

J. Andrew Casey-Clyde

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Biosketch

J. Andrew Casey-Clyde is a doctoral candidate at the University of Connecticut and visiting researcher at Yale University developing **multimessenger models of supermassive black hole binaries**. His models combine information from the **nanohertz gravitational wave background** and **quasars** to constrain their relationship. He is also developing models of **dual AGN** populations tied to supermassive black hole binary merger rates. He is interested in developing **self-consistent models of supermassive black hole growth** and evolution.

Experience

Academia

Yale University

New Haven, CT

Visiting Assistant in Research

2023–present

Developing new models of supermassive black hole binary populations, including models to predict dual AGN populations. Developing gravitational wave background anisotropy predictions.

Detailed achievements:

- Developing models of dual AGN distributions tied to the gravitational wave background;
- Leading NANOGrav search for discreteness in the gravitational wave background spectrum.

University of Connecticut

Storrs, CT

Graduate Assistant

2019–2023

- Developed methods to efficiently sample multi-dimensional probability distributions;
- Set constraints on the number of quasars hosting SMBHBs;
- Developed quasar-based model of SMBHB populations.

San José State University

San Jose, CA

Graduate Research and Teaching Associate

2016–2019

- Analyzed kinematics of gas observed in the central 5 pc around Sagittarius A*.

Industry

Salient Process, Inc.

Sacramento, CA

Software Engineer

2015–2016

- Developed and maintained both internal and client-facing software.

Education

University of Connecticut

Ph.D. Physics, GPA: 3.791

Advisor: Chiara M. F. Mingarelli

Storrs, CT

2019–present

University of Connecticut

M.S. Physics

Awarded en route to Ph.D.

Storrs, CT

2019–2023

San José State University

M.S. Physics, GPA: 3.791

Computational concentration

Advisors: Elisabeth A.C. Mills, Aaron Romanowsky

San Jose, CA

2016–2019

University of California, Davis

B.S. Physics, GPA: 2.945

Astrophysics emphasis

Davis, CA

2010–2014

Ph.D. Thesis Proposal

Title: *Characterizing Gravitational Wave Background Anisotropies with Multimessenger Supermassive Black Hole Binary Models*

Advisors: Chiara M. F. Mingarelli, Jonathan R. Trump, Daniel Anglés-Alcázar

Description: My proposed thesis centers on multi-messenger constraints of supermassive black hole binary (SMBHB) populations. First, I developed the first SMBHB population model tied to quasars and which reproduces the gravitational wave background (GWB) measured by NANOGrav. I then placed constraints on the number of genuine SMBHBs in the Catalina Real-time Transient Survey SMBHB candidate catalog, which identified 111 binary candidates via periodicity in their quasar light-curves. I will next predict anisotropy in the GWB by combining my SMBHB population models with clustering simulations and real galaxy catalogs to simulate gravitational wave skies.

Master's Thesis

Title: *Integrated Kinematic Fitting of Gas Streams in the Milky Way's Circumnuclear Disk*

Supervisors: Elisabeth A. C. Mills, Aaron Romanowsky

Description: I developed an integrated orbit model for the central 5 parsecs of the Milky Way, accounting for the distribution of mass in the galactic center. I then fit this model to observations of a highly linear, dense molecular gas structure near Sagittarius A*, finding it to be ~ 1.6 pc from our galaxy's central supermassive black hole.

Memberships

NANOGrav

Full Member

2023–present

Associate Member

2021–2023

UConn Physics Graduate Student Association

Member

2023–present

Event Coordinator

2019–2020, 2022–2023

American Astronomical Society

Graduate Student Member

2018–present

American Physical Society

Graduate Student Member

2018–present

Computer Skills

	Level	Skill	Years	Comment
Language:	■■■■■	Python	9	Extensive professional use, primary language used.
	■■■ ■■	SLURM	4	Used both with stand-alone python scripts and to host Jupyter Lab environments.
	■■ ■■■	SQL	2	Primarily used with SDSS SkyServer.
	■■ ■■■	C++	1	Academic use and experience.
	■■ ■■■	C	1	Academic use and experience.
Software:	■■■■ ■	Jupyter Lab	5	Primary development environment.
	■■■■ ■	Spyder	8	Alternate development environment.
OS:	■■■■ ■	macOS	4	Primary OS used for professional work.
	■■■■ ■	Linux	6	Currently used for HPC interactions. Previous primary OS.
	■■■ ■■	Windows	15	Academic and industry use.
■■ ■■■ ■■ basic knowledge		■■■■ ■■ extensive project experience		
■■ ■■■ ■■ intermediate knowledge with some project experience		■■■■ ■■■ deepened expert knowledge		
		■■■■ ■■■ expert / specialist		

Publications

Published.....

