

# WEI CHIEH (MASON) NG

Massachusetts Institute of Technology

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## EDUCATION

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**Massachusetts Institute of Technology (MIT)** Sep 2018 - May 2024 (Expected)

Ph.D. Candidate in Physics

Advisor: Professor Deepto Chakrabarty; GPA: 4.60/5.00

Thesis: Multifaceted Understanding of Accreting Neutron stars and their Environments

**The University of Auckland** 2017

Bachelor of Science (Honours) in Physics

Advisor: Professor Richard Easter; GPA: 8.63/9.00

Thesis: Inflationary Model Selection ft. Dark Matter in the CMB

**The University of Auckland** 2014 - 2016

Bachelor of Science

Majors: Physics and Mathematics; GPA: 8.74/9.00

## RESEARCH EXPERIENCE

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**Massachusetts Institute of Technology** Sep 2018 - present

*Graduate Research Assistant, Advisor: Prof. Deepto Chakrabarty*

X-ray pulsation searches, timing, spectroscopic, and polarimetric analyses of pulsars (NICER/NuSTAR/Chandra/IXPE/XMM-Newton/Swift/RXTE/AstroSat data)

**Australian National University** Feb 2018 - Jul 2018

*Graduate Research Assistant, Advisor: Prof. Martin Asplund*

Modeling stellar atmospheres in 3D with different magnetic field configurations and strengths

**Swinburne University of Technology** Dec 2017 - Feb 2018

*Summer Vacation Scholar, Advisors: Dr. Nikki Nielsen and Assoc. Prof. Glenn Kacprzak*

Kinematics of the OVI Circumgalactic Medium: Halo Mass Dependence and Outflow Signatures

**The University of Auckland** Feb 2017 - Nov 2017

*BSc (Honours) Student, Advisor: Prof. Richard Easter*

Inflationary Model Selection ft. Dark Matter in the CMB

**Australian National University** Nov 2016 - Feb 2017

*Summer Scholar, Advisors: Assoc. Prof. Christian Wolf and Dr. Christopher Onken*

Diagnosing poor seeing of the SkyMapper telescope

**The University of Auckland** Dec 2015 - Feb 2016

*Summer Research Scholar, Advisor: Assoc. Prof. Jan Jamie Eldridge*

Modelling the emergent spectra of hot, massive stars to update the Binary Population and Spectral Synthesis (BPASS) code

## PROFESSIONAL SERVICE

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**Referee**

2023 - now

*Journals: The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society***Graduate Student Member**

2021 - now

*IXPE Collaboration [Working Groups: Science Analysis and Simulations, Magnetars, and the Accreting White Dwarfs and Neutron Stars]***Graduate Student Member**

2019 - now

*NICER Science Team [Working Groups: Searches and Multiwavelength Coordination (from 2019), Bursts and Accretion Physics (from 2020), and Magnetars & Magnetospheres (from 2021)]***PUBLICATIONS**

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Also part of **38 Astronomer's Telegrams** and GCN Circulars (led 9 of them).First-author

- 5) **Mason Ng**, et al. 2023. *X-ray and Radio Monitoring of the Neutron Star Low Mass X-ray Binary 1A 1744-361*. In Review by ApJ. arXiv:2310.01511. DOI: 10.48550/arXiv.2310.01511
- 4) **Mason Ng**, et al. 2022. *Spectral Evolution of Ultraluminous X-ray Pulsar NGC 300 ULX-1*. ApJ, 940, 138. DOI: 10.3847/1538-4357/ac9965
- 3) Herman L. Marshall, **Mason Ng**, et al. (IXPE Collaboration + Norbert S. Schulz, Deepto Chakrabarty) 2022. *Observations of 4U 1626-67 with the Imaging X-ray Polarimetry Explorer*. ApJ, 940, 70. DOI: 10.3847/1538-4357/ac98c2
- 2) **Mason Ng**, Paul S. Ray, Peter Bult, Deepto Chakrabarty, et al. 2021. *NICER Discovery of Millisecond Pulsations and an Ultracompact Orbit in IGR J17494-3030*. ApJ, 908, L15. DOI: 10.3847/2041-8213/abe1b4
- 1) **M. Ng**, N.M. Nielsen, G.G. Kacprzak et al. 2019. *Kinematics of the OVI Circumgalactic Medium: Halo Mass Dependence and Outflow Signatures*. ApJ, 886, 66. DOI: 10.3847/1538-4357/ab48eb

