

# Cigole Thomas

Curriculum vitae

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Department of Mathematics,  
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## Education

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2018 - 2022 (Expected)    Ph.D. Student in Mathematics | George Mason University, Virginia  
Advisor: Prof. Sean Lawton  
2016 - 2018                MS in Mathematics | George Mason University, Fairfax, Virginia  
2010 - 2015                Integrated BS - MS in Mathematics |  
Indian Institute of Science Education and Research Mohali (IISER), India

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## Research Interests

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Algebraic Geometry | Arithmetic Dynamics on Character Varieties  
Mathematics Education | Data Learning using Algebraic Varieties

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## Research Experience

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Summer 2018 - Present    **PhD Thesis Research**  
Advisor: Prof. Sean Lawton  
Topic: *Stratification and Arithmetic Dynamics on Character Varieties*

Aug 2020 - Dec 2020    **Graduate Research Assistant**  
Industrial Immersion Program (IIP), George Mason University  
Topic: *Algebraic Varieties and Neural Networks*  
Advisor: Prof. Sean Lawton

June 2019 - May 2020    **Graduate Research Assistant**  
NSF - Improving Undergraduate STEM Education (IUSE) project  
George Mason University (GMU), Fairfax, VA  
Supervisors: Dr. Robert Sachs and Dr. Jill Nelson

Aug 2018 - Aug 2019    **Graduate Research Assistant**  
Industrial Immersion Program (IIP), George Mason University  
Topic: *Learning Algebraic Varieties*  
Advisor: Prof. Sean Lawton and Dr. Jeff Byers (Naval Research Academy)

Spring 2016 - Fall 2018    **Graduate Student Intern**  
Mason Experimental Geometry Lab (MEGL), GMU  
Advisor: Prof. Sean Lawton  
Project: *Arithmetic Dynamics of Moduli Spaces*

June 2015 - August 2015    **Graduate Student Intern**  
Research Experience for Graduate Student (REGS) by GEAR at MEGL  
Advisor: Dr. Christopher Manon  
Project: *'Experiments with Characteristic Varieties'*

May 2014 - May 2015    **MS Thesis Research**  
Indian Institute of Science Education and Research Mohali, India  
Advisor: Dr. Krishnendu Gongopadhyay  
Topic: *Decomposition of complex hyperbolic isometries by involutions.*

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## Teaching Experience

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Summer 2022	<b>Instructor of Record</b> (Upcoming)	Math 203 Linear Algebra
Fall 2020	<b>Graduate Learning Assistant</b> (Online)	Math 621 Graduate Algebra
Spring 2020	<b>Graduate Teaching Assistant</b> (Online for second half of semester)	Math 114 Analytic Geometry and Calculus II
Fall 2019	<b>Graduate Teaching Assistant</b>	Math 114
Summer 2019	<b>Instructor of Record</b>	Math 113 Analytic Geometry and Calculus I
Summer 2018	<b>Instructor of Record</b>	Math 125 Discrete Mathematics I
Spring 2018	<b>Graduate Teaching Assistant</b>	Math 113
Fall 2017	<b>Graduate Teaching Assistant</b>	Math 114
Summer 2017	<b>Instructor of Record</b>	Math 108 Introductory Calculus with Business Applications
Spring 2017	<b>Graduate Teaching Assistant</b>	Math 114
Fall 2016	<b>Graduate Teaching Assistant</b>	Math 114
Summer 2016	<b>Instructor of Record</b>	Math 108
Spring 2016	<b>Graduate Teaching Assistant</b>	Math 114

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## Active Learning Experience

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- Teaching - NSF - Improving Undergraduate STEM Education (IUSE) project at GMU
  - Graduate Research Assistant : June 2019 - May 2020 . Duties include:
    - \* Developing Inquiry Based Learning (IBL) worksheets to promote group work and discussion among students for Calculus 1 and Calculus 2.
    - \* Co-organizing biweekly Teaching Seminar to discuss the challenges and progress of the implementation of IBL worksheets in recitations.
    - \* Coordinating other teaching assistants involved in IUSE project.
- Ran problem sessions using active learning for Graduate Algebra course in Fall 2020 as a Learning Assistant.
- Developed IBL worksheets for Graduate Algebra Course based on problems for the Graduate Preliminary Examination.

