1 Personal details

Name: Marcelo SOBOTTKA

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Nationality: Brazilian.

Contents

2 Education

- **2005:** Ph.D. in Engineering Science-Mathematical Modelling, Universidad de Chile, Santiago, Chile.

  Title: *Representación y Aleatorización en Sistemas Dinámicos de tipo Algebraico.* (Spanish/English)

- **2002:** Master's degree in Pure Mathematics, Universidade Federal do Rio Grande do Sul, Porto Alegre - RS, Brazil.

  Title: *Propriedades Ergódicas do Algoritmo da Raiz Quadrada.* (Portuguese)

- **2000:** Bachelor in Science: Mathematics and Education, Universidade do Vale do Rio dos Sinos, São Leopoldo - RS, Brazil.

3 Language skills

Portuguese, Spanish and English.

4 Research Interests

Dynamical Systems, Symbolic Dynamics, Cryptography, Stochastic Processes, Biomathematics, Social Networks.

5 Professional Activities

- **March 2009 - actual:** Associate Professor in the Departamento de Matemática of the Universidade Federal de Santa Catarina (UFSC), Florianópolis, Brazil.

- **March 2020 - actual:** Editorial Board Member of *Notas em Matemática Aplicada (NoMA)*, Sociedade Brasileira de Matemática Aplicada e Computacional (SBMAC), Brazil.

- **March 2010 - February 2022:** Researcher of the Brazilian National Council of Scientific and Technological Development (CNPq), Florianópolis, Brazil.

- **March 2007 - February 2009:** Assistant Professor in the Departamento de Ingeniería Matemática of the Universidad de Concepción (UdeC), Concepción, Chile.

- **June 2007 - December 2008:** Young Researcher position in the Millennium Nucleus Information and Randomness ICM P04-069-F, Universidad de Chile, Santiago, Chile.

- **March 2004 - December 2005:** Teacher assistant, Department of Mathematical Engineering, Faculty of Physics and Mathematical Sciences, Universidad de Chile, Santiago, Chile.

6 Grants

6.1 Projects

- **March 2019 - February 2022:** *Dinâmica topológica e estocástica de autômatos celulares e suas aplicações.* CNPq grant: 301445/2018-4. Main researcher: Marcelo Sobottka. Brazil.

- **March 2016 - February 2019:** *Autômatos celulares: dinâmica topológica e estocástica.* CNPq grant: 308575/2015-6. Main researcher: Marcelo Sobottka. Brazil.

- **Octuber 2013 - September 2016:** *Comportamento limite de sistemas dinâmicos.* CNPq grant: 480314/2013-6. Main researcher: Marcelo Sobottka. Brazil.

- **March 2013 - February 2016:** *Autômatos celulares: teoria ergódica e suas aplicações.* CNPq grant: 304813/2012-5. Main researcher: Marcelo Sobottka. Brazil.

- **August 2010 - July 2012:** *Processos Estocásticos e Distribuição do ADN Bacterial.* CNPq grant: 506274/2010-1. Main researcher: Marcelo Sobottka. Brazil.

- **March 2010 - February 2013:** *Teoria ergódica para autômatos celulares.* CNPq grant: 304457/2009-4. Main researcher: Marcelo Sobottka. Brazil.

- **August 2009 - July 2010:** *Análise e comportamento limite de autômatos celulares probabilísticos.* FUNPESQUISA/UFSC grant: 2009/10. Main researcher: Marcelo Sobottka. Brazil.

- **Octuber 2008 - February 2009:** *Long-time behavior analysis of a probabilistic cellular automaton model for a social game on networks.* FONDECYT grant 11080004. Main researcher: Marcelo Sobottka. Chile.

- **July 2008 - August 2010:** *Application of Dynamical Systems to Digital Communication* - joint Chile(CONICYT)-Brazil(CNPq) project numbered 2007-153 (Chile) and 490327/2007-9 (Brazil). Main researchers: Marcelo Sobottka (Chile), Luiz P. L. de Oliveira (Brazil). Chile-Brazil.

- **April 2007 - February 2009:** *Aplicación de sistemas dinámicos a la biología y comunicación digital.* Universidad de Concepción-DIUC grant 207.013.030-1.0. Main researcher: Marcelo Sobottka. Chile.

