Curriculum Vitae

Ulderico Fugacci

Personal

Nationality: Italian
Sex: Male
Date of birth: August 31, 1988
Place of birth: Genova, GE, Italy

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Education

- B.Sc. (Mathematics). University of Genova, Department of Mathematics. Thesis: *Ideals of the Ring of Formal Power Series*. Advisor: Prof. M. E. Rossi. (September 2010)
- M.Sc. (Mathematics). University of Genova, Department of Mathematics. Thesis: *Constructive Methods to Compute Simplicial Homology*. Advisors: Prof. M. E. Rossi, Prof. L. De Floriani. (July 2012)
- Ph.D. (Computer Science). University of Genova, Department of Computer Science, Bioinformatics, Robotics and Systems Engineering. Thesis: *Topological Data Analysis through Homology and Discrete Morse Theory*. Advisors: Prof. L. De Floriani, Prof. M. E. Rossi. (May 2016)

Employments

- November 2017 - Present. Post-doctoral fellow, Institute of Geometry, Graz University of Technology, Austria.
- November 2016 - October 2017. Post-doctoral fellow, Department of Computer Science, Kaiserslautern University of Technology, Germany.
- March 2016 - October 2016. Post-doctoral fellow, Department of Computer Science, University of Maryland at College Park, USA.
- April 2016 - May 2016. External collaborator, Department of Mathematics, University of Genova, Italy.

- January 2013 - February 2016. Research assistant, Department of Computer Science, Bioinformatics, Robotics and Systems Engineering, University of Genova, Italy.

Research Interests

- Topological data analysis and visualization
- Computational topology and geometry
- Homology, persistent and multi-parameter persistent homology
- Complex network analysis
- Discrete Morse theory
- Combinatorics and commutative algebra
- Spatial data structures and algorithms

Publications

Papers in Refereed Journals

1. B. Rieck, U. Fugacci, J. Lukasczyk, H. Leitte. *Clique Community Persistence: A Topological Visual Analysis Approach for Complex Networks*. In IEEE Transactions on Visualization and Computer Graphics, 24(1), pages 822-831, 2018.
2. F. Iuricich, U. Fugacci, L. De Floriani. *Topologically-Consistent Simplification of Discrete Morse Complexes*. In Computers and Graphics, vol. 34, pages 157-166, 2015.
3. L. De Floriani, U. Fugacci, F. Iuricich, P. Magillo. *Morse Complexes for Shape Segmentation and Homological Analysis: Discrete Models and Algorithms*. In Computer Graphics Forum, vol. 34(2), pages 761-785, 2015.
4. L. Comic, L. De Floriani, F. Iuricich, U. Fugacci. *Topological Modifications and Hierarchical Representation of Cell Complexes in Arbitrary Dimensions*. In Computer Vision and Image Understanding (CVIU), vol. 121, pages 2-12, 2014.

Refereed Book Chapters

1. L. De Floriani, U. Fugacci, F. Iuricich. *Homological Shape Analysis through Discrete Morse Theory*. M. Breuß, A. Bruckstein, P. Maragos, S. Wuhrer (Eds.). In Perspectives in Shape Analysis. Springer International Publishing, pages 187-209, 2016.

Refereed Conference Papers

1. R. Fellegara, U. Fugacci, F. Iuricich, L. De Floriani. *Analysis of Geolocalized Social Networks based on Simplicial Complexes*. In 9th ACM SIGSPATIAL International Workshop on Location-Based Social Networks (LSBN), 2016.

2. U. Fugacci, S. Scaramuccia, F. Iuricich and L. De Floriani. *Persistent Homology: a Step-by-Step Introduction for Newcomers*. G. Pintore and F. Stanco (Eds.). In Smart Tools and Apps for Graphics - Eurographics Italian Chapter Conference, The Eurographics Association, 2016.

3. U. Fugacci, F. Iuricich, L. De Floriani. *Efficient Computation of Simplicial Homology through Acyclic Matching*. In 16th IEEE International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2014), pages 587-593, 2014.

Communications at International Conferences and Workshops

1. U. Fugacci, M. Kerber, H. Manet. *Topology-Aware Terrain Simplification*:
   - Poster, Algebraic Topology: Methods, Computation and Science, 2018.
   - Extended Abstract, Computational Geometry: Young Researchers Forum, 2018.
2. R. Corbet, U. Fugacci, M. Kerber, C. Landi, B. Wang. *A Kernel for Multi-Parameter Persistence*:
   - Poster, Algebraic Topology: Methods, Computation and Science, 2018.
   - Extended Abstract, Computational Geometry: Young Researchers Forum, 2018.

