

# Dominique Guillot

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Department of Electrical and Computer Engineering  
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## Appointments

June 2021 – present  
Associate Professor. University of Delaware.

August 2015 – May 2021  
Tenure-track Assistant Professor. University of Delaware.

## Education and Training

July 2012 – July 2015  
Postdoctoral Research Associate. Stanford University.  
Mentor: Bala Rajaratnam.

August 2010 – July 2012  
Postdoctoral Research Associate. University of Southern California and Stanford University.  
Mentors: Julien Emile-Geay (USC) and Bala Rajaratnam (Stanford).

Jan 2007 – June 2010  
Ph.D. in Mathematics (distinction recommendation)  
Laval University, Québec, Canada  
Thesis: Boundary behavior in Dirichlet spaces with harmonic weights and de Branges–Rovnyak spaces.  
Thesis advisor: Thomas J. Ransford.

Sep 2005 – Jan 2007  
M.Sc. in Mathematics (with honors)  
Laval University, Québec, Canada  
Thesis: Visibility of the spectrum in Banach algebras and the problem of controlled inversion.  
Advisor: Thomas J. Ransford.

Sep 2005 – June 2006  
Academic Visitor  
University of Oxford, United Kingdom.

Sep 2002 – Jun 2005  
B.Sc. in Mathematics (with honors)  
Laval University, Québec, Canada.

Sep 2000 – June 2002  
D.E.C. in Natural Sciences  
Collège François-Xavier-Garneau, Québec, Canada.

## Honors and Awards

- 2019 Inducted in the Honors Society of Phi Kappa Phi, U. Delaware chapter.
- 2017 Excellence in Teaching Award Nomination, U. Delaware.
- 2016 International Linear Algebra Society minisymposium award to invite early career speaker.
- 2015 Research-in-groups award, International Centre for Mathematical Sciences, Edinburgh, UK.
- 2015 Travel grant award to participate to the workshop *Challenges in Functional Connectivity Modeling and Analysis Workshop* at SAMSI.
- 2014 Selection and invitation by American Institute of Mathematics to organize international workshop (with full funding), Palo Alto, United States.
- 2012 Natural Sciences and Engineering Research Council of Canada Postdoctoral Fellowship.
- 2012 Postdoctoral Fellowship, Stanford University.
- 2012 National Science Foundation Travel Grant Award.
- 2011 Society for Industrial and Applied Mathematics Travel Grant Award.
- 2010 Postdoctoral Fellowship, University of Southern California and Stanford University.
- 2010 Fonds Québécois de la Recherche sur la Nature et les Technologies Postdoctoral Fellowship (University of Leeds, United Kingdom).
- 2010 Doctoral thesis ranked “excellent” by each of the four members of the thesis committee.
- 2009 *Star Professor* Prize for Excellence in Teaching, Laval University.
- 2008 *Star Professor* Prize for Excellence in Teaching, Laval University.
- 2007 Natural Sciences and Engineering Research Council of Canada Alexander-Graham-Bell Scholarship.
- 2007 Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship.
- 2007 Fonds Québécois de la Recherche sur la Nature et les Technologies Postgraduate Scholarship.
- 2007 Honors from the faculty of graduate studies for master studies.
- 2006 Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship (master).
- 2006 Grant for Abroad Studies (Oxford, UK).
- 2005 Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship (master).
- 2005 Fonds Québécois de la Recherche sur la Nature et les Technologies Postgraduate Scholarship (master).
- 2005 Natural Sciences and Engineering Research Council of Canada Undergraduate Scholarship, Summer 2005.
- 2005 Honors for undergraduate studies.
- 2005 Honors from the department of mathematics and statistics for the academic year 2005.
- 2005 Prize from the director of the department of mathematics and statistics of Laval University for the quality of the final-year project.
- 2004 Tembec Scholarship.
- 2004 Natural Sciences and Engineering Research Council of Canada Undergraduate Scholarship, Summer 2004.
- 2004 Honors from the department of mathematics and statistics for the academic year 2004.
- 2003 Natural Sciences and Engineering Research Council of Canada Undergraduate Scholarship, Summer 2003.
- 2003 Honors from the department of mathematics and statistics for the academic year 2003.
- 2002 Hydro-Québec Scholarship, 2002.