6.2   Fellowships

- **February 2020 - August 2020:** Visiting Professor Fellowship at Pacific Institute for the Mathematical Sciences, Canada. CAPES grant 88887.466958/2019-00, Brazil.

- **May 2019 - May 2019:** Visiting researcher at Departamento de Ingeniería Matemática, Universidad de Chile, Chile. DIM/CAPES grants, Chile/Brazil.

- **August 2018 - September 2018:** Visiting researcher at Centro de Modelamiento Matemático, Chile. MATHAmSud CAPES grant 88887.135125/2017-01, Brazil.

- **January 2018 - January 2018:** Visiting researcher at Centro de Modelamiento Matemático, Chile. CNPq grant 454091/2017-6, Brazil.

- **December 2017 - January 2018:** Visiting researcher at Centro de Modelamiento Matemático, Chile. CMM CONICYT Basal program PFB 03, Chile.

- **December 2013 - June 2014:** Postdoctoral Fellowship at Centro de Modelamiento Matemático, Chile. CAPES grant BEX 12066/13-3, Brazil.

- **January 2012 - February 2012:** Visiting researcher at Centro de Modelamiento Matemático, Chile. CNPq grant 455399/2011-5, Brazil.

- **October 2006 - March 2007:** Postdoctoral Fellowship at Universidade de São Paulo, Brazil. FAPESP grant 06/56331-1, Brazil.

- **April 2006 - September 2006:** Postdoctoral Fellowship at Millennium Nucleus Information and Randomness, Chile. ICM grant P04-069-F, Chile.

- **November 2005 - April 2006:** Postdoctoral Fellowship at research group "Modelos Estocásticos", Universidad de Zaragoza, Spain. Aragon Government (DGA) grant, Spain.

6.3   Scholarship

- **March 2002 - October 2005:** MECESUP Ph.D. Scholarship, The Chilean Government, Ministry of Education, Chile.

- **March 2000 - February 2002:** CNPQ Master's Degree Scholarship, The Brazilian Government, Ministry of Science and Technology, Brazil.

- **August 1998 - February 2000:** FAPERGS Scientific-Initiation, The Rio Grande do Sul State Government, Rio Grande do Sul State Secretary of Science and Technology, Brazil.

7   Published and accepted works

7.1   Articles

1. M. Sobottka, *Some notes on the classification of shift spaces: Shifts of Finite Type; Sofic shifts; and Finitely Defined Shifts.* Bulletin of the Brazilian Mathematical Society, New Series (2022), **53**, 981–1031. doi: 10.1007/s00574-022-00292-x.

2. T. Z. de Almeida and M. Sobottka, *Blur shift spaces.* Bulletin des Sciences Mathématiques (2021), **173**, 103069. doi: 10.1016/j.bulsci.2021.103069.

3. U. B. Darji, D. Gonçalves and M. Sobottka, *Shadowing, Finite Order Shifts and Ultrametric Spaces.*Adv. Math. (2021), **385**, 107760. doi: 10.1016/j.aim.2021.107760.

4. D. Gonçalves and M. Sobottka, *Continuous shift commuting maps between ultragraph shift spaces.* Disc. and Cont. Dynamic. Systems (2019), **39**, 2, 1033–1048. doi: 10.3934/dcds.2019043.

5. D. Gonçalves, M. Sobottka and C. Starling, *Inverse semigroup shifts over countable alphabets.* Semigroup Forum (2018), **96**, 2, 203–240. doi: 10.1007/s00233-017-9858-5.

6. D. Gonçalves, M. Sobottka and C. Starling. *Two-sided shift spaces over infinite alphabets.* Journal of the Australian Mathematical Society (2017), **103**, 3, 357–386. doi: 10.1017/S1446788717000039.

7. M. Sobottka and D. Gonçalves. *A note on the definition of sliding block codes and the Curtis-Hedlund-Lyndon Theorem.* Journal of Cellular Automata (2017), 12, 3-4, 209–215.

8. D. Gonçalves, M. Sobottka and C. Starling. *Sliding block codes between shift spaces over infinite alphabets.* Mathematische Nachrichten (2016), **289**, 17, 2178–2191. doi: 10.1002/mana.201500309.

