

CURRICULUM VITAE

SAMUELE GIRAUDO

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1. GENERAL INFORMATION

1.1. Current position. Associate Professor (“maître de conférences” in French) at University Gustave Eiffel from September, 2012.

1.2. Administrative data.

- **First name:** Samuele.
- **Last name:** Giraudo.
- **Date and place of birth:** September 27, 1986, Milan, Italy.
- **Citizenship:** Italian.
- **Place of residence:** France.

Date: May 2, 2021.

- **Professional address:** Bureau 4B162, bâtiment Copernic, Université Gustave Eiffel
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1.3. Formation and degrees.

- **2017.** Habilitation thesis (“Habilitation à diriger les recherches” in French), université Paris-Est Marne-la-Vallée.
 - *Thesis title:* Operads in algebraic combinatorics.
 - *Guarantor:* Jean-Yves Thibon.
 - *Reviewers:* Pierre-Louis Curien, Loïc Foissy, and Dominique Manchon.
 - *Examiners:* Frédéric Chapoton (jury president), Alessandra Frabetti, Florent Hivert, and Jean-Gabriel Luque.
 - *Host laboratory:* LIGM.
 - *Defended on:* December 4, 2017.
- **2009–2011.** PhD in computer science, université Paris-Est Marne-la-Vallée.
 - *Thesis title:* Combinatoire algébrique des arbres.
 - *Advisors:* Florent Hivert and Jean-Christophe Novelli.
 - *Reviewers:* Frédéric Chapoton, Sylvie Corteel, and Nathan Reading.
 - *Examiners:* Cyril Nicaud, Gilles Schaeffer, and Xavier Gérard Viennot (jury president).
 - *Host laboratory:* LIGM.
 - *Defended on:* December 8, 2011.
- **2007–2009.** Master in computer science, université de Rouen.
 - *Thesis title:* Les arbres équilibrés dans l’ordre de Tamari.
 - *Advisor:* Florent Hivert.
 - *Host laboratory:* LITIS.
 - *Defended on:* July 6, 2009.
- **2004–2007.** Bachelor in computer science, université de Rouen.

2. RESEARCH ACTIVITY

2.1. Description. My work fits in the field of algebraic combinatorics. I study combinatorial and algebraic structures involving various sorts combinatorial objects (trees, permutations, words, heaps of pieces, *etc.*). I consider some algebraic structures on these like lattices, Hopf bialgebras, operads, clones, and pros. These structures offer a solid formalism and a promising perspective for the study of combinatorial and algorithmic properties of these objects. For instance, the description of the Hilbert series of algebraic structures allows us to set up, to observe, and to understand better certain counting mechanisms. All of this provides enumerative combinatorics results. In addition, I am interested in algorithms to study these algebraic structures (computations of minimal generating families, nontrivial relations between generators, dimensions, symmetries, *etc.*). One of the key

tools to tackle these problems is to consider rewrite systems on combinatorial objects and their related algorithms. Finally, I also try to understand the existing relationships between models of computation (such as λ -calculus, combinatory logic, and term rewrite systems) and algebraic and combinatorial structures.

Key words. Combinatorics; Algebraic combinatorics; Enumerative combinatorics; Algorithmics; Permutation; Tree; Generating series; Formal power series; Rewrite system; Hopf bialgebra; Operad; Clone; Pro; Model of computation.