Current Work

1. U. Fugacci, F. Iuricich, L. De Floriani. *Computing Discrete Morse Complexes from Simplicial Complexes*, submitted for journal publication (accepted subject to minor revisions).

2. D. Bolognini, U. Fugacci. *Betti Splittings from a Topological and Computational Point of View*, submitted for journal publication (under revision).

3. U. Fugacci, M. Kerber, H. Manet. *Topology-Aware Terrain Simplification* (extended version), submitted for conference publication (under revision).

4. U. Fugacci, M. Kerber. *Chunk Reduction for Multi-Parameter Persistent Homology*, submitted for conference publication (under revision).

5. F. Iuricich, R. Fellegara, L. De Floriani, U. Fugacci. *Efficient Homology-Preserving Simplification of Simplicial Complexes*, under submission.

6. R. Corbet, U. Fugacci, M. Kerber, C. Landi, B. Wang. *A Kernel for Multi-Parameter Persistence* (extended version), under submission.

Professional Service

Presentations, Talks and Courses at Schools

- *Efficient Computation of Simplicial Homology through Acyclic Matching*, presented at CTIC 2014, Computational Topology in Image Context at SYNASC 2014, West University of Timisoara, Romania, September 2014.

- *Topologically-Consistent Simplification of Discrete Morse Complexes*, presented at SMI 2015, Shape Modeling International, Lille 1 University, France, June 2015.
- *Efficient Computation of Persistence Homology through Discrete Morse Theory*, presented at CAT-School 2015, Computational Algebraic Topology, University of Oxford, UK, September 2015.
- *Topological Data Analysis through Homology and Discrete Morse Theory*, presented at Kaiserslautern University of Technology, Germany, May 2016.
- *Persistent Homology: a Step-by-Step Introduction for Newcomers*, presented at STAG 2016, Smart Tools and Apps for Graphics, Genova, Italy, October 2016.
- *Homology and Discrete Morse Theory in Topological Data Analysis*, presented at Graz University of Technology, Austria, February 2017.
- *Persistent Homology: from Theory to Applications*, course (3 lectures + 1 lab session) given at "Persistent Homology" Summer School, Rabat, Morocco, July 2017.
- *Clique Community Persistence: A Topological Visual Analysis Approach for Complex Networks*, presented at SciVis, IEEE VIS 2017, Phoenix, AZ, USA, October 2017.
- *Topology-Aware Terrain Simplification*, presented at YRF - SoCG 2018, International Symposium on Computational Geometry, Budapest, Hungary, June 2018.
- *A Kernel for Multi-Parameter Persistence*, poster presented at ATMCS8, Algebraic Topology: Methods, Computation and Science, Klosterneuburg, Austria, June 2018.

Participations in Conferences, Workshops and Schools

2011

- MONICA 2011, MONomial Ideals, Computations and Applications, Castro Urdiales, Spain. (July 2011)

2012

- VisMac 2012, School on Machine Vision, Genova, Italy. (October 2012)

2013

- INdAM Meeting CoMeTA 2013, Combinatorial Methods in Topology and Algebra, Cortona, Italy. (September 2013)
- ACAT's Summer School on Computational Topology and Topological Data Analysis, Ljubljana, Slovenia. (July 2013)
- EACA's Second International School On Computer Algebra and Applications, Valladolid, Spain. (June 2013)
- BiSS 2013, Bertinoro international Spring School, Bertinoro, Italy. (March 2013)

2014

– SYNASC 2014, International Symposium on Symbolic and Numeric Algorithms for Scientific Computing, Timisoara, Romania. (September 2014)

– VisMac 2014, Summer School on Computer Vision and Pattern Recognition for Homeland Security, Marina di Ascea, Italy. (June 2014)

– IMA Annual Program Year Workshop, Topology and Geometry of Networks and Discrete Metric Spaces, Minneapolis, MN, USA. (April-May 2014)

2015

– Incontro di Algebra Commutativa, Genova, Italy. (October 2015)

– CAT-School 2015, Computational Algebraic Topology; ATI scoping workshop, Topological Data Analysis, Oxford, UK. (September 2015)

