

Franziska B. Hinkelmann

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RESEARCH AREA

Computational Algebra and Algebraic Geometry in Mathematical Biology

Mathematical modeling is vital to understanding and predicting a biological system. For systems discrete in nature, like many biological systems, algebraic modeling techniques are suitable. Unlike continuous systems, which have a wide range of theorems and software available for model generation (e.g., parameter estimation) and simulation (e.g., solving differential equations), very few tools exist for discrete networks. My research goal is to find practical methods to analyze the dynamics of discrete models using abstract algebra in place of complex computations.

EDUCATION

Virginia Tech, Blacksburg, VA

Ph.D. Mathematics, expected 2011
Reinhard Laubenbacher (Virginia Bioinformatics Institute), Advisor

M.S. Mathematics, May 2007
Master's Presentation: *Heat Transfer in a Layered Longeron*
Terry Herdman (Interdisciplinary Center for Applied Mathematics), Advisor
John Burns, Gene Cliff, Ed Green, committee members

Universität Karlsruhe, Karlsruhe, Germany

Vordiplom Mathematik, May 2006
Studium Informationswirtschaft (computer science, economics, law), 2002 - 2004

RESEARCH

Publications

Reverse Engineering Nested Canalizing Functions with A. Jarrah, in preparation

Boolean Models of Bistable Biological Systems with R. Laubenbacher, accepted to Journal of Discrete and Continuous Dynamical Systems - Series S (DCDS-S)

Parameter estimation for Boolean models of biological networks with Dimitrova, García-Puente, Jarrah, Labenbacher, Stilger, Stillman, Vera-Licona, accepted to Journal Theoretical Computer Science, April 2009

Talks

AMS Joint Mathematics Meeting Panel Discussion *Finding a Research Topic and Thesis Advisor*, MAA Committee on Graduate Students and the Young Mathematicians' Network, January, 2010

SAMSI (Statistical and Applied Mathematical Sciences Institute) Working Group *Random Delay Networks*, February 4, 2009

AMS Joint Mathematics Meeting *A General Method to derive a Boolean Model from a Continuous Model for Gene Regulatory Networks*, January 6, 2009

Virginia Tech Physics Department, Graduate Student Seminar *Gene Regulation in the Lac Operon*, September 12, 2008

SIAM Student Research Seminar *General Method to Transition from a Continuous Model to a Discrete Network*, September 3, 2008

2008 SIAM Annual Meeting *Understanding Dynamics of Gene Regulation Using a Discrete Model*, July 7-11, 2008

Posters

SAMSI Opening Workshop Program on Algebraic Methods in Systems Biology and Statistics, *Understanding Dynamics of Gene Regulation Using a Discrete Model*, September 14-17, 2008

RESEARCH EXPERIENCE

Virginia Tech

Graduate Research Assistant Virginia Bioinformatics Institute, Fall 2009
Computational Biomathematics: Toward Optimal Control of Complex Biological Systems

Lecture Series *Algebraic Statistics*, Fall 2009

Mentor for IMSD Undergraduate Research, *Network Modeling*, Spring and Summer 2009

- Mentoring an individual student in his undergraduate research
- Defined the project and set research goals
- Weekly meetings.
- Final report

Mentor for Undergraduate Research, *Network Modeling*, Fall 2008

- Mentoring an individual student in her undergraduate research

Mentor REU Modeling and Simulation in Systems Biology, Summer 2008

- Mentoring a group of 8 undergrads
- Providing help for their research

Graduate Research Assistant Interdisciplinary Center for Applied Mathematics, Spring 2007

Advisor: Terry Herdman

Heat Transfer in a Layered Longeron

HONORS

Awards

SACNAS Travel Scholarship (Advancing Hispanics/Chicanos and Native Americans in Science), Improving the Human Condition: Challenges for Interdisciplinary Science, October 15-18, 2009, Dallas, Texas

SIAM Annual Meeting, July 6-10, 2009, Denver, Colorado

SIAM Student Chapter Certificate of Recognition 2009, faculty advisor Lizette Zietsman

