

# CHI-KWAN CHAN

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Associate Astronomer, Steward Observatory & Dept. of Astronomy  
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*Google Scholar Rank:* Computational astrophysics #21, AI for Science #28, Gravitation #29, Visualization #39, Radio Astronomy #39; *citations:* 19,000+; *h-index:* 47; *i10-index:* 82; *publications:* 110+.

Continuing status (tenure-equivalent) Computational Astrophysicist and AI-for-Science researcher working at the intersection of machine learning and large-scale scientific computing. Faculty member in Astronomy, Data Science, and Applied Mathematics. Leader of the Event Horizon Telescope (EHT) Collaboration, a large-scale international consortium recognized for imaging black holes, and architect of its computational and data-processing infrastructure. Developed scalable algorithms and AI-driven methods to accelerate scientific inference, automate data processing, and enable discovery from petabyte-scale datasets. Principal Investigator of EHT-MOVIE, aimed to produce the first time-resolved movies of black holes. Department of Energy INCITE reviewer; evaluated AI-and simulation-driven projects for access to the world's most powerful supercomputers. Avid hiker; biked across the continental United States on the TransAmerica Trail.

## Research Interests

*AI & Machine Learning for Science:* deep learning, Bayesian neural networks, simulation-based inference, surrogate modeling.

*Scalable AI Systems:* parallel and heterogeneous computing (HPC/GPU/OSG/cloud), workflow automation.

*Scientific Applications:* computational astrophysics, gravitation, black hole astrophysics, radio astronomy, very long baseline interferometry.

*Human-in-the-Loop Science:* scientific visualization, VR/AR, and interactive simulations.

## Honors and Awards

2025	The Biggest Scientific Breakthroughs of the Last 25 years, National Geographic
2025	Frontiers of Science Award
2021	EHT Early Career Award
2021	Royal Astronomical Society Group Award
2020	Breakthrough Prize in Fundamental Physics
2020	Nelson P. Jackson Aerospace Award
2020	Bruno Rossi Prize
2020	Einstein Medal
2019	Special Congressional Recognition (U.S. Senate)
2019	Special Congressional Recognition (U.S. House)
2019	American Ingenuity Award in Physical Sciences

2019	NSF Diamond Achievement Award
2019	Breakthrough of the Year, Science Magazine
2019	#1 Science Image of the Year, Nature Magazine
2019	#1 Scientific Moments that Defined 2019, Popular Mechanics
2010–2012	NORDITA Fellowship
2007–2010	Harvard ITC Fellowship

## Education

May 2007	<i>Ph.D. Physics</i> , University of Arizona
May 2002	<i>B.S. (Cum Laude) Physics and Mathematics (Double Major)</i> , University of Arizona

## Employment

University of Arizona

<b>Associate Astronomer</b> , Steward Observatory	2021 – current
<i>Assistant Astronomer</i> , Steward Observatory	2018 – 2021
<b>Associate Astronomer</b> , Astronomy	2021 – current
<i>Assistant Research Professor</i> , Astronomy	2018 – 2021
<b>Faculty Member</b> , Data Science Institute	2021 – current
<i>Data Science Fellow</i> , Data Science Institute	2018 – 2021
<b>Faculty Member</b> , Applied Mathematics	2018 – current
<i>Researcher</i> , Steward Observatory	2013 – 2017

Harvard University

<i>Researcher</i> , Harvard Black Hole Initiative	2017
<i>Teaching Fellow</i> , Astronomy	2010
<i>ITC Fellow</i> , Harvard-Smithsonian Center for Astrophysics	2007 – 2010
<b>Nordic Institute for Theoretical Physics</b>	
<i>NORDITA Fellow</i> , Astrophysics	2010 – 2012

Los Alamos National Laboratory

<i>Summer Intern</i> , Theory Division	2005 – 2007
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## Grants and Contracts

6. “Frontier Science with the Event Horizon Telescope”  
*co-PI*; NSF; 2025/10/01 – 2026/09/30; \$2,606,099
5. “Collaborative Research: EAGER: A High-Throughput Science Gateway for the Event Horizon Telescope”  
*PI*; NSF; 2023/07/01 – 2025/06/30; \$98,957
4. “The Event Horizon Telescope: Resolving Black Holes in Time and Space”  
*co-PI*; NSF; 2020/09/01 – 2024/08/31; \$3,413,365

3. “PIRE: Black Hole Astrophysics in the Era of Distributed Resources and Expertise”  
*PI*; NSF; 2017/09/01 – 2023/08/31; \$5,678,833
2. “The Ultra-Violet Output of Sgr A\*”  
*PI*; NASA; 2022/07/01 – 2024/06/30; \$193,388
1. “Advanced Debris Disk Modeling for the Next Decade”  
*co-I*; NSF; 2020 – 2022; \$328,565

### Supercomputing Resource Awards

6. OSG “Event Horizon Telescope” and “Steward Observatory” Allocations  
*PI*; OSG; 2020 – current; 40M core-hr to date
5. “Accelerating Deep Learning in Astrophysics with ACCESS Resources”  
*PI*; ACCESS; 2025 – current; 200,000 ACCESS Credits
4. “The Event Horizon Telescope Science Gateway”  
*PI*; ACCESS; 2023 – 2025; 200,000 ACCESS Credits
3. “Deep Learning for Astrophysics”  
*PI*; ACCESS; 2024 – 2025; 200,000 ACCESS Credits
2. “The Frontera-Event Horizon Telescope Partnership”  
*PI*; TACC Frontera Large-Scale Community Partnerships; 2020 – 2022; 80M core-hr
1. “VLBI Data Analysis on the Cloud”  
*PI*; ACCESS; 2017 – 2018; 200,000 ACCESS Credits

### Telescope Allocations

19. “A Horizon-Scale Timelapse of M87\*: Monitoring a Black Hole with Multi-Epoch VLBI”  
*PI*; ALMA; 2026
18. “Exploration of the Black Hole Spacetime of Sgr A\*: Dynamics and Achromaticity in the Black Hole Shadow”  
*co-I*; ALMA; 2025
17. “The Multi-Frequency Horizon-Scale View of M87”  
*co-I*; ALMA; 2025
16. “Black Hole Dynamics and Achromaticity in the Shadow of Sgr A\*”  
*co-I*; ALMA; 2023
15. “A sample of SMBH shadows, rings, accretion flows and jet bases: exploratory EHT+ALMA flux measurements”  
*co-I*; ALMA; 2023
14. “NGC4261: the 2nd jet at < 50 gravitational radii (and the 3rd black hole shadow?)”  
*co-I*; ALMA; 2023
13. “A sample of SMBHs at < 100  $R_g$  scales: accretion flows, jets, shadows: GMVA+ALMA imaging”  
*co-I*; ALMA; 2023
12. “Kinematics of Jets in low luminosity AGNs”  
*co-I*; VLBA; 2023

11. “Constraining the accretion and jet properties of next generation EHT targets”  
*co-I*; NuSTAR; 2023
10. “X-ray reverberation in billion mass black holes”  
*co-I*; NICER; 2023
9. “Constraining the micro-variability time-scales to photon orbits in low luminosity AGNs”  
*co-I*; SMARTS-1m; 2023
8. “EHT Sample: Jet profile of nearby AGNs”  
*co-I*; LBA; 2023
7. “Pilot study to constrain the compactness of low luminosity AGN”  
*co-I*; ATCA; 2023
6. “A sample of black holes at  $< 100 R_g$  scales: accretion flows, jets, shadows”  
*co-I*; GMVA; 2023
5. “TESS Monitoring Of Low Luminosity AGNs”  
*co-I*; TESS; 2022
4. “Towards a sample of SMBH shadows, rings, accretion flows and jet bases: exploratory EHT+ALMA flux measurements”  
*co-I*; ALMA; 2022
3. “Connecting the black hole shadow and jet base in M87”  
*co-I*; ALMA; 2022
2. “Capturing Real-Time Black Hole Dynamics in Sgr A\*”  
*co-I*; ALMA; 2022
1. “Imaging the Global Accretion and Outflow of Sgr A\*: 3mm VLBI with GMVA+ALMA”  
*co-I*; ALMA; 2018

## Publications

Supervisees are underlined.

