Michael Ion

Curriculum Vitae

Postdoctoral Research Fellow
School of Information
University of Michigan
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Research interests: natural language processing, machine learning, conversational data analysis, educational data science, generative AI evaluation.

Teaching areas: data science, machine learning, natural language processing, statistical computing (R, Python), applied statistics, probability.

Education

2024 Ph.D. Mathematics Education, University of Michigan, Ann Arbor, MI.

Thesis: Beyond the Classroom: Exploring Mathematics Engagement in Online Communities with Natural Language Processing

Chair: Deborah Ball; *Committee:* David Jurgens, Christopher Quintana, Ying Xu

2015 M.S. Mathematics, California Polytechnic State University, San Luis Obispo, CA.

2013 B.S. Mathematics, California Polytechnic State University, San Luis Obispo, CA.

Academic Appointments

2025–present Lecturer, Statistics Department, California Polytechnic State University, San Luis Obispo, CA.

2024–present Postdoctoral Research Fellow, School of Information, University of Michigan, Ann Arbor, MI.

2016–2017 Lecturer, Mathematics Department, California Polytechnic State University, San Luis Obispo, CA.

Teaching

California Polytechnic State University, Instructor of Record

Fall 2025	Statistical Inference for Management I (STAT251)
Summer 2017	Calculus for Life Sciences (MATH161)
Spring 2017, Winter 2015, Fall 2014	Precalculus (MATH118)
Spring 2015, Spring 2014	Calculus for Business & Economics (MATH221)

Uplimit (formerly CoRise), Teaching Assistant

September–October 2023	Fine-Tuning Large Language Models
May–June 2023, Aug.–Sept. 2023	Prompt Design and Building AI Products
June–July 2023	Building AI Products with OpenAI
May–June 2023	Python for Data Science
April–May 2023	R for Data Science

Johns Hopkins Center for Talented Youth, Lead Instructor

Summer 2019 (Hong Kong), Summer 2018 (Seattle) Paradoxes and Infinities

University of Michigan, Graduate Student Instructor

Fall 2019, Fall 2018 Introduction to Quantitative Methods (EDUC793)

Stanford University, Residential Counselor/Teaching Assistant

Summer 2011, Summer 2012 Pre-Collegiate Studies Program: Educational support for gifted middle school students in mathematics

California Polytechnic State University, Workshop Facilitator

2011–2013 Peer instruction for Calculus I, II, and III workshops

Publications & Presentations

† denotes undergraduate student coauthor; * indicates presenter

Submitted

1. Asthana, S., Banovic, N., **Ion, M.**, Collins-Thompson, K. (Under Review). Understanding the Challenges and Opportunities for Responsible AI use in Prerequisite Skill Assessments For Interdisciplinary Graduate Programs. Submitted to *ACM Conference on Human Factors in Computing Systems (CHI) 2026.*
2. **Ion, M.**, Collins-Thompson, K. (Under Review). MathMentorDB: A Massive Dataset of Authentic Online Mathematics Tutoring Dialogues. Submitted to *Language Resources and Evaluation Conference (LREC-COLING) 2026.*
3. **Ion, M.**, McDonough, A. (Under Review). Chip-Firing and the Sandpile Group of the R_{10} Matroid. Submitted to *FPSAC 2026* (Formal Power Series and Algebraic Combinatorics). [preprint]

In Preparation

4. **Ion, M.**, Collins-Thompson, K. Measuring What Matters: A Scenario-Driven, Multidimensional Framework for Evaluating LLM Tutors. *Frontiers in Artificial Intelligence* (invited paper).
5. **Ion, M.**, Ball, D.L. Teaching and Learning in the Age of Generative AI: Understanding the Human Work of Instruction. *For the Learning of Mathematics*.