# Publications

## Peer-Reviewed

*Theoretical mathematics.*

1. A. Belton, D. Guillot, A. Khare, M. Putinar, *Totally positive kernels, Polya frequency functions, and their transforms*, to appear in Journal d'Analyse Mathématique, 2021, arXiv: 2006.16213, 63 pages.
2. A. Belton, D. Guillot, A. Khare, M. Putinar, *Moment-sequence transforms*, to appear in Journal of the European Mathematical Society, 2021, arXiv:1610.05740, 48 pages.
3. M. Ghandehari, D. Guillot, K. Hollingsworth, *Gabor-type frames for signal processing on graphs*, to appear in Journal of Fourier Analysis and Applications, 2020, arXiv:2009.06058, 19 pages.
4. A. Belton, D. Guillot, A. Khare, M. Putinar, *A panorama of positivity. II: Fixed dimension*, Complex Analysis and Spectral Theory. Proceedings of the CRM Workshop held at Laval University, QC, May 21-25, 2018. Contemporary Mathematics. CRM Proceedings. American Mathematical Society, Providence, RI, 2020. arXiv:1812.05482.
5. D. Guillot and J. Wu, *Total nonnegativity of GCD matrices and kernels*, Linear Algebra and its Applications, 578:446–461, 2019. arXiv:1901.01947.
6. A. Belton, D. Guillot, A. Khare, M. Putinar, *A panorama of positivity. I: Dimension free*, in Analysis of Operators on Function Spaces (The Serguei Shimorin Memorial Volume), A. Aleman, H. Hedenmalm, D. Khavinson, M. Putinar, Eds., pages 117–165, Trends in Mathematics, Birkhauser, 2019, arXiv:1812.05482.
7. M. Ghandehari, D. Guillot, K. Hollingsworth, *A non-commutative viewpoint on graph signal processing*, 13th International Conference on Sampling Theory and Applications (SampTA), Bordeaux, France, 2019.
8. A. Belton, D. Guillot, A. Khare, M. Putinar, *Simultaneous kernels of matrix Hadamard powers*, Linear Algebra and its Applications, 576:142–157, 2019, arXiv:1709.03280.
9. D. Guillot, A. Khare, B. Rajaratnam, *The critical exponent: a novel graph invariant*, 29th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC '17), Séminaire Lotharingien de Combinatoire 78B, article #62, 2017, arXiv:1802.06976.
10. D. Guillot, A. Khare, B. Rajaratnam, *Preserving positivity for rank-constrained matrices*, Trans. Amer. Math. Soc., 369:6105–6145, 2017, arXiv:1406.0042.
11. A. Belton, D. Guillot, A. Khare, M. Putinar, *Matrix positivity preservers in fixed dimension. I.*, Advances in Mathematics, 298, 325–368, 2016, arXiv:1504.07674.
12. A. Belton, D. Guillot, A. Khare, M. Putinar, *Schur polynomials and matrix positivity preservers*, FPSAC '16 Proceedings (DMTCS proc. BC), 155–166, 2016.
13. A. Belton, D. Guillot, A. Khare, M. Putinar, *Matrix positivity preservers in fixed dimension*, C. R. Acad. Sci. Paris, Volume 354, Issue 2, 2016, Pages 143–148.
14. D. Guillot, A. Khare, B. Rajaratnam, *Critical exponents of graphs*, J. Combin. Theory Ser. A, Volume 139, 2016, Pages 30–58, arXiv:1504.04069.

