Florent Foucaud

Post-doctoral researcher in Graph Algorithms and Graph Theory



(CV updated March 16, 2020)

Education and Employment

- 09.2019- Postdoctoral researcher, ANR HOSIGRA (HOmomorphisms of SIgned GRAphs),
 - today LaBRI, Université de Bordeaux, France, Advisor: Éric Sopena.
- 03.2019- Teaching assistant,
- 07.2019 Departments of Computer Science at IUT d'Orléans and Université d'Orléans, Orléans (France), Teaching: 128h eqTD.
- 01.2019- Visiting researcher,
- 03.2019 Research stays at IIT Madras, ISI Kolkata and IIT Dharwad (India).
- 01.2018- Postdoctoral researcher, I-SITE CAP 20-25,
- 12.2018 LIMOS, Université Clermont Auvergne, Clermont-Ferrand, France, Advisor: Lhouari Nourine.
- 03.2016- Independent researcher,
- 12.2017 Various research stays including at Thompson Rivers University (Kamloops, Canada) and Universidad Autonoma de Mexico (Querétaro, Mexico).
- 11.2014- Postdoctoral researcher, Région Auvergne,
- 02.2016 LIMOS, Université Blaise Pascal, Clermont-Ferrand, France, Advisor: Laurent Beaudou.
- 01.2014- Postdoctoral researcher,
- 12.2014 Department of Mathematics, University of Johannesburg, South Africa & LAMSADE, Université Paris-Dauphine, France,
 Advisor: Michael A. Henning.
- 02.2013- Postdoctoral researcher,
- 12.2013 Combgraph team, Universitat Politècnica de Catalunya (UPC), Barcelona, Spain, Advisors: Camino Balbuena and Oriol Serra.
- 09.2009- PhD in Computer Science and teaching assistant,
- 12.2012 LaBRI, Université Bordeaux 1, France, "mention Très Honorable".

Advisors: Ralf Klasing and André Raspaud.

Thesis: Combinatorial and algorithmic aspects of identifying codes in graphs.

Teaching: 192h eqTD at the Departement of Computer Science of IUT Bordeaux 1.

2007-2009 Master in Computer Science, speciality "Algorithms and Formal Methods",

Université Bordeaux 1, France, "mention Très Bien".

Thesis: Identifying codes in special graph classes.

Publications: journal articles

- [J33] F. Dross, F. Foucaud, V. Mitsou, P. Ochem, T. Pierron. Complexity of planar signed graph homomorphisms to cycles. *Discrete Applied Mathematics*, accepted. (arXiv link)
- [J32] F. Foucaud, S. Heydarshahi, A. Parreau. Domination and location in twin-free digraphs. *Discrete Applied Mathematics*, to appear. (DOI link)
- [J31] A. Dailly, F. Foucaud, A. Hansberg. Strengthening the Murty-Simon conjecture on diameter 2 critical graphs. *Discrete Mathematics* 342(11):3142–3159, 2019. (DOI link)
- [J30] L. Beaudou, R. C. Brewster, F. Foucaud. Broadcast domination and multipacking: bounds and the integrality gap. Australasian Journal of Combinatorics 74(1):86–97, 2019. (www link)