114. “Probing jet base emission of M87\* with the 2021 Event Horizon Telescope observations” Saurabh ... Georgiev, B. ... West, A.T. ... **Chan, C.-k.**, et al. 2025, arXiv:2512.08970
113. “A Direct Calibration Algorithm for ADC Interleaving” **Chan, C.-k.**, Suzuki, H. ... West, A.T., et al. 2025, arXiv:2511.20763
112. “High-Order Photon Rings around Kerr Naked Singularities” Suzuki, H. ... & **Chan, C.-k.** 2025, arXiv:2511.20756
111. “Event Horizon Telescope Pattern Speeds in the Visibility Domain” Conroy, N.S. ... **Chan, C.-k.**, et al. 2025, arXiv:2510.08848
110. “Horizon-scale variability of M87\* from 2017–2021 EHT observations” EHT Collaboration ... **Chan, C.-k.** ... Georgiev, B. ... West, A.T., et al. 2025, arXiv:2509.24593
109. “Deep learning inference with the Event Horizon Telescope: III. ZINGULARITY results from the 2017 observations and predictions for future array expansions” Janssen, M., **Chan, C.-k.**, et al. 2025, A&A, 968, A62
108. “Deep learning inference with the Event Horizon Telescope: II. The ZINGULARITY framework for Bayesian artificial neural networks” Janssen, M., **Chan, C.-k.**, et al. 2025, A&A,

- 968, A61
107. “Deep learning inference with the Event Horizon Telescope: I. Calibration improvements and a comprehensive synthetic data library” Janssen, M., **Chan, C.-k.**, et al. 2025, A&A, 968, A60
106. “Nuclear Neural Networks: Emulating Late Burning Stages in Core-collapse Supernova Progenitors” Grichener, A. ... **Chan, C.-k.**, et al. 2025, ApJS, 279, 49
105. “Dynamical Inference from Polarized Light Curves of Sagittarius A\*” Ricarte, A. ... **Chan, C.-k.**, et al. 2025, ApJ, 987, 152
104. “Origin of the ring ellipticity in the black hole images of M87\*” Dahale, R. ... **Chan, C.-k.** ... Bernshteyn, V.Y. ... Georgiev, B., et al. 2025, A&A, 699, A279
103. “First polarization study of the M87 jet and active galactic nuclei at submillimeter wavelengths with ALMA” Goddi, C. ... **Chan, C.-k.** ... Georgiev, B., et al. 2025, A&A, 699, A265
102. “The 230 GHz Variability of Numerical Models of Sagittarius A\* II. The Physical Origins of the Variability” Chan, H.S. & **Chan, C.-k.** 2025, ApJ, 985, 164
101. “Mahakala: a Python-based Modular Ray-tracing and Radiative Transfer Algorithm for Curved Space-times”, Sharma, A. ... **Chan, C.-k.**, et al. 2025, ApJ, 985, 164
100. “Novel Polarimetric Analysis of Near Horizon Flaring Episodes in M87\* in Millimeter Wavelength” Emami, R. ... **Chan, C.-k.**, et al. 2025, arXiv:2504.04695
99. “Tracking X-ray Variability in Next Generation EHT LLAGN Targets” Ford, N.M. ... **Chan, C.-k.** 2025, ApJ, 981, 126
98. “A multifrequency study of sub-parsec jets with the Event Horizon Telescope” Röder, J. ... **Chan, C.-k.** ... Georgiev, B., et al. 2025, A&A, 695, A233
97. “The persistent shadow of the supermassive black hole of M87: II. Model comparisons and theoretical interpretations” EHT Collaboration ... **Chan, C.-k.** ... Georgiev, B., et al. 2025, A&A, 693, A265
96. “The putative center in NGC 1052” Baczko, A.K. ... **Chan, C.-k.** ... Georgiev, B., et al. 2024, A&A, 692, A205
95. “Demographics of black holes at  $< 100 R_g$  scales: accretion flows, jets, and shadows” Nair, D.G. ... **Chan, C.-k.** ... et al. 2024, 16th EVN Symposium, 75
94. “Circular Polarization of Simulated Images of Black Holes” Joshi, A.V., Prather, B.S., **Chan, C.-k.** ... et al. 2024, ApJ, 972, 135
93. “First Very Long Baseline Interferometry Detections at  $870 \mu\text{m}$ ” Raymond, A. ... **Chan, C.-k.** ... Georgiev, B., et al. 2024, AJ, 168, 130
92. “The Black Hole Explorer: motivation and vision” Johnson, M. ... **Chan, C.-k.**, ... et al. 2024, Proceedings of the SPIE, 13092, 130922D
91. “First Sagittarius A\* Event Horizon Telescope Results. VIII. Physical Interpretation of the Polarized Ring” EHT Collaboration ... **Chan, C.-k.** ... Georgiev, B., et al. 2024, ApJ, 964, 26
90. “First Sagittarius A\* Event Horizon Telescope Results. VII. Polarization of the Ring” EHT Collaboration ... **Chan, C.-k.** ... Georgiev, B., et al. 2024, ApJ, 964L, 25

89. “The 230 GHz Variability of Numerical Models of Sagittarius A\* I. Parameter Surveys on Varying  $R_{\text{Low}}$ ”, Chan, H.S., **Chan, C.-k.**, et al. 2023, ApJ, 964, 17
88. “The persistent shadow of the supermassive black hole of M87. I. Observations, calibration, imaging, and analysis”, EHT Collaboration ... **Chan, C.-k.**, et al. 2024, ApJ, 681, 79
87. “A new covariant formalism for kinetic plasma simulations in curved spacetimes”, Trent, T., Christian, P., **Chan, C.-k.**, et al. 2023, ApJL, 959, 6
86. “A search for pulsars around Sgr A\* in the first Event Horizon Telescope dataset” Torne, P., ... **Chan, C.-k.**, et al. 2023, ApJ, 959, 14
85. “Polarimetric Geometric Modeling for mm-VLBI Observations of Black Holes”, Roelofs, F., ... **Chan, C.-k.**, et al. 2023, ApJL, 957, 21
84. “First M87 Event Horizon Telescope Results. IX. Detection of Near-horizon Circular Polarization”, EHT Collaboration ... **Chan, C.-k.**, et al. 2023, ApJ, 957, 20
83. “Not all spacetime coordinates for general-relativistic ray tracing are created equal”, Bozzola, G., **Chan, C.-k.**, & Paschalidis, V. 2023, PhRvD, 108, 8, 084004
82. “The EB Correlation in Resolved Polarized Images: Connections to the Astrophysics of Black Holes”, Emami, R., ... **Chan, C.-k.**, et al. 2023, ApJ, 955, 1, 6
81. “Shadow Geometry of Kerr Naked Singularities” Nguyen, B., Christian, P., & **Chan, C.-k.** 2023, ApJ, 954, 1, 78
80. “Rotation in Event Horizon Telescope Movies”, Conroy, N.S., ... **Chan, C.-k.**, et al. 2023, ApJ, 951, 1, 46
79. “Comparison of Polarized Radiative Transfer Codes Used by the EHT Collaboration”, Prather, B.S., ... **Chan, C.-k.**, et al. 2023, ApJ, 950, 1, 35
78. “The Event Horizon Telescope Image of the Quasar NRAO 530”, Jorstad, S. ... **Chan, C.-k.**, et al. 2023, ApJ, 943, 170
77. “Resolving the Inner Parsec of the Blazar J1924-2914 with the Event Horizon Telescope”, Issaoun, S. ... **Chan, C.-k.**, et al. 2022, ApJ, 934, 145
76. “Topological Data Analysis of Black Hole Images”, Christian, P., **Chan, C.-k.**, Anthony Hsu, et al. 2022, PhRvD, 106, 023017
75. “Characterizing and Mitigating Intraday Variability: Reconstructing Source Structure in Accreting Black Holes with mm-VLBI”, Broderick, A.E. ... **Chan, C.-k.**, et al. 2022, ApJL, 930, 18
74. “A Universal Power-law Prescription for Variability from Synthetic Images of Black Hole Accretion Flows”, Georgiev, B. ... **Chan, C.-k.**, et al. 2022, ApJL, 930, 18
73. “Millimeter Light Curves of Sagittarius A\* Observed during the 2017 Event Horizon Telescope Campaign”, Wielgus, M. ... **Chan, C.-k.**, et al. 2022, ApJL, 930, 18
72. “Selective Dynamical Imaging of Interferometric Data”, Farah, J. ... **Chan, C.-k.**, et al. 2022, ApJL, 930, 18
71. “First Sagittarius A\* Event Horizon Telescope Results. VI. Testing the Black Hole Metric”, EHT Collaboration ... **Chan, C.-k.**, et al. 2022f, ApJL, 930, 17
70. “First Sagittarius A\* Event Horizon Telescope Results. V. Testing Astrophysical Models of the Galactic Center Black Hole”, EHT Collaboration ... **Chan, C.-k.**, et al. 2022e, ApJL,