MSRI (Mathematical Sciences Research Institute) **Graduate Workshop** Toric Varieties, June 15-26, 2009, Berkeley, California

SIAM Student Travel Award SIAM Annual Meeting, July 7-11, 2008, San Diego, California

Hatcher Fellowship Summer 2008

Baden-Württemberg Stipendium Scholarship 2006-2007

Travel Support

MSRI Macaulay 2 Workshop, January 7 - 13, 2010, Berkeley, California

NIMBioS Optimal Control and Optimization for Individual-based and Agent-based Models, December 1-3, 2009, Knoxville, Tennessee

MBI (Mathematical Biosciences Institute) Mathematical Developments Arising from Biology, November 8-10, 2009, Columbus, Ohio

MBI Polynome working group, August 16-18, 2009, Columbus, Ohio

DIMACS (Center for Discrete Mathematics and Theoretical Computer Science) Polynome working group, June 27-30, 2009, Rutgers, New Jersey

SAMSI Software Workshop Polynome working group, February 24-26, 2009

AMS Joint Mathematics Meeting, January 5-8, 2009

SAMSI Discrete Models in Systems Biology Workshop, December 3-5, 2008

SAMSI Opening Workshop Program on Algebraic Methods in Systems Biology and Statistics, September 14-17, 2008

IMA (Institute for Mathematics and Its Applications) Workshop Design Principles in Biological Systems, April 21-25, 2008, Minneapolis, Minnesota

IMA Tutorial Network Dynamics and Cell Physiology, April 17-18, 2008

IMA Workshop Organization of Biological Networks, March 3-7, 2008

ASSOCIATION MEMBERSHIPS

SIAM Student Chapter at Virginia Tech

President, 2008 - 2009

Organized Student Research Seminar, visiting speakers program, field trip to Joint Mathematics Conference, Minisymposia, website maintenance

Pi Mu Epsilon

Mathematics Honorary Member, since 2007

TEACHING EXPERIENCE

Virginia Tech

Course Instructor - Integral Calculus, Summer 2009

- Lectured five times a week for a class of 32 undergraduate students
- Created syllabus
- Wrote and graded course exams
- Assigned grades to students

Course Instructor - Computer-tested Integral Calculus, Spring 2009

- Lectured three times a week for a class of 80 undergraduate students
- Held office hours twice a week
- Assigned grades to students

Course Instructor - Differential Calculus, Fall 2007 - Fall 2008

- Lectured two or three times a week for a class of 40 undergraduate students
- Created quizzes and worksheets
- Graded homework and *Mathematica* worksheets
- Held office hours three times a week
- Wrote and contributed to the creation of course exams
- Held review sessions for exams
- Graded exams
- Assigned grades to students

Instructional Assistant, Fall 2006

- Assisted students with math concepts and software questions

Universität Karlsruhe

Numerical Analysis Programming Lab Instructor, Spring 2006

- Instructed students once a week and graded C++ and Java Exercises

Linear Algebra and Analysis Recitations, Spring 2005 - Spring 2006

- Lectured once a week for a class of 70 undergraduate students
 - Graded homework and exams
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OTHER WORK EXPERIENCE

EnBW Trading GmbH, Karlsruhe, Germany, Summer 2007

Internship Methods and Models at EnBW Trading GmbH

- Researched energy consumption and production in Europe.

United Internet AG, Karlsruhe, Germany, 2001 - 2006

Unix System Developer

- Responsible for planning, programming and testing of software, mainly written in C, C++, Perl
 - Projects included Voice over IP server software and low level storage software.
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PROGRAMMING
EXPERIENCE

- common UNIX scripting languages
- Ruby on Rails, <http://polymath.vbi.vt.edu/polynome/>
- C, C++
- Computational Algebra Systems, *Reverse Engineering Nested Canalizing Functions (Singular)*
- Unix Server Administration, *Administration of server for Applied Discrete Mathematics Group at VBI*

LANGUAGES German, English, Italian