

## Matthew J. Hirn

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Department of Computational Mathematics, Science and Engineering (CMSE)  
Department of Mathematics

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### Professional Preparation

Cornell University	Ithaca, NY	Mathematics	<b>BA</b>	2004
University of Maryland	College Park, MD	Mathematics	<b>PhD</b>	2009
Yale University	New Haven, CT	Applied Mathematics	<b>Postdoc</b>	2009-2013
École Normale Supérieure	Paris, France	Computer Science	<b>Postdoc</b>	2013-2015

### Appointments

Michigan State University	East Lansing, MI	CMSE & Math	<b>Asst. Prof.</b>	2015-Present
Cornell University	Ithaca, NY	Mathematics	<b>Visit. Asst. Prof.</b>	2013 (2 months)

### Achievements and Honors

#### Awards and Grants

- Alfred P. Sloan Research Fellowship in Mathematics (2016-2018).
- DARPA Young Faculty Award (2016-2018).
- National Science Foundation Grant DMS #1620216 (2016-2019).
- AMS-Simons Travel Grant (2012-2014).
- Anne G. Wylie Dissertation Fellowship (Spring, 2009).

#### Selected Visits and Talks

- Invited Participant, Japanese-American-German Frontiers of Science symposium, co-sponsored by the Alexander von Humboldt Foundation, the Japan Society for the Promotion of Science and the U.S. National Academy of Sciences (September 21-24, 2017).
- Senior Fellow, Institute for Pure and Applied Mathematics (Fall, 2016).
- Invited Speaker, American Physical Society (APS) March Meeting 2016, Baltimore, Maryland. *Deep Wavelet Scattering for Quantum Energy Regression* (March 15, 2016).

### Publications

#### Closely Related to the Proposed Project

- [1] Matthew J. Hirn, Nicolas Poilvert, and Stéphane Mallat. Wavelet scattering regression of quantum chemical energies. *Multiscale Model. Simul.*, vol. 15, no. 2 pp. 827-863, 2017. arXiv:1605.04654.
- [2] Nicholas F. Marshall and Matthew J. Hirn. Time Coupled Diffusion Maps. Submitted to *Appl. Comput. Harmon. Anal.*, 2016. arXiv:1608.03628.
- [3] Ronald R. Coifman and Matthew J. Hirn. Diffusion maps for changing data. *Appl. Comput. Harmon. Anal.*, vol. 36, no. 1, pp. 79-107, 2014. arXiv:1209.0245.

- [4] John J. Benedetto, Wojciech Czaja, Martin Ehler, Justin C. Flake, and Matthew J. Hirn. Wavelet packets for multi and hyperspectral imagery. In *Proc. SPIE*, vol. 7535, Wavelet Applications in Industrial Processing VII, 753508, 2010.
- [5] John J. Benedetto, Wojciech Czaja, Justin C. Flake, and Matthew J. Hirn. Frame based kernel methods for automatic classification in hyperspectral data. In *Proc. IEEE IGARSS 2009*, vol. 4, pp. 697-700, Cape Town, South Africa, July 12-17, 2009.

### Other Significant Publications

- [1] Ariel Herbert-Voss, Matthew J. Hirn, and Frederick McCollum. Computing minimal interpolants in  $C^{1,1}(\mathbb{R}^d)$ . *Rev. Mat. Iberoam.*, vol. 33, no. 1, pp. 29-66, 2017. arXiv:1411.5668.
- [2] Matthew J. Hirn and Erwan Le Gruyer. A general theorem of existence of quasi absolutely minimal Lipschitz extensions. *Math. Ann.*, vol. 359, no. 3-4, pp. 595-628, 2014. arXiv:1211.5700.
- [3] Ronald R. Coifman and Matthew J. Hirn. Bi-stochastic kernels via asymmetric affinity functions. *Appl. Comput. Harmon. Anal.*, vol. 35, no. 1, pp. 177-180, 2013. arXiv:1209.0237.
- [4] Martin Ehler and Matthew J. Hirn. Sparse endmember extraction and demixing. In *Proc. IEEE IGARSS 2012*, pp. 1385-1388, Munich, Germany, July 22-27, 2012.
- [5] Matthew J. Hirn. The number of harmonic frames of prime order. *Linear Algebra Appl.*, vol. 432, no. 5, pp. 1105-1125, 2010. arXiv:1209.0153.

### Synergistic Activities

#### 1. Student and Junior Faculty Interactions

- Currently supervising or co-supervising four PhD students.
- Developed a new graduate course, *Mathematical Foundations of Data Science*, for the Department of Computational Mathematics, Science & Engineering at MSU.
- Panel member for the MSU College of Natural Science “Grants Workshop” (Sep 9, 2016).
- Panel member for MSU Dept. of Math. on “How to look for academic jobs” (Nov 5, 2015).
- Directed NSF Math. REU on *High Dimensional Data Analysis* at Cornell University (Summer, 2013).
- Speaker at Putnam Exam review sessions at Yale University (Fall, 2009).

#### 2. Conference and Seminar Organization

- Co-organizer of the 8<sup>th</sup> Whitney Problems Workshop at CIRM (Oct 19-23, 2015).
- Co-organizer of the Applied Mathematics Seminar at Yale University (2012-2013) and of the Norbert Wiener Center Seminar at the University of Maryland (2007-2008).

#### 3. Software Development

- Lead developer of ScatNet-QM-2D: <https://github.com/matthew-hirn/ScatNet-QM-2D>.
- Contributor to ScatNetLight: <https://github.com/edouardoyallon/ScatNetLight>.
- Supervisor of C-1-1-Interpolation: <https://github.com/matthew-hirn/C-1-1-Interpolation>.

#### 4. Public Outreach

Wrote expository article for the Fields Institute’s seasonal newsletter, *Fields Notes*, on Assaf Naor and the Lipschitz extension problem (volume 12, number 3, page 14, Winter 2013).

#### 5. Journal Referee for

Applied and Computational Harmonic Analysis, IEEE Signal Processing Letters, IEEE Transactions on Information Theory, Linear Algebra and Its Applications, Neural Computation, npj Computational Materials, Proceedings of the American Mathematical Society, SIAM Journal on Applied Dynamical Systems, Signal Processing.