- [J29] L. Beaudou, F. Foucaud, R. Naserasr. Homomorphism bounds of signed bipartite K_4 -minor-free graphs and edge-colourings of 2k-regular K_4 -minor-free multigraphs. Discrete Applied Mathematics 261:40–51, 2019. (DOI link)
- [J28] C. Bazgan, F. Foucaud, F. Sikora. Parameterized and approximation complexity of Partial VC DI-MENSION. *Theoretical Computer Science* 766:1–15, 2019. (DOI link)
- [J27] É. Bonnet, F. Foucaud, E. Kim, F. Sikora. Complexity of Grundy coloring and its variants. *Discrete Applied Mathematics* 243:99-114, 2018. (DOI link)
- [J26] L. Beaudou, P. Dankelmann, F. Foucaud, M. A. Henning, A. Mary and A. Parreau. Bounding the order of a graph using its diameter and metric dimension: a study through tree decompositions and VC dimension. SIAM Journal on Discrete Mathematics 32(2):902–918, 2018. (DOI link)
- [J25] F. Foucaud, R. Klasing. Parameterized and approximation complexity of the detection pair problem in graphs. *Journal of Graph Algorithms and Applications* 21(6):1039–1056, 2017. (DOI link)
- [J24] F. Foucaud, A. Harutyunyan, P. Hell, S. Legay, Y. Manoussakis, R. Naserasr. The complexity of tropical graph homomorphisms. *Discrete Applied Mathematics* 229:64–81, 2017. (DOI link)
- [J23] L. Beaudou, F. Foucaud, R. Naserasr. Homomorphism bounds and edge-colourings of K_4 -minor-free graphs. Journal of Combinatorial Theory, Series B 124:128–164, 2017. (DOI link)
- [J22] F. Foucaud, G. B. Mertzios, R. Naserasr, A. Parreau, P. Valicov. Identification, location-domination and metric dimension on interval and permutation graphs. II. Complexity and algorithms. *Algorithmica* 78(3):914–944, 2017. (DOI link)
- [J21] F. Foucaud, G. B. Mertzios, R. Naserasr, A. Parreau, P. Valicov. Identification, location-domination and metric dimension on interval and permutation graphs. I. Bounds. *Theoretical Computer Science* 668:43–58, 2017. (DOI link)
- [J20] O. Baudon, J. Bensmail, F. Foucaud, M. Pilsńiak. Structural properties of recursively partitionable graphs with connectivity 2. *Discussiones Mathematicae Graph Theory* 37(1):89–115, 2017. (DOI link)
- [J19] F. Foucaud, G. Perarnau, O. Serra. Random subgraphs make identification affordable. *Journal of Combinatorics* 8(1):57–77, 2017. (DOI link)
- [J18] R. C. Brewster, F. Foucaud, P. Hell, R. Naserasr. The complexity of signed and edge-coloured graph homomorphisms. *Discrete Mathematics* 340(2):223–235, 2017. (DOI link)
- [J17] F. Foucaud, M. A. Henning. Location domination in line graphs. *Discrete Mathematics* 340(1):3140–3153, 2017. (DOI link)
- [J16] F. Foucaud, M. A. Henning. Locating-total dominating sets in twin-free graphs: a conjecture. *The Electronic Journal of Combinatorics* 23(3):P3.9, 2016. (www link)
- [J15] F. Foucaud, M. A. Henning. Location-domination and matching in cubic graphs. *Discrete Mathematics* 339(4):1221–1231, 2016. (DOI link)
- [J14] F. Foucaud, M. A. Henning, C. Löwenstein, T. Sasse. Locating-dominating sets in twin-free graphs. Discrete Applied Mathematics 200:52-58, 2016. (DOI link)
- [J13] C. Balbuena, F. Foucaud, A. Hansberg. Locating-dominating sets and identifying codes in graphs of girth at least 5. *The Electronic Journal of Combinatorics* 22(2):P2.15, 2015. (www link)
- [J12] F. Foucaud. Decision and approximation complexity for identifying codes and locating-dominating sets in restricted graph classes. *Journal of Discrete Algorithms* 31:48–68, 2015. (DOI link)
- [J11] F. Foucaud, M. Krivelevitch, G. Perarnau. Large subgraphs without short cycles. SIAM Journal on Discrete Mathematics 29(1):65-78, 2015. (DOI link)
- [J10] F. Foucaud, R. Klasing, P. J. Slater. Centroidal bases in graphs. Networks 64(2):96–108, 2014. (DOI link)
- [J9] F. Foucaud, T. Laihonen, A. Parreau. An improved lower bound for $(1, \le 2)$ -identifying codes in the king grid. Advances in Mathematics of Communications $8(1):35-52,\ 2014.\ (DOI\ link)$
- [J8] O. Baudon, F. Foucaud, J. Przybyło, M. Woźniak. On the structure of arbitrarily partitionable graphs with given connectivity. *Discrete Applied Mathematics* 162:381–385, 2014. (DOI link)
- [J7] F. Foucaud, M. Kovše. Identifying path covers in graphs. Journal of Discrete Algorithms 23:21–34, 2013. (DOI link)
- [J6] F. Foucaud, S. Gravier, R. Naserasr, A. Parreau, P. Valicov. Identifying codes in line graphs. *Journal of Graph Theory* 73(4):425-448, 2013. (DOI link)
- [J5] F. Foucaud, R. Naserasr, A. Parreau. Characterizing extremal digraphs for identifying codes and extremal cases of Bondy's theorem on induced subsets. *Graphs and Combinatorics* 29(3):463–473, 2013. (DOI link)