Co-author

- 32) Birendra Chhotaray, et al. (6 co-authors including **Mason Ng**) 2024. *Long-term study of the first Galactic ultraluminous X-ray source Swift J0243.6+6124 using NICER*. Accepted. arXiv:2401.15058
- 31) Anna Bobrikova, et al. (24 Tier 1 co-authors including **Mason Ng**) 2024. *Discovery of a strong rotation of the X-ray polarization angle in the galactic burster GX 13+1*. Submitted. arXiv:2401.13058
- 30) Jeremy Heyl, et al. (10 Tier 1 co-authors including **Mason Ng**) 2024. *The detection of polarized x-ray emission from the magnetar 1E 2259+586*. MNRAS, 527, 12219. DOI: 10.1093/mnras/stad3680
- 29) Manoj Mandal, et al. (12 co-authors including **Mason Ng**) 2023. *Probing spectral and timing properties of the X-ray pulsar RX J0440.9+4431 in the giant outburst of 2022-2023*. MNRAS, 526, 771. DOI: 10.1093/mnras/stad2767
- 28) Roberto Turolla, et al. (15 Tier 1 co-authors including **Mason Ng**) 2023. *IXPE and XMM-Newton observations of the Soft Gamma Repeater SGR 1806-20*. ApJ, 954, 88. DOI: 10.3847/1538-4357/aced05
- 27) A. C. Albayati, et al. (12 co-authors including **M. Ng**) 2023. *Thermonuclear Type-I X-ray Bursts and Burst Oscillations from the Eclipsing AMXP Swift J1749.4-2807*. MNRAS, 524, 2477. DOI: 10.1093/mnras/stad1892

- 26) Christian Malacaria, et al. (19 Tier 1 co-authors including **Mason Ng**) 2023. *A polarimetric-oriented X-ray stare at the accreting pulsar EXO 2030+375*. A&A, 675, 29. DOI: 10.1051/0004-6361/202346581
- 25) G. K. Jaisawal, et al. (9 co-authors including **M. Ng**) 2023. *On the cyclotron absorption line and evidence of the spectral transition in SMC X-2 during 2022 giant outburst*. MNRAS, 521, 3951. DOI: 10.1093/mnras/stad781
- 24) Paul A. Draghis, et al. (9 co-authors including **Mason Ng**) 2023. *The Spin of a Newborn Black Hole: Swift J1728.9-3613*. ApJ, 947, 39. DOI: 10.3847/1538-4357/acc1c8
- 23) Mayura Balakrishnan, et al. (14 co-authors including **Mason Ng**) 2023. *The Black Hole Candidate Swift J1728.9-3613 and the Supernova Remnant G351.9-0.9*. ApJ, 947, 38. DOI: 10.3847/1538-4357/acc1c9
- 22) G. C. Mancuso, et al. (10 co-authors including **M. Ng**) 2023. *Detection of millihertz quasi-periodic oscillations in the low-mass X-ray binary 4U 1730–22 with NICER*. MNRAS, 521, 5616. DOI: 10.1093/mnras/stad949
- 21) Silvia Zane, et al. (26 Tier 1 co-authors including **Mason Ng**) 2023. *A strong X-ray polarization signal from the magnetar 1RXS J170849.0-400910*. ApJL, 944, 27. DOI: 10.3847/2041-8213/acb703
- 20) Giulia Illiano, et al. (21 co-authors including **Mason Ng**) 2022. *Timing analysis of the 2022 outburst of SAX J1808.4-3658: hints of an orbital shrinking*. ApJL, 942, 40. DOI: 10.3847/2041-8213/acad81
- 19) C. Malacaria, et al. (13 co-authors including **M. Ng**) 2022. *The unaltered pulsar: GRO J1750-27, a super-critical X-ray neutron star that does not blink an eye*. A&A, 669, 38. DOI: 10.1051/0004-6361/202245123
- 18) Sergey S. Tsygankov, et al. (17 Tier 1 co-authors including **Mason Ng**) 2022. *The X-ray polarimetry view of the accreting pulsar Cen X-3*. ApJL, 941, 14. DOI: 10.3847/2041-8213/aca486
- 17) Peter Bult, et al. (13 co-authors including **Mason Ng**) 2022. *The thermonuclear X-ray bursts of 4U 1730-22*. ApJ, 940, 81. DOI: 10.3847/1538-4357/ac9b26
- 16) Roberto Taverna, et al. (21 Tier 1 co-authors including **Mason Ng**) 2022. *Polarized x-rays from a magnetar*. Science, 378, 646. DOI: 10.1126/science.add0080
- 15) A. Sanna, et al. (14 co-authors including **M. Ng**) 2022. *MAXI J1957+032: a new accreting millisecond X-ray pulsar in an ultra-compact binary*. MNRAS, 516, L76. DOI: 10.1093/mnrasl/slac093
- 14) Peter Bult, et al. (17 co-authors including **Mason Ng**) 2022. *The Discovery of the 528.6 Hz Accreting Millisecond X-Ray Pulsar MAXI J1816-195*. ApJL, 935, 32. DOI: 10.3847/2041-8213/ac87f9
- 13) Tolga Guver, et al. (13 co-authors including **Mason Ng**) 2022. *Burst-Disk Interaction in 4U 1636-536 as observed by NICER*. ApJ, 935, 154. DOI: 10.3847/1538-4357/ac8106
- 12) A. Marino, et al. (20 co-authors including **M. Ng**) 2022. *Outflows and spectral evolution in the eclipsing AMXP SWIFT J1749.4-2807 with NICER, XMM-Newton and NuSTAR*. MNRAS, 515, 3838. DOI: 10.1093/mnras/stac2038
- 11) Kishalay De, et al. (26 co-authors including **Mason Ng**) 2022. *SRGA J181414.6-225604: A New Galactic Symbiotic X-Ray Binary Outburst Triggered by an Intense Mass-loss Episode of a Heavily Obscured Mira Variable*. ApJ, 935, 36. DOI: 10.3847/1538-4357/ac7c6e