2.2. Scientific production.

2.2.1. Books.

1. S. Giraud. *Nonsymmetric Operads in Combinatorics*, Springer Nature Switzerland AG, viii+172 pages, 2018.

2.2.2. Journal papers.

1. S. Giraud. Duality of graded graphs through operads. *Annals of Combinatorics*, 2021.
2. S. Giraud. Operads of decorated cliques I: Construction and quotients. *Séminaire Lotharingien de Combinatoire*, B79g, 2020.
3. S. Giraud. Tree series and pattern avoidance in syntax trees. *Journal of Combinatorial Theory, Series A*, 176, 2020.
4. S. Giraud. Colored operads, series on colored operads, and combinatorial generating systems. *Discrete Mathematics*, 342, Issue 6, 1624–1657, 2019.
5. C. Chenavier, C. Cordero, S. Giraud. Quotients of the magmatic operad: lattice structures and convergent rewrite systems. *Experimental Mathematics*, 2019.
6. S. Giraud, S. Vialette. Algorithmic and algebraic aspects of unshuffling permutations. *Theoretical Computer Science*, 729, 20–41, 2018.
7. J.-P. Bultel, S. Giraud. Combinatorial Hopf algebras from PROs. *Journal of Algebraic Combinatorics*, 44(2), 455–493, 2016.
8. S. Giraud. Operads from posets and Koszul duality. *European Journal of Combinatorics*, 56C, 1–32, 2016.
9. S. Giraud. Pluriassociative algebras II: The polydendriform operad and related operads. *Advances in Applied Mathematics*, 77, 43–85, 2016.
10. S. Giraud. Pluriassociative algebras I: The pluriassociative operad. *Advances in Applied Mathematics*, 77, 1–42, 2016.
11. S. Giraud, J.-G. Luque, L. Mignot, F. Nicart. Operads, quasiorders, and regular languages. *Advances in Applied Mathematics*, 75, 56–93, 2016.
12. H. Cheballah, S. Giraud, R. Maurice. Hopf algebra structure on packed square matrices. *Journal of Combinatorial Theory, Series A*, 133, 139–182, 2015.
13. S. Giraud. Combinatorial operads from monoids. *Journal of Algebraic Combinatorics*, 41, Issue 2, 493–538, 2015.

14. F. Chapoton, S. Giraudo. Enveloping operads and bicoloured noncrossing configurations. *Experimental Mathematics*, 23, Issue 3, 332–349, 2014.
15. S. Giraudo. Construction d'opérades ensemblistes à partir de monoïdes. *Comptes-Rendus de l'Académie des Sciences*, 350, Issue 11-12, 549–552, 2012.
16. S. Giraudo. Algebraic and combinatorial structures on pairs of twin binary trees. *Journal of Algebra*, 360, 115–157, 2012.
17. S. Giraudo. Intervals of balanced binary trees in the Tamari lattice. *Theoretical Computer Science*, 420, 1–27, 2012.

2.2.3. Conference papers.

1. L. Bulteau, S. Giraudo, S. Vialette. Disorders and permutations. To appear at *Combinatorial Pattern Matching*, 2021.
2. S. Giraudo. Generation of musical pattern through operads. *Journées d'informatique musicale*, 2020.
3. C. Combe, S. Giraudo. Three interacting families of Fuss-Catalan posets. *Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire*, 84B.22, 2020.
4. J.-C. Aval, S. Giraudo, T. Karaboghossian, A. Tanasa. Graph insertion operads. *Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire*, 84B.66, 2020.
5. G. Fertin, S. Giraudo, S. Hamel, S. Vialette. Unshuffling permutations: Trivial bijections and compositions. *Theory and Applications of Models of Computation*, 242–261, 2019.
6. C. Chenavier, C. Cordero, S. Giraudo. Generalizations of the associative operad and convergent rewrite systems. *Higher-Dimensional Rewriting and Algebra*, Preprint no. 143, 2018.
7. S. Giraudo. Comb-algebraic structures on decorated cliques. *Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire*, 78B.15, 2017.
8. S. Giraudo, S. Vialette. Unshuffling Permutations. *Latin American Theoretical Informatics Symposium, LNCS 9644*, 509–521, 2016.
9. S. Giraudo. Constructing combinatorial operads from monoids. *Formal Power Series and Algebraic Combinatorics*, 229–240, 2012.
10. S. Giraudo. Algebraic and combinatorial structures on Baxter permutations. *Formal Power Series and Algebraic Combinatorics*, 387–398, 2011.
11. S. Giraudo. Balanced binary trees in the Tamari lattice. *Formal Power Series and Algebraic Combinatorics*, 596–607, 2010.

2.2.4. *Miscellaneous.*

1. S. Giraud. Operads in algebraic combinatorics. Habilitation thesis (“Habilitation à diriger des recherches” in French), université Paris-Est Marne-la-Vallée, 2017.
2. S. Giraud. Combinatoire algébrique des arbres. PhD thesis, université Paris-Est Marne-la-Vallée, 2011.
3. S. Giraud. Les arbres équilibrés dans l’ordre de Tamari. Master thesis, université de Rouen, 2009.

2.2.5. *Pre-publications.*

1. L. Bulteau, S. Giraud, S. Vialette, Disorders and permutations: parity, 2021.
2. S. Giraud. The music box operad: Random generation of musical phrases from patterns, 2021.
3. C. Combe, S. Giraud. Cliff operads: a hierarchy of operads on words, 2020.
4. C. Combe, S. Giraud. Three Fuss-Catalan posets in interaction and their associative algebras, 2020.
5. J.-C. Aval, S. Giraud, T. Karaboghossian, A. Tanasa. Graph operads: general construction and natural extensions of canonical operads, 2020.
6. S. Giraud. Operads of decorated cliques II: Noncrossing cliques, 2018.