- [J4] F. Foucaud, R. Klasing, A. Kosowski, A. Raspaud. Bounds on the size of identifying codes in triangle-free graphs. *Discrete Applied Mathematics* 160(5-6):1532–1546, 2012. (DOI link)
- [J3] F. Foucaud, I. Honkala, T. Laihonen, A. Parreau, G. Perarnau. Locally identifying colourings for graphs with given maximum degree. *Discrete Mathematics* 312(10):1832–1837, 2012. (DOI link)
- [J2] F. Foucaud, G. Perarnau. Bounds on identifying codes in terms of degree parameters. *The Electronic Journal of Combinatorics* 19:P32, 2012. (www link)
- [J1] F. Foucaud, E. Guerrini, M. Kovše, R. Naserasr, A. Parreau, P. Valicov. Extremal graphs for the identifying code problem. *European Journal of Combinatorics* 32(4):628–638, 2011. (DOI link)

Publications: conferences with refereed proceedings

- F. Foucaud, B. Gras, A. Perez, F. Sikora. Parameterized complexity of broadcast domination and multi-[C14] packing in digraphs. Accepted for presentation at the 31st International Workshop on Combinatorial Algorithms, IWOCA'20. Lecture Notes in Computer Science, to appear.
- [C13] D. Chakraborty, F. Foucaud, H. Gahlawat, S. K. Ghosh, B. Roy. Hardness and approximation for the geodetic set problem in some graph classes. Proceedings of the 6th International Conference on Algorithms and Discrete Applied Mathematics (CALDAM 2020). Lecture Notes in Computer Science 12016:102–115, 2020. (DOI link)
- [C12] F. Foucaud, R. Klasing, M. Miller, J. Ryan. Monitoring the edges of a graph using distances. Proceedings of the 6th International Conference on Algorithms and Discrete Applied Mathematics (CALDAM 2020). Lecture Notes in Computer Science 12016:28–40, 2020. (DOI link)
- [C11] L. Beaudou, F. Foucaud, R. Naserasr. Smallest not C_{2l+1} -colourable graphs of odd-girth 2k+1. Proceedings of the 6th International Conference on Algorithms and Discrete Applied Mathematics (CALDAM 2020). Lecture Notes in Computer Science 12016:184–196, 2020. (DOI link)
- [C10] F. Foucaud, H. Hocquard, D. Lajou, V. Mitsou, T. Pierron. Parameterized complexity of edge-colored and signed graph homomorphism problems. Proceedings of the 14th International Symposium on Parameterized and Exact Computation (IPEC 2019). Leibniz International Proceedings in Informatics (LIPIcs) 148,15:1-15:16, 2019. (DOI link)
- [C9] L. Beaudou, F. Foucaud, L. Nourine, F. Madelaine, G. Richard. Complexity of regular path query homomorphisms. Proceedings of the 15th Conference on Computability in Europe, CIE 2019. Lecture Notes in Computer Science 11558:108-119, 2019. (DOI link)
- [C8] C. Bazgan, F. Foucaud, F. Sikora. On the approximability of Partial VC Dimension. Proceedings of the 10th Annual International Conference on Combinatorial Optimization and Applications, COCOA 2016. Lecture Notes in Computer Science 10043:92–106, 2016. (DOI link)
- [C7] F. Foucaud, G. B. Mertzios, R. Naserasr, A. Parreau, P. Valicov. Algorithms and complexity for metric dimension and location-domination on interval and permutation graphs. Proceedings of the 41st Workshop on Graph-Theoretic Concepts in Computer Science, WG 2015. Lecture Notes in Computer Science 9224:456-471, 2016. (DOI link)
- [C6] É. Bonnet, F. Foucaud, E. Kim, F. Sikora. Complexity of Grundy coloring and its variants. Proceedings of the 21st International Conference on Computing and Combinatorics, COCOON 2015. Lecture Notes in Computer Science 9198:109-120, 2015. (DOI link)
- [C5] F. Foucaud, R. Naserasr. The complexity of signed graph homomorphisms and signed constraint satisfaction. Proceedings of the 11th Latin American Symposium on Theoretical Informatics, LATIN 2014. Lecture Notes in Computer Science 8392:526-537, 2014. (DOI link)
- [C4] F. Foucaud, G. Perarnau, O. Serra. Random subgraphs make identification affordable. Proceedings of the 7th European Conference on Combinatorics, Graph Theory and Applications, EUROCOMB 2013. CRM Series 16:415–420, 2013. (DOI link)
- [C3] F. Foucaud. The complexity of the identifying code problem in restricted graph classes. Proceedings of the 24th International Workshop on Combinatorial Algorithms, IWOCA 2013. Lecture Notes in Computer Science 8288:150–163, 2013. (DOI link)
- [C2] F. Foucaud, M. Kovše. On graph identification problems and the special case of identifying vertices using paths. Proceedings of the 23rd International Workshop on Combinatorial Algorithms, IWOCA 2012. Lecture Notes in Computer Science 7643:32–45, 2012. (DOI link)
- [C1] F. Foucaud, S. Gravier, R. Naserasr, A. Parreau, P. Valicov. Edge identifying codes. Proceedings of the 6th European Conference on Combinatorics, Graph Theory and Applications, EUROCOMB 2011. Electronic Notes in Discrete Mathematics 38:343–348, 2011. (DOI link)

