



CURRICULUM VITAE

Personal

Omar Colón Reyes
Born: San Juan, Puerto Rico, 1977

Education

Doctor of Philosophy in Mathematics, (May 2005)
Virginia Polytechnic Institute and State University,
Blacksburg, VA 24060, U.S.A.

Research Interest:

Discrete Mathematics; Combinatorics and Algebra; and Discrete Dynamical Systems.

Professional Experience:

September 2012 – Present	Department Head, Mathematical Sciences Department, University of Puerto Rico, Mayaguez, PR
July 2011 – September 2012	Deputy Department Head, Mathematical Sciences Department, University of Puerto Rico, Mayaguez, PR
July 2008 – Present	Associate Professor, Mathematics Department, University of Puerto Rico, Mayaguez, Mayaguez, PR.
August 2005 – July 2008	Assistant Professor, Mathematics Department, University of Puerto Rico, Mayaguez, Mayaguez, PR.
January 2004 - May 2005	Teaching Assistant, Mathematics Department (0123), Virginia Tech, Blacksburg, VA 24061
January 2002 - January 2004	Research Assistant, Virginia Bioinformatics Institute (0477), Blacksburg, VA 24060
May 2000 - January 2002	Research Assistant, Physical Sciences Laboratories, New Mexico State University, Las Cruces, NM 88003-8002
August 1999 - May 2000	Teaching Assistant, Mathematics Department, New Mexico State University, Las Cruces, New Mexico 88003-8001



Courses taught:

1. Mathematics of Modern Science I and II
2. Complete Sequence of College Calculus
3. Combinatory, Numerical Analysis
4. Homological Algebra
5. Mathematics for Computer Simulation
6. Automata and Formal Languages
7. Mathematical Analysis for Biotechnology

Computer Experience:

Programming Languages: C++, TPW, JAVA

Operating Systems: Linux, UNIX and DOS

Mathematical Languages: MATHEMATICA, Maple, MATLAB and CoCoA

Research Experience:

On primitive graphs and discrete dynamical systems, July 2011- Current

The problem of finding transients in boolean monomial dynamical systems is equivalent to the problem of determining exponents of primitive graphs. However, there is no known formula for determining either transients or exponents. In this ongoing work we seek to determine the exponent of a special class of primitive graphs, which in turn, corresponds to the simplest class of nonlinear systems. We give an upper bound for the exponent of such a primitive graph in terms of the Frobenius function. We conjecture that this bound is actually achieved, thus implying that the problem of determining the transient of a Boolean monomial dynamical systems is NP hard.

Collaborators: Dorothy Bollman, UPR Mayaguez

On the transient of Discrete Dynamical Systems, July 2010 – Current

A question of interest is how long it takes for a state of a discrete dynamical system to reach an attractor, that is, what is the transient of a state. The transient of a discrete dynamical systems is then defined as the maximum of the transients among all states. In this work, we are interested to find the transient of a monomial dynamical system

Collaborators: Dorothy Bollman, UPR Mayaguez.

Control Theory for Discrete Dynamical Systems, July 2008 - July 2010

In this project we gave criteria to determine if a monomial dynamical system over a finite field with two elements is stabilizable. Currently we are working to find criteria for a monomial dynamical system over any finite field and any dimension to be stabilizable

Collaborators: Dorothy Bollman, UPR-Mayaguez, Edusmildo Orozco, UPR-RIP, Edgar Delgado Eckert, University of Munich.

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Discrete Dynamical Systems, August 2002 - July 2008

In this project we create the mathematical theory that helps us to develop tools to describe the phase space of discrete dynamical systems over any finite field of any dimension. Our main results are criteria to determine if certain non linear discrete dynamical systems are fixed point systems.

Collaborators: Bodo Pareigis, University of Munich, Germany; Bernd Sturmfels, University of California, Berkeley. Reinhard Laubenbacher, Virginia Tech, Abdul Salam, Virginia Bioinformatic Institute, Dorothy Bollman, University of Puerto Rico, Mayaguez and Edusmildo Orozco, Universidad de Puerto Rico, Rio Piedras

Decision Related Structures, August 2000 - May 2002

Our objective is to determine special features of discrete dynamical systems using classical analysis and combinatorial tools. We correlate local components of attractors with fitness properties and combinatorial structures as a first step in designing controls for optimal system performance.

Collaborators: Joseph Lakey, New Mexico State University; Reinhard Laubenbacher, Virginia Tech.

Permutation Polynomials over Finite Fields, January 1997 - May 1999

Our goal is to find necessary and sufficient conditions for a general polynomial over finite fields to be permutation polynomials. Our results include a new criterion that classifies a wide family of binomials over finite fields to be permutation binomials. Also we found a relationship between our criteria and quadratic residues.

Collaborators: Alberto Caceres, University of Puerto Rico.

Groebner Conversion Methods for the Implicitization of Bisector Surfaces, Summer 1998

In this work, using Groebner basis conversion methods, we created and implemented an algorithm which gives the implicit equation of a bisector surface.

Collaborators: John Little, Holy Cross College.

Computerized Tomography, Summer 1996

We created an algorithm that reconstructs any square matrix from its rows, columns and diagonal weights.

Collaborator: Pablo Salzberg, University of Puerto Rico

Symbolic Polynomial Reduction over Finite Fields, January - May 1997

We created an implement an algorithm that performs multivariate polynomial reduction over an arbitrary finite field.

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Research Activities:

A New Characterization of the Frobenius Problem.

Contributed invited presentation at CET 2012. Beijing China. October 2012

Primitive graphs and boolean monomial dynamical systems

Contributed invited presentation at the XXVII SIDIM. UPR-Mayaguez, March 2012

On the transient of Discrete Dynamical Systems

Contributed invited presentation at the XXVI SIDIM. UPR-Humacao, February 2011

Computational Algebra and its applications.