2.3. **Communications.**

2.3.1. *As invited main speaker in conferences.*

1. *Combinatorial operads, rewrite systems, and formal grammars*, July 1, 2019, Computational Logic and Applications, Versailles, France.

2.3.2. *As invited in conferences.*

1. *Combinatorial realizations of algebraic structures*, November 5, 2020, Journée opérades LAGA-LIPN 2020, Paris, France, remotely.
2. *Some combinatorial structures related to operads*, February 7, 2019, Séminaire Flajolet, IHP, Paris, France.
3. *Algebraic structures, series, and enumeration*, April 5, 2018, Journées Nationales 2018 du GDR Informatique Mathématique, Palaiseau, France.
4. *Operads, enumeration, and constructions*, September 28, 2017, Discrete Structures Days, Rouen, France.
5. *Series on colored operads and combinatorial generation*, January 27, 2016, Workshop Category, Homotopy and Rewriting, Toulouse, France.
6. *From PROs to combinatorial Hopf algebras*, September 24, 2013, Journées Trees and graphs, LIPN, Paris, France.
7. *Construction d’opérades combinatoires à partir de monoïdes et application aux algèbres de Hopf combinatoires*, February 2, 2012, Journées de Combinatoire de Bordeaux, Bordeaux, France.

2.3.3. In conferences.

1. *Algebraic and combinatorial structures on decorated cliques*, July 2017, Formal Power Series and Algebraic combinatorics, London, United Kingdom.
2. *Opérades \sqcup combinatoire*, June 21, 2017. Journées du GT-CombAlg, LIGM, Paris, France.
3. *Unshuffling Permutations*, April 15, 2016, Latin American Theoretical Informatics Symposium 2016, Ensenada, Mexico.
4. *Opérades colorées et combinatoire*, June 14, 2013, Journées du GT-CombAlg, LIGM, Paris, France.
5. *Constructing combinatorial operads from monoids*, July 31, 2012, Formal Power Series and Algebraic combinatorics, Nagoya, Japan.
6. *Algebraic and combinatorial structures on Baxter permutations*, June 2011, Formal Power Series and Algebraic combinatorics, Reykjavik, Iceland.
7. *Algebraic and combinatorial structures on Baxter permutations*, March 8, 2011, Séminaire Lotharingien de Combinatoire, Ellwangen, Germany.
8. *Balanced binary trees in the Tamari lattice*, August 2010, Formal Power Series and Algebraic combinatorics, San Francisco, United States of America.
9. *Construction algébrique sur les objets de Baxter*, June 24, 2010, Journées du GT-CombAlg, LIGM, Paris, France.

2.3.4. In team seminars.

1. *Some combinatorial aspects of combinatory logic*, March 31, LIX, Palaiseau, France, remotely.
2. *Interstice operads of words*, February 23, 2021, LIPN, Paris, France, remotely.
3. *A hierarchy of operads on words*, February 4, 2021, LMPA, Calais, France, remotely.
4. *Associative algebras on cliffs*, April 24, 2020, DI ENS, Paris, France, remotely.
5. *Cliff posets and algebras*, April 1, 2020, GREYC, Caen, France, remotely.
6. *Pattern avoidance in trees, operads, and enumeration*, September 17, 2019, LIPN, Paris, France.
7. *Graded graphs and operads*, February 21, 2019, IRIF, Paris, France.
8. *Tree rewriting and enumeration*, September 17, 2018, LaBRI, Bordeaux, France.
9. *Opérades, séries formelles et arbres à motifs exclus*, March 29, 2018, LAGA, Paris, France.
10. *Séries d'arbres, motifs exclus et opérades*, March 8, 2018, IRIF, Paris, France.
11. *Opérades, séries et combinatoire*, January 23, 2018, GREYC, Caen, France.
12. *Bigèbres de Hopf combinatoires des pros*, July 5, 2017, LIX, Palaiseau, France.
13. *Découpage d'associativité généralisé*, June 15, 2017, IRIF, Paris, France.
14. *Grammaires à bourgeons*, June 13, 2017, LIPN, Paris, France.