- [1] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. Mar. 1, 2024. "The NANOGrav 12.5 Yr Data Set: A Computationally Efficient Eccentric Binary Search Pipeline and Constraints on an Eccentric Supermassive Binary Candidate in 3C 66B". *The Astrophysical Journal* 963, p. 144.
- [2] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. Mar. 1, 2024. "The NANOGrav 12.5 Yr Data Set: Search for Gravitational Wave Memory". *The Astrophysical Journal* 963, p. 61.
- [3] Bécsey, Bence, [...], **Casey-Clyde, J. Andrew**, et al. Dec. 1, 2023. "How to Detect an Astrophysical Nanohertz Gravitational Wave Background". *The Astrophysical Journal* 959, p. 9.
- [4] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. Oct. 1, 2023. "The NANOGrav 15 Yr Data Set: Search for Anisotropy in the Gravitational-wave Background". *The Astrophysical Journal* 956, p. L3.
- [5] Khusid, Nicole M., [...], **Casey-Clyde, J. Andrew**, et al. Sept. 1, 2023. "Strongly Lensed Supermassive Black Hole Binaries as Nanohertz Gravitational-wave Sources". *The Astrophysical Journal* 955, p. 25.
- [6] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. Aug. 1, 2023. "The NANOGrav 15 Yr Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational-wave Background". *The Astrophysical Journal* 952, p. L37.
- [7] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. July 1, 2023. "The NANOGrav 15 Yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries". *The Astrophysical Journal* 951, p. L50.
- [8] Arzoumanian, Zaven, [...], **Casey-Clyde, J. Andrew**, et al. July 1, 2023. "The NANOGrav 12.5 Yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries". *The Astrophysical Journal* 951, p. L28.
- [9] Falxa, M., [...], **Casey-Clyde, J. A.**, et al. June 1, 2023. "Searching for Continuous Gravitational Waves in the Second Data Release of the International Pulsar Timing Array". *Monthly Notices of the Royal Astronomical Society* 521, pp. 5077–5086.
- [10] Koss, Michael J., [...], **Casey-Clyde, J. Andrew**, et al. Jan. 1, 2023. "UGC 4211: A Confirmed Dual Active Galactic Nucleus in the Local Universe at 230 Pc Nuclear Separation". *The Astrophysical Journal* 942, p. L24.
- [11] Mingarelli, Chiara M. F. and **Casey-Clyde, J. Andrew**. Nov. 1, 2022. "Seeing the Gravitational Wave Universe". *Science* 378, pp. 592–593.
- [12] Antoniadis, J., [...], **Casey-Clyde, J. A.**, et al. Mar. 1, 2022. "The International Pulsar Timing Array Second Data Release: Search for an Isotropic Gravitational Wave Background". *Monthly Notices of the Royal Astronomical Society* 510, pp. 4873–4887.

- [13] **Casey-Clyde, J. Andrew** et al. Jan. 1, 2022. “A Quasar-based Supermassive Black Hole Binary Population Model: Implications for the Gravitational Wave Background”. *The Astrophysical Journal* 924, p. 93.

Forthcoming.....

- [1] Agazie, Gabriella, [...], **Casey-Clyde, J. Andrew**, et al. in press. “The NANOGrav 15-Year Data Set: Search for Transverse Polarization Modes in the Gravitational-Wave Background”.
- [2] Davis, Megan C., [...], **Casey-Clyde, J. Andrew**, et al. in press. “Reliable Identification of Binary Supermassive Black Holes from Rubin Observatory Time-Domain Monitoring”.

White Papers.....

- [1] Haiman, Zoltán, [...], **Casey-Clyde, J. Andrew**, et al. June 1, 2023. “Massive Black Hole Binaries as LISA Precursors in the Roman High Latitude Time Domain Survey”.
- [2] Shen, Yue **Casey-Clyde, J. Andrew** et al. June 1, 2023. “Discovery and Characterization of Galactic-scale Dual Supermassive Black Holes Across Cosmic Time”.

