CV Juan Andres Montoya

1. Personal Information

- email: amontoyaa@googlemail.com, juamonto@uis.edu.co
- web page: http://matematicas.uis.edu.co/jmontoya/
- Nationality: Colombian
- Languages: Spanish (native), German, English.
- Married, one son aged six.
- Erdoss' Number 5: Erdoss∼Gurevich∼Grohe∼Flum∼Mueller∼Montoya

2. Studies

- Bachelor degree in mathematics, Universidad Nacional de Colombia, Bogota 2000.
- Master degree in Mathematics, Universidad Nacional de Colombia, Bogota 2003.
- Dr. rer. nat, Albert Ludwig Universitat Freiburg, 2008.

3. Grants

- DAAD grant (Germany). April 2008-September 2008.
- DFG grant (Germany). April 2004-March 2007.
- Mazda Foundation grant (Colombia). February 2001-January 2003.
- Advisor best undergraduate thesis in mathematics written in Colombia year 2003, Otto de Greiff's prize.

4. Research Projects

- (Leader) The Computational Complexity of Statistical Mechanics, in progress, expected end date August 2011, research project funded by COLCIENCIAS.
- (Leader) The Parameterized Complexity of Mining Graphs, 2008-2009, Research project funded by VIE-UIS.

5. Publications: published and accepted

(1) J. Andres Montoya, Moritz Mueller. Parameterized random complexity. Accepted Theory of Computing Systems.

(2) J. Andres Montoya. A note concerning the algorithmic analysis of polymer thermodynamics. MATCH: Communications in mathematical and computer chemistry Vol. 67(3): 761-772, 2012.

(3) J. Andres Montoya, Carolina Mejia. The computational Complexity of Sandpile Group Computations. Theoretical Computer Science, 412:3964-3974, 2011.

(4) J. Andres Montoya. The parameterized complexity of approximate counting. Theoretical Informatics and Applications, 45(2):197-223, 2011.

(5) J. Andres Montoya, Francisco Gutierrez, Luis Zambrano. Applications of Schutzenberger-Bertoni method: counting polygons. Electronic Notes in Discrete Mathematics, 37(1):93-98, 2011.

(6) J. Andres Montoya, Carolina Mejia. The Complexity of Three-dimensional Critical Avalanches. LNCS.6350:153-162, 2010.

(7) J. Andres Montoya, Carolina Mejia. On the complexity of Sandpile Prediction problems. Electronic Notes In Theoretical Computer Science 252: 229 - 245, 2009.

(8) J. Andres Montoya. The Parameterized Complexity of Probability Amplification. Information processing letters 109(1):46 - 53, 2008.

(9) J. Andres Montoya. Cayley's Theorem Revisited. Colombian Journal of Mathematics 43(1): 19-34, 2009.

(10) J. Andres Montoya. The Parameterized Complexity of Mining Graphs I: Upper Bounds. Colombian Journal of Computation, 10(1):61-83, 2009.

(11) J. Andres Montoya. The Parameterized Complexity of Mining Graphs II: Lower Bounds. Colombian Journal of Computation, 10(1):84-109, 2009.

(12) J. Andres Montoya. On Parameterized Counting. Ph.D thesis, Freiburg University 2008.

(13) J. Andres Montoya. The Model Theory of Sheaves. Lectures in Mathematics, Sociedad Colombiana de Matematicas, 28(1): 5 - 37, 2007.

(14) J. Andres Montoya. The Permanent Complexity of The Permanent. Bulletin of the Colombian Mathematical Society. 14(2): 68 - 82, 2007.

(15) J. Andres Montoya. Intuitionist Model Theory: Kripke Models. Bulletin of the Colombian Mathematical Society 10(2): 92 - 109, 2003.

(16) J. Andres Montoya, Carolina Mejia. Schanuel's Effective Reals. ERM mathematical journal 15(1): 85 - 108, 2007.

(17) J. Andres Montoya. The Complexity of Sudoku. Integracion: Journal of Mathematics 24(1): 1 - 15, 2006.

(18) J. Andres Montoya. Model Theory of Topological Structures. Master thesis, Universidad Nacional de Colombia, Bogota 2003.

6. Submitted

(1) J. Andres Montoya. On the complexity of the two-dimensional abelian sandpile model (Physica D)

(2) Two tapes do not suffice (LATIN conference)

(3) The complexity of recognizing two-dimensional sandpile critical configurations (Complex systems)

7. Finished, not yet submitted

(1) J. Andres Montoya. Open problems concerning palindrome recognition: are there open problems concerning palindrome recognition?

(2) J. Andres Montoya. The work of Leslie Valiant: alle die Strassen fuhren nach Strassen.

8. In preparation

(1) J. Andres Montoya. Kutrib's problem or the computational power of real-time one-way cellular automata.

(2) J. Andres Montoya. Manacher's problem: Real-time one-way cellular automata vs deterministic two-way pushdown automata.

(3) J. Andres Montoya. Galil´s problem: which are the context-free languages whose recognition require superlinear time?

(4) J. Andres montoya, Juan Pablo Rada. The complexity of Chemistry: Computing chemical indices

9. Miscellaneous

(1) J. Andres Montoya. Automata, palindrome and real time computations. (draft of a book, spanish).

(2) J. Andres Montoya. A note on Freivalds algorithm.

(3) J. Andres Montoya. Non-elementary applications of an elementary theorem.

(4) J. Andres Montoya. Topology vs. Logic = Convergence. Booklet, published by Colombian Mathematical Society. 2001.

(5) J. Andres Montoya. Matemiotika 1. Undergradute thesis, Universidad Nacional, Bogota, 2000.