15. *Opérades des cliques décorées*, June 13, 2017, LIPN, Paris, France.
16. *Grammaires et séries d'opérades colorées*, November 17, 2016, LITIS, Rouen, France.
17. *Grammaires d'opérades colorées*, February 22, 2016, IRMA, Strasbourg, France.
18. *Polydendriform algebras*, January 13, 2015, LIGM, Paris, France.
19. *Opérades pluriassociatives et polydendriformes*, May 21, 2014, LIX, Palaiseau, France.
20. *Opérades colorées et configurations non croisées bicolorées*, May 23, 2013, LITIS, Rouen, France.
21. *Construction of combinatorial operads*, April 20, 2012, Fields Institute, Toronto, Canada.
22. *L'opérade des configurations non croisées bicolorées*, April 4, 2012, LaCIM, Montréal, Canada.
23. *Construction d'opérades combinatoires à partir de monoïdes*, November 10, 2011, LaCIM, Montréal, Canada.
24. *Les arbres binaires équilibrés dans le treillis de Tamari*, September 29, 2011, LIAFA, Paris, France.
25. *Algèbres de Hopf des permutations et des objets de Baxter*, March 1, 2011, LIPN, Paris, France.

2.3.5. *Miscellaneous.*

1. *CALIMBA: a language for computer music*, January 21, 2021, Creative Code Paris, France, remotely.
2. *Random generation of musical patterns through operads*, September 19, 2019, Creative Code Paris, France.
3. *Combinatorics, operations, and graded graphs*, February 12, 2019, HCERES evaluation, LIGM, Paris, France.

2.4. **Associated activities.**

2.4.1. *Stay invitations.*

1. Invitation for one week in April/May 2019 at LaBRI at Bordeaux in France.
2. Invitation for some days in September 2018 at LaBRI at Bordeaux in France.
3. Invitation for three weeks in April 2012 at Fields Institute at Toronto in Canada.
4. Invitation for two weeks in March/April 2012 at LaCIM at Montréal in Canada.
5. Invitation for one week in February 2012 at Institut Camille Jordan at Lyon in France.
6. Invitation for two weeks in January/February 2012 ("Invité Junior") at LaBRI at Bordeaux in France.
7. Invitation for two weeks in November 2011 at LaCIM at Montréal in Canada.

2.4.2. *PhD supervision.*

1. Christophe Cordero (co-supervised with Jean-Christophe Novelli), from September 2016 to December 2019.

2.4.3. *Other research supervisions.*

1. Master 1 thesis on configurations of chords, Lilian Berruet, 2021.
2. Master 2 thesis on combinatorics of stammering tableaux, Bishal Deb, 2019.
3. Master 2 thesis on operads and parking functions, Ricardo Rojas-Echenique, 2018.
4. Master 2 thesis on operads of permutations, Tina Malalanirainy, 2016.
5. Master 1 thesis on rook placements and perfect matchings, Quentin Campos, 2015.

2.4.4. *Participation on habilitation juries.*

1. Examiner of the habilitation of Ludovic Mignot, December 2020.

2.4.5. *Participation on PhD juries.*

1. Examiner of the PhD of Edwin Hamel-de le court, December 2020.
2. Participation as co-adviser of the PhD of Christophe Cordero, December 2019.
3. Examiner of the PhD of Zakaria Chemli, March 2017.

2.4.6. *Reviewing activity.*

1. For the journal *Symmetry, Integrability and Geometry: Methods and Applications*, in 2021 (in progress);
2. For the journal *Discrete Mathematics*, in 2021 (in progress);
3. For the conference *International Symposium on Symbolic and Algebraic Computation* (two times), in 2021;
4. For the journal *Séminaire Lotharingien de Combinatoire* in 2020.
5. For the journal *Logical Methods in Computer Science* in 2019.
6. For the journal *Linear and Multilinear Algebra* in 2018.
7. For the journal *Journal of Pure and Applied Algebra* in 2018.
8. For the journal *Journal of Combinatorial Theory, Series A* in 2017.
9. For the journal *Journal of Algebra* in 2017.
10. For the journal *Journal of Algebraic Combinatorics* in 2016.
11. For the journal *RAIRO - Theoretical Informatics and Applications* in 2015.
12. For the journal *Journal of Combinatorial Theory, Series A* in 2015.
13. For *Mathematical Reviews* (two times) in 2015.
14. For the journal *Séminaire Lotharingien de Combinatoire* in 2015.
15. For the journal *Discrete Mathematics* in 2015.
16. For the journal *Journal of Combinatorial Mathematics and Combinatorial Computing* in 2014.