– SMI 2015, Shape Modeling International, Lille, France. (June 2015)

– HTCA-2015 International School, Homology: Theoretical and Computational Aspects, Genova, Italy. (February 2015)

2016

– SoCG 2016, International Symposium on Computational Geometry, Boston, MA, USA. (June 2016)

– STAG 2016, Smart Tools and Apps for Graphics, Genova, Italy. (October 2016)

2017

– "Persistent Homology" Summer School, Rabat, Morocco. (July 2017)

– IEEE VIS 2017, Phoenix, AZ, USA. (October 2017)

2018

– TAGS, Linking Topology to Algebraic Geometry and Statistics, Leipzig, Germany. (February 2018)

– SoCG 2018, International Symposium on Computational Geometry, Budapest, Hungary. (June 2018)

– ATMCS8, Algebraic Topology: Methods, Computation and Science, Klosterneuburg, Austria. (June 2018)

– Joint Meeting of UMI-SIMAI-PTM, Wrocław, Poland. (September 2018)

Visits

- April 2014 and October-December 2014, University of Maryland, MD, USA.
- April 2016, University of Miami, FL, USA.
- May 2016, Kaiserslautern University of Technology, Germany.
- February 2017, Graz University of Technology, Austria.

Scientific Event Co-organizer

- Local organizer for the School "Homology: Theoretical and Computational Aspects", International School, jointly organized by the Department of Computer Science, Bioinformatics, Robotics and Systems Engineering and by the Department of Mathematics of the University Genova, February 2015.
- Organizer of the session on "Geometric Aspects of Applied Topology" at the Joint Meeting of UMI-SIMAI-PTM, Wrocław, Poland, September 2018.

Participations in Research Projects

- Mesh-based Representation and Topological Analysis of Static and Time-varying 3D Scalar Fields and 4D Shapes (NSF project IIS-1116747).
- Commutative Algebra and Applications (project CARIGE).
- Algorithms for Topological Data Analysis (Austrian Science Fund (FWF) - grant P29984-N35).

Awards

- SMI 2015 - Honorable Mention, *Topologically-Consistent Simplification of Discrete Morse Complexes* (joint work with F. Iuricich and L. De Floriani).
- 2016 Best Ph.D. Thesis in Computer Science, University of Genova.

Teaching and Advising Activity

At University of Genova

- Tutor, Elements of Mathematics and Logic, Undergraduate Program in Computer Science, AY 2011-2012.
- Guest lecturer, Geometric Modeling, Master Program in Computer Science and Mathematics, AY 2012-2013.
- Assistant tutor for Master Thesis in Mathematics by Beatrice Roticiani, advisor Prof. L. De Floriani, September 2013.
- Lecturer at Mathematics stage for High School students, February 2014.
- Assistant tutor for Master Thesis in Mathematics by Simone Rubino, advisor Prof. L. De Floriani, February 2014.
- Tutor for Mathematics and Physics Undergraduate Students, AY 2013-2014.
- Guest lecturer, Geometric Modeling, Master Program in Computer Science and Mathematics, AY 2013-2014.

- Guest lecturer, Geometric Modeling, Master Program in Computer Science and Mathematics, AY 2014-2015.
- Assistant tutor for Master Thesis in Mathematics by Lisa Chiang, advisors Dr. F. Giannini and Dr. M. Monti, March 2015.
- Teaching assistant, Elements of Mathematics and Logic, Undergraduate Program in Computer Science, AY 2015-2016.
- Instructor, Topology-based Data Analysis and Visualization, Ph.D. Program in Computer Science, AY 2017-2018.

At Kaiserslautern University of Technology

- Guest lecturer, Computational Geometry, Master Program in Applied Computer Science, AY 2016-2017.
- Guest lecturer, Visual Analytics, Master Program in Applied Computer Science, AY 2016-2017.
- Co-advisor for Master Thesis in Computer Science by Jan Stärz, co-advised with Prof. H. Leitte, September 2017.

At Graz University of Technology

- Co-advisor of the Internship of Hugo Manet, April-August 2018.
- Instructor, Knots and 3-manifolds, Master Program in Mathematics, AY 2018-2019. (upcoming)

Languages

- Italian, Mother Tongue
- English, Fluent, First Certificate
- German, Basic User, A2.1 GeR

December 6, 2018