- 930, 16
69. "First Sagittarius A\* Event Horizon Telescope Results. IV. Variability, Morphology, and Black Hole Mass", EHT Collaboration ... **Chan, C.-k.**, et al. 2022d, ApJL, 930, 15
68. "First Sagittarius A\* Event Horizon Telescope Results. III. Imaging of the Galactic Center Supermassive Black Hole", EHT Collaboration ... **Chan, C.-k.**, et al. 2022c, ApJL, 930, 14
67. "First Sagittarius A\* Event Horizon Telescope Results. II. EHT and Multiwavelength Observations, Data Processing, and Calibration", EHT Collaboration ... **Chan, C.-k.**, et al. 2022b, ApJL, 930, 13
66. "First Sagittarius A\* Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole in the Center of the Milky Way", EHT Collaboration ... **Chan, C.-k.**, et al. 2022a, ApJL, 930, 12
65. "PATOKA: Simulating Electromagnetic Observables of Black Hole Accretion", Wong, G.N. ... **Chan, C.-k.**, et al. 2022, ApJS, 259, 64
64. "Black Hole Physics and Computer Graphics", Bozzola, G., **Chan, C.-k.**, Paschalidis, V. 2022, Computing in Science and Engineering, 24, 19
63. "Markov Chains for Horizons MARCH. I. Identifying Biases in Fitting Theoretical Models to Event Horizon Telescope Observations", Psaltis, D. ... **Chan, C.-k.**, et al. 2022, ApJ, 928, 55
62. "The Variability of the Black Hole Image in M87 at the Dynamical Timescale", Satapathy, K. ... **Chan, C.-k.**, et al. 2022, ApJ, 925, 13
61. "Brightness Asymmetry of Black Hole Images as a Probe of Observer Inclination", Medeiros, L., **Chan, C.-k.**, et al. 2022, ApJ, 924, 46
60. "Accretion properties of low-luminosity active galactic nuclei", Ramakrishnan, V., **Chan, C.-k.**, & Nagar, N. 2021, Astron. Nachr., 342:1180–1184
59. "A Plasmoid model for the Sgr A\* Flares Observed With Gravity and CHANDRA", Ball, D. ... **Chan, C.-k.**, et al. 2021, ApJ, 917, 8
58. "Event Horizon Telescope observations of the jet launching and collimation in Centaurus A", Janssen, M. ... **Chan, C.-k.**, et al. 2021, Nature Astronomy, 5, 1017
57. "Constraints on black-hole charges with the 2017 EHT observations of M87\*", Kocherlakota, P. ... **Chan, C.-k.**, et al. 2021, PhRvD, 103, 104047
56. "Ten simple rules to cultivate transdisciplinary collaboration in data science", Sahneh, F., Balk, M.A., Kisley, M., **Chan, C.-k.**, et al. 2021, PLOS Computational Biology, vol 17, issue 5, p. e1008879
55. "The Polarized Image of a Synchrotron-emitting Ring of Gas Orbiting a Black Hole", Narayan, R. ... **Chan, C.-k.**, et al. 2021, ApJ, 912, 35
54. "Broadband Multi-wavelength Properties of M87 during the 2017 Event Horizon Telescope Campaign", EHT MWL Science Working Group ... **Chan, C.-k.**, et al. 2021, ApJL, 911, 11
53. "Polarimetric Properties of Event Horizon Telescope Targets from ALMA", Goddi, C. ... **Chan, C.-k.**, et al. 2021, ApJL, 910, 14
52. "First M87 Event Horizon Telescope Results. VIII. Magnetic Field Structure near The Event Horizon", EHT Collaboration ... **Chan, C.-k.**, et al. 2021, ApJL, 910, 13

51. "First M87 Event Horizon Telescope Results. VII. Polarization of the Ring", EHT Collaboration ... **Chan, C.-k.**, et al. 2021, ApJL, 910, 12
50. "FANTASY: User-friendly Symplectic Geodesic Integrator for Arbitrary Metrics with Automatic Differentiation", Christian, P. and **Chan, C.-k.** 2021, ApJ, 909, 67
49. "Gravitational Test beyond the First Post-Newtonian Order with the Shadow of the M87 Black Hole", Psaltis, D. ... **Chan, C.-k.**, et al. 2020, PRL, 125, 14
48. "Monitoring the Morphology of M87\* in 2009-2017 with the Event Horizon Telescope", Wielgus, M. ... **Chan, C.-k.**, et al. 2020, ApJ, 901, 67
47. "Event Horizon Telescope Imaging of the Archetypal Blazar 3C 279 at an Extreme 20 microarcsecond Resolution", Kim, J.Y. ... **Chan, C.-k.**, et al. 2020, Astronomy & Astrophysics, 640, 69
46. "Verification of Radiative Transfer Schemes for the EHT", Gold, R. ... **Chan, C.-k.**, et al. 2020, ApJ, 897, 148
45. "A Plasmoid Model for the Sgr A\* Flares Observed with GRAVITY and Chandra", Ball, D. ... **Chan, C.-k.**, et al. 2020, arXiv:2005.14251
44. "Markov Chains for Horizons (MARCH). I. Identifying Biases in Fitting Theoretical Models to Event Horizon Telescope Observations", Psaltis, D. ... **Chan, C.-k.**, et al. 2020, arXiv:2005.09632
43. "Discretization and Filtering Effects on Black Hole Images Obtained with the Event Horizon Telescope", Psaltis, D., Medeiros, L., Lauer, T.R., **Chan, C.-k.**, Özel, F. 2020, arXiv:2004.06210
42. "Prospects for Wideband VLBI Correlation in the Cloud", Gill, A., Blackburn, L., Roshanimeshat, A., **Chan, C.-k.**, et al. 2019, PASP, 131, 124501
41. "EHT-HOPS pipeline for millimeter VLBI data reduction", Blackburn, L., **Chan, C.-k.**, et al. 2019, ApJ, 882, 23
40. "The Event Horizon General Relativistic Magnetohydrodynamic Code Comparison Project", Porth, O., Chatterjee, K., Narayan, R., Gammie, C.F., Mizuno, Y., Anninos, P., Baker, J.G., Bugli, M., **Chan, C.-k.**, et al. 2019, ApJS, 243, 26
39. "SYMBA: An end-to-end VLBI synthetic data generation pipeline-Simulating Event Horizon Telescope observations of M87", Roelofs, F ... **Chan, C.-k.**, et al. 2020, Astronomy & Astrophysics 636, A5
38. "The Growing Importance of a Tech Savvy Astronomy and Astrophysics Workforce", Norman, D ... **Chan, C.-k.**, et al. 2019, arXiv:1910.08376
37. "Sustaining Community-Driven Software for Astronomy in the 2020s", Tollerud, E ... **Chan, C.-k.**, et al. 2019, BAAS 51 (7), 180
36. "Training the Future Generation of Computational Researchers", Besla, G ... **Chan, C.-k.**, et al. 2019, Bulletin of the American Astronomical Society 51 (7) and arXiv:1907.04460
35. "Astro2020 APC White Paper: Elevating the Role of Software as a Product of the Research Enterprise", Smith, A.M. ... **Chan, C.-k.**, et al. 2019, arXiv:1907.06981
34. "First M87 Event Horizon Telescope Results and the Role of ALMA", Goddi, C. ... **Chan, C.-k.**, et al. 2019, The Messenger, 177, 25-35
33. "First M87 Event Horizon Telescope Results. VI. The Shadow and Mass of the Central Black