17. For the journal *Journal of Combinatorial Theory, Series A* in 2014.
18. For the journal *Discrete Mathematics* in 2013.
19. For the journal *Séminaire Lotharingien de Combinatoire* in 2013.

2.4.7. Project participation.

1. From 2021, member of the ANR “Combinatoire Algébrique, Renormalisation, Probabilités Libres et Opérades” (CARPLO).
2. From 2019, member of the ANR “Algebraic Combinatorics of Hikes On Lattices” (ALCOHOL).
3. In 2019–2020, member of the DIM-RSFI “Species and Operads in Combinatorics and Semantics” (SOCS).
4. In 2018–2019, member of the DIM-RFSI about “Polynômes d’Ehrhart des associaèdres” (PEAS).

2.4.8. Organization of scientific events.

1. Conference “Species and Operads in Combinatorics and Semantics 2020”, <https://www.irif.fr/~socs2020>, December 10 and 11, 2020, co-organized with B. Delcroix-Oger, M. Josuat-Vergès, and C. Tasson.

2.4.9. Software realizations.

1. *Calimba*, 2020–2021. A programming language to create music based on the theory of operads and clones. Page of the project: <https://github.com/SamueleGiraud0/Calimba>.
2. *Bud Music Box*, 2019–2021. A tool to generate random music from short patterns using operads, colored operads, and bud generating systems. Page of the project: <https://github.com/SamueleGiraud0/Bud-Music-Box>.

3. TEACHING ACTIVITY

3.1. **Activity.** I teach various fields of computer science from 2009. I have taught for about 700 h of lectures and 1100 h of exercise sessions.

3.2. **Audience.** My audience is mainly composed of

- Students of Bachelor in Mathematics and Computer science.
- Students of Master of Computer Science.
- Students of engineering schools.
- Students for a DUT (“Diplôme universitaire de technologie” in French), which is a kind of shorter bachelor, in only 2 years, intended to work in companies).

3.3. Main lectures. The main modules I teach and for which I am the responsible are the following.

- Imperative programming in C language, from 2012.
- Functional programming in CAML language, from 2013.
- Discrete mathematics, from 2012.
- Architecture of computers, from 2011.
- Algebraic combinatorics and operads, from 2015.

3.4. Secondary lectures. I intervene also in the teaching of the following.

- Zététique, a french word standing for the scientific method and the critical thinking, from 2017.
- Various topic that are part of computer science: programming PYTHON, programming in JAVA, algorithms, graphs, automata and languages, and logic.

3.5. Internship supervision. Here is the list of the student internships I have supervised.

- Two TER (“Travail encadré de recherche“ en French) in the third year of bachelor degree in computer science in 2020–2021.
- One tutored project in the second year of DUT in computer science in 2020–2021.
- Two TER in the third year of bachelor degree in computer science in 2018–2019.
- Two tutored projects in the second year of DUT in computer science in 2018–2019.
- One tutored project in the second year of DUT in computer science in 2016–2017.
- Two TER in the third year of bachelor degree in computer science in 2016–2017.
- Three TER in the third year of bachelor degree in computer science in 2014–2015.
- One TER in the third year of bachelor degree in computer science in 2013–2014.

I have been an academic referent of

- three students of first year of bachelor degree in 2020–2021.
- a student of first year of Master in 2020–2021.
- a student of second year of Master in 2020–2021.
- a student of second year of Master in 2019–2020.

3.6. Related but different activities.

- Participation in the open days of the Université Gustave Eiffel, for the presentation of the bachelor degree in computer science in 2021, remotely.
- **September 2020–now:** In charge of the third year of the bachelor of computer science at Université Gustave Eiffel.
- **April 2019–now:** In charge of the computer science reference (“responsable de mention” in French) in the bachelor of Mathematics and Computer science at Université Gustave Eiffel.

- Participation in the open days of the Université Gustave Eiffel, for the presentation of the bachelor degree in computer science in 2020.

4. OTHER ACTIVITIES

- **2019–now:** Member of the PhD monitoring committee of the doctoral school ED MSTIC (“École Doctorale Mathématiques et Sciences et Technologies de l’Information et de la Communication” in French).
- **2017–now:** Member of the PhD committee of the doctoral school ED MSTIC.
- **2015–now :** Member of the laboratory board of the LIGM.

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