Presentations

Talks.....

- [1] **Casey-Clyde, J. Andrew**. Jan. 9, 2024. “Quasars Can Signpost Supermassive Black Hole Binaries”. Contributed talk. The 243rd Meeting of the American Astronomical Society (New Orleans, Louisiana).
- [2] **Casey-Clyde, J. Andrew**. Dec. 8, 2023. “Multi-Messenger Constraints on Supermassive Black Hole Binaries”. Invited talk. U.Pittsburgh Astro Seminar (Pittsburgh, Pennsylvania).
- [3] **Casey-Clyde, J. Andrew**. Dec. 16, 2023. “Quasars Can Signpost Supermassive Black Hole Binaries”. Contributed talk. Accretion History of AGN III (Miami, Florida).
- [4] **Casey-Clyde, J. Andrew**. Oct. 20, 2023. “Interpreting Power-Law Excursions in Nanohertz Gravitational-Wave Background Spectra”. Contributed talk. NANOGrav 2023 Fall Meeting (Vancouver, British Columbia, Canada).
- [5] **Casey-Clyde, J. Andrew**. July 21, 2023. “How Many Quasars Host Supermassive Black Hole Binary Systems?” Contributed talk. Amaldi 15.
- [6] **Casey-Clyde, J. Andrew**. June 20, 2023. “How Many Quasars Host SMBHB Systems?” Contributed talk. IPTA Meeting 2023 (Port Douglas, Australia).
- [7] **Casey-Clyde, J. Andrew**. Mar. 31, 2023. “How Many Quasars Host Supermassive Black Hole Binary Systems?” Contributed talk. Pre-LISA Electromagnetic Observations of Massive Black Hole Binaries.
- [8] **Casey-Clyde, J. Andrew**. Mar. 28, 2023. “Interpreting Nanohertz Gravitational-Wave Background Spectra”. Contributed talk. NANOGrav Spring 2023 Collaboration Meeting (Corvallis, Oregon).

- [9] **Casey-Clyde, J. Andrew.** Feb. 8, 2023. "How Many Quasars Host Supermassive Black Hole Binaries?" Invited talk. UConn Astro Seminar (Storrs, Connecticut).
- [10] **Casey-Clyde, J. Andrew.** Jan. 8, 2023. "How Many Quasars Host Supermassive Black Hole Binaries?" Contributed talk. 241st Meeting of the American Astronomical Society (Seattle, Washington).
- [11] **Casey-Clyde, J. Andrew.** Oct. 17, 2022. "How Many Quasars Host Supermassive Black Hole Binaries?" Contributed talk. NANOGrav Fall 2022 Meeting (Milwaukee, Wisconsin).
- [12] **Casey-Clyde, J. Andrew.** July 15, 2022. "Quantifying the Relationship Between Supermassive Black Hole Binaries and Quasars Using Pulsar Timing Arrays." Contributed talk. VIPER Summer School (Nashville, Tennessee, United States).
- [13] **Casey-Clyde, J. Andrew.** July 25, 2022. "Quantifying the Relationship Between Supermassive Black Hole Binaries and Quasars Using Pulsar Timing Arrays." Contributed talk. NANOGrav Astrophysics Working Group.
- [14] **Casey-Clyde, J. Andrew.** June 15, 2022. "A Quasar-Based Supermassive Black Hole Binary Population Model: Implications for the Gravitational-Wave Background". Contributed talk. 240th Meeting of the American Astronomical Society (Pasadena, California, United States).
- [15] **Casey-Clyde, J. Andrew.** June 28, 2022. "Quantifying the Relationship Between Supermassive Black Hole Binaries and Quasars Using Pulsar Timing Arrays." Contributed talk. NANOGrav Detection Working Group.
- [16] **Casey-Clyde, J. Andrew.** Apr. 2022. "A Quasar-Based Supermassive Black Hole Binary Population Model: Implications for the Gravitational-Wave Background". Contributed talk. APS April Meeting 2022 (New York, New York, United States).
- [17] **Casey-Clyde, J. Andrew.** Mar. 16, 2022. "Quantifying the Relationship Between Supermassive Black Hole Binaries and Quasars Using Pulsar Timing Arrays." Contributed talk. NANOGrav Spring 2022 Collaboration Meeting (New York, New York, United States).
- [18] **Casey-Clyde, J. Andrew.** Dec. 2021. "An AGN-based Supermassive Black Hole Binary Population Model: Implications for the Gravitational-Wave Background". Contributed talk. The Gravitational Wave Physics and Astronomy Workshop.
- [19] **Casey-Clyde, J. Andrew.** Sept. 2021. "Anchoring Supermassive Black Hole Binaries to Quasars with the Gravitational-Wave Background". Contributed talk. CCA Lunch Talk (Center for Computational Astronomy, Flatiron Institute, New York, New York).
- [20] **Casey-Clyde, J. Andrew.** July 2021. "Anchoring Supermassive Black Hole Binaries to Active Galactic Nuclei with the Gravitational-Wave Background". Contributed talk. Amaldi 14.
- [21] **Casey-Clyde, J. Andrew.** June 2021. "Anchoring Supermassive Black Hole Binaries to Active Galactic Nuclei with the Gravitational Wave Background". Contributed talk. IPTA Virtual Meeting 2021.
- [22] **Casey-Clyde, J. Andrew.** Apr. 2021. "Interpreting the Gravitational Wave Background in Terms of Supermassive Black Hole Binary Populations". Contributed talk. APS April Meeting 2021.

