Curriculum Vitae ▪ Ariel Cintrón-Arias

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US Citizen

Education

Ph.D., Center for Applied Mathematics, Cornell University. August, 2006.
- Thesis: Modeling and Parameter Estimation of Contact Processes.
- Advisor: Carlos Castillo-Chavez.

M.S., Center for Applied Mathematics, Cornell University, January, 2004.
B.S. with honors, Mathematics, University of Puerto Rico-Cayey, May, 1999.

Professional Experience

Assistant Professor.
- Department of Mathematics, East Tennessee State University, Johnson City, Tennessee. Fall 2009 through present**.**

Postdoctoral Research Associate.
- Center for Quantitative Sciences in Biomedicine, North Carolina State University, Raleigh, North Carolina. Fall 2007 through Summer 2009**.**

Mentor to Graduate Students.
I assisted a team of six graduate students, while working in a project about cardiovascular events associated with antibacterial agents. This project entailed mathematical modeling, numerical simulation, and sensitivity analysis. Industrial Mathematical and Statistical Modeling Workshop for Graduate Students 2008.
- Center for Research in Scientific Computation, North Carolina State University, Raleigh, North Carolina. July 21-29, 2008.

Instructor of Mathematics.
Some of my duties entailed: teaching brief calculus four times per week, holding office hours, writing tests, as well as make-up and final examinations.
- Department of Mathematics, North Carolina State University, Raleigh, North Carolina. Fall 2007.

Mentor to Undergraduate Students.
I taught a MATLAB tutorial about linear inverse problems in an undergraduate workshop (targeted to college juniors and seniors) focusing on mathematical modeling and statistical analysis of experimental data.
- Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, North Carolina.
- Center for Research in Scientific Computation, North Carolina State University, Raleigh, North Carolina. May 21-25, 2007.

Postdoctoral Research Associate.
- Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, North Carolina. Center for Research in Scientific Computation, North Carolina State University, Raleigh, North Carolina. Fall 2006 through Summer 2007.

Instructor of Mathematical Biology.
I joined a team of four instructors in teaching an experimental course of nonlinear dynamics specially designed for advanced high-school students, who had not previously studied calculus.
- Institute for Strengthening the Understanding of Mathematics and Science, Arizona State University, Tempe, Arizona. Summer 2006.

Instructor of Mathematics.
Some of my duties included: teaching introductory courses of calculus, three lectures per week, office hours, designing homework assignments and exams, and grading.
- Department of Mathematics and Statistics, Arizona State University, Tempe, Arizona. Spring 2006, Fall, 2005 and 2004.

Assistant to the Directors of Mathematical and Theoretical Biology Institute (MTBI).
My duties included:

- Selection of applicants (reading statements of purpose, academic transcripts and letters of recommendations).
- Planning academic schedule.
- Coordination of duties among graduate students and teaching assistants.
- Planning of weekly colloquium.
- Teaching computer laboratories.
- Teaching review session in linear algebra.
- Hosting visiting faculty.
- Co-supervision of undergraduate research projects.

• Los Alamos National Laboratory, Los Alamos, New Mexico. June August, 2005 and 2004.

Undergraduate Research Supervisor. I mentored teams of undergraduate students working in research projects that entailed mathematical modeling, linear stability analysis, simulation, sensitivity and uncertainty analysis. The project titles and brief descriptions are given below:

- Summer 2006:*Estimation of Within-host Reproductive Number Distributions from HIV-1 Viral Load Data*. A Bayesian methodology is applied to longitudinal observations obtained from antiretroviral drug-naïve patients infected with HIV-1.
- Summer 2005: *Epidemiology as Related to the Phylogenetic Analysis of the Evolution of the Influenza Virus.* This project examined the interplay between two scales in epidemiology and evolution of influenza A viruses.
- Summer 2004: *Does Gravitational Gossip Weigh Heavy in your LAN?* The project explored the spread of information in computer networks.
- Summer 2003: *A Deterministic Approach to the Spread of Rumors* . This project investigated rumor spread among a heterogeneous population, where two extreme attitudes were enhanced among the total population: passive and active.

