

# Cigole Thomas

Curriculum vitae

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Department of Mathematics,  
Colorado State University,  
Fort Collins, Colorado.

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## Work Experience

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| August 2022 - Present     | Postdoctoral Fellow, Colorado State University<br>Mentor: Prof. Rachel Pries |
| Spring 2016 - Summer 2022 | Graduate Teaching Assistant, Graduate Lecturer<br>George Mason University    |

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## Education

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| 2018 - 2022 | Ph.D. in Mathematics   George Mason University, Virginia<br>Advisor: Prof. Sean Lawton                          |
| 2016 - 2018 | MS in Mathematics   George Mason University, Fairfax, Virginia  |
| 2010 - 2015 | Integrated BS - MS in Mathematics  <br>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   | <b>PhD Thesis Research</b><br>Advisor: Prof. Sean Lawton<br>Topic: <i>Stratification and Arithmetic Dynamics on Character Varieties</i>   |
| Aug 2020 - Dec 2020     | <b>Graduate Research Assistant</b><br>Industrial Immersion Program (IIP), George Mason University<br>Topic: <i>Algebraic Varieties and Neural Networks</i><br>Advisor: Prof. Sean Lawton                                  |
| Aug 2018 - Aug 2019     | <b>Graduate Research Assistant</b><br>Industrial Immersion Program (IIP), George Mason University<br>Topic: <i>Learning Algebraic Varieties</i><br>Advisor: Prof. Sean Lawton and Dr. Jeff Byers (Naval Research Academy) |
| Spring 2016 - Fall 2018 | <b>Graduate Student Intern</b><br>Mason Experimental Geometry Lab (MEGL), GMU<br>Advisor: Prof. Sean Lawton<br>Project: <i>Arithmetic Dynamics of Moduli Spaces</i>   |
| June 2015 - August 2015 | <b>Graduate Student Intern</b><br>Research Experience for Graduate Student (REGS) by GEAR at MEGL<br>Advisor: Dr. Christopher Manon<br>Project: <i>'Experiments with Characteristic Varieties'</i>                        |
| May 2014 - May 2015     | <b>MS Thesis Research</b><br>Indian Institute of Science Education and Research Mohali, India<br>Advisor: Dr. Krishnendu Gongopadhyay<br>Topic: <i>Decomposition of complex hyperbolic isometries by involutions.</i>     |

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## Teaching Experience

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| Fall 2020   | <b>Graduate Learning Assistant</b><br>(Online)                             | Math 621<br>Graduate Algebra                                 |
| Spring 2020 | <b>Graduate Teaching Assistant</b><br>(Online for second half of semester) | Math 114<br>Analytic Geometry and Calculus II                |
| Fall 2019   | <b>Graduate Teaching Assistant</b>   | Math 114   |
| Summer 2019 | <b>Graduate Student Lecturer</b>   | Math 113<br>Analytic Geometry and Calculus I                 |
| Summer 2018 | <b>Instructor of Record</b>  | Math 125<br>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<br>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 seminars 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 type 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 *Groups of free-type and transitivity on the set of epimorphisms* (In preparation).
- (2) C. Thomas. *Transitivity and Asymptotic Transitivity on finite field points of  $SL_3(\mathbb{F}_q)$ -character varieties of  $\mathbb{Z}^r$*  (In preparation).
- (3) J. Jauchen, H. Klawns, 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).
- (4) RG Rebecca, H. Klawns, C. Thomas, L. Nguyen, J. Jauchen, 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.
- (5) 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).
- (6) 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>Clarke Family Award for Excellence in Analysis, Algebra or Topology</b> , George Mason University  |
| Spring 2022                                  | <b>Dissertation Completion Grant</b><br>Instituted by Office of Provost, George Mason University (GMU)  |
| Aug 2021 - Dec 2022 &<br>Aug 2018 - Aug 2019 | <b>Industrial Immersion Program (IIP) Fellowship</b><br>Funded by George Mason University's Provost Graduate Education Office   |
| Summer 2021 &<br>Summer 2020                 | <b>Summer Research Fellowship</b><br>Instituted by Office of Provost, GMU   |
| Spring 2021                                  | <b>Doctoral Research Scholars Fellowship</b><br>Instituted by Office of Provost, GMU  |
| Aug 2019 - May 2020                          | <b>Graduate Research Assistant</b> for the project,<br>NSF-IUSE (Improving Undergraduate STEM Education) at GMU   |
| May 2018                                     | <b>T.C. Lim Award for Excellence in Teaching</b><br>Awarded by Department of Mathematics, GMU.  |
| May 2016                                     | <b>INSPIRE Fellowship for PhD</b> instituted by<br>Department of Science and Technology, Government of India (Not availed)  |
| July 2015 - August 2015                      | <b>Research Experience for Graduate Student (REGS)</b><br>By GEometric Structures And Representation Varieties (GEAR)   |
| August 2010 - May 2015                       | <b>INSPIRE - SHE Fellowship</b> (Roll No: 259S/2010)<br>Instituted by Department of Science and Technology (DST), Government of India   |
| June 2012 - August 2012                      | <b>Undergraduate Summer Fellowship</b><br>INnovation in Science Pursuit for Inspired REsearch (INSPIRE), DST India<br>Location: National Centre for Biological Sciences (NCBS), India |

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## Presentations and Talks

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

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

- 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.