Peer-Reviewed Journal Articles

6. Herbst, P., Brown, A.M., **Ion, M.**, Margolis, C. (2023). Teaching Geometry for Secondary Teachers: What are the Tensions Instructors Need to Manage? *International Journal of Research in Undergraduate Mathematics Education*. [paper]
7. Gere, A., Godfrey, J., Griffin, M., **Ion, M.**, Limlamai, N., Moos, A., Van Zanen, K. (2023). Alumni Perspectives on General Education: How Writing Can Increase What We Know. *Journal of General Education, 70*(1-2), 149-175. [paper]

Peer-Reviewed Conference Proceedings

8. **Ion, M.**, Asthana, S., Jiao, F.†, Wang, T.†, Collins-Thompson, K. (2025). Adaptive Knowledge Assessment in Simulated Coding Interviews. *Proceedings of Machine Learning Research 273:260–262, iRAISE Workshop at AAAI 2025.* Philadelphia, PA. [paper]
9. **Ion, M.**, Herbst, P., Ko, I., Hetrick, C. (2023). Agreeing on objectives of geometry for teachers' courses: Feedback from instructors on an initial list. *Psychology of Mathematics Education, North America Annual Conference*. Reno, NV. [paper]
10. Brown, A., Herbst, P., **Ion, M.** (2023). How Instructors of Undergraduate Mathematics Courses Manage Tensions Related to Teaching Courses for Teachers. *Psychology of Mathematics Education, North America Annual Conference*. Reno, NV. [paper]
11. Boyce, S., An, T., Pyzdrowski, L., Oppong-Wadie, K., **Ion, M.**, St. Goar, J. (2023). Learning from Lesson Study in the College Geometry Classroom. *25th Annual Conference on Research in Undergraduate Mathematics Education*. Omaha, NE. [paper]
12. Hetrick, C., Herbst, P., **Ion, M.**, Brown, A. (2023). Building Instructional Capacity Across Difference: Analyzing Transdisciplinary Discourse in a Faculty Learning Community focused on Geometry for Teachers Courses. *25th Annual Conference on Research in Undergraduate Mathematics Education*. Omaha, NE. [paper]
13. Hetrick, C., Herbst, P.G., Brown, A.M., **Ion, M.** (2023). Contention and Coalescence in Mathematical Knowledge: Undergraduate Geometry Instructors' Cooperative Design of Student Learning Objectives. *American Educational Research Association*. San Diego, CA. [paper]
14. **Ion, M.**, Herbst, P. (2022). Conceptions of the Derivative: A Natural Language Processing Approach. *Research in Undergraduate Mathematics Education Conference*. Boston, MA. [paper]
15. Margolis, C., **Ion, M.**, Herbst, P., Milewski, A., Shultz, M. (2020). Understanding instructional capacity for high school geometry as a systemic problem through stakeholder interviews. *Psychology of Mathematics Education, North America*. Mexico. [paper]
16. Bardelli, E., **Ion, M.**, Ko, I., Herbst, P. (2020). Who Benefits from Mathematics Courses for Teachers? An Analysis of MKT-G Growth During Geometry for Teachers Courses. *American Education Research Association*. San Francisco, CA. [paper]

17. **Ion, M.**, Herbst, P., Margolis, C., Milewski, A., Ko, I. (2019). Developing Practical Measures To Support the Improvement of Geometry for Teachers Courses. *Psychology of Mathematics Education, North America Annual Conference*. St. Louis, MO. [paper]
18. Milewski, A., **Ion, M.**, Herbst, P., Shultz, M., Ko, I., Bleecker, H. (2019). Tensions in Teaching Mathematics to Future Teachers: Understanding the Practice of Undergraduate Mathematics Instructors. *American Education Research Association Conference*. Toronto, Canada. [paper]
19. Herbst, P., Milewski, A., **Ion, M.**, Bleecker, H. (2018). What Influences Do Instructors of the Geometry for Teachers Course Need to Contend With? *Psychology of Mathematics Education, North America*. Greenville, SC. [paper]

Edited Book Chapters

20. An, T., Boyce, S., Brown, A., Buchbinder, O., Cohen, S., Dumitrascu, D., Escuadro, H., Herbst, P., **Ion, M.**, Krupa, E., Miller, N., Pyzdrowski, L., Sears, R., St. Goar, J., Szydlik, S., Vestal, S. (2024). (Toward) Essential student learning objectives for teaching geometry to pre-service secondary teachers. *The AMTE Handbook of Mathematics Teacher Education: Reflection on Past, Present and Future – Paving the Way for the Future of Mathematics Teacher Education*, 175-197. [chapter]

