

# Mario Diaz

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## Current Position

### Joint Postdoctoral Scholar

*School of Electrical, Computer and Energy Engineering  
Arizona State University  
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*School of Engineering and Applied Sciences  
Harvard University  
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## Education

- Degree: **Ph.D. Mathematics and Statistics (2013 - 2017)**  
 Institution: Queen's University, Kingston, Canada  
 Advisors: James Mingo and Serban Belinschi  
 Thesis: *Global Fluctuations of Random Matrices and The Second-Order Cauchy Transform*
- Degree: **M.Sc. Probability and Statistics (2011 - 2013)**  
 Institution: Centro de Investigación en Matemáticas, A.C. Guanajuato, Mexico  
 Advisor: Víctor Pérez-Abreu  
 Thesis: *Analysis of the Asymptotic Spectra of Multiantenna Channels via Free Probability*<sup>1</sup>
- Degree: **B.Eng. Electronics and Communications (2006 - 2011)**  
 Institution: Universidad de Guadalajara, Guadalajara, Mexico  
 Advisor: Víctor Pérez-Abreu  
 Thesis: *Analysis of the Asymptotic Ergodic Spectral Efficiency of MIMO Systems with Kronecker C.*<sup>1</sup>

## Publications

### Journal Papers

1. M. Diaz and J. Mingo. "On the CLT for the linear statistics of random matrices and second-order non-commutative probability spaces." In preparation.
2. M. Diaz, J. Mingo, and S. Belinschi. "On the global fluctuations of block Gaussian matrices." In preparation.
3. S. Asoodeh, M. Diaz, F. Alajaji, and T. Linder. "Estimation efficiency under privacy constraints." Submitted to *IEEE Transactions on Information Theory*.
4. M. Diaz and V. Pérez-Abreu. "On the capacity of block multiantenna channels." *IEEE Transactions on Information Theory*, vol. 63, no. 8, pp. 5286 – 5298, 2017. [DOI:10.1109/TIT.2017.2712711](https://doi.org/10.1109/TIT.2017.2712711)
5. S. Asoodeh, M. Diaz, F. Alajaji, and T. Linder. "Information extraction under privacy constraints." *Information*, vol. 7, no. 1, Art. no. 15, 2016. [DOI:10.3390/info7010015](https://doi.org/10.3390/info7010015)

### Conference Papers

6. S. Asoodeh, M. Diaz, F. Alajaji, and T. Linder. "Privacy-aware guessing efficiency." *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, pp. 754 – 758. 2017. [DOI:10.1109/ISIT.2017.8006629](https://doi.org/10.1109/ISIT.2017.8006629)
7. M. Diaz. "On the symmetries and the capacity achieving input covariance matrices of multiantenna channels." *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, pp. 1073 – 1077, 2016. [DOI:10.1109/ISIT.2016.7541464](https://doi.org/10.1109/ISIT.2016.7541464)

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<sup>1</sup> Written in Spanish.

## Awards

1. *Ontario Trillium Scholarship*<sup>2</sup>. Canada 2013 - 2017.
2. *Science and Technology National Council (CONACYT) Graduate Scholarship*. Mexico, 2011 - 2013.
3. *National System of Researchers (SNI) Undergraduate Research Assistantship*. Mexico, 2009 - 2011.

## Seminar and Colloquium Talks

Seminar and colloquium talks given at Arizona State University (U.S.), Huawei's Mathematical and Algorithmic Sciences Lab (France), Institut de Mathématiques de Toulouse (France), Universität des Saarlandes (Germany), Texas A&M University (U.S.), Queen's University (Canada), Centro de Investigación en Matemáticas A.C. (Mexico), and Universidad de Guadalajara (Mexico).

## Most Relevant Conferences and Workshops Attended

1. *Mathematical Congress of the Americas (MCA)*. Montreal, Canada 2017.  
**Invited Talk:** A New Application of Free Probability Theory: Data Privacy.
2. *Canadian Ann. Symp. on Operator Algebras and Their Apps. (COSy)*. Thunder Bay, Canada 2017.  
**Invited Talk:** On the fluctuations of block Gaussian matrices.
3. *21st Int'l ITG Workshop on Smart Antennas*. Berlin, Germany 2017.  
**Invited Talk:** Random operator-valued models: combining stochastic and algebraic models.
4. *Analytic versus Combinatorial in Free Probability*. Banff International Research Station, Canada 2016.  
**Invited Talk:** On the fluctuations of polynomials in Gaussian matrices.
5. *Complex Analysis and Noncommutative Functions*. Toulouse, France 2016.
6. *Int'l Symposium on Information Theory (ISIT)*. Barcelona, Spain 2016.  
**Contributed Talk:** On the symmetries and the CAICM of multiantenna channels.
7. *Canadian Ann. Symp. on Operator Algebras and Their Apps. (COSy)*. Montreal, Canada 2016.
8. *Great Plains Operator Theory Symposium (GPOTS)*. Urbana-Champaign, U.S. 2016.
9. *Canadian Ann. Symp. on Operator Algebras and Their Apps. (COSy)*. Waterloo, Canada 2015.
10. *Inter-institutional Seminar on Random Matrices (SIMA)*. Guanajuato, Mexico 2015.  
**Invited Talk:** Free probability based optimizations: capacity of multiantenna communication systems.
11. *Conference on Stochastic Processes and their Applications (SPA)*. Buenos Aires, Argentina 2014.  
**Contributed Talk:** On an operator-valued free probability based model for systems with block dynamics.
12. *Free Probability Concentration Week*. College Station, U.S. 2014.
13. *Workshop on Risk Analysis in Economics and Finance*. Guanajuato, Mexico 2013.
14. *Random Matrices School (EMA)*. Guanajuato, Mexico 2012.  
**Invited Talk:** Marchenko-Pastur law and multiantenna communications.
15. *Workshop on Solutions to Industrial Problems*. Guanajuato, Mexico 2012.
16. *Inter-institutional Seminar on Random Matrices (SIMA)*. Guanajuato, Mexico 2011.  
**Invited Talk:** Some numerical aspects of the Stieltjes transform: correlated MIMO systems.
17. *National Conference and Int'l Conference in Computer Science ANIEI*. Jalisco, Mexico 2010.
18. *Summer Research Program*. Guanajuato, Mexico, 2010.
19. *Inter-institutional Seminar on Random Matrices (SIMA)*. Guanajuato, Mexico 2010.  
**Invited Talk:** Correlated MIMO systems.

