

Contact Information

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Academic Positions

Assistant Professor

Texas A&M University, August 2018 – Present.
(On leave at MSU 2018–2019).

NSF Mathematical Sciences Postdoctoral Research Fellow

Michigan State University, June 2017 – May 2019.

NSF Mathematical Sciences Postdoctoral Research Fellow

Washington University in St. Louis, June 2016 – May 2017.

Hale Postdoctoral Fellow

Georgia Institute of Technology, School of Mathematics, August 2014 – May 2016.

Education

2008 - 2014	PhD	Mathematics	Louisiana State University
2008 - 2010	MS	Mathematics	Louisiana State University
2004 - 2008	BS	Mathematics	Louisiana State University (Summa cum Laude)

Publications

- Irina Holmes Fay, Guillermo Rey, Kristina Ana Škreb, *Sharp restricted weak-type estimates for sparse operators*, 2024, Submitted. [arXiv:2403.06751](https://arxiv.org/abs/2403.06751)
- Irina Holmes Fay, Alexander Volberg, *Borderline estimates for weighted singular operators and concavity*, Harmonic Analysis and Convexity, edited by Alexander Koldobsky and Alexander Volberg, Berlin, Boston: De Gruyter, 2023, pp. V-VI. <https://doi.org/10.1515/9783110775389-toc>
- Valentia Fragkiadaki, Irina Holmes Fay, *Paraproducts, Bloom BMO and Sparse BMO Functions*, Revista Matematica Iberoamericana (2022). [arXiv:2201.06530](https://arxiv.org/abs/2201.06530)
- Nicola Arcozzi, Irina Holmes, Pavel Mozolyako, and Alexander Volberg, *Bi-parameter embedding and measures with restriction energy condition*, Mathematische Annalen, **377**, 643 – 674 (2020). [arXiv:1811.00978](https://arxiv.org/abs/1811.00978)
- Irina Holmes, Paata Ivanisvili, and Alexander Volberg, *The Sharp Constant in the Weak (1,1) Inequality for the Square Function: A New Proof*, Revista Matematica Iberoamericana, vol. 36, no. 3, 2020, p. 741+. [arXiv:1710.01346](https://arxiv.org/abs/1710.01346)
- Nicola Arcozzi, Irina Holmes, Pavel Mozolyako, and Alexander Volberg, *Bellman function sitting on a tree*, International Mathematics Research Notices, rnz224, <https://doi.org/10.1093/imrn/rnz224>, [arXiv:1809.03397](https://arxiv.org/abs/1809.03397)
- Irina Holmes and Alexander Volberg, *Obstacle problems generated by the estimates of square function*, [arXiv:1809.06469](https://arxiv.org/abs/1809.06469) Proceedings of the conference “Geometric Aspects of Harmonic Analysis” (Cortona, 25-29 June 2018), series Springer INdAM
- Irina Holmes, Stefanie Petermichl, and Brett D. Wick, *Weighted little bmo and two-weight inequalities for Journé commutators*, Analysis & PDE, Volume 11, No 7, 2018. [arXiv:1701.06526](https://arxiv.org/abs/1701.06526)
- Xuan Thinh Duong, Irina Holmes, Ji Li, Brett D. Wick, and Dongyong Yang, *Two weight Commutators in the Dirichlet and Neumann Laplacian settings*, Journal of Functional Analysis, Vol. 276, Number 4, 2019. [arXiv:1705.06858](https://arxiv.org/abs/1705.06858)

