

# Michael Damron

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## Education

Ph.D. Mathematics, New York University, 2009.

Advisor: Charles Newman and Daniel Stein

B.S.E. Computer Engineering, B.S. Mathematics, University of Florida, 2004.

## Employment

Georgia Institute of Technology

Associate Professor, 2017-

Assistant Professor, 2015-2017

Indiana University, Bloomington

Assistant Professor, 2013-2016

Princeton University

Instructor, 2010-2013

NSF Postdoctoral Research Fellow, 2009-2012

## Awards and honors

### *Research*

(with C. Houdré) IMA participating institutions conference grant (\$5,000), 2018

NSF CAREER grant 1552267 (\$400,000) "Distances in random media," 2016-2021

(with R. Lyons) NSF grant 1503743 (\$15,000) "Seymour Sherman memorial conference," 2015

NSF grant 1419230 (\$145,000) "Random spatial systems and ground states of short range spin glasses,"  
2013-2016

NSF Postdoctoral Research Fellowship, 2009-2012

Wilhelm Magnus memorial prize, NYU, 2009

for significant contributions to the mathematical sciences

## Teaching

LexisNexis Dean's award, Georgia Tech, 2016

Trustees teaching award, IU, 2013-2014

First time awarded to a first-year faculty

Outstanding teaching assistant award, NYU, 2009, university-wide award

## Publications

### Books

(edited with F. Rassoul-Agha and T. Seppäläinen) Random growth models. *AMS Proceedings of the 2017 Joint Math Meetings Short Course*.

(with A. Auffinger and J. Hanson) 50 years of first-passage percolation. *AMS University Lecture Series. Vol. 68*.

### Preprints/In progress

(with J. Hanson and W.-K. Lam) Universality for the time constant in 2D critical first-passage percolation. *arXiv: 1904.12009*

(with A. Sen) Zero-temperature Glauber dynamics on the 3-regular tree and the median process. *arXiv: 1904.11625*

(with B. Bock) The acceptance profile of invasion percolation at  $p_c$  in two dimensions. *arXiv: 1904.08893*

(with J. Fickenscher) The number of ergodic measures for transitive shifts with the regular bispecial condition. *arXiv: 1902.04619*

(with M. Bernstein and T. Greenwood) Sublinear variance in Euclidean first-passage percolation. *arXiv: 1901.10325*

(with B. Bock, C. Newman, and V. Sidoravicius) Percolation of finite clusters and infinite shielded paths. *arXiv: 1811.01678*

(with J. Hanson and P. Sosoe) Strict inequality for the chemical distance exponent in two-dimensional critical percolation. *arXiv: 1708.03643*

Recent work on chemical distance in critical percolation. *arXiv: 1602.00775*

(with J. Hanson and P. Sosoe) On the chemical distance in critical percolation II. *arXiv: 1601.03464*

### Journal publications

(with J. Hanson, C. Houdré, and C. Xu) Lower bounds for fluctuations in first-passage percolation for general distributions. *To appear in Ann. Inst.*

(with P. Tang) Superlinearity of geodesic length in 2D critical first-passage percolation. *To appear in Festschrift for C. Newman.*

(with J. Gravner, H. Lyu, M. Junge, and D. Sivakoff) Parking on transitive unimodular graphs. *To appear in Ann. Appl. Probab.*