Non-Peer-Reviewed Articles

21. **Ion, M.**, Herbst, P. (2021). A Contribution to Stewarding the SLOs: Developing SLO Assessment Items and Examining Item Responses. *GeT: The News!, 3*(1). [article]
22. Herbst, P., **Ion, M.** (2021). A Deeper Dive into an SLO Item: Examining Students' Ways of Reasoning about Relationships between Euclidean and Non-Euclidean Geometries. *GeT: The News!, 3*(1). [article]
23. Boyce, S., **Ion, M.**, Lai, Y., McLeod, K., Pyzdrowski, L., Sears, R., St. Goar, J. (2021). Best-Laid Co-Plans for a Lesson on Creating a Mathematical Definition. *AMS Blogs: On Teaching and Learning Mathematics*. [article]
24. **Ion, M.** (2020). Using natural language processing techniques to classify mathematics teachers' responses to representations of practice. *Medium*. [article]

Presentations

Invited

1. **Ion, M.*** (2025). Text-as-Data in Mathematics Education: Harnessing LLMs to Analyze Student Conversations at Scale. *AMS Special Session on SoTL: Connecting Generative AI and Scholarly Inquiry to Improve Teaching and Learning, Joint Mathematics Meeting (JMM)*. Seattle, WA. [session]
2. **Ion, M.*** (2024). Use of LLMs and Langchain to Extract Insights about Mathematics Conversations at Scale. Guest lecture, *SIADS 676: Applications of Generative AI*, University of Michigan.
3. **Ion, M.*** (2023). New Directions in Education Research: Harnessing Text-as-Data Methods. San Diego State University, CA.

Conferences

4. **Ion, M.***, Light, M., Collins-Thompson, K. (2025). Bayesian Hierarchical Modeling of Large-Scale Math Tutoring Dialogues. *Joint Statistical Meetings*, Nashville, TN, August 2-7, 2025. [session]
5. **Ion, M.*** (2023). New Directions in Education Research: Harnessing Text-as-Data Methods. *Educational Studies Graduate Student Brown Bag Series*, University of Michigan, Ann Arbor, MI.
6. Paulson, A.*, Godfrey, J., **Ion, M.** (2023). Writing Across the Curriculum: a Case Study in Text as Data Methods for Postsecondary Education Policy Research. Denver, CO.
7. Godfrey, J.*, Paulson, A., **Ion, M.** (2023). What Are the Common Contexts for College Writing? *Conference on College Composition and Communication Annual Convention*. Chicago, IL.
8. Paulson, A.*, **Ion, M.**, Godfrey, J. (2022). Writing Across the Curriculum: a Text as Data Approach. *Causal Inference in Education Research Seminar (CIERS)*. Ann Arbor, MI.
9. Paulson, A., Bardelli, E.*, Godfrey, J., **Ion, M.**, Frisby, M. (2022). Who Follows Placement Recommendations? Differential Effects of Non-binding Placement Recommendations on Students' Course-taking Decisions. *American Education Research Association*. San Diego, CA.
10. **Ion, M.***, Margolis, C. (2019). Sources of Justification for College Geometry Instructional Actions. *Graduate Student Community Organization Graduate Student Conference*. Ann Arbor, MI.
11. Milewski, A., Herbst, P.*, **Ion, M.**, Bleecker, H. (2019). What do we know about courses in Geometry for Secondary Teachers? *Joint Mathematics Meetings*. Baltimore, MD.
12. **Ion, M.*** (2018). Characterizing University Geometry Courses: An Interview-Based Approach. *Graduate Student Community Organization Graduate Student Conference*. Ann Arbor, MI.

Posters

13. Boyce, B.*, **Ion, M.** (2023). Geometry Students' Ways of Thinking About Adinkra Symbols. Poster presentation, *Psychology of Mathematics Education, North America Annual Conference*. Reno, NV.
14. Wang, T.†*, **Ion, M.**, Asthana, S., Jiao, F.†, Collins-Thompson, K. (2025). The Fidelity of LLM Classifiers in Analyzing Mathematics Teaching and Learning Conversations. Poster presentation, *Undergraduate Research Opportunity Program (UROP) Symposium*. Ann Arbor, MI. Blue Ribbon Outstanding Presenter Award.
15. Danai, A.†*, Quimper Osores, A.†*, **Ion, M.**, Herbst, P. (2023). Analysis of Citation Networks of Submitted Manuscripts in Mathematics Education. Poster presentation, *Undergraduate Research Opportunity Program (UROP) Symposium*. Ann Arbor, MI. Blue Ribbon Outstanding Presenter Award.
16. Beckemeyer, R.†*, Brown, A., **Ion, M.**, Spiteri, A.†, Herbst, P. (2022). How Experience and Knowledge Affect the Breaching Patterns of Secondary Mathematics Teachers. Poster presentation, *Undergraduate Research Opportunity Program (UROP) Symposium*. Ann Arbor, MI. Blue Ribbon Outstanding Presenter Award.
17. Ko, I.*, **Ion, M.**, Herbst, P. (2022). Comparing the Mathematical Knowledge for Teaching Geometry of Preservice and Inservice Secondary Teachers. Poster presentation, *24th Annual Conference on Research in Undergraduate Mathematics Education*. Boston, MA.