• Mathematical and Theoretical Biology Institute, Los Alamos National Laboratory, Los Alamos, New Mexico. June-August, 2006, 2005, 2004, 2003.

Instructional Teaching Assistant. I taught an introductory calculus course. Some of my duties included: four lectures per week, office hours, writing exams, classroom laboratories, and grading.

• Department of Mathematics, Cornell University, Ithaca, New York. Fall 2002.

Teaching Assistant. Recitation and office hours for vector calculus courses.

• Department of Mathematics, Cornell University, Ithaca, New York. Fall 2000, Spring 2001.

Grader. Graduate course in numerical linear algebra.

• Department of Computer Science, Cornell University, Ithaca, New York. Fall 2001.

Research Interests

My research interests lie in the areas of: nonlinear dynamics, mathematical modeling, simulation, and parameter estimation. I am interested in mathematical formulations (deterministic and stochastic) that describe time-evolution of contact processes including population models for single species (e.g. logistic) and population models for interacting species (e.g. predator-prey systems, transmission dynamics of infectious diseases, within-host dynamics, and the social dynamics of scientific discovery and drinking behavior).

Publications

- Cintron-Arias, A., Banks, H.T., Capaldi, A., Lloyd, A.L.: A sensitivity matrix based methodology for inverse problem formulation. Center for Research in Scientific Computation Technical Report CRSC-TR09-09, NCSU, April, 2009. J. Inv. Ill-Posed Problems **17**, 545-564 (2009).
- Banks, H.T., Holm, K., Wanner, N.C., Cintron-Arias, A., Kepler, G.M., Wetherington, J.D.: A mathematical model for the first-pass dynamics of antibiotics acting on the cardiovascular system. Center for Research in Scientific Computation Technical Report CSRC-TR08-25, NCSU, December, 2008. Math. Comput. Model. **50**, 959-974 (2009).
- Cintron-Arias, A., Sanchez, F., Wang, X., Castillo-Chavez, C., Gorman, D.M., Gruenewald, P.J.: The role of nonlinear relapse on contagion amongst drinking communities. Center for Research in Scientific

Computation Technical Report CRSC-TR08-22, NCSU, December, 2008. *Mathematical and Statistical Estimation Approaches in Epidemiology*, (Chowell et al., eds.), Springer, New York.

- Cintron-Arias, A., Sanchez, F., Castillo-Chavez, C.: Sensitivity analysis of drinking dynamics: From deterministic to stochastic formulations. Center for Research in Scientific Computation Technical Report CRSC-TR08-14, NCSU, October, 2008.
- Cintron-Arias, A., Castillo-Chavez, C., Bettencourt, L.M.A., Lloyd, A.L., Banks, H.T.: The estimation of the effective reproductive number from disease outbreak data. Center for Research in Scientific Computation Technical Report CRSC-TR08-08, NCSU, April, 2008. Math. Biosci. Eng. **6**, 261-282 (2009).
- Bettencourt, L.M.A., Cintron-Arias, A., Kaiser, D.I., Castillo-Chavez, C.: The power of a good idea: quantitative modeling of the spread of ideas from epidemiological models. *Physica A* **364**, 513-536 (2006).
- Chowell, G., Cintron-Arias, A., Del Valle, S., Sanchez, F., Song, B., Hyman, J.M., Hethcote, H.W., Castillo-Chavez, C.: Mathematical applications associated with the deliberate release of infections agents. In: Gumel, A., Castillo-Chavez, C., Clemence, D.P., Mickens, R. E. (eds.) *Mathematical studies on human disease dynamics: emerging paradigms and challenges*. Contemp. Math., 410, pp. 51-72. Amer. Math. Soc., Providence (2006).
- Lloyd, A., Valeika, S., Cintron-Arias, A.: Infection dynamics on small world networks. In: Gumel, A., Castillo-Chavez, C., Clemence, D.P., Mickens, R. E. (eds.) *Mathematical studies on human disease dynamics: emerging paradigms and challenges*. Contemp. Math., 410, pp. 209-234, Amer. Math. Soc., Providence (2006).