Contributed invited presentation at the AMP undergraduate student presentation. UPR-Mayaguez, September 2009.

A control theory approach for finite dynamical systems.

Contributed oral presentation at the XXII SIDIM. University of Puerto Rico, Carolina. 2008.

How to determine when a discrete dynamical system is a fixed point system in Polynomial Time

Contributed oral presentation at the mathematical seminar, UPR-Humacao Humacao, PR 2007

Non-linear discrete dynamical Systems and its applications

Contributed oral presentation at the 2006 SACNAS Tampa Conference Center, Florida October 26-29, 2006

Sistemas dinamicos secuenciales

Contributed Oral Presentation at Mathematics Seminar, UPR – Cayey Noviembre 2005, PR

Discrete Dynamical Systems and its applications

Contributed Oral Presentation at SIDIM XXII UPR-Ponce, Febrero 2007

Some applications for discrete dynamical systems

Contributed Oral Presentation at SIDIM XXI, Universidad del Turabo, Caguas, PR., Feb. 2006

Fixed Point Dynamical Systems

Contributed oral presentation at the “Seminario Interuniversitario de Investigación Matematica” (SIDIM) Mayaguez, Puerto Rico, 2006

Non Linear Dynamical Systems over Finite Fields

Contributed oral presentation at the CoheMis Symposium Mayaguez, Puerto Rico, 2006

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Wavelet Analysis of Influential Flow in Distributed Decision Systems

Contributed poster presentation at the 27th National Conference of the Society for Advance in Chicanos and Native Americans (SACNAS).
Atlanta, GA, October 2000.

Groebner Basis Conversion Methods for the Implicitization of Bisector Surfaces.

Contributed poster presentation at the 25th National Conference of the Society for Advance in Chicanos and Native Americans (SACNAS).
Washington, DC September 1998.

Symbolic Polynomial Reduction over Finite Fields

Contributed oral presentation at the Computer Research Conference.
Mayaguez, Puerto Rico, 1997.

Grants/Awards/Scholarship/Reviewer:

Reviewer for International Journal of Computer Mathematics, 2012

Role Model Chapter Award, 2008-2012. SACNAS Chapter.

Pi, Development of a Computer Science Research Laboratory for Undergraduates. Grant given by Lockheed-Martin. \$25,000.00

Co-Pi, Development of a Portable, Continuous-mode Quartz Crystal Microbalance Biosensor. Internal Grant by UPR-Mayaguez. \$ 74,900.00. (Co-Pi, Abel Baerga, Pi, Rick Valentin)

Co-Pi, PREMUR, Research Experiences for Undergraduates at The University of Puerto Rico, Mayaguez. Grant given by the National Security Agency, \$93,000.00. (Co-Pi Damaris Santana and Pi Luis Caceres)

National Science Foundation, Alliances for Graduate Education and the Professoriate (NSF-AGEP), Scholarship

Beca Presidente, Scholarship given by the University of Puerto Rico

Alliance for Minority Participation (AMP), Travel and research stipend.

Poster awarded at the Undergraduate Research Section at the 1999 Joint Meetings of the American Mathematical Society and Mathematical Association of America, San Antonio, TX, January 1999.

Poster awarded at the Undergraduate Research Section at the 1998 Joint Meetings of the American Mathematical Society and Mathematical Association of America, Baltimore, MD, January 1998.

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Publications:

On the transient of Boolean Monomial Dynamical Systems. In preparation. (With D. Bollman)

A New Characterization of the Frobenius Problem. To be published in: CET 2012 Proceedings, Scientific Research Publishing. (With D. Bollman)

A control theory for Boolean Monomial Dynamical Systems, Journal of Discrete Event Dynamic Systems. **20**: 19-35. 2010. (with D. Bollman, V. Ocasio and E. Orozco)

Fixed Points in Discrete Models for Regulatory Genetic Networks, EURASIP Journal on Bioinformatics and Systems Biology, vol. 2007, Article ID 97356, 8 pages, 2007. (with D. Bollman and E. Orozco)

Monomial dynamical systems over finite fields. Complex Systems. **16**: 333-342. 2006. (with A. Jarrah, R. Laubenbacher and B. Sturmfelds)

Monomial Dynamical Systems over Finite Fields. Paperback: 74 pages Publisher: ProQuest / UMI (March 18, 2006) ISBN: 0496983520

Boolean Monomial Dynamical Systems. "Annals of Combinatorics". 425-439. 2004. (with Reinhard Laubenbacher and Bodo Pareigis)

Multivariable Polynomial Reduction over Finite Fields. Proceedings of the Computer Research Conference, 1996. University of Puerto Rico, Mayaguez Campus. (with A. Caceres)

Ph.D. Students Graduate Committee

Edgar Ferrer, Graduate 2009. CISE

Marie Llubere-Contreras, August 2011-Current. CISE

M.S. Students Graduate Committee

Xavier Theran, August 2012-Current

Einstein Morales, August 2010-Current

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MS Graduate Student Mentoring

Aragones-Geney, Ernes Ch. 2010. Teoría de control para sistemas dinámicos monomiales sobre cuerpos finitos.

Tomaiconza-Ataulluco, Oscar. 2010. Cuñas en sistemas dinámicos.

Ocasio, Víctor A. 2009. Stability of Boolean Dynamical Systems and Graph Periodicity.

Orjuela-Garavito, María del P. 2009. Un algoritmo para la aplicación de ingeniería reversa en sistemas biológicos.

Pérez-Báez, Luis O. 2008. Sistemas Dinámicos Booleanos y Operaciones de Puente.

Sepúlveda-Avenidaño, Leonid B. 2007. Sistemas dinámicos finitos booleanos monomiales Afines