[poster]

18. **Ion, M.*** (2022). Studying Conceptions of the Derivative at Scale: A Machine Learning Approach. Poster presentation, *45th Conference of the International Group for the Psychology of Mathematics Education*. Alicante, Spain. [poster]
19. Berzina Pitcher, I.*, **Ion, M.**, An, T., Brown, A., Buchbinder, O., Herbst, P., Hetrick, C., Miller, N., Prasad, P., Pyzdrowski, L., St. Goar, J., Sears, R., Szydlik, S., Oshkosh, Vestal, S. (2022). Learning and Participating in Scholarship of Teaching and Learning through a Faculty Online Learning Community. Poster presentation, *American Education Research Association*. San Diego, CA. [paper]
20. Herbst, P. G.*, Milewski, A. M., **Ion, M.**, Ko, I. (2021). Preparing Teachers for Secondary Geometry: Helping Shape the Geometry Course for Teachers. Poster presentation, *National Council of Teachers of Mathematics*. Virtual.
21. Herbst, P.*, Stevens, I., Milewski, A., **Ion, M.**, Ko, I. (2020). State of Undergraduate Geometry Courses for Secondary Teachers: Curriculum, Instructional Practices, and Student Achievement. Poster presentation, *Joint Mathematics Meeting*. Denver, CO.
22. Milewski, A.*, Herbst, P., **Ion, M.**, Bleecker, H. (2019). Preparing Teachers for Secondary Geometry: Understanding the Tensions in Teaching Undergraduate Mathematics Courses for Future Teachers. Poster presentation, *Association of Mathematics Teacher Educators Annual Conference*. Orlando, FL.
23. **Ion, M.***, Bardelli, E., Herbst, P. (2018). Learning About the Norms of Teaching Practice: How Can Machine Learning Help Analyze Teachers' Reactions to Scenarios? Poster presentation, *Michigan Institute for Data Science Annual Symposium*. Ann Arbor, MI. Awarded 'Most Likely Scientific Impact'. [poster]

Students

Graduate Student Mentees, University of Michigan

2025–present Megan Pouncy, M.S. Applied Data Science

2024–2025 Michael Light, M.S. Applied Data Science
(now Research Assistant, School of Information)

2024–2025 Sumit Asthana, Ph.D. Computer Science and Engineering
(now at Microsoft Research)

UROP Mentees, University of Michigan

2025–present Esther Tirat-Gefen, Mathematics

2024–2025 Fengquan Jiao, Computer Science

2024–2025 Tianyi Wang, Computer Science

2022–2023 Andre Quimper Osores, Computer Science

2022–2023 Amirali Danai, Computer Science

2021–2022 Robert Beckemeyer, Mathematics

2021–2022 Andrew Spiteri, Pre-Medicine

Grants & Fellowships

Grants

2025 Co-PI, Learning Through Technical Interviews: Combining Data Science Mentorship with AI-Powered Practice. Academic Innovation Fund, University of Michigan. $12,435.

2023 ES Mini Grant, School of Education, University of Michigan. $1,100.

2022 School of Education Travel Grant, School of Education, University of Michigan.

2021 Educational Studies Summer Grant, University of Michigan. $2,500.

2019 Educational Studies Summer Grant, University of Michigan. $5,000.

Fellowships

2023 Candidacy Tuition Fellowship, University of Michigan. (One semester funding)

2017–2021 School of Education Scholar Award, University of Michigan. (Full funding for four years)

Grant Proposals (Not Funded)

Senior Personnel & Co-Author, Instructor-centered Holistic Modeling of Student Engagement and Progress in Data Science, submitted to NSF 23-624: Research on Innovative Technologies for Enhanced Learning (RITEL). PI: K. Collins-Thompson; Co-PIs: S. Oney, C. Brooks. $750,000.