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<sup>2</sup> Only 75 of these scholarships are awarded every year in the whole province of Ontario.

20. *Inter-institutional Seminar on Random Matrices (SIMA)*. Guanajuato, Mexico 2009.  
**Invited Talk:** Random Matrices: An Application to Wireless Communication (Multiuser Detection).
21. *Summer Program in Probability and Statistics*. Guanajuato, Mexico 2009.
22. *Summer Research Program*. Guanajuato, Mexico, 2009.
23. *Stochastic Methods and Dynamical Systems*. Guanajuato, Mexico 2009.
24. *Workshop on Solutions to Probability Problems: Second Phase*. Yucatan, Mexico 2008.
25. *Workshop on Solutions to Probability Problems: First Phase*. Guanajuato, Mexico 2008.
26. *National Conference and Int'l Conference in Computer Science ANIEI*. Chihuahua, Mexico 2007.
27. *Workshop on Solutions to Calculus Problems*. Guanajuato, Mexico 2007.

## Academic Experience

### National System of Researchers (SNI) Research Assistant

Centro de Investigación en Matemáticas A.C., Guanajuato, Mexico 2009 - 2011.

Worked on the analysis of the asymptotic ergodic capacity of multiantenna wireless systems.

### Research Assistant

Institute of Robotics and Intelligent Systems, Universidad de Guadalajara, Mexico 2008 - 2009.

Worked on non-asymptotic improvements to motion planning algorithms.

## Teaching Experience

### Teaching Assistant

Centro de Investigación en Matemáticas A.C. and Universidad de Guanajuato, Mexico 2012 - 2013.

Courses: Markov Chains, Stochastic Models, Elements of Probability and Statistics.

## Work Experience

### Warranty Technician

*Informática AD*, Guadalajara, Mexico 2009

## Miscellaneous Academic Activities

**Coordinator** of the Math & Stats Graduate Seminar at Queen's University, Canada 2015 - 2016. Additional events organized: Research at MAST, Christmas Talks 2015, and Christmas Talks 2016.

**Organizer** of a series of mini courses on probability, statistics and related topics given by graduate students Centro de Investigación en Matemáticas A.C., Mexico 2013

**Lecturer** of a brief course on Coding Theory at CUCEI Universidad de Guadalajara, Mexico 2011.

**Coach** of the CUCEI Universidad de Guadalajara's programming contest teams, Mexico 2008 - 2011.

**TopCoder rating:** 1351, 2009. Profile: <https://www.topcoder.com/members/Cumbias/> (TopCoder is a company which organizes online computer programming competitions.)

**Coach** of the Jalisco team for the Mexican Mathematical Olympiad (high-school), Mexico 2006 - 2008.

## Most Relevant Results in Academic Contests

1. *Mexico and Central America ACM ICPC Programming Contest*. Mexico 2010. **Sixth Place**.
2. *ANIEI Programming Contest*. Mexico 2010. **First Place**.
3. *National Math Contest "Pierre Fermat"*. Mexico 2008. **Finalist**.

4. *ACM International Collegiate Programming Contest World Finals*. Canada 2008. **Honorable Mention**.
5. *Mexico and Central America ACM ICPC Programming Contest*. Mexico 2007. **First Place**.
6. *ANIEI Programming Contest*. Mexico 2007. **First Place**.
7. *Universidad de Guadalajara Calculus Tournament*. Mexico, 2007. **First Place**.
8. *Historical Essay Contest "Vida y Obra de Benito Juárez"*. Mexico, 2006. **First Place**.
9. *XIX Mexican Mathematical Olympiad*. Mexico 2005. **Second Place**.
10. *XV National Contest in Physical Devices and Experiments*. Mexico 2005.

## Computer Skills

**Languages:** C/C++, MatLab, R. **Applications:** Simulink, LaTeX, MS Office.

## Languages

**Spanish:** native speaker. **English:** good command.

**Last Update: September, 2017.**