Publications: submitted work

- [S3] F. Foucaud, H. Hocquard, D. Lajou, V. Mitsou, T. Pierron. Parameterized complexity of edge-colored and signed graph homomorphism problems. Full version of [C3]. Submitted.
- [S2] D. Chakraborty, S. Das, F. Foucaud, H. Gahlawat, D. Lajou, B. Roy. Complexity and algorithms for geodetic set in planar graphs and chordal graphs. Submitted.
- [S1] S. Dey, F. Foucaud, S. C. Nandy, A. Sen. Discriminating codes in geometric setups. Submitted.

Publications: work in preparation

- [P1] L. Beaudou, F. Foucaud, R. Naserasr, G. F. Royle. Small 4-chromatic graphs with specific girth conditions.
- [P2] F. Foucaud. Complexity of METRIC DIMENSION with respect to various graph classes and parameters.
- [P3] F. Foucaud, H. Hocquard, S. Mishra, N. Narayanan, R. Naserasr, É. Sopena, P. Valicov. Exact square coloring and injective coloring of subcubic graphs.
- [P4] Alcoloco team. The good, the bad, and the ugly: connected greedy colourings in various graph classes.
- [P5] F. Foucaud, R. Naserasr, R. Xu. Improved homomorphism bounds for (signed) K_4 -minor-free graphs.
- [P6] F. Foucaud, S. Mishra, N. Narayanan, R. Naserasr. Exact square cliques and the maximum degree.
- [P7] F. Foucaud, S. Mishra, N. Narayanan, R. Naserasr, Rohini S. Signed cliques of given maximum degree.
- [P8] F. Foucaud, F. McInerney, A. Parreau. Identification problems on sparse graphs.

Teaching

- 03.2020 Course on "Representation and encoding of information" (part on "coding of images/sounds/videos, data compression"), 1st year of Bsc at Université d'Orléans (5h).
- 12.2019 "scientific paper reading", supervision of 4 CS Msc students at Université de Bordeaux (3h eqTD).
- 03.2019 72h eq
TD at CS Departement of IUT d'Orléans. 06.2019
 - Basics of conception (GIT), DUT 1A, TP (12h).
 - Basics of conception (UML), DUT 1A, TP/TD (12h).
 - Databases (MySQL, PSQL, JDBC), DUT 1A, TD (14h) et TP (42h).
 - Human-Machine Interaction, DUT "année spéciale", TD (12h).
 - Project tutoring, two groups, DUT 1A (4h eqTD).
- 03.2019– 56h eq
TD at CS Departement of Université d'Orléans. 06.2019
 - Course on "Representation and encoding of information" (part on "coding des images/sounds/videos, data compression"), 1st year of Science Bsc (5h).
 - Algorithmics of discrete structures, 2nd year of CS Bsc, TP (6h).
 - Representation and encoding of information, 1st year of Science Bsc, TP (18h).
 - Algorithms and Programming, 1st year of Science Bsc, TP (12h).
 - Tutoring of 12 interns at 3rd year of CS Bsc (24h eqTD).
- 2009–2012 192h eqTD at CS Department of IUT Bordeaux 1.
 - Linear algebra and geometry, Licence pro, cours/TD (40h).
 - UML and advanced object-oriented programming, DUT "année spéciale", cours/TD (52h).
 - UML and conception, DUT 1A, cours/TD (28h).
 - System programming, DUT 2A, cours/TP (16h).
 - Java Enterprise Edition (JEE), DUT 2A, TP (16h).
 - \bullet Event-oriented programming in C#, DUT 1A, TP (20h).
 - Usage of computer systems, DUT 1A, TP (10h).
 - Algorithms and Programming, DUT 1A, TP (10h).