9. E. Garibaldi and M. Sobottka. *A nonsmooth two-sex population model.* Mathematical Biosciences (2014), **253**, 1–10. doi: 10.1016/j.mbs.2014.03.015.

10. M. Sobottka. *Standard decomposition of expansive ergodically supported dynamics.* Nonlinear Dynamics (2014), **77**, 4, 1339–1347. doi: 10.1007/s11071-014-1383-4.

11. E. Garibaldi and M. Sobottka. *Average sex ratio and population maintenance cost.* SIAM Journal on Applied Mathematics (2011), **71**, 1009–1025. doi: 10.1137/100817310.

12. M. Sobottka and A. Hart. *A model capturing novel strand symmetries in bacterial DNA*. Biochemical and Biophysical Research Communications (2011), **410**, 4, 823–828. doi: 10.1016/j.bbrc.2011.06.072.

13. D. Formolo, L. P. L. de Oliveira and M. Sobottka. *A competitive searching-based chaotic cipher*. International Journal of Modern Physics C (2010), **21**, 11, 1377–1390. doi: 10.1142/S0129183110015907.

14. M. Sobottka and L. P. L. de Oliveira. *A searching-based probabilistic cipher*. Journal of Statistical Mechanics (2008), P11016. doi: 10.1088/1742-5468/2008/11/P11016.

15. F. J. López, G. Sanz and M. Sobottka. *Dualities for multi-state probabilistic cellular automata*. Journal of Statistical Mechanics (2008), P05006. doi: 10.1088/1742-5468/2008/05/P05006.

16. M. Sobottka. *Right-permutative cellular automata on topological Markov chains*. Disc. and Cont. Dynamic. Systems (2008), **20**, 4, 1095–1110. doi: 10.3934/dcds.2008.20.1095.

17. L. P. L. de Oliveira and M. Sobottka. *Cryptography with chaotic mixing*. Chaos, Solitons and Fractals (2008), **35**, 3, 466-471. doi: 10.1016/j.chaos.2006.05.049.

18. M. Sobottka. *Topological quasi-group shifts*. Disc. and Cont. Dynamic. Systems (2007), **17**, 1, 77–93. doi: 10.3934/dcds.2007.17.77.

19. A. Maass, S. Martínez and M. Sobottka. *Limit measures for affine cellular automata on topological Markov subgroups*. Nonlinearity (2006), **19**, 9, 2137–2147. doi: 10.1088/0951-7715/19/9/009.

20. M. Sobottka and L. P. L. de Oliveira. *Dynamical properties of an exact algorithm for square root calculation*. Physica D (2006), **223**, 2, 189–193. doi: 10.1016/j.physd.2006.07.032.

21. M. Sobottka and L. P. L. de Oliveira. *Periodicity and predictability in chaotic systems*. Amer. Math. Monthly (2006), **113**, 5, 415–424. doi: 10.2307/27641949.

22. M. Sobottka and L. P. L. de Oliveira. *Previsibilidade computacional em sistemas caóticos*. Scientia, **11**, 2, p.109–126, July/December 2000. UNISINOS. Brazil. (Portuguese).

23. G. A. Hoffmann, M. Sobottka and L. P. L. de Oliveira. *Dinâmica caótica: uma introdução*. Scientia, **10**, 2, p.147–175, July/December 1999. UNISINOS. Brazil. (Portuguese).

7.2   Books

1. *Teoria Ergódica para Autômatos Celulares Algébricos*. Rio de Janeiro: IMPA, 2009. ISBN: 978-85-244-0303-3.

8   Invited Talks

- *Curtis-Hedlund-Lyndon theorem for ultragraph shift spaces*. Lecture at Institute of Mathematics, Fedral University of Rio Grande do Sul. Porto Alegre, Brazil, Apr 04, 2018.

- *Curtis-Hedlund-Lyndon theorem for ultragraph shift spaces*. Lecture at Departamento de Ingeniería Matemática, Centro de Modelamiento Matemático, Universidad de Chile. Santiago, Chile, Jan 22, 2018.

- *Generalized sliding block codes between Ott-Tomforde-Willis shift spaces and the Curtis-Hedlund-Lyndon Theorem*. Lecture at Departamento de Matemática, Federal University of Rio Grande do Sul - UFRGS. Porto Alegre, Brazil, Jun 02, 2017.