Senior Personnel and Co-Author, Test Beds for Higher Education, submitted to NSF 24-111: Planning Grants to Create Artificial Intelligence (AI)-Ready Test Beds. PI: K. Collins-Thompson; Co-PI: C. Brooks. $100,000.

Research Experience

2017–2024 **Graduate Research Assistant**, GRIP Lab, University of Michigan, Ann Arbor, MI
Lead graduate student researcher for the Geometry for Teachers (GeT) Support Project, NSF IUSE Grant #1725837 ($2.3M). PI: P. Herbst. Organized and led weekly working groups with university geometry instructors across the U.S. Developed and distributed psychometric instruments to measure student growth in mathematical knowledge for teaching geometry. Conducted large-scale surveys of instructors and students, and performed conversation analysis of community interactions.

2022–2023 **Editorial Assistant (Statistical Consultant)**, Journal for Research in Mathematics Education (JRME). Supervisor: P. Herbst.
Provided statistical consulting for manuscripts under review. Reviewed and validated statistical analyses, psychometric instruments, and quantitative methods. Wrote technical feedback for decision letters on statistical methodology and analysis quality.

2020–2022 **Research Assistant**, College and Beyond II Project (Mellon Grant), University of Michigan, Ann Arbor, MI. PI: A. Gere.
Analyzed longitudinal student writing data using text-as-data methods. Applied psychometrics and structural equation modeling (SEM) to link survey results across thousands of student responses.

Summer 2013 **Undergraduate Research Assistant**, California Polytechnic State University, San Luis Obispo, CA. Advisor: B. Richert.
Investigated Stanley's conjecture on partitionability of pure simplicial complexes. Demonstrated conjecture holds for all dimension 2 pure simplicial complexes on ≤ 6 vertices.

Service

Reviews

Journals

- Investigations in Mathematics Learning
- Journal of Engineering Education
- Journal for Research in Mathematics Education

Conferences

- Psychology of Mathematics Education (PME-NA)
- Research in Undergraduate Mathematics Education (RUME)
- Geometry Teacher (GeT) Support Conference
- University of Michigan Graduate Student Conference (GSCO)

Professional Memberships

2024–present American Statistical Association (ASA)

2017–2024 American Educational Research Association (AERA)

2017–2020 Association of Mathematics Teacher Educators (AMTE)

Outreach Activities

2015–2016 United States Peace Corps Volunteer, Hukuntsi, Botswana

2014 Alternatives to Violence Project, California Men's Colony, San Luis Obispo, CA

Professional Development Provided

2018 Herbst, P., Milewski, A., Boileau, N., **Ion, M.** Integrating Geogebra into High School Geometry. 3-Day Workshop in Ann Arbor Public Schools.

Professional Training

2018–2022 Statistics and Machine Learning Reading Group

2021 AERA-ICPSR Workshop

2019 Deep Learning Workshop, Google

2018 Deep Neural Networks with Keras/Tensorflow Workshop

2018 Big Data Camp

2018 Machine Learning for Social Scientists Workshop

Honors & Awards

University of Michigan

2023 UROP Mentor Nominee, Undergraduate Research Opportunity Program

2022 Rackham Debt Management Award, University of Michigan. $15,000.

2021 Harold and Vivian Shapiro/John Malik/Jean Forrest Award, University of Michigan. $2,000.

2021 Jones-Payne-Coxford Award for excellent scholarly achievement based on preliminary examination paper

2018 Most Likely Transformative Science Impact Award, Michigan Institute for Data Science Annual Symposium. $100.

California Polytechnic State University

2015 Outstanding Teaching Associate Award. $500.

2014 Marie Porter Lehman Math Educator Scholarship. $1,500.

2013 Bryant Russell Memorial Award. $1,500.

2012 Volmar A. and Viola I. Folsom Scholarship. $800.

2011 Ralph M. Warten Memorial Scholarship. $1,200.

2010 George H. McMeen Scholarship. $1,000.