- Hole”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019f, ApJL, 875, L6
32. “First M87 Event Horizon Telescope Results. V. Physical Origin of the Asymmetric Ring”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019e, ApJL, 875, L5
31. “First M87 Event Horizon Telescope Results. IV. Imaging the Central Supermassive Black Hole”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019d, ApJL, 875, L4
30. “First M87 Event Horizon Telescope Results. III. Data Processing and Calibration”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019c, ApJL, 875, L3
29. “First M87 Event Horizon Telescope Results. II. Array and Instrumentation”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019b, ApJL, 875, L2
28. “First M87 Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole”, EHT Collaboration ... **Chan, C.-k.**, et al. 2019a, ApJL, 875, L1
27. “GRMHD Simulations of Visibility Amplitude Variability for Event Horizon Telescope Images of Sgr A\*”, Medeiros, L., **Chan, C.-k.**, Özel, F., Psaltis, D., Kim, J., Marrone, D.P., & Sađowski, A. 2018, ApJ, 856, 163
26. “The Properties of Reconnection Current Sheets in GRMHD Simulations of Radiatively Inefficient Accretion Flows”, Ball, D., Özel, F., Psaltis, D., **Chan, C.-k.**, Sironi, L. 2018, ApJ, 853, 184
25. “GRay2: A General Purpose Geodesic Integrator for Kerr Spacetimes”, **Chan, C.-k.**, Medeiros, L., Özel, F., & Psaltis, D. 2017, ApJ, 867, 59
24. “Variability in GRMHD Simulations of Sgr A\*: Implications for EHT Closure Phase Observations”, Medeiros, L., **Chan, C.-k.**, Özel, F., Psaltis, D., Kim, J., Marrone, D.P., & Sađowski, A. 2017, ApJ, 844, 35
23. “Bayesian Techniques for Comparing Time-Dependent GRMHD Simulations to Variable Event Horizon Telescope Observations”, Kim, J., Marrone, D.P., **Chan, C.-k.**, Medeiros, L., Özel, F., Psaltis, D. 2016, ApJ, 832, 156
22. “Particle Acceleration and the Origin of X-ray Flares in GRMHD Simulations of Sgr A\*”, Ball, D., Özel, F., Psaltis, D., & **Chan, C.-k.** 2016, ApJ, 826, 77
21. “Persistent Asymmetric Structure of Sagittarius A\* on Event Horizon Scales”, Fish, V.L., Johnson, M.D., Doeleman, S.S., ..., **Chan, C.-k.**, et al. 2016, ApJ, 820, 90
20. “GRMHD Simulations of Visibility Amplitude Variability for EHT Images of Sgr A\*”, Medeiros, L., **Chan, C.-k.**, Özel, F., Psaltis, D., Kim, J., Marrone, D.P., & Sađowski, A. 2016, ApJ, 856, 163
19. “A General Relativistic Null Hypothesis Test with Event Horizon Telescope Observations of the Black Hole Shadow in Sgr A\*”, Psaltis, D., Özel, F., **Chan, C.-k.**, & Marrone, D.P. 2015, ApJ, 814, 115
18. “Fast Variability and mm/IR flares in GRMHD Models of Sgr A\* from Strong-Field Gravitational Lensing”, **Chan, C.-k.**, Psaltis, D., Özel, F., Medeiros, L., Marrone, D.P., Sađowski, A., & Narayan, R. 2015, ApJ, 812, 103
17. “The Power of Imaging: Constraining the Plasma Properties of GRMHD Simulations using EHT Observations of Sgr A\*”, **Chan, C.-k.**, Psaltis, D., Özel, F., Narayan, R., & Sađowski, A. 2015, ApJ, 799, 1
16. “GRay: A Massively Parallel GPU-based Code for Ray Tracing in Relativistic Spacetimes”,

- Chan, C.-k.**, Psaltis, D., & Öznel, F. 2013, ApJ, 777, 13
15. “On Magnetohydrodynamic Turbulence and Angular Momentum Transport in Accretion Disk Boundary Layers”, **Chan, C.-k.** & Pessah, M.E. 2013, IAU Symposium, 294, 349
  14. “Angular Momentum Transport in Accretion Disk Boundary Layers Around Weakly Magnetized Stars”, Pessah, M.E. & **Chan, C.-k.** 2013, EPJ Web of Conferences, 46, 04004
  13. “On Hydromagnetic Stresses in Accretion Disk Boundary Layers”, Pessah, M.E. & **Chan, C.-k.** 2012, ApJ, 751, 48
  12. “Dynamics of Saturated Energy Condensation in Two-Dimensional Turbulence”, **Chan, C.-k.**, Mitra, D., & Brandenburg, A. 2012, PhRvE, 85, 036315
  11. “A Class of Physically Motivated Closures for Radiation Hydrodynamics”, **Chan, C.-k.** 2011, ApJ, 727, 67
  10. “Oscillations of the Inner Regions of Viscous Accretion Disks”, **Chan, C.-k.** 2009, ApJ, 704, 68
  9. “MHD Simulations of Sgr A\*: Quiescent Fluctuations, Outbursts, and Quasi-Periodicity”, **Chan, C.-k.**, Lui, S., Fryer, C.L., Psaltis, D., Öznel, F., Rockefeller, G., & Melia, F. 2009, ApJ, 701, 521
  8. “Spectral Methods for Time-Dependent Studies of Accretion Flows. III. Three-Dimensional, Self-Gravitating, Magnetohydrodynamic Disks”, **Chan, C.-k.**, Psaltis, D., & Öznel, F. 2009, ApJ, 700, 741
  7. “Viscous, Resistive Magnetorotational Modes”, Pessah, M.E. & **Chan, C.-k.** 2008, ApJ, 684, 498
  6. “The fundamental difference between shear  $\alpha$ -viscosity and turbulent magnetorotational stresses”, Pessah, M.E., **Chan, C.-k.**, & Psaltis, D. 2008, MNRAS, 383, 683
  5. “Angular Momentum Transport in Accretion Disks: Scaling Laws in MRI-driven Turbulence”, Pessah, M.E., **Chan, C.-k.**, & Psaltis, D. 2007, ApJ, 668, 51
  4. “A Local Model for Angular Momentum Transport in Accretion Disks Driven by the Magnetorotational Instability”, Pessah, M.E., **Chan, C.-k.**, & Psaltis, D. 2006, PRL, 97, 1103
  3. “The Signature of the Magnetorotational Instability in the Reynolds and Maxwell Stress Tensors in Accretion Discs”, Pessah, M.E., **Chan, C.-k.**, & Psaltis, D. 2006, MNRAS, 372, 183
  2. “Spectral Methods for Time-Dependent Studies of Accretion Flows. II. Two-Dimensional Hydrodynamic Disks with Self-Gravity”, **Chan, C.-k.**, Psaltis, D., & Öznel, F. 2006, ApJ, 645, 506
  1. “Spectral Methods for Time-Dependent Studies of Accretion Flows. I. Two-dimensional, Viscous, Hydrodynamic Disks”, **Chan, C.-k.**, Psaltis, D., & Öznel, F. 2005, ApJ, 628, 353