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## Preprints and Publications

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- (1) C. Thomas. *Transitivity and Asymptotic Transitivity on finite field points of  $SL_3(\mathbb{F}_q)$  character varieties of  $F_r$* . (In preparation)
- (2) J. Jauch, H. Klaw, L. Nguyen, R.G. Rebecca, E. Sander, P. Seshaiyer and C. Thomas. *Graduate Learning Assistants in the Mathematical Sciences: A new approach to core graduate classes* (Submitted).
- (3) RG Rebecca, H. Klaw, C. Thomas, L. Nguyen, J. Jauch, P. Seshaiyer and E. Sander. *ON DEMAND: Graduate Assistants supporting active learning in graduate classrooms*. Innovations in Teaching and Learning Conference Proceedings Volume 13, 2 September 2021.
- (4) Broeckelman-Post, M; Fernandez, L; Polk, T; Hwang, J; Thomas, C; Stewart, B; Tuckerman, S; Hassell-Goodman, S; Taylor, S; Nordin, K; Brophy, N; Hingle, A; Staudt, E RC. *WORKSHOP: [For GTAs] Engaging Students and Giving Feedback as a GTA*. Innovations in Teaching & Learning Conference Proceedings Vol. 12 (2020).

- (5) G. Gongopadhyay and C.Thomas. *Decomposition of complex hyperbolic isometries by involutions*.  
Linear Algebra and its Applications Volume 500, 1 July 2016, Pages 63-76.  
DOI: <https://doi.org/10.1016/j.laa.2016.03.011>

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## Awards and Fellowships

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Spring 2022	<b>Dissertation Completion Grant</b> Instituted by Office of Provost, George Mason University (GMU)
Aug 2021 - Dec 2022 & Aug 2018 - Aug 2019	<b>Industrial Immersion Program (IIP) Fellowship</b> Funded by George Mason University's Provost Graduate Education Office
Summer 2021 & Summer 2020	<b>Summer Research Fellowship</b> Instituted by Office of Provost, GMU
Spring 2021	<b>Doctoral Research Scholars Fellowship</b> Instituted by Office of Provost, GMU
Aug 2019 - May 2020	<b>Graduate Research Assistant</b> for the project, NSF-IUSE (Improving Undergraduate STEM Education) at GMU
May 2018	<b>T.C. Lim Award for Excellence in Teaching</b> Awarded by Department of Mathematics, GMU.
May 2016	<b>INSPIRE Fellowship for PhD</b> instituted by Department of Science and Technology, Government of India (Not availed)
July 2015 - August 2015	<b>Research Experience for Graduate Student (REGS)</b> By GEometric Structures And Representation Varieties (GEAR)
August 2010 - May 2015	<b>INSPIRE - SHE Fellowship</b> (Roll No: 259S/2010) Instituted by Department of Science and Technology (DST), Government of India
June 2012 - August 2012	<b>Undergraduate Summer Fellowship</b> INnovation in Science Pursuit for Inspired REsearch (INSPIRE), DST India Location: National Centre for Biological Sciences (NCBS), India

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## Presentations and Talks

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April 2022	<b>AMS Contributed Paper Session on Algebraic and Arithmetic Geometry and Commutative Algebra, JMM</b> (Virtual) <i>Dynamics of the Outer Automorphism Group Action on Certain Character Varieties over finite fields.</i> (Upcoming)
April 2022	Poster session of <b>AWM Special Session on Women in Geometry, JMM</b> (Virtual) <i>Dynamics of Outer Automorphism group action on <math>SL_2(\mathbb{F}_q)</math>-Character Variety of <math>\mathbb{Z}^r</math>.</i> (Upcoming)
April 2022	<b>Combinatorics, Algebra and Geometry Seminar, GMU</b> (Invited) <i>Arithmetic Dynamics on Character Varieties</i>
March 2022	<b>Student Research Talks, GMU</b> <i>Stratification and Arithmetic Dynamics on Character Varieties</i>
March 2022	The <b>Three Minute Thesis (3MT)</b> , GMU <i>Motion of Points on Varieties</i>
February 2022	<b>IISER Math Alumni Talk</b> (Virtual) <i>Dynamics of Group Action on Character Varieties</i> Indian Institute of Science Education and Research Mohali, India
January 2022	<b>Student Research Talks, IIP Presentations, George Mason University</b> <i>Varieties in Data Learning</i>
November 2021	<b>Binghamton University Graduate Conference in Algebra and Topology (BUGCAT) 2021</b> (Virtual) <i>Asymptotic Transitivity of Outer Automorphism Group Action on Character Varieties over Finite Fields.</i>
November 2021	<b>Student Research Talks, George Mason University (GMU)</b>

