

Christian E. Laing

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PERSONAL

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EDUCATION

Florida State University, Tallahassee, FL

- *PhD Biomedical Mathematics (Computational Biology)*,
PhD Advisor: De Witt Sumners, December 2006
- *Master of Science in Biomedical Mathematics (Computational Biology)*, May 2003
- *Program for Instructional Excellence (PIE) Teaching Certificate*, April 2002

Universidad de Guanajuato, Guanajuato, Gto, México

- *Bachelor of Science in Mathematics, thesis title "El Grupo Fundamental para Enlaces"*, *Advisor: Jose Carlos Gomez Larrañaga*, May 2001

TEACHING EXPERIENCE

Lead Instructor, Florida State University, Tallahassee, FL

- Calculus I, August 2006 – December 2006
- Calculus III, May 2006 – July 2006
- Calculus I, January 2004 – August 2004

Present lectures as well as evaluated the students' performance by grading assignments, quizzes and exams.

Design course materials such as the exams, quizzes and solutions to quizzes.

Maintain regularly scheduled office hours in order to advise and assist students.

Utilize technology to disseminate information and assignments to students.

- Biocalculus Lab, August 2004 – May 2005

Presented lectures designed to introduce students to topics in computational and mathematical biology.

Introduced students to problems in biology, medicine and physiology to illustrate how computation and mathematics (techniques from calculus) improve and enhance the understanding of these problems.

Instructed the students on how to use *Matlab* and *Maple* programming software.

Chose and designed the topics and materials for the course.

Evaluated and graded students' assignments and tests.

Supervised two graduate teaching assistants and demonstrated teaching strategies.

- Trigonometry, May 2003 – December 2003

Planned and presented class lectures.

Evaluated students' performance on assignments quizzes and tests.

Maintained regularly scheduled office hours in order to advise and assist students.

Teaching Assistant, Florida State University, Tallahassee, FL August 2001 – April 2003

Answered students' questions regarding assignments, quizzes and exams in *Liberal Arts Mathematics, College Algebra, Trigonometry, and Practical Finite Mathematics* classes.

Maintained student attendance records, grades, and other required records.

Initiated, facilitated, and moderated classroom discussions.

Prepared course materials such as syllabi, homework assignments, and handouts.

RESEARCH INTERESTS

- Knot Theory
- Differential Geometry
- Mathematical Biology
- Pattern Classification
- Molecular Entanglement of Polymers
- Brain Structure Classification
- RNA Secondary and Tertiary Structures
- Protein Classification
- Cancer Research
- Drug Design

RESEARCH EXPERIENCE

Independent Research, Tallahassee, FL

- May 2006-present

Develop mathematical and statistical models of phenomena to be used for analysis or for computational simulation in the classification of RNA tertiary structures.

Writing scientific papers containing a number of theorems and mathematical proofs within the field of Knot Theory and applying these results within the field of Molecular Biology and Neuroscience.

- May 2003-May 2005

Read academic journals, books in the field of Mathematics applied to Molecular Biology and Medicine.

Studied theory of Topology, Differential Geometry and Biochemistry.

Conferred with other professionals, both in Mathematical and Biochemical areas of application.

Wrote computer programs to generate structural information about proteins.

Described theoretical background and justification of Crystallographic techniques for

biopolymers.

Joined professional associations, attend conferences, seminars.

Research Assistant, Florida State University, Tallahassee, FL

- PMMB Fellowship, Advisor: *De Witt Sumners*, May 2005 – May 2006

Worked on generalizations of geometrical/topological knot invariants such as the writhe, linking number, average crossing number, average linking number, and generalized gauss integrals.

Co-authored article on writhe geometrical entanglement measures for ring polymers.

Defined classification problems in mathematical terms using variables and equations.

Worked on a method to classify brain structures by using geometrical/topological invariants.

Worked on the RNA classification problem using topology and differential geometry.

Developed, wrote and implemented algorithms, computer programs and databases to classify proteins, RNA and structures of the brain.