- (with J. Hanson and P. Sosoe) Arm events in two-dimensional invasion percolation. *J. Stat. Phys.* **173**, no. 5 (2018), 1321–1352.
- (with D. Sivakoff and L. Petrov) Coarsening model on  $\mathbb{Z}^d$  with biased zero-energy flips and an exponential large deviation bound for ASEP. *Commun. Math. Phys.* **362**, no. 1 (2018), 185–217.
- (with J. Hanson and W.-K. Lam) The size of the boundary in first-passage percolation. *Ann. Appl. Probab.* **28**, no. 5 (2018), 3184–3214.
- (with J. Hanson and P. Sosoe) On the chemical distance in critical percolation. *Electron. J. Probab.*, paper 75.
- (with J. Hanson) Bigeodesics in first-passage percolation. *Commun. Math. Phys.* **349**, no. 2 (2017), 753–776.
- (with X. Wang) Entropy reduction in Euclidean first-passage percolation. *Electron. J. Probab.* **21**, no. 65 (2016), 1–23.
- (with W.-K. Lam and X. Wang) Asymptotics for critical 2D first-passage percolation. *Ann. Probab.* **45**, no. 5 (2016), 2941–2970.
- (with N. Kubota) Rate of convergence in first-passage percolation under low moments. *Stoch. Proc. Appl.* **126**, no. 10 (2016), 3065–3076.
- (with H. Kogan, C. Newman, and V. Sidoravicius) Coarsening with a frozen vertex. *Electron. Commun. Probab.* **21**, no. 9 (2016), 1–4.
- (with D. Ahlberg and V. Sidoravicius) Inhomogeneous first-passage percolation. *Electron. J. Probab.* **21**, no. 4 (2016), 1–19.
- (with J. Fickenscher) On the number of ergodic measures for subshifts of eventually constant complexity growth. *To appear in Ergodic Theory Dynam. Systems.*
- (with S. Eckner, H. Kogan, C. Newman and V. Sidoravicius) Coarsening dynamics on  $\mathbb{Z}^d$  with frozen vertices. *J. Stat. Phys.* **160**, no.1 (2015), 60–72.
- (with A. Auffinger and J. Hanson) Rate of convergence of the mean for sub-additive ergodic sequences. *Adv. Math.* **285** (2015), 138–181.
- (with J. Hanson and P. Sosoe) Subdiffusive concentration in first-passage percolation. *Electron. J. Probab.* **19**, no. 109 (2014), 1–27.
- (with J. Hanson and P. Sosoe) Sublinear variance in first-passage percolation for general distributions. *To appear in Probab. Theory Relat. Fields.*
- (with C. Newman and V. Sidoravicius) Absence of site percolation at criticality in  $\mathbb{Z}^2 \times \{0, 1\}$ . *Random Struct. Alg.* **47** (2015), 328–340.
- (with H. Kogan, C. Newman and V. Sidoravicius) Fixation for coarsening dynamics in 2D slabs. *Electron. J. Probab.* **18**, no. 105 (2013), 1–20.
- (with A. Auffinger and J. Hanson) Limiting geodesics for first-passage percolation on subsets of  $\mathbb{Z}^2$ . *Ann. Appl. Probab.* **25** (2015), 373–405.
- (with H. Kogan, C. Newman and V. Sidoravicius) Coarsening in 2D slabs. In *Percolative and Disordered Systems*, Springer.

(with J. Hanson and P. Sosoe) Subdiffusivity of random walk on the 2D invasion percolation cluster. *Stoch. Proc. Appl.* **123** (2013), 3588-3621.

(with J. Hanson) Busemann functions and infinite geodesics in two-dimensional first-passage percolation. *Commun. Math. Phys.* **325** (2014), 917-963.

(with A. Auffinger) A simplified proof of the relation between scaling exponents in first-passage percolation. *Ann. Probab.* **42** (2014), 1197-1211.

(with A. Auffinger) The scaling relation  $\chi = 2\xi - 1$  for directed polymers in a random environment. *ALEA*. **10** (2013), 857-880.

(with L.-P. Arguin) On the number of ground states for the Edwards-Anderson spin glass model. *Ann. Inst. H. Poincaré Probab. Statist.* **50** (2014), 28-62.

(with A. Auffinger) Differentiability at the edge of the percolation cone and related results in first-passage percolation. *Probab. Theory Relat. Fields.* **156** (2013), 193-227.

(with L.-P. Arguin) Short-range spin glasses and Random Overlap Structures. *J. Stat. Phys.* **143** (2011), 226-250.

(with M. Hochman) Examples of non-polygonal limit shapes in i.i.d. first-passage percolation and infinite coexistence in spatial growth models. *Ann. Appl. Probab.* **23** (2013), 1074-1085.

(with A. Sapozhnikov) Limit theorems for 2d invasion percolation. *Ann. Probab.* **40** (2012), 893-920.

(with L.-P. Arguin, C. Newman and D. Stein) Uniqueness of ground states for short-range spin glasses in the half-plane. *Commun. Math. Phys.* **300** (2010), 641-657.

(with A. Sapozhnikov) Outlets of 2d invasion percolation and multiple-armed incipient infinite clusters. *Probab. Theory Relat. Fields* **150** (2011), 257-294.

(with A. Sapozhnikov and B. Vágvölgyi) Relations between invasion percolation and critical percolation in two dimensions. *Ann. Probab.* **37** (2009), 2297-2331.

(with C.L. Winter) A non-Markovian model of rill erosion. *Netw. Heterog. Media* **4** (2009), 731-753.