- 10) A. Sanna, et al. (17 co-authors including **M. Ng**) 2022. *On the peculiar long-term orbital evolution of the eclipsing accreting millisecond X-ray pulsar SWIFT J1749.4-2807*. MNRAS, 514, 4385. DOI: 10.1093/mnras/stac1611
- 9) R. M. Ludlam, et al. (10 co-authors including **Mason Ng**) 2022. *Radius Constraints from Reflection Modeling of Cygnus X-2 with NuSTAR and NICER*. ApJ, 927, 112. DOI: 10.3847/1538-4357/ac5028
- 8) Pasham, D.R., et al. (18 co-authors including **Mason Ng**) 2021. *Evidence for a compact object in the aftermath of the extragalactic transient AT2018cow*. Nat Astron., 6, 249. DOI: 10.1038/s41550-021-01524-8
- 7) The LIGO Scientific Collaboration; the Virgo Collaboration; the KAGRA Collaboration (including **Mason Ng**) 2021. *Search for continuous gravitational waves from 20 accreting millisecond X-ray pulsars in O3 LIGO data*. Phys. Rev. D 105, 022002. DOI: 10.1103/PhysRevD.105.022002
- 6) Yuhao Yao, et al. (27 co-authors including **Mason Ng**) 2020. *A Comprehensive X-ray Report on AT2019wey*. ApJ, 920, 121. DOI: 10.3847/1538-4357/ac15f8
- 5) Teruaki Enoto, **Mason Ng** et al. 2021. *A Month of Monitoring the New Magnetar Swift J1555.2-5402 during an X-Ray Outburst..* ApJ, 920, L4. DOI: 10.3847/2041-8213/ac2665
- 4) D. J. K. Buisson, et al. (including **Mason Ng**) 2021. *Dips and eclipses in the X-ray binary Swift J1858.6-0814 observed with NICER*. MNRAS, 503, 5600. DOI: 10.1093/mnras/stab863
- 3) Peter Bult, et al. (including **Mason Ng**) 2021. *Long term coherent timing of the accreting millisecond pulsar IGR J17062-6143*. ApJ, 912, 120. DOI: 10.3847/1538-4357/abf13f
- 2) Peter Bult, et al. (12 co-authors including **Mason Ng**) 2020. *The X-ray bursts of XTE J1739-285: a NICER sample*. ApJ, 907, 79. DOI: 10.3847/1538-4357/abd54b
- 1) J.J. Eldridge, E.R. Stanway, et al. (7 co-authors including **M. Ng**) 2017. *Binary Population and Spectral Synthesis Version 2.1: construction, observational verification and new results*. PASA, 34, 58. DOI: 10.1017/pasa.2017.51