15. D. Guillot, A. Khare, B. Rajaratnam, *Preserving positivity for matrices with sparsity constraints*, Trans. Amer. Math. Soc. 368:8929–8953, 2016 arXiv:1406.3408.
16. P. Diao, D. Guillot, A. Khare, B. Rajaratnam, *Differential calculus on graphon space*, J. Combin. Theory Ser. A, Volume 133, 2015, Pages 183-227, arXiv:1403.3736.
17. D. Guillot, B. Rajaratnam, *Functions preserving positive definiteness for sparse matrices*, Trans. Amer. Math. Soc. 367 (2015), 627-649, arXiv:1210.3894.
18. D. Guillot, A. Khare, B. Rajaratnam, *Complete characterization of Hadamard powers preserving Loewner positivity, monotonicity, and convexity*, Journal of Mathematical Analysis and Applications, 425 no. 1, pages 489–507, 2015, arXiv:1311.1581.
19. D. Guillot, A. Khare, B. Rajaratnam, *The critical exponent conjecture for powers of doubly nonnegative matrices*, Linear Algebra and its Applications, Volume 439, Issue 8, 2013, Pages 2422-2427 arXiv:1303.4701.
20. D. Guillot, B. Rajaratnam, *Retaining positive definiteness in thresholded matrices*, Linear Algebra and its Applications, Volume 436, Issue 11, 1 June 2012, Pages 4143–4160, arXiv:1108.3325.
21. D. Guillot, N. Chevrot, T. J. Ransford, *De Branges-Rovnyak spaces and Dirichlet spaces*, J. Funct. Anal., 259 (2010), 2366-2383.
22. D. Guillot, *Blaschke condition and zero sets in weighted Dirichlet spaces*, Arkiv för Matematik, Volume 50, Issue 2 (2012), 269-278.
23. D. Guillot, *Fine boundary behavior and invariant subspaces of harmonically weighted Dirichlet spaces*, Complex Analysis and Operator Theory, 2012, Volume 6, Issue 6, 1211-1230.
24. D. Guillot, *Comportement au bord dans les espaces de Dirichlet avec poids harmoniques et espaces de de Branges-Rovnyak* [Boundary behavior in Dirichlet spaces with harmonic weights and de Branges–Rovnyak spaces], Doctoral dissertation, Laval University, 2010.
25. D. Guillot, *La visibilité du spectre des algèbres de Banach et le problème de l'inversion contrôlée* [Visibility of the spectrum in Banach algebras and the problem of controlled inversion], Master thesis, Laval University, 2007.
26. D. Guillot, T.J. Ransford, *Bloch's theorem for algebroid multifunctions II*, Math. Proc. R. Ir. Acad., 105A(2) (2005), 103-109.

*Applied mathematics, engineering, and statistics.*

1. I. Balogun, M. Leadingham II, D. Guillot, and N. Attah-Okine, *Deep Learning Approach Towards Squat Isolation in a Multi-Embedded Track Geometry Defects*, accepted in IEEE BigData workshop, 2021.
2. A. Vaccaro, J. Emile-Geay, D. Guillot, R. Verna, C. Morice, J. Kennedy, B. Rajaratnam, *Climate field completion via Markov random fields – Application to the HadCRUT4.6 temperature dataset*, Journal of Climate, Volume 34(10), 4169–4188, 2021.
3. D. Guillot, A. Parada, S. Cioaba, G. Arce, *Optimal sampling sets in cographs*, IEEE Data Science workshop, Minneapolis, USA, 2019.
4. A. Lasisi, E. N. Martey, D. Guillot, N. Attah-Okine, *A three-step agglomerated Machine Learning: An alternative to Weibull Defect Analysis of Rail Infrastructure*, IEEE International Conference on Big Data, Seattle, USA, 2018.