## Invited conference talks

Absence of backward infinite paths in first-passage percolation in arbitrary dimensions

Stochastic processes and their applications conference, percolation session (July 2019)

Percolation of finite clusters and infinite shielded paths

AMS sectional meeting, Auburn University (Mar. 2019)

Zero-temperature Glauber dynamics on the 3-regular tree

AMS sectional meeting, Binghamton University (Oct. 2019)

Conference in interacting particle systems in honor of Tom Liggett, IPAM, UCLA (Mar. 2019)

Problems in first-passage percolation I: limit shapes (part 1 of 3-part series)

Challenges in Probability and Mathematical Physics, Université de Montreal (July 2018)

The travel time to infinity in percolation

- Southeastern Probability Conference, Duke University (May 2017)
- Random Growth models (2 lectures of 7 part course)
- AMS Joint Math Meetings Short Course, Atlanta (Jan. 2017)
- Geodesics in first-passage percolation (5-7 part course)
- School on information and randomness, University of Chile (Dec. 2016)
- Summer school in probability, Northwestern University (Jul. 2016)
- School and workshop on random interacting systems, University of Bath (Jun. 2016)
- The boundary of the Eden Model
- Workshop on random growth problems and random matrices, CRM Montreal (Sep. 2016)
- Asymptotics for 2D critical first-passage percolation
- AMS sectional meeting, North Dakota State University (Apr. 2016)
- On the number of ergodic measures for minimal shifts of eventually constant complexity growth
- AMS sectional meeting, University of Georgia (Mar. 2016)
- Bigeodesics in first-passage percolation
- International conference on probability theory and statistical physics, NYU Shanghai (Mar. 2016)
- Canadian mathematical society, special session (Dec. 2015)
- AMS sectional meeting, Rutgers University (Nov. 2015)
- On the chemical distance in critical percolation
- Department Colloquium, UCLA (Oct. 2017)
- Department Colloquium, Iowa State University (Oct. 2016)
- Department Colloquium, Rice University (Apr. 2016)
- Department Colloquium, University of Alabama, Birmingham (Sep. 2015)
- ICMP thematic session in probability, Santiago, Chile (July 2015)
- Fluctuations in first-passage percolation
- Department Colloquium, Georgia Institute of Technology (Jan. 2015)
- Recent advances in first-passage percolation
- Department Colloquium, University of Cincinnati (Mar. 2015)
- Frontier probability days (plenary lecture), University of Arizona (May 2014)
- Broken ergodicity and invasion percolation
- Disorder in statistical mechanics, NYU (July 2013)
- Infinite geodesics and direction in first-passage percolation
- Toronto probability day, University of Toronto (Mar. 2013)
- Invasion percolation, the incipient infinite cluster and random walks in 2D

Advances in percolation and related topics, University of Michigan (May 2012)

The regeneration structure of 2d invasion percolation

Columbia-Princeton probability day, Columbia University (Mar. 2012)

PASI school on probability and statistical mechanics, PUC, Santiago, Chile (Jan. 2012)

A simplified proof of the relation between scaling exponents in first-passage percolation

Indiana University, Bloomington, Department colloquium (Jan. 2012)

Ohio State University, Department colloquium (Jan. 2012)

University of Oregon, Department colloquium (Jan. 2012)

University of Delaware, Department colloquium (Feb. 2012)

Limit shapes outside the percolation cone

Johns Hopkins University, Applied math colloquium (Oct. 2011)

Cornell probability summer school (Jul. 2011)

Non-polygonal limit shapes in first-passage percolation

Conference on probability theory (NYU Abu Dhabi, Jan. 2011)

Ground states of the 2d EA model, 3-part mini course

Statistical mechanics on random structures (Banff, Nov. 2009)

Order, disorder and double disorder (EURANDOM, Aug. 2009)

2d invasion percolation

Scaling limits in statistical mechanics models (Oberwolfach, Aug. 2009)

Workshop on percolation and related topics (Cornell University, Apr. 2009)

## Invited seminar talks

Absence of backward infinite paths in first-passage percolation in arbitrary dimensions

Probability seminar, Temple/UPenn (Nov. 2019)

Zero-temperature Glauber dynamics on the 3-regular tree and the median process

Analysis Seminar, Stonybrook University (Apr. 2019)

Lower bounds for fluctuations in first-passage percolation

Combinatorics seminar, Ohio State (Nov. 2018)

Probability seminar, Cornell University (Sep. 2018)

The travel time to infinity in percolation

Probability seminar, CUNY (Nov. 2017)

Probability seminar, Cornell University (Apr. 2017)