Publications in preparation

- *On the transmission dynamics of knowledge,* with Luis Bettencourt, David Kaiser, and Carlos Castillo-Chávez. In preparation.
- *An estimation methodology for seasonal transmissibility*, with H.T. Banks, A. Lloyd, and P. Reichert. In preparation.

Awards and Honors

- Postdoctoral Research Supplement, National Institutes of Health and North Carolina State University, Raleigh, North Carolina, Fall 2007 through present.
- Postdoctoral Fellowship, Statistical and Applied Mathematical Sciences Institute (funded by the National Science Foundation), Research Triangle Park, North Carolina, Fall 2006 through Summer 2007.
- Research Assistant, Arizona State University. Tempe, Arizona. Fall, and Spring, 2005
- Graduate Associate in the 2004-2005 Program on Genomes to Global Health: Computational Biology of Infectious Diseases. Statistical and Applied Mathematical Sciences Institute. Research Triangle Park, North Carolina. Spring, 2005.
- Graduate Research Assistant, Center for Nonlinear Studies, Los Alamos National Laboratory. Los Alamos, New Mexico. Fall, 2003.
- SUNY Fellowship. Spring 2004, and Spring, 2003.
- Cornell-Sloan Fellowship. Awarded to former MTBI participants who were admitted into a graduate program in Cornell University. 1999-2002.
- Cornell University Graduate Student Travel Grant. 2004, 2003, 2002, 2000.

Service

Working Group Coordination

Leader: Dynamics of Infectious Diseases: Longitudinal Data Acquisition and Analysis, Population and In-Host Models, and Statistical and Mathematical Methodologies.

- Statistical and Applied Mathematical Sciences Institute. January – April, 2007.

Seminar Organization

Organizer: 2004 Mathematical and Theoretical Biology Institute Colloquium.
- Center for Nonlinear Studies, Los Alamos National Laboratory. June-August, 2004.

Co-organizer: Mathematical Epidemiology Graduate Student Seminar Series.
- Center for Nonlinear Studies, Los Alamos National Laboratory. Spring, 2003.

Conference Organization

Co-organizer: *Arizona Days 2004.*
- Center for Nonlinear Studies, Los Alamos National Laboratory. January 30-31, 2004.

Co-organizer: *Computational and Mathematical Approaches to Homeland Security, Public Health and Policy Control: Challenges Posed by Emerging and Re-emerging Diseases.*
- Los Alamos National Laboratory. June 30 and July 1, 2003.

Sessions co-organized at Conferences

- Professional Development Evening, Landing a Job after Graduate School, and Effective Grant Proposal Writing, 2005 SIAM Annual Meeting (with Roummel Marcia).
- Mini-symposium about Dynamics in Social Networks, 2004 SIAM Annual Meeting (with Carlos Castillo-Chavez).