5. J. Wang, J. Emile-Geay, D. Guillot, N. McKay, B. Rajaratnam, *Fragility of reconstructed temperature patterns over the Common Era: Implications for model evaluation*, Geophysical Research Letters, Volume 42, Issue 17, 2015, Pages 7162–7170.
6. D. Guillot, B. Rajaratnam, J. Emile-Geay, *Statistical paleoclimate reconstructions via Markov random fields*, Ann. Appl. Stat., Volume 9, Number 1 (2015), 324-352. arXiv:1309.6702.
7. J. Wang, J. Emile-Geay, D. Guillot, J. E. Smerdon, and B. Rajaratnam, *Evaluating climate field reconstruction techniques using improved emulations of real-world conditions*, Clim. Past, 10, 1-19, 2014.
8. J. Wang, J. Emile-Geay, D. Guillot, and B. Rajaratnam, *Spatiotemporal Patterns of low-frequency variability in a 2000-year long global temperature reconstruction*, 4th International Workshop on Climate Informatics, NCAR, Boulder, CO, 2014.
9. D. Guillot, A. Maleki, B. Rajaratnam, B. Rolfs, I. Wong, *Iterative thresholding algorithms for sparse inverse covariance estimation*, NIPS, Lake Tahoe, 2012, arXiv:1211.2532.

## Submitted papers

1. A. Belton, D. Guillot, A. Khare, M. Putinar, *Hirschman–Widder densities*, submitted, 2021, arXiv: 2101.02129, 26 pages.
2. A. Belton, D. Guillot, A. Khare, M. Putinar, *Matrix compression along isogenic blocks*, submitted, 2021, arXiv: 2010.14429, 29 pages.
3. J. Florez-Ospina, D. Lau, D. Guillot, K. Barner, G. Arce, *Rank-Order Graphs for Signal Recovery and Its Application to Compressive Spectral Imaging*, submitted, 2021, 15 pages.
4. P. Diao, D. Guillot, A. Khare, B. Rajaratnam, *Model-free consistency of graph partitioning*, submitted, 2021, arXiv:1608.03860, 33 pages.

## Current and past grants

- Travel grant for plenary speakers, Fields Institute for Research in Mathematical Sciences, Toronto, Canada, \$CAD 1,000.
- Strategic initiative grant, University of Delaware Research Foundation, 2017–2018, \$48,949.00, UDRF-SI GUILLOT, *Efficient design of uniqueness sets for band-limited signals on networks*.
- Research experience for undergraduates (REU) supplement, University of Delaware Research Foundation, 2017, \$3,500.
- Simons collaboration grant for mathematicians, 2017-2022, \$42,000.00, *Matrix positivity preservers, Schur polynomials, and Hankel operators*.
- Research-in-groups grant, International Centre for Mathematical Sciences, Edinburgh, UK, 2016, £10,180 (\$13,300).
- University of Delaware Research Foundation Grant, 2016-2018, \$35,000.00, UDRF GUILLOT 16-18, *Analysis of clustering algorithms via graph limits*.
- American Institute of Mathematics (AIM) workshop grant (full funding to support 20 workshop participants), Palo Alto, CA, 2014.