- Irina Holmes, Robert Rahm, and Scott Spencer, *Two-Weight Inequalities for Commutators with Fractional Integral Operators*, *Studia Math*, Volume 233, Number 3, 2016. [arXiv:1510.05331](#)
- Irina Holmes and Brett D. Wick, *Two Weight Inequalities for Iterated Commutators with Calderón-Zygmund Operators*, *Journal of Operator Theory*, Vol. 79, No. 1, 2018. [arXiv:1509.03769](#).
- Irina Holmes, Michael T. Lacey, and Brett D. Wick, *Commutators in the Two-Weight Setting*, *Mathematische Annalen*, Volume 367, Issue 1–2, 2017. [arXiv:1506.05747](#)
- Irina Holmes, Michael T. Lacey, and Brett D. Wick, *Bloom's Inequality: Commutators in a Two-Weight Setting*, *Archiv der Mathematik*, Volume 106, Issue 1, 2016. [arXiv:1505.07947](#)
- Irina Holmes, Georgios Psaromiligkos, and Alexander Volberg, *A comparison of box and Carleson conditions on bi-trees*, [arXiv:1903.02478](#) [Preprint]
- Irina Holmes and Ambar N. Sengupta, *The Gaussian Radon Transform in Classical Wiener Space*, *Communications on Stochastic Analysis*, Volume 8, Number 2, 2014. [CoSA](#)
- Irina Holmes and Ambar N. Sengupta, *The Gaussian Radon Transform and Machine Learning*, *Infinite Dimensional Analysis, Quantum Probability and Related Topics*, Volume 18, No. 3, 2015. [arXiv:1310.4794](#)
- Irina Holmes, *An Inversion Formula for the Gaussian Radon Transform for Banach Spaces*, *Infinite Dimensional Analysis, Quantum Probability and Related Topics*, Volume 16, No. 4, 2013. [arXiv:1308.1392](#)
- Irina Holmes and Ambar N. Sengupta, *A Gaussian Radon transform for Banach spaces*, *Journal of Functional Analysis*, Volume 263, Issue 11, 2012. [arXiv:1208.5743](#)
- Horst R. Beyer and Irina Holmes, *On a new symmetry of the solutions of the wave equation in the background of a Kerr black hole*, *Classical and Quantum Gravity*, Vol. 25, No. 13, 2008. [arXiv:gr-qc/0607070](#).
- Irina Holmes, *On a Problem in the Stability Discussion of Rotating Black Holes*, *Proceedings of the National Conference for Undergraduate Research*, 2006.
- Irina Holmes, Sergei Treil, and Alexander Volberg, *Dyadic bi-parameter repeated commutator and dyadic product BMO*, Preprint. [arXiv:2101.00763](#)
- Irina Holmes, Sergei Treil, and Alexander Volberg, *Dyadic bi-parameter simple commutator and dyadic little BMO*, Preprint. [arXiv:2012.05376](#)

Funding

- ▷ (PI) NSF DMS-2246985 – “Sparseness and Bellman Functions in Harmonic Analysis” 2023 – 2026; \$307,181.
- ▷ (PI) Simons Foundation – Mathematics and Physical Sciences-Collaboration Grants for Mathematicians; “Inequalities in Harmonic Analysis and Multi-Parameter Analysis” 2021–2026; \$42,000.
- ▷ (co-PI) NSF DMS-1900844 “Workshop in Analysis and Probability” – co-PI with David Kerr (PI), Bill Johnson and Eviatar Procaccia; 2019–2022; \$174,000.
- ▷ (PI) NSF Mathematical Sciences Postdoctoral Research Fellowship Award No. 1606270 (June 2016 – May 2018, \$150,000)
- ▷ (PI) AMS-Simons Travel Grant (July 1, 2015 – June 30, 2017; \$4,000)

Teaching

<i>MATH 491 - Undergraduate Research</i>	TAMU, Spring 2024
<i>MATH 409H - Advanced Calculus – Honors (Section 200)</i>	TAMU, Spring 2024
<i>MATH 172 - Calculus II (Sections 501, 502)</i>	TAMU, Fall 2023
<i>MATH 172H - Calculus II Honors (Section 200)</i>	TAMU, Spring 2023
<i>MATH 409 - Advanced Calculus (Section 503)</i>	TAMU, Spring 2023
<i>MATH 689 - Special Topics, Dyadic Harmonic Analysis (Section 604)</i>	TAMU, Spring 2022
<i>MATH 308 - Differential Equations (Section 501)</i>	TAMU, Spring 2022
<i>MATH 308 - Differential Equations (Sections 506, 507)</i>	TAMU, Fall 2020
<i>MATH 172 - Calculus II (Sections 501, 502)</i>	TAMU, Fall 2019
<i>MTH 132 - Calculus I (Section 43)</i>	MSU, Fall 2018
<i>MTH 133 - Calculus II (Section 60: AP)</i>	MSU, Fall 2017
<i>MATH 2551 - Calculus III (Sections L1 – L3)</i>	Georgia Tech, Spring 2016
<i>MATH 2552 - Differential Equations (Sections F1 – F4; L1 – L4)</i>	Georgia Tech, Fall 2015
<i>MATH 2401 - Calculus III (Sections K1 – K3)</i>	Georgia Tech, Spring 2015
<i>MATH 2401 - Calculus III (Sections D1 – D3)</i>	Georgia Tech, Fall 2014
<i>MATH 1552 - Calculus II (Section 18)</i>	LSU, Fall 2012
<i>MATH 1550 - Calculus I (Section 21)</i>	LSU, Fall 2011
<i>MATH 1550 - Calculus I (Section 30)</i>	LSU, Fall 2010
<i>MATH 1022 - Trigonometry (Sections 4, 13)</i>	LSU, Spring 2010
<i>MATH 1021 - College Algebra (Sections 14, 33)</i>	LSU, Fall 2009