## ACCEPTED OBSERVING PROPOSALS AS PI

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<b>Chandra DDT Observation</b>	2023
<i>Tracking the Ne X Accretion Disk Line Emission of Ultracompact X-ray Binary 4U 1626-67 Across a Torque Reversal (60 ks).</i>	
<b>NuSTAR DDT Observations</b>	2023
<i>Monitoring the Pulse Profile and Spectroscopic Evolution Across the Latest Torque Reversal of 4U 1626-67 (90 ks).</i>	
<b>NICER (AO5)</b>	2023
<i>Detecting Millisecond X-ray Pulsations and Confirming the Ultracompact Nature of the Low Mass X-ray Binary 4U 1850-087 (20 ks)</i>	
<b>NICER (AO4)</b>	2022
<i>Time-Resolved Spectroscopic and Polarimetric Studies of 4U 1626-67 with NICER and IXPE (40 ks).</i>	
<b>Swift ToO Observations</b>	2022 - present
<i>Total of 7 ks over 2 sources</i>	
<b>NICER ToO Observations</b>	2021 - present
<i>Total of 377 ks over 10 sources</i>	

## PRESENTATIONS

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\* = Virtual

**Dissertation Talk - 243rd Meeting of the American Astronomical Society** Jan 2024  
*X-ray and Radio Monitoring of the Neutron Star Low Mass X-ray Binary 1A 1744-361: Quasi Periodic Oscillations, Transient Ejections, and a Disk Atmosphere*

**Special Astrophysics Seminar - McGill University** Dec 2023  
*Multifaceted Understanding of Accreting Neutron stars and their Environments: An X-ray Polarimetric Focus*

**Department Lunch Talk (Astronomy) - UC Berkeley** Nov 2023  
*Multifaceted Understanding of Accreting Neutron stars and their Environments: An X-ray Polarimetric Focus*

**Astronomy Tea Talk - Caltech** Nov 2023  
*Multifaceted Understanding of Accreting Neutron stars and their Environments: An X-ray Polarimetric Focus*

**KIPAC Tea Talk - Stanford University** Nov 2023  
*Understanding Neutron Star Geometry through the Lens of X-ray Polarization*

**Seminar - NASA Goddard Space Flight Center** Oct 2023  
*Probing the Accretion Geometry of Neutron Stars with X-ray Polarization*

**Seminar - U.S. Naval Research Laboratory** Oct 2023  
*Probing the Accretion Geometry of Neutron Stars with X-ray Polarization*

**Seminar - University of Michigan** Oct 2023  
*Probing the Accretion Geometry of Neutron Stars with X-ray Polarization*

**Poster - 20th Divisional Meeting of the High Energy Astrophysics Division** Mar 2023  
*Discovery of a 7.8 Hz QPO from the High-Intensity Outburst of Dipping NS LMXB 1A 1744-361*

**Poster - 20th Divisional Meeting of the High Energy Astrophysics Division** Mar 2023  
*IXPE Observations of the Pulsar 4U 1626-67*

**Contributed Talk - 241st Meeting of the American Astronomical Society** Jan 2023  
*IXPE Observations of the Pulsar 4U 1626-67*

**Seminar - Nanyang Technological University** Dec 2022  
*IXPE Observations of the Neutron Star Low-Mass X-ray Binary 4U 1626-67*