## Software

### Core Scientific Computing Software (Sole Developer)

11. XAJ, an ordinary differential equation (ODE) integrator compatible with Google’s GPU-accelerated autodiff package JAX: <https://github.com/adxsrc/xaj/tree/archive-v0.1>; related projects: <https://github.com/adxsrc>

10. `lux`, a high-performance scientific computation framework that can measure the run time performance of algorithms and optimize it on-the-fly: <https://github.com/luxsrc/lux/tree/archive-v0.2.x>; related projects: <https://github.com/luxsrc>
9. `gray`, a massively parallel ODE integrator for performing general-relativistic radiative transfer using ray tracing: <https://github.com/luxsrc/gray/tree/gray1>; demo: <https://youtu.be/8L9cEQceksg>, [https://youtu.be/G6sSwRf\\_9ME](https://youtu.be/G6sSwRf_9ME)
8. `μcast`, a weather forecast data processing package with micro-weather forecasting for radio astronomy: <https://github.com/focisrc/ucast>
7. `insight`, one of the first interactive data visualization tools in virtual reality: <https://github.com/luxsrc/insight>; video: <https://youtu.be/tfD088R1jTw>
6. `orbits`, a collection of symplectic integrators that are ideal for solving celestial mechanic problems: <https://github.com/rndsrc/orbits>
5. `gopen`, Reimplementing the high-order finite difference code `pencil` in CUDA C for NVIDIA GPU: <https://github.com/rndsrc/gopen>
4. `fg2`, a 2D grid-based partial differential equation solver written in CUDA C for NVIDIA GPU: <https://github.com/rndsrc/fg2>
3. `sg2`, a 2D spectral Galerkin code written in CUDA C and runs on NVIDIA GPUs: <https://github.com/rndsrc/sg2>; video: <https://youtu.be/40RDgzIwK00>
2. EHT docker stack, Dockerfile recipes and tools to set up EHT's data analysis containers for reproducibility: <https://github.com/eventhorizontelescope/docker-recipes>
1. OSG tools for `igrmonty` and `ipole`, tools for running large GRRT and GR Monte Carlo simulations: <https://github.com/bhpire/igrmonty-osg>, <https://github.com/bhpire/ipole-osg>

### Scientific Pipelines and Infrastructure (Lead Developer)

6. `hallmark`, a lightweight package designed to version control and manage data products in a complex workflow: <https://github.com/16a/hallmark>
5. EHT 2017 HOPS pipeline, a HOPS pipeline used to process EHT's 2017 observation data: <https://github.com/eventhorizontelescope/2017-april>
4. Sgr A\* theory paper data analysis tools, Jupyter notebooks for managing and analyzing large number of GRRT images and GR Monte Carlo SEDs of black holes, used for EHT Sgr A\* paper V: [https://github.com/eventhorizontelescope/2017\\_sgra\\_paper5](https://github.com/eventhorizontelescope/2017_sgra_paper5)
3. `ehtplot`, a plotting utility including the perceptually uniform `afmhot_10us` colormap, which was created for the first images of black holes: <https://github.com/liamedeiros/ehtplot>
2. `AstroCardboard` Google Cardboard VR app for interactive astronomy learning and visualization
1. `RosettaTour` Google Cardboard VR app for interactive astronomy learning and visualization

### Community Ecosystems (Key Contributor)

5. Zingularity, parameter inference with deep Bayesian artificial neural networks: <https://gitlab.com/mjanssen2308/zingularity>
4. OSG SYMBA pipeline, a Pegasus pipeline for running very large scale synthetic data gener-

- ation jobs for VLBI: <https://github.com/bhpire/symba-osg>
3. OSG calsz tools, tools for estimating second moments in visibility domain of very large number of images: <https://github.com/bhpire/calsz-osg>
  2. igrmonty, a well tested GR Monte Carlo code for computing SEDs of black holes, <https://github.com/AFD-Illinois/igrmonty>
  1. eht-imaging, one of EHT's main image reconstruction and data processing packages, <https://github.com/achael/eht-imaging>

## Advising, Mentoring, and Teaching

### Post-Doctoral Fellows:

*Dr. Boris Georgiev* (2023–current), Postdoctoral Research Associate, Steward Observatory, University of Arizona

*Supervisee Honors:* EHT Early Career Award, (2022, 2024), Gordon & Betty Moore Foundation Postdoctoral Fellowship (2025-2027)

*Project:* analysis of Event Horizon Telescope (EHT) data and leadership of the EHT-MOVIE observing campaign, develop EHT reference pipeline

*Dr. Rahul Kumar* (2024–2025), Postdoctoral Fellow, Department of Physics, University of Arizona

*Supervisee Honors:* Fulbright-Nehru Postdoctoral Fellow, Newton International Fellowship (Royal Society)

*Project:* application of energy conditions to constrain photon-ring structures

*Currently at University College of London*

*Dr. Andrew West* (2023–2025), Postdoctoral Research Associate, Steward Observatory, University of Arizona

*Project:* analysis of Event Horizon Telescope (EHT) data and contributions to EHT observational campaigns, develop EHT reference pipeline

### Graduate Students:

*Ningyuan Xu* (2023–current), Ph.D Student in Astronomy (year 3), Department of Astronomy and Theoretical Astrophysics Program, University of Arizona

*Research:* analytical studies of fluid instabilities in magnetically arrested disks (MADs)

*Ian Nathaniel Luff* (2024–current, co-advise), Ph.D Student in Applied Math (year 3), Interdisciplinary Program in Applied Mathematics, University of Arizona

*Research:* machine-learning methods for load balancing across HPC and cloud computing resources, with applications to energy grids

*Shambhavi Srivastava* (2025–current, rotational), Ph.D Student in Applied Math (year 1), Interdisciplinary Program in Applied Mathematics and Theoretical Astrophysics Program, University of Arizona

*Research:* research on low-luminosity active galactic nuclei (LLAGNs) and Event Horizon Telescope (EHT) data analysis

*Emily Margaret Foley* (2024–2025, rotational), Ph.D Student in Applied Math (year 2), Interdisciplinary Program in Applied Mathematics, University of Arizona

*Supervisee Honors:* DOE Computational Science Graduate Fellowship

*Research:* numerical studies of boundary-condition effects in magnetized accretion disks

*Anthony Hsu* (2021–2023), M.S. in Applied Math, University of Arizona; B.S. in Mathematics and Computer Science, University of Arizona, Honors College

*Internship:* Machine Learning Researcher, Black Hole PIRE

*Thesis:* development of machine-learning methods and topological data analysis software for astrophysical imaging

*Currently a software developer and AI researcher at IBM*

### **Undergraduate Students:**

*Phani Datta Velicheti* (2020–2023), B.S. Computer Science and Statistics and Data Science

*Internships:* National Radio Astronomy Observatory (2021), Space Telescope Science Institute (2022)

*Project:* development of the `μcast` software package to monitor weather data for the Event Horizon Telescope (EHT)

*Currently a research software engineer at NASA Jet Propulsion Laboratory (JPL), California Institute of Technology.*

*Bao “Tintin” Nguyen* (2021–2023), B.S. in Astronomy, Physics, and Mathematics (triple major, with honors), University of Arizona

*Supervisee Honors:* Excellence in Undergraduate Research Award (Dept. Astronomy), Undergraduate First Prize of the Data Visualization Challenge, the Galileo Circle Scholarship (College of Science), the Weaver Award for Undergraduate Research in Physics, the David Lomen Excellence in Mathematics Award, Merrill P. Freeman Medal (2024, highest undergraduate research honor).