Mentoring

- ▷ Undergraduate Research: Samuel Hernandez, Jennifer Mackenzie, Shivam Aggarwal (Texas A&M University); Spring 2024.
- ▷ PhD student: Valentia Fragkiadaki (Texas A&M University); August 2020 - Present.

Invited Talks

University of New Mexico Analysis Seminar;
April 17, 2024; University of New Mexico; Albuquerque, NM.

University of Florida Annual AWM Colloquium;
April 15, 2024; University of Florida; Gainesville, FL.

Houston Analysis Seminar;
April 5, 2024; University of Houston; Houston, TX.

UWY Analysis Seminar;
November 3, 2023; University of Wyoming; Laramie, WY.

Fisk Distinguished Speaker and Colloquium Series;
November 2, 2023; University of Wyoming; Laramie, WY.

Potential Theory Workshop: Intersections in Harmonic Analysis, Partial Differential Equations and Probability;
September 28–October 6, 2023; CIMAT; Guanajuato, Mexico.

Baylor Analysis Seminar;
September 20, 2023; Baylor University; Waco, TX.

Conference in honor of S. Treil and A. Volberg;
June 6–8, 2023; Universität Würzburg; Würzburg, Germany.

Irina Holmes Fay

13th AIMS Conference;

May 31 – June 4, 2023; UNC Wilmington; Wilmington, NC.

2023 AMS Spring Central Sectional Meeting;

April 15–16, 2023; University of Cincinnati, Cincinnati, OH.

2023 AMS Spring Southeastern Sectional Meeting;

March 18–19, 2023; Georgia Tech; Atlanta, GA.

ICERM Semester Program Seminar;

October 7, 2022; ICERM; Providence, RI.

AMS Spring Central Virtual Sectional Meeting, AMS Special Session on A Women in Analysis Research Network Event (via ZOOM);

March 26, 2022.

AMS Fall Southeastern Sectional Meeting; Special Session Harmonic Analysis and Spectral Theory (via ZOOM);

November 20, 2021.

OARS Online Analysis Research Seminar (via ZOOM);

October 11, 2021.

8th European Congress of Mathematics: Minisymposium in Harmonic Analysis – via Zoom;

June 20–26, 2021; CRM; Slovenia.

Corona Seminar (via ZOOM);

June 3, 2021.

SEAM 2021 (plenary speaker; via ZOOM);

March 13–14, 2021.

Colloquium at UNM (via ZOOM);

October 27, 2020; University of New Mexico, Albuquerque, NM.

Concentration Week: Bellman Function Methods for the Hamming Cube (Organizer, Speaker);

(via ZOOM) August 3-7, 2020; Texas A & M University; College Station, TX.

Harmonic Analysis conference in honor of Michael Lacey's 60th birthday – postponed due to coronavirus;

May 25 – 29, 2020; CRM; Barcelona, Spain.

Rainwater Seminar – postponed due to coronavirus;

April 14, 2020; University of Washington; Seattle, WA.

Johns Hopkins Analysis Seminar – postponed due to coronavirus;

April 6, 2020; Johns Hopkins University; Baltimore, MD.

SEAM 2020 (plenary speaker) – canceled due to coronavirus;

March 13 – 15, 2020; Old Dominion University; Norfolk, VA.

Brazos Analysis Seminar;

November 9 – 10, 2019; Baylor University; Waco, TX.

The 40th International Conference on Quantum Probability and Infinite Dimensional Analysis, in honor of Leonard Gross;

August 11 – 16, 2019; The Ohio State University; Columbus, OH.

Analysis and PDE seminar;

April 11, 2019; Purdue University, West Lafayette, IN.

Caltech/UCLA joint analysis seminar;
April 5; Caltech; Pasadena, CA.

Geometric and Harmonic Analysis - Mini-course;
March 28 – 30, 2019; University of Connecticut; Storrs, CT.