Student supervision

- 2020 Master 2 internship of Sébastien Clauzel at LaBRI, Bordeaux. Topic: Complete colorings of signed graphs. Co-supervised with Éric Sopena.
- 2020 Master 2 internship of Sarah Vita Paardekooper at LaBRI, Bordeaux. Topic: Switching homomorphisms of signed digraphs. Co-supervised with Éric Sopena.

2018 Master 1 internship of Tristan Benoit at LIMOS, Clermont-Ferrand. Topic: Metric dimension of 2-trees. Co-supervised with Laurent Beaudou, Aurélie Lagoutte and Florent Madelaine.

Scientific community-related activities

- Member of Programme Committee of the conference *IWOCA 2020*, Bordeaux, France, June 2020 http://iwoca2020.labri.fr.
- Member of Programme Committee of the "International Conference on Emerging Trends in Mathematical Sciences & Computing" (IEMSC-20), Calcutta, India, February 2020 http://iemsc.uem.edu.in.
- \bullet Active member of the organizing committees of the conferences BWIC~2011 http://bwic2011.labri.fr, SEA~2012 http://sea2012.labri.fr and IWOCA~2020 http://iwoca2020.labri.fr (co-chair)
- Preliminary examiner (i.e. reviewer) of the PhD thesis of Tuomo Lehtilä, University of Turku, Finland, 2020.
- Invited as member of jury of PhD defense of Berenice Martinez-Barona, Universitat Politècnica de Catalunya, Spain, 2020.
- Refereed 28 papers for journals and 13 papers for conferences.

Journals: Ars Combinatoria, Australasian Journal of Combinatorics (x2), Discrete Applied Mathematics (x7), Discrete Mathematics (x3), Discrete Mathematics & Theoretical Computer Science (x2), European Journal of Combinatorics, Information Processing Letters (x2), Journal of Combinatorial Mathematics and Combinatorial Computing, Journal of Graph Theory, Questiones Mathematicae, The Electronic Journal of Combinatorics (x2), Theoretical Computer Science (x4), Transactions on Combinatorics.

Conferences: IWOCA 2011, IC3 2011, IWOCA 2012, IWOCA 2013, FCT 2013, COCOA 2013, IWOCA 2014, WALCOM 2015, IPEC 2018, WAOA 2018, WG 2018, FCT 2019, WALCOM 2020.

- Member of the funded research projects:
- -IDEA: Identifying coDes in Evolving grAphs, ANR (PI: Ralf Klasing), 2009-2012 (http://idea.labri.fr)
- -Arbitrarily decomposable graphs, PHC Polonium (PI: Olivier Baudon), 2010-2012
- -HOGRASI: HOmomorphismes de GRAphes SIgnés, PEPS CNRS (PI: Reza Naserasr), 2012-2013 (http://www.irif.fr/~reza/pmwiki/pmwiki.php?n=Site.PEPS2013)
- -IDIS: Identification dans les structures DIScrètes, PEPS CNRS (PI: Aline Parreau), 2015
- -HOSIGRA: HOmomorphisms of SIgned GRAphs, ANR (PI: Reza Naserasr), 2018-2022 (http://www.irif.fr/~hosigra/)
- -AGraHom: Applications of Graph Homomorphisms, IFCAM Indo-French Center for Applied Mathematics (PI: Sagnik Sen), 2018–2021

Invited talks

- 12.2020 Invited as keynote speaker of the *International Conference in Graph Theory and its Applications*, Amrita University, Coimbatore, India (https://www.amrita.edu/event/international-conference-graph-theory-and-its-applications-icgta20).
- 02.2020 Indo-French pre-conference school of the 6th International Conference on Algorithms and Discrete Applied Mathematics (CALDAM'20), Hyderabad, India (https://www.iith.ac.in/~caldam2020/conferenceschool.php).