Produced tables, charts, diagrams, arrays and graphs to aid in data analysis on RNA secondary structure classification.

Formulated sets of equations that capture both structure and function of biopolymers (RNA and proteins) as well as brain structures.

Assisted with writing NIH grant proposal, April 2006.

FUTURE RESEARCH PLANS

- Work on more generalizations of geometrical/topological knot invariants such as the writhe, linking number, average crossing number, average linking number, and generalized gauss integrals, applied to open, broken and branched curves.
- To understand more about the morphology of the brain and the changes during development, aging and pathology.
- A set of three computer databases of public domain for the classification of proteins, RNA and brain structures respectively.
- To explore problems related to DNA topology.
- Investigate through geometrical and topological invariants, the structure of enzymes that bind to biopolymers such as DNA, RNA and proteins, and infer biophysical properties from it.

PUBLICATIONS

Christian Laing, De Witt Sumners. *Computing the writhe on lattices*. Journal of Physics A: Mathematics and General. 39 1-9 (2006).

Christian Laing. *El grupo fundamental para enlaces*. Bachelor of Science in Mathematics thesis, Universidad de Guanajuato. Thesis advisor: Jose Carlos Gomez Larrañaga, Guanajuato, Gto. México (2001).

Christian Laing, Gil Bor. *Extensiones del teorema de Helly*. Primer Verano de la

Investigacion del Centro, Guanajuato Gto, Mexico (2000).

PRESENTATIONS

- Biomedical Math Seminar FSU: *Introduction to Data Mining: Linear models and decision trees*, November 22, 2005
- **International Conference on Combinatorial Geometry, Topology and Optimization; BoltianskiiFest:** *The writhe of polygonal open curves*, September 1, 2005, Mexico
- Biomedical Math Seminar FSU: *Exploring RNA secondary structures by using graph theory*, April 4, 2005
- Greebaun's RNA Lab FSU: *Exploring structural RNA motifs by using graph theory*, March 26, 2005
- **III International Joint Meeting Japan-Mexico:** *The writhe on lattices*, December 6, 2004, Mexico
- Biomedical Math Seminar FSU: *The writhe of a polygonal curve on a lattice*, November 16, 2004
- Biomedical Math Seminar FSU: *Knot Theory and its Applications*, November 9, 2004

MEETINGS AND CONFERENCES

- International Conference in Combinatorial Geometry BoltianskiiFest, Guanajuato, Mexico, 2005
- III International Joint Meeting Japan-Mexico in Topology and its Applications, Oaxaca Mexico, 2004
- Knots in Vancouver at PIMS, University of British Columbia, Canada, 2004
- BioMaPS/DIMACS/MBBC/PMMB Short Course: Transcriptional Regulation from Molecules to Systems and Beyond, Rutgers University, 2004
- Seminar on Topology Applied to Biology, University of Florida, 2002
- VII Escuela de Verano, CIMAT, México, 2000
- XXXII Congreso de la Sociedad Matemática Mexicana, 1999
- VI Escuela de Verano, CIMAT, México, 1999
- III Encuentro de Geometría Diferencial IMATE-CIMAT, México, 1999
- XXXI Congreso de la Sociedad Matemática Mexicana, 1998
- V Escuela de Verano, CIMAT, México, 1998
- XXX Congreso de la Sociedad Matemática Mexicana, 1997

AWARDS

- PMMB Fellowship, May 2005
- Howard Hughes Fellowship, August 2004

COMPUTER SKILLS

- Visual Studio .NET
- C/C++
- SQL
- Java
- Java Script
- WEKA
- Maple
- Matlab
- Scilab
- Linux
- Windows
- HTML
- Microsoft Office
- Knowledge of Hardware

PROFESSIONAL AFFILIATIONS

- Society for Industrial and Applied Mathematics (SIAM)
- American Mathematical Society (AMS)
- Phi Mu Epsilon Mathematical Society
- RNA Journal Club, Florida State University