Analysis Seminar;
October 17, 2018; Michigan State University; East Lansing, MI.

Workshop in Fourier Analysis;
May 16 – 18, 2018; University of Wisconsin-Madison; Madison, WI.

Analysis Day 2018;
April 28–29, 2018; University of Michigan–Dearborn; Dearborn, MI.

Analysis Seminar at University of Toulouse;
April 9, 2018; Institut de Mathématiques de Toulouse, Toulouse, France.

Analysis Seminar;
March 5, 2018; Brown University; Providence, RI.

Job Talk/Colloquium;
December 15, 2017; Texas A&M University; College Station, TX.

Nonsmooth Analysis: a Workshop for Postdocs;
November 9 – 11, 2017; University of Connecticut; Storrs, CT.

Midwestern Workshop on Asymptotic Analysis;
October 6 – 8, 2017; Indiana University – Purdue University Indianapolis; Indianapolis, IN.

Colloquium – Kent State Math;
September 14, 2017; Kent State University; Kent, OH.

SUMIRFAS 2017;
July 21 – 23, 2017; Texas A&M University; College Station, TX.

Analysis Seminar – UConn;
April 14, 2017; University of Connecticut; Storrs, CT.

MSRI Workshop – Connections for Women: Harmonic Analysis;
January 19 – 20, 2017; MSRI; Berkeley, CA.

Joint Mathematics Meetings of the AMS; AMS Special Session on Operator Theory, Function Theory, and Models; January 4 – 7, 2017; Atlanta, GA.

Harmonic Analysis: Learning Seminar – WUSTL Math;
December 1 and December 8, 2016; Washington University in St. Louis; St. Louis, MO.

Machine Learning Seminar – WUSTL Math;
December 1, 2016; Washington University in St. Louis; St. Louis, MO.

VOTCAM 2016;
October 8, 2016; University of Richmond; Richmond, VA.

Analysis Seminar – University of Alabama;
April 15, 2016; University of Alabama; Tuscaloosa, AL.

Spring Southeastern AMS Sectional Meeting; Special Session on Sharp Estimates and Bellman Functions in Harmonic Analysis; March 5 – 6, 2016; University of Georgia; Athens, GA.

Joint Mathematics Meetings of the AMS;
January 6–9, 2016; Washington State Convention Center; Seattle, WA.

Irina Holmes Fay

Analysis Seminar at University of Toulouse;

December 14, 2015; Institut de Mathématiques de Toulouse, Toulouse, France.

Analysis Seminar at Clemson;

October 30, 2015; Clemson University; Clemson, SC.

Analysis Seminar at WUSTL;

September 21, 2015; Washington University in St. Louis; St. Louis, MO.

Analysis Seminar at KSU;

September 15, 2015; Kansas State University; Manhattan, KS.

High-Dimensional Phenomena in Statistics and Machine Learning Seminar;

September 2014; Georgia Institute of Technology; Atlanta GA.

Stochastics Seminar;

April 2014; Georgia Institute of Technology; Atlanta GA.

AMS Fall Southeastern Section Meeting;

October 2012; Tulane University; New Orleans LA.

Probability Seminar at LSU;

October 2012; Louisiana State University, Baton Rouge LA.

National Conference for Undergraduate Research;

April 2006; UNC Asheville, Asheville NC.

Service

Conference Organizing:

- ▷ Hausdorff Research Institute for Mathematics: Dual Trimester Program: “Boolean Analysis in Computer Science” (with Sergey Bobkov, Polona Durcik, Paata Ivanisvili, Alexandros Eskenazis, Dor Minzer, and Alexander Volberg)
HIM, Bonn, Germany; Sept 9 – Dec 18, 2024.
- ▷ Topical Workshop (Follow-up to ICERM Semester) (with Javier Gomez Serrano, Bo’Az Klartag, Alexander Koldobskiy, Sergei Treil, Alexander Volberg, Artem Zvavitch)
ICERM, Providence RI; Dec 9 – 13, 2024.
- ▷ ICERM Semester: “Harmonic Analysis and Convexity” (with Javier Gomez Serrano, Bo’Az Klartag, Alexander Koldobskiy, Sergei Treil, Alexander Volberg, Artem Zvavitch)
ICERM, Providence RI; Sep 7 – Dec 9, 2022.
- ▷ AIM Workshop: “Analysis on the hypercube with applications to quantum computing” (with Paata Ivanisvili and Polona Durcik)
American Institute of Mathematics, San Jose, CA; June 6–10, 2022.
- ▷ AIM SQuaREs (Structured Quartet Research Ensembles) – with Polona Durcik, Paata Ivanisvili, Joris Roos, and Sasha Volberg
First week held online, November 2021.
- ▷ Special Session on “Harmonic Analysis and Applications” – part of the Fall 2021 Meeting of the AMS Western Section in Albuquerque (UNM), co-organizer with Maria Cristina Pereyra.
- ▷ SUMIRFAS 2021 (with Florent Baudier, Bill Johnson, and Eviatar Procaccia)
Texas A&M University, College Station, TX; July 30 – August 1, 2021.
- ▷ SUMIRFAS 2020 – Concentration Week: Bellman Function Methods for the Hamming Cube (with Sasha Volberg and Paata Ivanisvili)
Texas A&M University, College Station, TX; August 3–7, 2020.
- ▷ SUMIRFAS 2019 (with David Kerr, Bill Johnson, and Eviatar Procaccia)
Texas A&M University, College Station, TX; July 26–28, 2019.