- *A Curtis-Hedlund-Lyndon Theorem for shift spaces over countable alphabets*. Lecture at Departamento de Matemática Aplicada e Estatística, ICMC Universidade de São Paulo - USP. São Carlos, Brazil, Jul 03, 2015.

- *Shift groups on denumerable alphabets*. Lecture at Departamento de Matemática, Federal University of Santa Catarina - UFSC. Florianópolis, Brazil, Aug 19, 2016.

- *Statistical test for a hidden Markov model for nucleotide distribution in bacterial DNA*. Lecture at Departamento de Matemática, Federal University of Santa Catarina - UFSC. Florianópolis, Brazil, Jun 08, 2016.

- *Two-sex population models.* Lecture at Departamento de Matemática, Federal University of Santa Catarina - UFSC. Florianópolis, Brazil, Apr 14, 2015.

- *A hidden Markov model for nucleotide distribution in bacterial DNA.* Lecture at Departamento Matemática, Universidad del Bío-Bío - UBB. Concepción, Chile, May 27, 2014.

- *Two-sex population models.* Lecture at Departamento de Ingeniería Matemática, Universidad de Concepción - UdeC. Concepción, Chile, May 26, 2014.

- *Mecânica estatística e dinâmica de populações.* Lecture at Departamento de Matemática Aplicada e Estatística, ICMC Universidade de São Paulo - USP. São Carlos, Brazil, Apr 03, 2013.

- *Teoremas ergódicos para uma ampla classe de autômatos celulares probabilísticos.* Lecture at Departamento de Matemática Pura, IMECC Universidade de Estadual de Campinas - UNICAMP. Campinas, Brazil, Mar 23, 2012.

- *A dynamic-programming-based model for two-sex populations.* Lecture at Departamento de Ingeniería Matemática, Universidad de Concepción - UdeC. Concepción, Chile, Dic 21, 2011.

- *Segunda regra de Chargaff e outras simetrias nas fitas de ADN.* Lecture at Programa de Pós-Graduação em Computação Aplicada, Universidade do Vale do Rio dos Sinos. São Leopoldo, Brazil, Apr 20, 2011.

- *Mecânica estatística e proporção de gêneros.* Lecture at Departamento de Matemática, Universidade Federal de Santa Catarina. Florianópolis, Brazil, Nov 05, 2010.

- *Mecânica estatística e dinâmica de gêneros.* Lecture at Programa de Pós-Graduação em Computação Aplicada, Universidade do Vale do Rio dos Sinos. São Leopoldo, Brazil, Oct 07, 2010.

- *Padrões assintóticos na dinâmica de autômatos celulares.* Lecture at Departamento de Métodos Matemáticos, Instituto de Matemática, Universidade de Federal do Rio de Janeiro - UFRJ. Rio de Janeiro, Brazil, Sep 03, 2010.

- *Teoria de códigos e autômatos celulares.* Two three-hour lectures at Departamento de Matemática Pura, IMECC Universidade de Estadual de Campinas - UNICAMP. Campinas, Brazil, Jul 21 and 22, 2010.

- *Endomorfismos expansivos e entropia.* Lecture at Departamento de Matemática Pura, IMECC Universidade de Estadual de Campinas - UNICAMP. Campinas, Brazil, Dic 11, 2009.

- *Espaços Shift como Quasegrupos Topológicos.* Lecture at Departamento de Matemática Pura, IMECC Universidade de Estadual de Campinas - UNICAMP. Campinas, Brazil, Jul 23, 2009.

- *Ergodicity for linear and non-linear voter models.* Lecture at Departamento de Ingeniería Matemática, Centro de Modelamiento Matemático, Universidad de Chile. Santiago, Chile, Oct 22, 2007.

- *Limit behaviour for cellular automata.* Lecture at Departamento de Ingeniería Matemática, Universidad de Concepción. Concepción, Chile, Aug 17, 2006.

- *Non-periodic orbits in chaos-based cryptography.* Lecture at Departamento de Ingeniería Matemática, Centro de Modelamiento Matemático, Universidad de Chile. Santiago, Chile, Aug 04, 2006.

- *Coding theory & deterministic and probabilistic cellular automata.* Lecture at Instituto de Matemática y Física, Universidad de Valparaiso. Valparaiso, Chile, May 18, 2006.