- Probability Seminar, Iowa State University (Oct. 2016)
- Bigeodesics in first-passage percolation
  - Random Matrix Theory Seminar, Harvard University (Oct. 2016)
- On the chemical distance in critical percolation
  - Probability seminar, UCLA (Oct. 2017)
  - Probability seminar, University of Utah (Feb. 2016)
  - Stochastics seminar, Georgia Institute of Technology (Aug. 2015)
  - Analysis seminar, Northwestern University (Mar. 2015)
  - Probability seminar, University of Cincinnati (Mar. 2015)
- Rate of convergence of the mean for sub-additive ergodic sequences
  - Probability seminar, University of Colorado, Boulder (Oct. 2014)
  - Probability seminar, Columbia University (Oct. 2014)
- Sublinear variance in first-passage percolation
  - Probability seminar, University of Utah (Nov. 2013)
  - Probability and analysis seminar, Purdue University (Oct. 2013)
- Invasion percolation, the incipient infinite cluster and random walks
  - Probability seminar, Michigan State University (Mar. 2013)
  - Probability seminar, University of Illinois, Urbana-Champaign (Sep. 2012)
- Geodesics and direction in first-passage percolation
  - Probability seminar, University of Wisconsin, Madison (Nov. 2012)
- A simplified proof of the relation between scaling exponents in first-passage percolation
  - Probability seminar, University of Delaware (Feb. 2012)
  - Random matrix theory seminar, Harvard University (Feb. 2012)
  - Probability and Mathematical Physics seminar, NYU (Dec. 2011)
  - Probability and Mathematical Physics seminar, Princeton University and IAS (Dec. 2011)
  - Probability seminar, University of Minnesota (Dec. 2011)
  - Probability seminar, Université de Montreal (Nov. 2011)
  - Analysis and Probability seminar, University of Connecticut (Sep. 2011)
  - Probability seminar, University of Chicago (Oct. 2011)
  - Probability seminar, Duke University (Sep. 2011)
- Limit shapes outside the percolation cone
  - Probability and Discrete Math seminar, University of Pennsylvania (Oct. 2011)
- Non-polygonal limit shapes in first-passage percolation
  - Probability seminar, Cornell University (Mar. 2011)

Ground states of the 2d EA model

Analysis and Mathematical Physics seminar, IAS (Nov. 2010)

2d invasion percolation

Probability seminar, Cornell University (Feb. 2009)

Probability seminar, NYU (Oct. 2008)

Probability seminar, Columbia University (Sep. 2008)

## Service

### *Conferences organized*

(coorganizer) Mathematics Research Communities, Stochastic Spatial Models, AMS, 2019.

(with C. Houdré) Recent trends in continuous and discrete probability, Georgia Tech, 2018.

(coorganizer) Southeastern probability conference, Duke University, 2018.

(with R. Gong) AMS special session on random matrices, random percolation models, and random sequence comparison, AMS Joint Math Meetings, Jan. 2017

(with T. Seppäläinen and F. Rassoul-Agha) Random growth models, AMS Joint Math Meetings Short Course, Jan. 2017

(with A. Auffinger, J. Hanson) First-passage percolation and related models, AIM workshop, Aug. 2015

(with R. Lyons) Sherman memorial conference, IU, May 2015

(with D. Sivakoff) AMS special session on discrete stochastic models, MSU, Mar. 2015.

### *Department service*

Undergraduate Committee 2018-2020

Junior promotion and tenure committee 2017-2021

Graduate Committee 2016-2018

Postdoc Committee 2017

Colloquium Committee 2015-2016

### *Editorial service*

Refereed journal articles for:

Annals of Applied Probability, Annals of Mathematics, Annals of Probability, Annales de l'Institut Henri Poincaré, Communications in Mathematical Physics, Communications on Pure and Applied Mathematics, Electronic Journal of Probability, Journal of Statistical Physics, Inventiones Mathematicae, Statistics and Probability Letters

Reviewed articles for Mathscinet

Served on 4 NSF panels



## *Mentorship*

### Postdoctoral scholars mentored

Gerandy Brito, GaTech, 2017-2019

Jack Hanson, IU/GaTech, 2013-2015

Xuan Wang, IU/GaTech, 2014-2016

### Ph. D. students

David Harper (initial mentor), GaTech, 2017-

Wai Kit Lam, IU, 2014-2018.

Bounghun Bock, IU/GaTech, 2014-2019

## Undergraduate/High school service

### Senior thesis projects:

Daniel Wu, Kamron Saniee, Princeton, Spring 2013

Steven Kim, Princeton, Spring 2013 (won PACM independent project prize)

### REU projects:

Yuyao Wang, GaTech, Spring 2018; Xiaomeng Wan, GaTech, Spring 2018; Thomas Koelle, GaTech, 2017.

George Kerchev, Princeton, Summer 2013; Daniel Penner, Princeton, Summer 2012

Michael Khanarian, NYU, Summer 2011; Scott Yang, NYU, Summer 2009.