- [23] **Casey-Clyde, J. Andrew.** Oct. 30, 2020. "Interpreting the Gravitational-Wave Background in Terms of Supermassive Black Hole Binary Populations". Contributed talk. NANOGrav Fall 2020 Meeting.
- [24] **Casey-Clyde, J. Andrew.** Sept. 22, 2020. "Constraining Supermassive Black Hole Binary Populations with PTAs". Contributed talk. IPTA Catch-up Meeting 2020.
- [25] **Casey-Clyde, J. Andrew.** July 16, 2020. "Constraining Supermassive Black Hole Binary Populations with PTAs". Invited talk. NANOGrav Astrophysics Working Group.

Posters

- [1] **Casey-Clyde, J. Andrew.** Nov. 2021. "A Quasar-Based Model of Supermassive Black Hole Binaries". Poster. Connecticut Space Grant Fall 2021 Expo (Windsor Locks, CT, USA).
- [2] **Casey-Clyde, J. Andrew.** July 2021. "Anchoring Supermassive Black Hole Binaries to Active Galactic Nuclei with the Gravitational-Wave Background". Poster. EPS-HEP 2021 Conference.
- [3] **Casey-Clyde, J. Andrew.** June 2021. "Interpreting the Gravitational Wave Background in Terms of Supermassive Black Hole Binary Populations". Poster. EAS Annual Meeting 2021.
- [4] **Casey-Clyde, J. Andrew.** Jan. 13, 2021. "Interpreting the Gravitational-Wave Background in Terms of Supermassive Black Hole Binary Populations". iPoster. 237th Meeting of the American Astronomical Society.
- [5] **Casey-Clyde, J. Andrew,** Thummar, H., and Donet, J. Jan. 1, 2019. "Galaxy Classification with Neural Networks in SDSS". 233rd Meeting of the American Astronomical Society (Seattle, WA, USA).
- [6] **Casey-Clyde, J. Andrew.** Jan. 2018. "Mapping Gas Orbits in the Circumnuclear Disk". Poster. 231st Meeting of the American Astronomical Society (Washington, D.C., USA).
- [7] **Casey-Clyde, J. Andrew.** Aug. 2017. "Kinematics of the Eastern Arm in the Circumnuclear Disk". Poster. Star Formation in Different Environments (Quy Nhon, Vietnam).

Outreach

Astronomy on Tap

Astronomy on Tap Speaker, Contributed

Supermassive Black Holes: A Crash Course on the Biggest Objects in the Universe

Storrs, CT

August 2023

Ecotarium

Astrophysical Speaker Series, Invited

Low Frequency Gravitational Waves: A New View of the Universe

Worcester, MA

May 2023

Connecticut Invention Convention

Virtual Inventors Club Mentor

Offered constructive feedback on inventions to middle school students.

Virtual

January 2022