- *Asymptotic behaviour for probabilistic models of competition among many species in $\mathbb{Z}^d$.* Lecture at Programa de Pós-Graduação em Computação Aplicada, Universidade do Vale do Rio dos Sinos. São Leopoldo, Brazil, Apr 11, 2006.

- *Dualities for multi-state probabilistic cellular automata.* Lecture at Institut de Mathématiques de Bourgogne, Université de Bourgogne. Dijon, France, Mar 22, 2006.

- *Randomization for deterministic cellular automata.* Two one-hour lectures at Departamento de Métodos Estadísticos, Universidad de Zaragoza. Zaragoza, Spain, Nov 28 and 30, 2005.

9   Contributed Conference Works

- **Invited Talk:** *Characterizations of shift spaces with algebraic structure.* 100 Doctores. Departamento de Ingeniería Matemática, Universidad de Chile. Santiago, Chile, May 2019.

- **Invited Talk:** *Inverse semigroup shifts over countable alphabets.* II Workshop de Sistemas Dinâmicos. Institute of Mathematics, Fedral University of Rio Grande do Sul. Porto Alegre, Brazil, December 2018.

- **Short talk:** *On the neighbourhoods of idempotents in zero-dimensional algebras.* International Congress of Mathematicians. IMPA-SBM. Rio de Janeiro, Brazil, August 2018.

- **Short talk:** *Statistical tests for a hidden Markov model of dinucleotide distributions in bacterial DNA.* II Workshop de Modelamiento Matemático de Sistemas Biológicos. Universidad Tecnológica Metropolitana. Santiago, Chile, January 2018.

- **Invited Talk:** *Inverse Semigroup Shifts.* Workshop de Sistemas Dinâmicos. Institute of Mathematics, Fedral University of Rio Grande do Sul. Porto Alegre, Brazil, September 2017.

- **Invited Talk:** *Inverse Semigroup Shifts.* MCA Satellite Conference in Operator Algebras. Fields Institute, University of Toronto. Toronto, Canada, August 2017.

- **Invited Talk:** *The Curtis-Hedlund-Lyndon Theorem for generalized sliding block codes between Ott-Tomforde-Willis shift spaces.* Mathematical Congress of the Americas (MCA 2017), Topological Dynamics and Operator Algebras Session. Montreal, Canada, July 2017.

- **Invited Talk:** *Generalizations of the Curtis-Hedlund-Lyndon Theorem for shift spaces over infinitely countable alphabets.* Workshop on Dynamical Systems and Operator Algebras, University of Ottawa. Ottawa, Canada, June 2016.

- **Poster:** *Group shifts over countable alphabets.* Workshop on Symbolic Dynamics on finitely presentd Groups, CMM Universidad de Chile. Santiago, Chile, December 2014.

- **Invited Lecture:** *O diálogo das dimensões.* VII Bienal da Sociedade Brasileira de Matemática, IMECC Universidade de Estadual de Campinas. Maceió-AL, Brazil, November 2014.

- **Invited Lecture:** *Como construir operações de grupo para as quais um sistema dinâmico ergódico seja um automorfismo.* Oficina de Tendências Dinâmicas, IMECC Universidade de Estadual de Campinas - UNICAMP. Campinas-SP, Brazil, January 2013.

- **Poster:** *A two-sex population model.* 2^a Escola Brasileira de Sistemas Dinâmicos, Universidade de São Paulo - USP. São Carlos-SP, Brazil, October 2012.

- **Short talk:** *A model for all bacterial genomes.* 16^a Escola Brasileira de Probabilidade. Universidade Federal de Pernambuco. Recife-PE, Brazil, August 2012.

- **Short talk:** *Custo de manutenção e proporção de gêneros em populações biológicas.* CWB 2010 - II Congresso de Matemática e suas Aplicações, Universidade Federal do Paraná - UFPR. Curitiba-PR, December 2010.

- **Short talk:** *A nucleotide distribution model for bacterial DNA.* II Workshop on Stochastic Modeling, Universidade Federal do ABC - UFABC. Santo André-SP, Brazil, July 2010.

- **Invited Lecture:** *Sistemas dinâmicos expansivos e quase-grupos.* 1^a Escola Brasileira de Sistemas Dinâmicos, Universidade Federal de Alagoas - UFAL. Maceió-AL, Brazil, February 2010.