October 2021	<i>Asymptotic Transitivity of Dynamics on Character Varieties</i> (Upcoming) The <b>3rd JNU-KAIST Geometry Topology Fair</b> , (Virtual) Talk 1: <i>An Introduction to Character Varieties</i> Talk 2: <i>Dynamics of the outer automorphism group action on finite field points of character varieties</i> (Invited)
September 2021	<b>Innovations in Teaching and Learning Conference (ITL)</b> , GMU On-Demand Video Session <i>Graduate Assistants Supporting Active Learning in Graduate Classrooms</i> (co-presenter with Hannah Klawns and Long Nyguen.)
March 2021	The <b>Three Minute Thesis (3MT)</b> , GMU <i>Dynamics of Mapping Class Group Action on Character Varieties</i>
December 2020	<b>IIP Talks</b> , George Mason University <i>Algebraic Varieties and Neural Networks.</i>
November 2020	<b>Binghamton University Graduate Conference in Algebra and Topology, BUGCAT 2020</b> (Virtual) <i>Conjugacy classes of polystable unimodular commuting matrices over finite fields</i>
September 2020	<b>Innovations in Teaching and Learning (ITL) Conference</b> , GMU (Virtual) Panelist for ‘ <i>Engaging Students and Giving Feedback as a GTA</i> ’(Invited)
July 2020	<b>Geometry Labs United</b> , ICERM Brown. <i>A Glimpse into a MEGL Project</i> (Virtual).
March 2020	<b>Topology Seminar</b> , George Washington University (Invited) <i>The Character Varieties of Torus knots.</i>
Spring 2018	<b>Student Research Talks</b> , George Mason University <i>An Introduction to Character Varieties.</i>
Spring 2018	<b>Topology Seminar</b> , George Washington University (Invited) <i>On <math>SL(2, \mathbb{C})</math> Character Varieties.</i>
Fall 2016	<b>Student Research Talks</b> , George Mason University <i>Decomposition of Complex Hyperbolic Isometries by Involution.</i>
Summer 2015 - Fall 2018	<b>MEGL Symposium</b> , George Mason University Talks and Poster Presentations as part of Mason Experimental Geometry Lab Research Team (jointly with undergraduate students)

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### Travel Grants and Funded Conferences

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- April 2022: *AWM Funding* to present a poster at AWM Poster Session, JMM
- January 2022: *AMS Grad Student Travel Grant* to attend JMM, 2022.
- January 2022: *GMU Graduate Student Travel Grant* to present at JMM 2022.(Didn’t avail)
- July 2021: Funding to attend Mathematical Congress of America organized by Mathematical Association of America
- July 2021: *Motivic Homotopy*, Park City Advanced Mathematics Institute 2021 Graduate Summer School (PCMI 2021)
- March 2019: *Workshop on the Geometry and Physics of Higgs bundles IV*, Simons Center for Geometry and Physics (SCGP)
- May 2019: *Current trends on spectral data for Higgs bundles V*, Simons Center for Geometry and Physics (SCGP)
- June 2018: *RTG Workshop on the Geometry and Physics of Higgs bundles III* , University of Illinois at Chicago (UIC)
- November 2017: *RTG Workshop on the Geometry and Physics of Higgs bundles II*, University of Illinois at Chicago
- January 2017: AMS-MRC funding to attend Joint Mathematical Meetings, Atlanta

- October 2016: *Workshop on the Geometry and Physics of Higgs bundles I*, University of Illinois at Chicago
- June 2016: *Character Varieties: Experiments and New Frontiers* as part of the AMS: Mathematics Research Committees - 2016, Snowbird, Utah
- October 2015: *Topology and Groups*, Goa University, India
- August 2015: Selected with funding for poster presentation at *Advanced School and Workshop on Geometry of Discrete Actions*, International Centre for Theoretical Physics, Trieste, Italy (Didn't attend)
- December 2014: ATM Workshop on *Lattices: Geometry and Dynamics*, IISER Mohali, India
- December 2014: *International Workshop of Geometry and Analysis on Hyperbolic Geometry*, Delhi University, India

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## Professional Services and Outreach

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### 1. Diversity, Equity and Inclusion

- **Committee Member:** Spring 2021, Spring 2022  
Graduate student representative in the *GMU College of Science Diversity, Equity and Inclusion subcommittee for Graduate Student Recruitment, Retention, and Degree Attainment* to outline and propose a plan to support undergraduates, graduate students, faculty and staff who have been historically marginalized in STEM fields (Spring 2021).
- Part of the *Association for Women in Mathematics (National Chapter)* group of *Capitol Hill Visit* in November 2018. The purpose of the visit was to engage in discussions with legislators/legislative staffers advocating for Women in STEM. See [Article 16](#), '[Advocating for STEM: A Capitol Idea!](#)' from AWM Newsletter for details of this visit.

### 2. Reviewer

- Reviewer for Innovations in Teaching and Learning (ITL) conference proposals at GMU
- Reviewer for Spring 2020 Mason Core Assessment: Natural Sciences

### 3. Teaching

- Talked about *Character Varieties and Torus Knots* as a one day substitute instructor for the graduate course 'Geometric Group Theory' in Spring 2020.