**Seminar - JAXA/ISAS** Nov 2022  
*IXPE Observations of the Neutron Star Low-Mass X-ray Binary 4U 1626-67*

**Seminar - Kyoto University** Nov 2022  
*IXPE Observations of the Neutron Star Low-Mass X-ray Binary 4U 1626-67*

**\*Contributed Talk - Astrophysical Polarimetry in the Time-Domain Era** Sep 2022  
*IXPE Observations of the Pulsar 4U 1626-67*

**Contributed Talk - COSPAR - Athens, Greece** Jul 2022  
*IXPE Observations of the Pulsar 4U 1626-67*

**Poster - 19th Divisional Meeting of the High Energy Astrophysics Division** Mar 2022  
*NICER Pulsation Search and Spectroscopy of the Original Black Widow Pulsar, PSR B1957+20*

<b>Poster - Celebrating 20 Years of Chandra Science Symposium</b> <i>Spectral Evolution of NGC 300 ULX-1</i>	Dec 2019
<b>Invited Talk - Auckland Astronomical Society</b> <i>Modelling the spectra of hot stars</i>	Aug 2016
<b>Talk - Royal Astronomical Society of New Zealand Conference</b> <i>Modelling the spectra of hot stars</i>	Apr 2016

## TECHNICAL SKILLS

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<b>Programming</b>	Python, HTML/CSS, IDL, L <sup>A</sup> T <sub>E</sub> X
<b>High Performance Computing</b>	OpenMP, MPI, Slurm

## HONORS & AWARDS

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Bruno Rossi Prize [shared], High Energy Astrophysics Division of the AAS, as a Member of the IXPE Science Team	2024
Bruno Rossi Prize [shared], High Energy Astrophysics Division of the AAS, as a Member of the NICER Science Team	2022
School of Science Service Fellowship ( <i>Massachusetts Institute of Technology</i> )	2022
Graduate Service Award, Physics Department ( <i>Massachusetts Institute of Technology</i> )	2021
Department of Physics Scholarship, 2017 ( <i>The University of Auckland</i> )	2016
University of Auckland Postgraduate Honours/PG Diploma Scholarships	2016
Joyce Mary Clark Scholarship ( <i>The University of Auckland</i> )	2016
First in Course Award (x6) ( <i>The University of Auckland</i> )	2014 - 2017
Scholarship ( <i>New Zealand Qualifications Authority</i> )	2014
The Trusts Charitable Foundation Scholarship ( <i>The Trusts Charitable Foundation</i> )	2013
Dux Litterarum ( <i>Lynfield College</i> )	2013

## RESEARCH SUPERVISION

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<b>Swati Ravi</b> <i>MIT first-year graduate student (co-supervised with Herman Marshall)</i>	Sep 2023 - present
<b>Claire McLellan-Cassivi</b> <i>MIT Undergraduate Research Student (co-supervised with Herman Marshall)</i>	Jun 2023 - Dec 2023

## TEACHING EXPERIENCE

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TA = Teaching Assistant	
<b>TA for (Graduate) Astrophysics I</b> <i>Department of Physics, Massachusetts Institute of Technology</i>	Spring 2021, Spring 2022
<b>TA for “Introduction to Astronomy” and “Modern Astrophysics”</b> <i>Department of Physics, Massachusetts Institute of Technology</i>	Spring 2020
<b>Marker (5 applied mathematics courses across all undergraduate levels)</b> <i>Department of Mathematics, The University of Auckland</i>	2015 - 2017

**TA (Physics) for Planets, Stars and Galaxies**  
*Department of Physics, The University of Auckland*

2015 - 2017

**TA for Advancing Physics I**  
*Department of Physics, The University of Auckland*

2015

## LEADERSHIP & POSITIONS

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**Vice-Chair** 2023 - 2024  
*Graduate Research and Development (GRAD) Coalition. Assisting the co-Chairs and members of the GRAD Caucus in the House of Representatives to present issues and concerns by graduate students and provide a platform to discuss possible legislative solutions. Successfully organized an in-person Congressional briefing in October 2023 on the topic of graduate advising/mentorship.*

**Graduate Student Member** 2020 - 2022  
*Graduate Admissions Committee, Department of Physics, MIT. Worked with the Graduate Admissions Chair to review prospective physics PhD applicants.*