## Courses Taught

Date	Institution	Course name
Fall 2021	University of Delaware	MATH508: Complex Analysis (29 students)
Fall 2021	University of Delaware	MATH450: Mathematical Statistics (30 students)
Summer 2021	University of Delaware	MATH349: Elementary Linear Algebra (30 students)
Spring 2021	University of Delaware	MATH450: Mathematical Statistics (25 students)
Spring 2021	University of Delaware	MATH450: Mathematical Statistics (18 students)
Winter 2021	University of Delaware	MATH242: Analytic Geometry and Calculus B (30 students)
Fall 2020	University of Delaware	MATH350: Probability Theory and Simulation Methods (35 students)
Summer 2020	University of Delaware	MATH350: Probability Theory and Simulation Methods (23 students)
Spring 2020	University of Delaware	MATH637: Mathematical Techniques in Data Science (16 students)
Spring 2020	University of Delaware	MATH401: Introduction to Real Analysis (27 students)
Winter 2020	University of Delaware	MATH242: Analytic Geometry and Calculus B (21 students)
Fall 2019	University of Delaware	MATH 350: Probability Theory and Simulation Methods (38 students)
Fall 2019	University of Delaware	MATH 350: Probability Theory and Simulation Methods (39 students)
Spring 2019	University of Delaware	MATH 350: Probability Theory and Simulation Methods (30 students)
Fall 2018	University of Delaware	MATH 350: Probability Theory and Simulation Methods (38 students)
Fall 2018	University of Delaware	MATH 451: Abstract Algebra I (25 students)
Fall 2017	University of Delaware	MATH 245: Introduction to Proof (23 students)
Spring 2017	University of Delaware	MATH 567: Mathematical Techniques in Data Science (16 students)
Fall 2016	University of Delaware	MATH 450: Mathematical Statistics (25 students)
Fall 2016	University of Delaware	MATH 349: Elementary Linear Algebra (20 students)
Spring 2016	University of Delaware	MATH 829: Introduction to data mining and analysis (21 students)
Fall 2015	University of Delaware	MATH 349: Elementary Linear Algebra (21 students)
Summer 2014	Stanford University	STATS 116: Theory of Probability (50 students)
Spring 2014	Stanford University	STATS 116: Theory of Probability (85 students)
Spring 2013	Stanford University	STATS 116: Theory of Probability (85 students)
Fall 2009*	Laval University	MAT-1900: Mathematics for Engineers I (105 students)
Fall 2008	Laval University	MAT-1500: Geometry (80 students)
Winter 2008*	Laval University	MAT-1910: Mathematics for Engineers II (150 students)

\* *Star professor* prize for excellence in teaching awarded for this course.

## Mentoring Experience

### Ph.D. Students.

- Kristopher Hollingsworth, University of Delaware, 2016–2020.  
Co-supervision with M. Ghandehari.  
Now postdoctoral fellow at U. Minnesota.  
Dissertation: *Discrete frames for high-dimensional data: constructions on regular and irregular domains.*

### Graduate Summer Projects.

- Thang Xuan Nguyen, University of Delaware, Summer 2021.
- Yikun Bai, University of Delaware, Summer 2017.
- Abhijit Kumar Baruah, University of Delaware, Summer 2017.

## Undergraduate Projects.

- Logan Hallee, U. Delaware, Fall 2021.
- Emily Goldfarb, U. Delaware, Fall 2021.
- Brandon Myers, U. Delaware, Summer and Fall 2021.
- Yunpeng Wang, U. Delaware, Spring 2021.
- Lucas Wu, U. Delaware, Summer 2018.
- Kyle Wang, U. Delaware, Summer 2017.
- Tina Torkaman, U. Delaware (visiting from Sharif University of Technology), Summer 2016.
- Kyle Wang, U. Delaware, Summer 2016.

## Recent and Upcoming Talks

- Hilbert spaces of analytic functions (Plenary speaker), Fields Institute, Toronto, Canada, June 2020.
- University of Nevada, Reno Colloquium, April 2020.
- 36th Southeastern Analysis Meeting (Plenary speaker), Virginia, USA, March 2020.
- AMS Fall Western Sectional Meeting, UC Riverside, California, USA, November 2019.
- International Linear Algebra Society Meeting (Matrix Inequalities and Matrix Equations session), Rio, Brazil, 2019.
- International Linear Algebra Society Meeting (Spectral graph theory session), Rio, Brazil, 2019.
- Workshop on Positivity (Plenary speaker, Mini-course lecture series on positivity preservers), University of New Mexico, May 2019.
- IIT Bombay mathematics seminar, Mumbai, India, 2019.
- IISc Bangalore mathematics seminar, Bangalore, India, 2019.
- University of Richmond Colloquium, 2018.
- Virginia Operator Theory and Complex Analysis Meeting (Plenary Speaker), 2018.
- Complex Analysis and Spectral Theory, Laval University, 2018.
- U. Delaware Signal Processing and Communications Seminar Series, 2017.
- Joint Mathematics Meetings, Atlanta, 2017.
- Recent Advances in Linear Algebra and Graph Theory, Chattanooga, 2016.
- U. Delaware Inverse Problems and Analysis Seminar, 2016.
- SIAM Conference on Applied Linear Algebra, Atlanta, 2015.
- Discrete Mathematics Day at Worcester Polytechnic Institute, 2015.
- University of Oregon Seminar, 2015.
- San Jose State University Colloquium, 2015.
- Joint Mathematics Meetings, San Antonio, 2015.
- American Institute of Mathematics (AIM), Palo Alto, 2014.
- American Geophysical Union Meeting, San Francisco, 2014.

