meeting, January 10-15, 2021.

Keck Science Meeting, W. M. Keck Observatory, Virtual Meeting, September 24-25, 2020.

SciPy 2020 Virtual Conference, “Scientific Computing with Python,” July 5-10, 2020.

Contributed Talks

1. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Capital of Texas Undergraduate Research Conference, University of Texas at Austin, Virtual Conference, January 26, 2021. Watch online [here](#).
2. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Society of Physics Students General Meeting, University of Texas at Austin, Virtual Meeting, November 4, 2020.
3. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Astronomy Students Association General Meeting, University of Texas at Austin, Virtual Meeting, October 17, 2020.
4. Sanghi, A. et al. “Population Synthesis Simulations: Uncovering the Mass Distribution of Brown Dwarfs in the Solar Neighborhood,” Summer Undergraduate Research Seminar, Department of Astronomy, University of Texas at Austin, Virtual Seminar, August 14, 2020. Watch recorded talk (starting 1:07:28) [here](#).
5. Sanghi, A., and Daniels, M. L., “Visualizing the Complex Roots of Quadratic and Cubic Polynomial Functions in Three Dimensions,” UGS303 - From Numbers to Chaos, Research Seminar, University of Texas at Austin, Austin, TX, December 5, 2019.

Contributed Posters

1. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Sagan Summer Workshop, NExSci, Virtual Workshop, July 19-23, 2021. View the poster online [here](#).
2. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Undergraduate Research Forum, University of Texas at Austin, Virtual Forum, April 16, 2021. View the poster online [here](#).
3. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” Longhorn Research Poster Session, University of Texas at Austin, Virtual Forum, April 14-15, 2021. *Received award for Best Poster Design*. View the poster online [here](#).
4. Sanghi, A. et al. “Identifying Periodic Variable Stars and Eclipsing Binary Systems with Long-Term Las Cumbres Observatory Photometric Monitoring of ZTF J0139+5245,” Freshman Research Initiative Poster Session: Exploring the Physics of White Dwarf Stars, University of Texas at Austin, Virtual, December 8, 2020. View the poster online [here](#).
5. Sanghi, A. et al. “Measuring the Substellar IMF using a 25 pc Volume-Limited Sample of L0-T8 Brown Dwarfs,” 237th American Astronomical Society Meeting, Virtual Meeting, January 13, 2021. *Received Chambliss Astronomy Achievement Award for research poster and presentation*. View the AAS 237 iPoster [here](#).
6. Sanghi, A. et al. “Population Synthesis Simulations: Uncovering the Mass Distribution of Brown Dwarfs in the Solar Neighborhood,” Undergraduate Research Forum, University of Texas at Austin, Virtual Forum, April 16, 2020. View the poster online [here](#).
7. Sanghi, A., and Daniels, M. L., “Visualizing the Complex Roots of Quadratic and Cubic Polynomial Functions in Three Dimensions,” Undergraduate Research Forum, University of Texas at Austin, Virtual Forum, April 16, 2020. View the poster online [here](#).
8. Sanghi, A. et al. “Population Synthesis Simulations: Uncovering the Mass Distribution of Brown Dwarfs in the Solar Neighborhood,” Longhorn Research Poster Session, University of Texas at Austin, Virtual Forum, April 14-15, 2020. View the poster online [here](#).
9. Sanghi, A., and Daniels, M. L., “Visualizing the Complex Roots of Quadratic and Cubic Polynomial Functions in Three Dimensions,” Longhorn Research Poster Session, University of Texas at Austin, Virtual Forum, April 14-15, 2020. View the poster online [here](#).

Public/Outreach

1. Sanghi, A. et al. “Reference Star Differential Imaging of the PDS 70 planetary system with HST/WFC3,” 2021 Texas Research Showdown, Video Competition at the University of Texas at Austin. *Received honorable mention for research communication video (200+ views)*. Watch online [here](#).
2. Sanghi, A., and Daniels, M. L., “Visualizing the Complex Roots of Quadratic and Cubic Polynomial Functions in Three Dimensions,” National Public School, Bangalore, India, January 15, 2020.
3. Sanghi, A. et al. “Population Synthesis Simulations: Uncovering the Mass Distribution of Brown Dwarfs in our Solar Neighborhood,” Kealing Middle School, Austin, TX, December 10, 2019.

REFERENCES

Dr. Brendan P. Bowler – Assistant Professor, Department of Astronomy, The University of Texas at Austin
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Dr. Mark L. Daniels – Professor of Practice, Department of Mathematics, The University of Texas at Austin
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