*Project:* development of the `fadge` code and its application to null-geodesic calculations around naked singularities

*Currently a Ph.D. student in Astronomy at Harvard University.*

*Hina Suzuki* (2022–current), Senior majoring in Astronomy with a minor in Electrical and Computer Engineering, University of Arizona

*Supervisee Honors:* Outstanding Senior Award (Dept. Astronomy), Undergraduate Research Travel Grant, the Galileo Circle Scholarship (College of Science), Angelos C. Langadas Scholarship (Astronomy), William F. Lucas Astronomy Scholarship.

*Internship:* National Radio Astronomy Observatory; FreeFall Aerospace.

*Project:* numerical studies of Kerr naked singularities and their observational signatures; development of calibration algorithms for analog-to-digital converter (ADC) interleaving

*Yi-Tung “Cari” Tsang* (2024–current), Senior majoring in Physics, Chinese University of Hong Kong (CUHK), undergraduate research student, University of Arizona

*Supervisee Honors:* Shaw Prize Student Correspondents (2025)

*Project:* studies of electron distribution functions and development of improved mesh-refinement algorithms

*Vadim Bernshteyn* (2024–current), Senior majoring in Astronomy and Applied Mathematics, University of Arizona

*Supervisee Honors:* Dean’s List with Distinction, University of Arizona

*Internship:* Black Hole Explorers Internship at the Smithsonian Astrophysical Observatory

- (2025), University of Illinois Urbana-Champaign Physics REU program (2024)
- Project:* modeling of effective synchrotron radiation from turbulent magnetohydrodynamic flows
- Nayera Abdessalam* (2025–current), TIMESTEP Software Engineering Internship focused on development of the data-management framework **hallmark** (*Honors College*)
- Hayden Marchinek* (2025–current), TIMESTEP Software Engineering Internship focused on development of the data-management framework **hallmark** (*Honors College*)
- Fong Ching “Square” Ho* (2025–current), *Project:* theoretical studies of Kaluza-Klein theory and its applications to numerical plasma physics
- Ram Adithya Muthukumarasamy* (2024–current), TIMESTEP Software Engineering Internship on **hallmark** data management, combined with simulations of supermassive black holes (*Honors College*)
- Rohin Sant* (2024–current), studies of time variability and correlation structure in accretion flows around supermassive black holes (*Honors College*)
- Jorge Blanquer Redondo* (2024–current), improvements to general-relativistic Monte Carlo radiative transfer algorithms (*Honors College*)
- Yiwei “Lisa” Li* (2025), application of energy conditions to constrain cosmological models
- Limeng Jiang* (2022–2024), development of machine-learning algorithms to identify leading-order sources of variability in general-relativistic magnetohydrodynamic (GRMHD) simulations
- Elyas Loutfi Farah* (2022–2023), use of **fadge** to solve timelike geodesics around naked singularities
- Aniket Sharma* (2021–2023), development of general-relativistic ray-tracing code **mahakala** using Google JAX
- Justin Luk* (2023), analytical studies of magnetically arrested disks around black holes
- Edward Chang* (2022), comparative studies of clustering algorithms for very long baseline interferometry (VLBI) imaging
- Tin-Lok Chan* (2021–2022), simulations of black hole accretion flows using **Athena++** and **BHAC**; results published in EHTC Sgr A\* Papers I and V
- Rachel Wells* (2021), development of educational materials for elementary school students
- Jarod Bristol* (2020), improvements to cloud-computing infrastructure security
- Ethan Glasberg* (2020), improvements to cloud-computing infrastructure security
- Ryan Luu* (2020), improvements to cloud-computing infrastructure security
- Jimena Stephenson* (2020), development of educational augmented-reality (AR) applications
- Hafizudin Hashim* (2020), development of educational augmented-reality (AR) applications
- JianDa Zhai* (2020), development of educational augmented-reality (AR) applications
- Jose Perez* (2019–2020), development of educational augmented-reality (AR) and virtual-reality (VR) applications, including **EHTGo**
- Yuan Jea Hew* (2019–2020), development of machine-learning algorithms to classify Sgr A\* imaging results; development of the educational virtual-reality (VR) application **EHTGo**
- Muaz Burhanudin* (2019), development of the educational augmented-reality (AR) application **ARStellarEvolution**

*Ryan Gatski* (2019), development of model-free calibration algorithms for polarimetric visibility data

*Will Price* (2019), development of algorithms for visualization of black hole simulations

*Devin Shawn Cameron* (2019), development of algorithms for visualization of black hole simulations

*Elizabeth Champagne* (2019), development of the educational virtual-reality (VR) application EHTGo

*Alexis Tinoco Cazarez* (2018), application of Docker technologies for astronomical data processing

## Courses

5. ASTR 513 “Statistical and Computational Methods in Astrophysics” Astronomy Departments, University of Arizona, 2024–current
4. ASTR 501 “Introduction to Computing” Astronomy Departments, University of Arizona, 2024–current
3. MOEMS “Math Olympiads for Elementary and Middle Schools” Dreams of Sunshine Institute, 2022–current
2. PHYS 305 “Computational Physics” Physics Departments, University of Arizona, 2025
1. PHYS 105A “Introduction to Scientific Computing” Physics Departments, University of Arizona, 2021–2022

## Lectures

5. PHYS 305 “Computational Physics—From Statistics to Machine Learning” Physics Department, University of Arizona, Nov 2025
4. MATH 586A “Case Studies in Applied Mathematics—Math Used in Studying Black Holes” Math Department, University of Arizona, Sep 2024
3. ASTR 170B1 “The Physical Universe—Resolving the Galactic Center Black Hole with the Event Horizon Telescope” Astronomy Department, University of Arizona, Nov 2023
2. Special Lecture “Testing Gravity with Event Horizon Telescope” UNIR, Remote, Jul 2023
1. Numerical Analysis Course “GPU Computation” KTH, Stockholm, 2010

## Workshops

18. “Los Alamos-Arizona Days” Los Alamos National Lab & University of Arizona, 2025
17. “Numerical Astrophysics with PLUTO” Theoretical Astrophysics Program (TAP), University of Arizona, 2025
16. “Speeding Up Your Python Codes 1000×” Hack Arizona, University of Arizona, 2025
15. “AthenaK Workshop/Hackathon” Theoretical Astrophysics Program (TAP), University of Arizona, 2024
14. “Deep Learning for Astrophysics” Theoretical Astrophysics Program (TAP), University of Arizona, 2024
13. “PIRE Weather Data Busy Week” Black Hole PIRE Workshop, Georgia Institute of Technology, 2023
12. “Performing Large Scale Parameter Surveys with OSG Services” Black Hole PIRE Webinar Series, University of Arizona, 2022