- International Linear Algebra Society Meeting, Providence, 2013.
- Joint Mathematics Meetings, San Diego, 2013.
- American Geophysical Union Meeting, San Francisco, 2013.
- European Geophysical Union Meeting, Vienna, 2012.
- American Geophysical Union Meeting, San Francisco, 2012.
- American Geophysical Union Meeting, San Francisco, 2011.
- International Congress on Industrial and Applied Mathematics (ICIAM), Vancouver, 2011.

## Recent Professional Activities

- President-elect of the Honors Society of Phi Kappa Phi, U. Delaware Chapter, 2021–2022.
- Manager of the ILAS website, International Linear Algebra Society, 2021–present.
- U. Delaware Math Club advisor, 2021.
- Senator, College of Arts and Sciences, University of Delaware, 2020–present.
- Referee for: *Advances in Operator Theory*, *American Mathematical Monthly*, *Bulletin of the London Mathematical Society*, *Colloquium Mathematicum*, *Computational Statistics and Data Analysis*, *Concrete Operators*, *Electronic Linear Algebra*, *Journal of Combinatorial Theory Series A*, *Journal of Fourier Analysis and Applications*, *Linear Algebra Appl.*, *Linear and Multilinear Algebra*, *MathSciNet*, *Mediterranean Journal of Mathematics*, *Proc. Amer. Math. Soc.*, *Publicationes Mathematicae Debrecen*, *SampTA*, *SIAM Journal on Mathematics of Data Science*, *SIGMA*, *Special Matrices*, *Studia Mathematica*, and *Trans. Amer. Math. Soc.*
- Co-organizer of the invited ILAS 2022 minisymposium on “Matrix positivity: theory and applications”, Galway, Ireland, 2022.
- Co-organizer of a special session on *Interplay between Analysis and Combinatorics* at the AMS Fall Eastern Sectional Meeting 2018.
- U. Delaware Undergraduate Research Coordinator 2018–2019.
- Co-organizer of the ILAS 2017 invited mini-symposium on “Linear Algebra and Positivity with Applications to Data Science”, Iowa State University, Ames, IA, 2017.
- Co-organizer of an AMS Special Session on *Positivity and Matrix Inequalities*, Joint Mathematics Meetings, San Antonio, 2015.
- Co-organizer of an AMS Special Session on *Limits of Discrete Structures*, Joint Mathematics Meetings, San Antonio, 2015.
- Co-organizer of the workshop “Positivity, graphical models, and modeling of complex multivariate dependencies” at the American Institute of Mathematics (AIM), Palo Alto, United States, 2014.
- Putnam supervisor, University of Delaware, December 2019.

## Professional Organization Memberships

- Member of the Honors Society of Phi Kappa Phi.
- Member of the International Linear Algebra Society



## **Computer Literacy**

Matlab, Python, C/C++, R, Fortran, Java, HTML

LaTeX, Maple, GeoGebra

Linux, Mac OS, Windows

## **Languages**

English: fluent

French: native

Spanish: intermediate level

## **References**

Letters of recommendation available upon request.