 Identification problems on graphs: selected topics. Invited short lecture.
- 02.2020 International Conference on Emerging Trends in Mathematical Sciences & Computing (IEMSC-20), Calcutta, India (http://iemsc.uem.edu.in).

Broadcast domination and multipacking in graphs. Invited talk.

O6.2014 SIAM conference on Discrete Mathematics 2014, Minneapolis, USA.

The complexity of signed graph homomorphisms. Invited talk at the minisymposium MS6 - Graph Homomorphisms: Edge Colours, Signs, and Crossings (https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=19095).

Selected international research visits

01.2019 Mathematics Department, Indian Institute of Technology Madras (Chennai, Inde).

+02.2020 Host: N. Narayanan.

(2 weeks.)

- 02.2020 Mathematics Department, Indian Institute of Technology Dharwad (Dharwad, Inde). (1 sem.) Host: Sagnik Sen. 02.2019 Computer Science Department, Indian Statistical Institute (Calcutta, Inde). +02.2020 Host: Sandip Das. (4 weeks.) Mathematics Department, Universidad Autonoma de Mexico (Querétaro, Mexico). 11.2015 +12.2017Host: Adriana Hansberg. (8 weeks) 06.2014 Mathematics Department, Thompson Rivers University, (Kamloops, Canada). +06.2016Host: Richard C. Brewster. (5 weeks) 09.2012 Algorithms and Complexity theory team, TU Berlin (Berlin, Germany).
- +11.2013 Host: Rolf Niedermeier.

 (7 weeks)
- (2 weeks) Host: Tero Laihonen.
 11.2010 Department of Discrete Mathematics, Akademia Górniczno-Hutnicza w. Krakowie (Krakow, Poland).

Foundations of Computing and Discrete Mathematics team, Turun Yliopisto (Turku, Finland).

(2 weeks) Host:: Monika Pilsńiak, Mariusz Woźniak.
 10.2009 Department of Algorithms and System Modelling, Gdańsk University of Technology (Gdańsk, Poland).
 (1 week) Host: Adrian Kosowski.

Language skills

08.2011

French, German: native speaker English: fluent Spanish: intermediate

Selected professional references

• Camino Balbuena

Full Professor, Universitat Politècnica de Catalunya, Barcelona m.camino.balbuena@upc.edu

- Cristina Bazgan Full Professor, LAMSADE, University of Paris-Dauphine bazgan@lamsade.dauphine.fr
- Laurent Beaudou Assistant Professor, LIMOS, Université Clermont Auvergne beaudou@isima.fr
- \bullet Richard C. Brewster Full Professor, Thomson Rivers University, Kamloops <code>rcbrewster@tru.ca</code>
- Pavol Hell Full Professor, Simon Fraser University, Vancouver pavol@sfu.ca
- Michael A. Henning Full Professor, University of Johannesburg mahenning@uj.ac.za
- Ralf Klasing Directeur de Recherche CNRS (Senior Researcher), LaBRI, Université de Bordeaux ralf.klasing@labri.fr
- Tero Laihonen Full Professor, Turku University, Finland terolai@utu.fi
- \bullet Florent Madelaine Full Professor, Université Paris-Est Créteil, France florent.madelaine@u-pec.fr
- Reza Naserasr Chargé de Recherche CNRS (Researcher), IRIF, Université Paris-Diderot reza@lri.fr
- André Raspaud Emeritus Professor, LaBRI, Université de Bordeaux andre . raspaud@labri . fr
- Oriol Serra Full Professor, Universitat Politècnica de Catalunya, Barcelona oserra@ma4.upc.edu
- Éric Sopena Full Professor, LaBRI, Université de Bordeaux eric.sopena@labri.fr