Invited Presentations

Conference Oral Presentation

- *The Estimation of Effective Reproductive Number from Disease Outbreak Data, Parameter Estimation from Epidemic Data*
  - 2009 SIAM Annual Meeting, July 6-10, 2009.
- *The Estimation of Effective Reproductive Number from Disease Outbreak Data*
  - 2009 Joint Mathematics Meetings, January 5-9, 2009.
- *Parameter Estimation of Epidemic Processes*
  - 2008 Inverse Problems: Modeling and Simulation, May 26-30, 2008.
- *Seasonal Influenza Transmissibility in the US*
  - 2007 Joint Statistical Meetings, July 29 – August 2, 2007.
- *Estimation of Seasonal Reproductive Numbers and Transmission Rates*
  - SAMSI Transition Workshop, May 14 -16, 2007.
- *Analysis of Oscillatory Patterns in Disease Transmission*
  - SAMSI/MUCM Mid-Program Workshop, April 2-3, 2007.
- *Epidemiology of Information Spread*
  - 2005 SIAM Annual Meeting, July 11, 2005.
- *Epidemic Parameter Estimation via Ensemble Stochastic Search Methods*
  - 2005 SIAM Annual Meeting, July 13, 2005.
- *Rumors in Complex Attractors*
  - 2004 SIAM Annual Meeting, July 12-16, 2004.
  - International Conference in Complex Systems, May 16-21, 2004.
- *Initial Growth for Epidemics and Rumors*
  - Iowa Conference in Biomathematics, University of Iowa. November, 2003.
- *Rumor Propagation in Random Networks*
  - Computational and Mathematical Approaches to Homeland Security, Public Health, Policy and Control: Challenges Posed by Emerging and Re-emerging Diseases. June 30 - July1, 2003.
- *Homogeneous Mixing versus Social Structure in Rumor Spreading*
  - 2003 SIAM Annual Meeting, June 17, 2003.

Conference Poster Presentation

- *Estimation of Seasonal Influenza Reproductive Numbers*
  - Opportunities in Mathematical Biology for Underrepresented Groups, March 23-25, 2007.
- *Epidemic Parameter Estimation via Stochastic Search Methods*
  - 2005 SIAM Annual Meeting, July 12, 2005.
  - 2005 Ecology and Evolution of Infectious Diseases Conference, May 20, 2005.

- *Ecology of Information Spread*
  - First Young Researchers Workshop in Mathematical Biology, March 29-April 1, 2005.
- *Rumors in Complex Attractors*
  - Gordon Conference in Theoretical Biology and Biomathematics**,** June 5-11, 2004.
  - Arizona Days, January 30-31, 2004.
- *Using Filter Methods in a Nonlinear Interior-Point Algorithm*
  - Richard Tapia Celebration of Diversity in Computing, October, 2001.

Seminars

- *Rumors in Complex Attractors*
  - Mathematical Biology Seminar, Department of Mathematics, Arizona State University. May, 2004.
- *A Mathematical Study for the Spread of Rumors*
  - Mathematical Sciences Graduate Student Seminar Series, Center for Applied Mathematics, Cornell University. October, 2003.
- *There is Something about Rumors*
  - Mathematical Epidemiology Graduate Student Seminar Series, Center for Nonlinear Studies, Los Alamos National Laboratory. April, 2003.
- *Informational Cascades*
  - Mathematical Epidemiology Graduate Student Seminar Series, Center for Nonlinear Studies, Los Alamos National Laboratory. March, 2003.
- *Epidemics in Random Graphs*
  - Mathematical Epidemiology Graduate Student Seminar Series, Center for Nonlinear Studies, Los Alamos National Laboratory. February, 2003.
- *Using Filter Methods in a Nonlinear Interior-Point Algorithm*
  - Mathematical Sciences Graduate Student Seminar Series, Center for Applied Mathematics, Cornell University. September, 2001.

Professional Membership

- American Mathematical Society.
- Society for Mathematical Biology.

Computer Skills

- Languages: MATLAB and Mathematica
- Tools: Latex, PDFTex, Berkeley Madona.
- Platforms: Unix/Linux, Windows, Mac OS X.

References

- H.T. Banks (Postdoctoral supervisor): htbanks@unity.ncsu.edu
- Alun Lloyd: alun_lloyd@ncsu.edu
- Carlos Castillo-Chavez (Ph.D. advisor): ccchavez@asu.edu
- Linda Gao: lqgao@noctrl.edu
- Luis Bettencourt: lmbett@lanl.gov
- Priscilla Greenwood: pgreenw@math.la.asu.edu