- ▷ *Special Session on Harmonic Analysis and Applications* (with B. D. Wick)
Spring Southeastern AMS Sectional Meeting, University of Georgia, Athens, GA; March 5–6, 2016.

Outreach:

- ▷ *TAMU Math Circle* Beginner Group Activity, January 25, 2020.
- ▷ *AMUSE* (Applied Mathematics Undergraduate SEminar) Texas A&M, November 18, 2019.
- ▷ Panel member at the TX-LA Undergraduate Mathematics Conference; Texas A&M, October 19, 2019.
- ▷ *SEE-Math* (Summer Educational Enrichment in Math) Summer 2019: Instructor for 3-day activity on Probability, attended by 17 middle school students.
- ▷ Research talk and activity at the “TAMU and Beihang University Exchange Program” August 2019.

Committee Participation:

- ▷ John J. Koldus III Faculty and Staff Achievement Awards - Spring 2020.
- ▷ Masters Thesis committee member for Michael Kutzler (University of New Mexico), July 2021.
- ▷ Pre-examiner for doctoral candidate Emil Airta, University of Helsinki, Spring 2022.

Refereeing: *Advances in Mathematics* (1); *Analysis and Mathematical Physics* (2); *Applied and Computational Harmonic Analysis* (1). *Bulletin of the London Mathematical Society* (1); *Indiana University Mathematics Journal* (1); *Israel Journal of Mathematics* (1); *Journal of Geometric Analysis* (1); *Mathematika* (1); *Mathematische Annalen* (1); *Proceedings of the AMS* (2); *Transactions of the AMS* (1).

Honors and Awards

- ▷ *CETL “Thank a Teacher” Certificate* (Georgia Tech) January 2016 and May 2016.
- ▷ *Distinguished Dissertation Award* (LSU College of Science) April 2015.
- ▷ *LSU Dissertation Year Fellowship* (LSU Graduate School) Academic Year 2013 – 2014.
- ▷ *GAANN Doctoral Fellowship* (LSU Mathematics Department) Academic Years 2010 – 2013.
- ▷ *David Oxley Graduate Teaching Award* (LSU Mathematics Department) Fall 2011.
- ▷ *Certificate of Teaching Excellence* (LSU Mathematics Department) Fall 2010 and Fall 2012.
- ▷ *VIGRE travel support* (LSU Mathematics Department) for travel to the *Random Matrix Theory Graduate Workshop* at MSRI; July 2009.
- ▷ *Robert and Betti Giles Senior Mathematics Award In Recognition of Outstanding Academic Achievement by an Undergraduate Student in the Department of Mathematics* (LSU Mathematics Department) April 2008.
- ▷ *Behre Scientific Writing Award*, second prize.
Awarded by the LSU Chapter of Sigma Xi for the paper “*On a Problem in the Stability Discussion of Rotating Black Holes*”; April 2007.
- ▷ *Academic Excellence Award* (LSU College of Arts and Sciences) April 2007 and 2008.
- ▷ *Herbert Huey McElveen Scholarship* (LSU College of Arts and Sciences) May 2007.
- ▷ *Best Student Researcher at CCT*
Awarded by the Center for Computation and Technology at LSU; August 2006.
- ▷ *Board of Supervisors Tuition Exemption Scholarship*
Awarded by the Louisiana State University Board of Supervisors; Academic Year 2004-2005.