11. "EHT Sgr A\* Theory Busyweek II" Event Horizon Telescope, University of Arizona, 2021
10. "EHT Data Analysis" Black Hole PIRE Webinar Series, University of Arizona, 2021
9. "EHT Sgr A\* Theory Busyweek I" Event Horizon Telescope, University of Arizona, 2020
8. "Astrophysics Empowered by the EHT" Black Hole PIRE Webinar Series, University of Arizona, 2020
7. "VLBI Data Series" Black Hole PIRE Webinar Series, University of Arizona, 2020
6. "Container Camp" CyVerse Workshop, University of Arizona, 2019
5. "PIRE Cloud Computing Busyweek" Black Hole PIRE Workshop, University of Arizona, 2019
4. "Cloud Computing" Black Hole PIRE Webinar Series, University of Arizona, 2019
3. "High-Performance Computing and Coordinating Global Observations" Black Hole PIRE Winter School, University of Arizona, 2018
2. "Learning Docker and Singularity" CyVerse AstroContainers Workshop, University of Arizona, 2018
1. "Docker and Jupyter for Reproducible Astronomy" Black Hole PIRE Hackathon, University of Arizona, 2018

## Presentations

### Keynote Speaker

4. "Imaging the Supermassive Black Hole at the Center of the M87 Galaxy: A Computation Perspective" IUPAP Conference on Computational Physics, Hong Kong, Jul 2019
3. "In the Shadow of the Black Hole" GitHub Satellite, Berlin, May 2019
2. "Bringing Black Holes into Focus: The Event Horizon Telescope's First Image" Tucson, Apr 2019
1. "GPU Computing: from PC & HPC to the Cloud & the Edge" Black Hole PIRE Launch, Tucson, Feb 2018

### Invited Speaker

17. "Revealing the Secrets of Sagittarius A\* with the Event Horizon Telescope" Mizzou Academy Science Team, Virtual, Sep 2025
16. "Multi-physics and Multi-scale Simulations of Accreting Supermassive Black Holes" Algorithms for Multiphysics Models in the Post-Moore's Law Era, Los Alamos, Jun 2025
15. "Testing Gravity and Astrophysical Models with EHT Observations" Testing Gravity 2025, Vancouver, Feb 2025
14. "Toward Scientific Discovery with AI: High-Order Learning and Out-of-Domain Generalization" Department of Computer Science Colloquium, Tucson, Nov 2024
13. "From Models of Neural Nets to AlphaFold Proteins" AI-Physics-Chemistry Nobel Jamboree, Tucson, Oct 2024
12. "Black Hole Astrophysics" COMPASS Workshop, Tucson, Aug 2024
11. "Black Hole Astrophysics" Program of Applied Math Orientation, Tucson, Aug 2024

10. "Scientific Discovery with AI: Unlocking the Secrets of the Universe" OpenAI Forum, San Francisco, Jul 2024
9. "Accretion Models Review and Outlook" Semi-analytic+ modeling of black hole accretion, IAS, Nov 2023
8. "There are still Innovations in General Relativistic Ray Tracing!" Princeton Gravity Initiative, Princeton, Oct 2023
7. "Decoding Black Hole Images—How OSG and Simulations Were Used to Understand Black Holes" Throughput Computing 2023, UW-Madison, Jul 2023
6. "Selected Future Science Cases for the EHT" BHI Colloquium, Harvard, Mar 2023
5. "First Sagittarius A\* Event Horizon Telescope Results: Testing Astrophysical Models of the Galactic Center Black Hole" AAS Meeting, Pasadena, Jun 2022
4. "Sagittarius A\*: the Supermassive Black Hole at our Galactic Centre" Hong Kong Space Museum, May 2022 (*Cantonese*)
3. "Resolving Black Holes with the Event Horizon Telescope" Tucson Amateur Astronomers Club, Apr 2022
2. "Capturing Black Holes in the Era of Distributed Resources and Expertise" Zoomtopia, San Jose, Oct 2019
1. "Imaging Event Horizons—A Journey Walked Together by Observers and Theorists" Shanghai Astronomical Observatory, Sep 2018

## Speaker

40. EHT Working Group Meetings, Virtual, 2017–current (*Organizer*)
39. "The Scientific Method in the AI Era?" Los Alamos-Arizona Days, Los Alamos, NM, Nov 2025 (*Organizer*)
38. "Scientific (Re)Discovery with AI" College of Science Forum, Tucson, Sep 2024
37. "Fast GRRT for Fitting Sgr A\*" The Event Horizon and Beyond—Celebrating 50 Years of Narayan, Boston, Jun 2024
36. "Unveiling the Mysteries of Sagittarius A\* with the Event Horizon Telescope" Public Lecture, Hong Kong Space Museum, Hong Kong, May 2024
35. "Magnetic Structure Around the Galactic Center Black Hole Sagittarius A\*" Seminar, HKUST Jockey Club Institute for Advanced Study, May 2024
34. "There are still Innovations in General Relativistic Ray Tracing!" Seminar, The University of Hong Kong, May 2024
33. "There are still Innovations in General Relativistic Ray Tracing!" Seminar, Chinese University of Hong Kong, May 2024
32. "Not Enough ML/AI in Astrophysics: a Case Study with Black Holes" RTG Showcase, Tucson, Apr 2024
31. "Cloud Data Processing for the Event Horizon Telescope" Astronomical Data Analysis Software & Systems XXXIII, Tucson, Nov 2023
30. "Rethink Adaptive Mesh: And Its Potential Applications in Organizing Data" HiPSCat Meeting, Remote, Oct 2023

29. "Variability Crisis: Are GRMHD too variable?" New Era of AGN Science with the Vera C. Rubin LSST, NRAO, Jul 2023
28. "100-year Start-up: from Black Hole Research to Medical Applications" Tsuen Wan Public Ho Chuen Yiu Memorial College, Hong Kong, Mar 2023
27. "Sparking Imaginations with Black Hole Images" 4th Shaw-IAU workshop, Nov 2022
26. "Resolving the Galactic Center Black Hole with the Event Horizon Telescope" Astrophysics Colloquium, UBC, Oct 2022
25. "Resolving the Galactic Center Black Hole with the Event Horizon Telescope" Cosmology Seminar, SFU, Oct 2022
24. "Resolving the Galactic Center Black Hole with the Event Horizon Telescope" Astronomy Seminar, UW, Oct 2022
23. "Resolving the Galactic Center Black Hole with the Event Horizon Telescope" Steward Observatory/NSF's NOIRLab Joint Colloquium, Tucson, Sep 2022
22. "Astrophysics Empowered by the EHT: Ray Tracing" Black Hole PIRE Webinar Series Session 3, Oct 2020
21. "Imaging the Supermassive Black Hole at the Center of the M87 Galaxy: A Data Analysis Perspective" UA-TRIPODS Seminar, Tucson, Oct 2019
20. "Imaging the Supermassive Black Hole at the Center of the M87 Galaxy" Public talk to visiting highschool students, Tucson, Dec 2019
19. "Imaging the Supermassive Black Hole at the Center of the M87 Galaxy" Public talk to visiting students from Korea, Tucson, Nov 2019
18. "Imaging the Supermassive Black Hole at the Center of the M87 Galaxy" Public talk to visiting students from Hong Kong, Tucson, Jul 2019 (*Organizer*)
17. "Recent Progress in General Relativistic Ray Tracing" Black Hole Initiative, Cambridge, Sep 2017
16. "GRay2: Improving General Relativistic Ray Tracing and Beyond" TCAN Collaboration Meeting, Tucson, Oct 2016
15. "Fast Variabilities in GRMHD Models of Sgr A\* and Their Implications for EHT Observations" International Astronomical Union Symposium 322, Australia, Jul 2016
14. "On MHD Turbulence and Angular Momentum Transport in Accretion Disk Boundary Layers" International Astronomical Union Symposium 294, Beijing, Aug 2012
13. "Astrophysics Code Comparison Workshop" NORDITA, Stockholm, Aug 2012 (*Organizer*)
12. "Condensates in Two Dimensional Turbulence" FrischFest: the Solar Course, the Chemic Force, and the Speeding Change of Water, Stockholm, Oct 2011
11. "The Pseudospectral Method: Recent Advances and Prospects, Part II" The Nature of Turbulence Workshop at KITP, Santa Barbara, Mar 2011
10. "Local Anisotropy in MHD Turbulence" RädlerFest:  $\alpha$  Effect and Beyond, Stockholm, Feb 2011
9. "High Order Numerical Methods on GPUs" Computational Physics with GPUs Conference, Lund, Nov 2010
8. "Lessons from Radiative and MHD Simulations for Supermassive Black Hole Growth" Aspen