(6) J. Andres Montoya. Interruptible OCA

(7) J. Andres Montoya. The complexity of predicting.

10. Invited talks

(1) Tally counting problems of discrete tomography. Simulation of Geophysical Systems Seminar, Universidad de Pamplona, February 2011.

(2) Tally Counting Complexity. Workshop Mathematics and Computation, November 2010 Universidad de Concepcion, Chile.

(3) Automata, counting and hydrological models. Center of mathematical Modelling (International research center of CNRS), Universidad de Chile, Santiago, December 3 2010.

(4) The parameterized complexity of probability amplification. GK, Logik und Anwendungen, Freiburg University September 2008.

(5) The complexity of predicting. Congreso Colombiano de Matematicas, Cali August 2007.

(6) On parameterized Counting. GK, Logik und Anwendungen, Freiburg University may 2005.

11. Talks

(1) LAGOS 2011, Bariloche, Argentina. Some Applications of Schutzenberger-Bertoni Method: counting polygons, (joint work with Eduardo Zambrano and Francisco Gutierrez).

(2) ODSA 2010, Rostock, Germany. Counting Monomer-dimer covers in Grids is Hard (joint work with Carolina Mejia).

(3) ACRI 2010, Ascoli Piceno, Italy. The Complexity of Three-dimensional Critical Avalanches (joint work with Carolina Mejia).

(4) AUTOMATA 2009, Sao Jose dos Campos, Brazil. On the Computational Complexity of Sandpile Prediction Problems (joint work with Carolina Mejia).

(5) CNM 2011, Colombia. Some Applications of Schutzenberger-Bertoni Method: counting polyominoes, (joint work with Eduardo Zambrano and Francisco Gutierrez).

(6) ALTENCOA 2010, Santiago de Tunja. Counting Self-avoiding Walks via Schutzenberger Method (joint work with Francisco Gutierrez).

(7) ALTENCOA 2010, Santiago de Tunja. The Complexity of Two-dimensional Critical Avalanches (joint work with Sergio Montoya).

(8) CNM 2009, Santiago de Cali. The Computational Complexity of Statistical Mechanics.

(9) Coloquio Nororiental de Matematicas, Bucaramanga 2007. The Permanent Complexity of the Permanent.

(10) Latin American Symposium on Mathematical Logic, San jose de Costa Rica 2004. The model Theory of Sheaves and The Model Existence Theorem.

(11) Bogota Meeting in Model Theory, Bogota 2002. The Model Theory of Sheaves.

(12) CNM 2000, Bogota. Matemiotika I.

(13) Coloquio disdrital de matematicas, Bogota 2001. Matemiotika II.

12. Teaching

Since 2006, I am assistant professor with tenure at Universidad Industrial de Santander, Bucaramanga Colombia. A sample of the courses that I have taught is given below.

- Discrete Mathematics, Formal Languages (II-2006).
- Discrete Mathematics, Formal Languages (I 2007).
- Abstract Algebra, Linear Algebra (II 2007).
- Finite Markov Chains (first time in Colombia), Discrete Mathematics (I 2009).
- Ramanujan Graphs (first time in Latin America), Computation Theory (II 2009).
- The Abelian Sandpile Model (first time in Latin America), Computational Complexity (I 2010).
- Automata theory, Discrete mathematics (II-2010).
- Complexity theory, Computational Mathematics (I-2011).
- Advanced linear algebra: Frobenius-Perron Theory (II-2011)

I have supervised three undergraduate thesis. Nowadays I am supervising four master thesis and a undergradute thesis. Those (finished and unfinished) thesis are listed below.

- Pedro Zambrano. Axiomatizability. Undergraduate thesis, Universidad Nacional de Colombia at Bogota, 2003. This thesis won the first prize as the best undergraduate thesis in Mathematics written in Colombia in 2003.
- Raul Leal. Towards a Constructive Proof of Banach-Tarski Paradox. Undergraduate thesis, Universidad Nacional de Colombia at Bogota, 2003.
- Ronal Villamizar. The Probabilistic Abacus. Undergraduate thesis, Universidad Industrial de Santander, 2010.
- Sergio Montoya. The Complexity of the Abelian Sandpile Model. Master Thesis, Universidad Industrial de Santander, submited.
- Sterling Castañeda. Diffusive Process on Ramanujan Graphs. Master Thesis, Universidad Industrial de Santander, submited
- Luis Eduardo Zambrano. Census Functions of Context-free Languages. Master Thesis, Universidad Industrial de Santander, submited.

- Jonathan Villamizar. the complexity of the planar-graph-isomorphism problem. Undergraduate thesis, Universidad Industrial de Santander, in preparation, expected end date November 2011.

Remark. The teaching load along this five years have been **180 hours per semester** plus administrative duties.

13. Service to the profession

- Editorial board *Integracion: Journal of Mathematics,* from 2006 to 2010.
- Referee: Discrete applied mathematics, Boletin de matematicas, Revista integracion, Theoretical Computer Science, Mathematical logic quaterly.
- Since 2009 I am the chair of postgraduate studies at the mathematical institute UIS.
- Since September 2011 I am chair of research of the faculty of fundamental and enabling sciences.
- I am the organizer of Rafa Fest: first colombian workshop on discrete mathematics
- I belonged to the organizing committee of CNM 2011 and Simposio nororiental de matematicas 2009.
- I belonged to the scientific committee of ALTENCOA 2010

14. Academic References

- Prof. Dr. Joerg Flum. Freiburg University, Joerg.Flum@math.uni-freiburg.de
- Prof. Dr. Michael Fellows. Charles Darwin University, michael.fellows@cdu.edu.au
- Prof. Dr. Frances Rosamond. Charles Darwin University, frances.rosamond@cdu.edu.au