**Co-Organizer** 2020 - 2022  
*Physics Graduate Application Assistance Program, Department of Physics, MIT. Co-led the establishment of mentoring-based physics PhD application assistance programs as well as virtual webinars. Successfully co-developed a proposal for funding graduate student mentors.*

**MIT Graduate Student Council External Affairs Board** 2019 - 2023  
*Vice-Chair (2022-2023), Development (2020-2022), Public Outreach (2019-2020). Led the groundwork for the annual MIT Research Slam (2020); led the writing and publishing of the monthly advocacy newsletter (2021-2023); led multiple in-person trips with 8 to 10-student teams to Washington D.C. to meet with Congressional offices to advocate for graduate student concerns. I have overseen the scheduling for over 100 Congressional offices and committees over two trips.*

**Committee Member (Graduate Student)** 2019 - present  
*MIT Open Space Programming Advisory Committee. Advising the Open Space Programming team on activities and programming for the Kendall Square Open Space by providing graduate student input and acting as a liaison.*

**MITvote Graduate Liaison** 2018 - present  
*MITvote. Developing and sending informational emails on voting in local, state, and federal elections during election seasons.*

**Volunteer Observer** 2018 - present  
*MIT Sidewalk Astrogazers. Have participated in over a dozen pop-up public astrogazing events so far and trained other students in operating the telescopes.*

**Executive Member** 2017  
*Science Students' Association. Introduced the annual Science Trivia, and worked with other executive members to obtain funding from the various departments for this new association.*

**President** 2015 - 2017  
*The Physics Association of The University of Auckland (PAUA). Introduced the annual Physics Careers Panel Discussion, organized monthly social gatherings ("Fluid Dynamics"), introductory Python workshops, and research seminars for undergraduate students.*

## OUTREACH AND PANELS

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<b>Physics Graduate Application/Admissions Information Session</b> <i>Speaker for a virtual presentation and Q&amp;A session (&gt; 45 attendees) for undergraduates of IISER Bhopal</i>	Jul 2023
<b>Physics Graduate Application/Admissions Information Session</b> <i>Speaker for an in-person presentation and Q&amp;A session (&gt; 15 attendees) for undergraduates of the Nanyang Technological University in Singapore</i>	Dec 2022
<b>Physics Graduate Applications Panel for Cenca Bridge</b> <i>Panelist for a live virtual webinar (&gt; 5 attendees) to talk about the graduate admissions process. This panel was particularly for the Central American-Caribbean Bridge in Astrophysics students</i>	Apr 2022
<b>PhysGAAP Webinar for Prospective Applicants</b> <i>Panelist for a live virtual webinar (&gt;90 attendees) to talk about the graduate admissions process</i>	Dec 2021
<b>International Graduate School Panel</b> <i>Panelist for a live virtual webinar (&gt;10 attendees) to talk about international opportunities for graduate school to current undergraduate students in New Zealand</i>	Nov 2021
<b>PGSC Career Panel</b> <i>In-person panelist on a career panel (&gt; 20 attendees); spoke about physics graduate admissions</i>	Nov 2021
<b>Site 4 Art Kits &amp; Stargazing Program</b> <i>In-person presentation to two dozen graduate students and their family from all backgrounds about neutron stars</i>	Nov 2021
<b>Discord Panel for Physics/Astro Graduate School Applicants</b> <i>Panelist for a live virtual panel (&gt; 20 attendees); spoke about physics graduate admissions</i>	Oct 2021
<b>PhysGAAP Webinar for Prospective Applicants</b> <i>Panelist for a live virtual webinar (&gt;140 attendees) to talk about the graduate admissions process</i>	Sep 2021
<b>Physics Information Session for MSRP Students</b> <i>Panelist for a live virtual panel (&gt;20 attendees) to talk about the graduate school</i>	Jul 2021
<b>Graduate Admissions Panel for MIT SPS</b> <i>Panelist for a live virtual panel (&gt;20 attendees) to talk about the graduate admissions</i>	May 2021
<b>Graduate School Panel for UPRM</b> <i>Panelist for a live virtual panel (&gt;20 attendees) to talk about the graduate admissions</i>	Sep 2020