- Winter Conference on Formation and Evolution of Black Holes, Aspen, Feb 2010
7. "What do Spectra Mean in MHD Turbulence?" Institute for Advanced Study Thursday Seminar, Princeton, May 2009
  6. "Plasma Astrophysics Meetings" Institute for Theory and Computation, Cambridge, 2009 (*Organizer*)
  5. "Generalized Shearing Boxes for Multi-Scale Studies of MHD Turbulence" Saturation and Transport Properties of MRI-driven Turbulence Conference at IAS, Princeton, Jun 2008
  4. "Saturation and Transport Properties of MRI-driven Turbulence" IAS, Princeton, Jun 2008 (*Organizer*)
  3. "Turbulence Generation in Magnetized Accretion Disks" Harvard-Smithsonian Center for Astrophysics PEOPLE Lecture, Cambridge, Dec 2007
  2. "Astrophysical Turbulence Meetings" Institute for Theory and Computation, Cambridge, 2007–2008 (*Organizer*)
  1. "Toward Realistic Accretion Disk Simulations" Los Alamos National Laboratory Theory Seminar, Los Alamos, Jul 2007

## Leadership and Service

### Review Panel

- 2021–current DOE INCITE Astrophysics Review Panel, U.S. Department of Energy
- 2020–current Internal Publication Committee, EHT Collaboration
- 2009–current Multiple astrophysics journals (Nature, ApJ, ApJL, MNRAS, PASJ, A&A, etc.)
- 2025 Travel Grants Committee of the Theoretical Astrophysics Program (TAP), University of Arizona
- 2024 Undergraduate Scholarships Committee, Steward Observatory, University of Arizona
- 2023–2024 Theory Postdoc Fellow Selection Committee, Steward Observatory, University of Arizona
- 2022–2024 Graduate Student Admission Committee, Steward Observatory, University of Arizona
- 2023 Research Prize Committee of the Theoretical Astrophysics Program (TAP), University of Arizona
- 2022 Early Career Award Committee, EHT Collaboration
- 2022 RII Research Development Grants, University of Arizona
- 2021 NASA Open Source Tools, Frameworks, and Libraries 2020 Review Panel, NASA
- 2020–2021 Theory Prize Committee, Steward Observatory, University of Arizona

### Leadership

- 2025–current Analysis Working Group, EHT Collaboration
- 2023–current Steering Committee of the Theoretical Astrophysics Program (TAP), University of Arizona

- 2022–current Math Olympiads for Elementary and Middle Schools, Dreams of Sunshine Institute (*Director*)
- 2021–current Computation and Data Initiative (CDI) of the Theoretical Astrophysics Program (TAP), University of Arizona
- 2021–current Advisory Committee of the Computer Support Group (CSG), Steward Observatory, University of Arizona
- 2020–current Black Hole Visualization Lab, University of Arizona (*Founder*)
- 2022–2025 Gravitational Physics Working Group, EHT Collaboration
- 2020–2025 Hong Kong Student Association, University of Arizona (*Advisor*)
- 2023–2024 Research Computing Governance Committee (RCGC), University of Arizona (*Vice-Chair*)
- 2018–2024 Software and Data Compatibility Working Group, EHT Collaboration
- 2023 Faculty Senate IT Committee, University of Arizona
- 2021–2022 Sgr A\* Theory Paper, EHT Collaboration
- 2020–2022 Science Council, EHT Collaboration (*Secretary*)

### **International Collaborations**

- 2022–current LSST Active Galactic Nucleus (AGN) Science Collaboration (*Associate Member*)
- 2017–current Event Horizon Telescope Collaboration

### **Governance**

- 2024–current AI Blueprint Factory, SGX3
- 2022–current Theory, Data, and Computation Group, Steward Observatory, University of Arizona
- 2021–current Research Computing Governance Committee (RCGC), University of Arizona
- 2024 Deep Drilling Field (DDF) Task Force, Rubin Survey Cadence Optimization Committee (SCOC)
- 2022–2024 Undergraduate Research Task Force, University of Arizona
- 2022–2023 High-Performance Computing Refresh Committee, University of Arizona
- 2022 Outreach Activity Planning, South by Southwest™
- 2018 Campus Data Visualization Services Committee, University of Arizona
- 2018 Home Coming Outreach, University of Arizona
- 2008–2009 Postdoc Council, Harvard-Smithsonian Center for Astrophysics

### **Organizer**

- 2025 “Los Alamos-Arizona Days” Workshop, Los Alamos National Lab & University of Arizona
- 2025 “Numerical Astrophysics with PLUTO” Workshop, Theoretical Astrophysics Program (TAP), University of Arizona
- 2025 Hong Kong Student and Teachers Visit, partnering with the Chinese University of Hong Kong (*Host*)
- 2025 “Hack Arizona”, University of Arizona (*Faculty Advisor*)

- 2024        “AthenaK Workshop/Hackathon”, Theoretical Astrophysics Program (TAP), University of Arizona
- 2024        “New Horizons at the interface between Computational Astrophysics and Big Data”  
2024 IAU Focus Meeting 7 (*Scientific Organizing Committee*)
- 2024        “Deep Learning for Astrophysics”, Theoretical Astrophysics Program (TAP), University of Arizona
- 2022        EHT Winter Collaboration Meeting, Virtual (*Chair, Scientific Organizing Committee*)
- 2022        “A Deep Look Into the Black Hole in the Center of the Milky Way”, Black Hole PIRE Webinar Series
- 2021        EHT 2021 U.S. Meeting, Tucson (*Scientific Organizing Committee*)
- 2021        EHT Sgr A\* Theory Busyweek II, Virtual
- 2020        EHT 2020 Winter Collaboration Meeting, Virtual (*Scientific Organizing Committee*)
- 2020        EHT Sgr A\* Theory Busyweek I, Virtual
- 2020        “Astrophysics Empowered by the EHT” Black Hole PIRE Webinar Series
- 2020        “VLBI Data Series” Black Hole PIRE Webinar Series
- 2019        “Cloud Computing” Black Hole PIRE Webinar Series
- 2019        PIRE Cloud Computing Busyweek
- 2019        Penguin AI Club Visit, University High School (*Host*)
- 2019        Hong Kong Student Visit, partnering with the Chinese University of Hong Kong (*Host*)
- 2019        “University Outreach—Einstein Chalk Art”, University of Arizona
- 2018        Black Hole PIRE Winter School on High-Performance Computing and Coordinating Global Observations
- 2018        “Learning Docker and Singularity” CyVerse AstroContainers Workshop
- 2018        “Docker and Jupyter for Reproducible Astronomy” PIRE Mini-Hackathon
- 2016        “Multi-Scale Plasma Flows Around Black Holes” TCAN Collaboration Meeting

## In the News

- 2025        “Astronomers Watched a Black Hole Unexpectedly Flip Its Magnetic Field, Challenging Theoretical Models” <https://www.smithsonianmag.com/smart-news/astronomers-watched-a-black-hole-unexpectedly-flip-its-magnetic-field-challenging-theoretical-models-180987397/>
- 2025        “This black hole flipped its magnetic field” <https://www.sciencenews.org/article/m87-black-hole-flipped-magnetic-field>
- 2025        “New images reveal clues about the feeding habits of black holes” <https://news.arizona.edu/news/new-images-reveal-clues-about-feeding-habits-black-holes>
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