### 4. Professional Organizations

- **Association for Women In Mathematics (GMU Chapter)**
  - \* Vice President: 2020 - 2022 , 2016 - 2017  
Duties include helping organize the events sponsored by AWM
  - \* President: 2018 - 2020
  - \* Treasurer: 2017 - 2018  
Duties include securing grants/funds from GMU for events organized/sponsored by AWM
- Society for Industrial and Applied Mathematics (SIAM) National Chapter : Member
- Women of Color in STEM (GMU Chapter) : Member
- American Mathematical Society (AMS) National Chapter : Member
- Association for Women in Mathematics (AWM) National Chapter : Member
- Mathematical Association of America (MAA)

### 5. Mentoring and Outreach

- August 2020 - May 2022: Mentor for three incoming PhD students as part of the peer mentor program instituted by Department of Mathematics at GMU

- Spring 2018 - Spring 2022 : Met with prospective graduate students
- Spring 2018 : Assisted the new graduate student orientation
- **Mason Experimental Geometry Lab (MEGL)**
  - Graduate Lab Manager : Spring 2019, Fall 2019, Spring 2020
  - Volunteer for MEGL Outreach at Elementary, Middle and High Schools including the Nifty Fifty Event Feb 2019
  - Graduate student mentor for research team of undergraduates in Summer 2015, Spring 2016, Fall 2016, Summer 2016, Spring 2017, Fall 2017 and Spring 2018
  - Graduate Student Intern : Summer 2015 and Spring 2016 - Fall 2018
- **Mathematics Outreach**
  - April 2021 : Member of the panel discussion as part of the virtual outreach session organized by ‘*Math Initiatives in Nepal*’ as part of Kovalsky day in Nepal
  - Spring 2017 and Spring 2018: Co-organizer of outreach events for girl students from Highschool in (as Vice president and Treasurer of AWM)
  - Volunteer for multiple outreach activities organized by MEGL at elementary, middle, high schools and library including the Nifty-Fifty event at the Department of Homeland Security for S&T/CWMD Kids day
  - Spring 2016 and Spring 2018: Volunteer at the SIAM booth at USA Science and Engineering Festival
  - Spring 2017: Volunteer as Crowd counter for National Math Festival
  - Feb 2017, Feb 2018 and Feb 2019: Grader for MATHCOUNTS

## 6. Seminars and Conferences Organized

- Chair : **AMS Contributed Paper Session on Algebraic and Arithmetic Geometry and Commutative Algebra, JMM 2022** (Virtual)
- Co-organizer : **AWM/IIP Talk** at GMU by Dr. Anne Costolanki on ‘*Navigating a technical career as a woman in STEM*’- Nov 2021. (Virtual)
- Organizer : **AWM Young Mathematician Talk** at GMU - April 2021 (Virtual)
- **StReeTs(Student Research Talks) Seminar Series at GMU**
  - Organizer - Fall 2018
  - Co-organizer - Spring 2019, Fall 2019, Spring 2020
- Conference Organization
  - Volunteer for **East Coast Optimization Meeting (ECOM)** 2019 and ECOM 2020. Duties included securing partial funding from GMU and helping out with organization
  - Co-organizer for one day workshop on ‘**Professional Development Event**’ at GMU in March 2017 in the capacity as the Vice President of AWM
  - Assistant to Organizers for **Mathematics Research Communities (MRC)** conference on *Character Varieties: Experiments and New Frontiers* by AMS in June 2011
  - Volunteer for **Advanced Training in Mathematics Workshop** on *Lattices: Geometry and Dynamics* at IISER Mohali, India in December 2014

## 7. Disability Services

- Reader for Office of Disability Services: Duties include recording chapters of books for Homological Algebra, Equivariant K-Theory, Category Theory and Introduction to Algebraic Geometry

## 8. Organizing Social Events at GMU

- Spring 2022: Co-organized **Lunch with AWM**, Duties include securing funding and coordinating the event. (Upcoming)
- Spring 2019 and Spring 2020(Virtual) : Co-organized **AWM Social**, Secured funding.
- Fall 2019 and Fall 2017 : Co-organized **AWM Math Hike**
- Fall 2017, Fall 2018, , Fall 2019, Fall 2020 (Virtual), Fall 2021: Co-organized **AWM Hot Chocolate Event**  
Duties included securing funding and coordinating the event.
- Fall 2019: Helped in coordinating **Departmental Tea/Coffee Time** organized by Department of Mathematical Sciences, GMU.
- Spring 2019: Co-organize **AWM Potluck and movie night** for graduate students.