- **Mini course:** *Teoria Ergódica para Autômatos Celulares Algébricos.* 27° Colóquio Brasileiro de Matemática, Instituto Nacional de Matemática Pura e Aplicada - IMPA. Rio de Janeiro-RJ, Brazil, July 2009.

- **Short talk:** *Limit behaviour for a wide class of voter models.* 4to Encuentro Regional de Probabilidad y Estadística Matemática. Balneario Solis, Uruguay, November 2007.

- **Short talk:** *Cuasigrupos shifts.* XXI Jornada de Matemática de la Zona Sur. Facultad de Ingeniería, Universidad Católica de la Santísima Concepción. Concepción, Chile, April 2007.

- **Poster:** *Ergodicity for multi-state biased voter models.* School and Workshop on Probability Theory and Applications International Centre for Theoretical Physics & National Council of Scientific and Technological Development. Campos do Jordão, Brazil, January 2007.

- **Invited Talk:** *Limit Measures for Structurally-Compatible Cellular Automata.* 3er Encuentro Regional de Probabilidad y Estadística Matemática. Centro de Física y Matemática de América del Sur, Universidad Torcuato Di Tella, and Universidad de San Andrés. Buenos Aires, Argentina, October 2006.

- **Poster:** *Duality and ergodicity in probabilistic cellular automata.* XV International Congress on Mathematical Physics. Instituto de Matemática Pura e Aplicada. Rio de Janeiro-RJ, Brazil, August 2006.

- **Short talk:** *The Cesàro mean of infinite-memory measures on Markov shifts for algebraic cellular automata.* IX International Conference Zaragoza-Pau on Applied Mathematics and Statistics. Universidad de Zaragoza and Université de Pau. Zaragoza, Spain, September 2005.

- **Poster:** *Limits of infinite-memory measures on Markov shifts for algebraic c.a..* 9^a Escola Brasileira de Probabilidade. Universidade de São Paulo. Maresias, Brazil-SP, August 2005.

- **Poster:** *Limit Measures for Algebraic Cellular Automata on Markov Shifts.* II Escuela de Invierno de Análisis Estocástico y Aplicaciones. Universidad de Valparaíso. Valparaíso, Chile, September 2004.

- **Short talk:** *Randomization of Cellular Automata on Markov Shifts.* 8^a Escola Brasileira de Probabilidade. Universidade de São Paulo. Ubatuba-SP, Brazil, August 2004.

- **Short talk:** *Espacios Shift como Casi-Grupos Topológicos.* II Congreso Latino Americano de Matemáticos. UMALCA. Cancún, Mexico, June 2004.

- **Short talk:** *Autómatas celulares con reglas locales algebraicas definidos sobre shifts de Markov.* IX Congreso Latino Americano de Probabilidad y Estadística Matemática. Universidad de la República. Punta del Este, Uruguay, March 2004.

10 Conference Organization

- Coordinator of Organization Committee for *IV Workshop on Dynamics, Numeration and Tilings - IV FLORIPADYNSYS.* 2019. https://floripadynsys4.sciencesconf.org

- Coordinator of Organization Committee for *III Workshop on Dynamics, Numeration and Tilings - III FLORIPADYNSYS.* 2017. https://floripadynsys3.sciencesconf.org

- Coordinator of Organization Committee for *II Workshop on Dynamics, Numeration and Tilings - II FLORIPADYNSYS.* 2015. https://floripadynsys2.sciencesconf.org

- Member of Organization Committee for *Workshop on Functional Analysis and Dynamical Systems - FADYS.* 2015. http://mtm.ufsc.br/ alcides/fadys/

- Coordinator of Organization Committee for *Workshop on Dynamics, Numeration and Tilings - FLORIPADYNSYS.* 2013. https://floripadynsys.sciencesconf.org

- Member of Organization Committee for *Taller Jovenes Nucleo Milenio.* 2008.

11 Professional Society Affiliations

- Sociedade Brasileira de Matemática (SBM) - Brazil

- Sociedade Brasileira de Matemática Aplicada e Computacional (SB-MAC) - Brazil

- Sociedad de Matemática de Chile (SOMACHI) - Chile