

EDUCATION

Ph.D., Electrical Engineering

Aug. 2017 - Mar. 2020

Universidade Federal de Minas Gerais (UFMG)

Brazil

Title: *Learning nonlinear differentiable models for signals and systems: with applications*

Supervisor: Luis Antonio Aguirre

Co-supervisor: Thomas Schön.

Credits: A total of 23 credits (345 class-hours). Graded point average: 5.0 out of 5.0.

With one year, from *Sept. 2018 to Sept. 2019*, as a guest doctoral student at **Uppsala University** (Sweden) under the supervision of **Thomas Schön**.

M.Sc., Electrical Engineering

Jan. 2016 - Jul. 2017

Universidade Federal de Minas Gerais (UFMG)

Brazil

Title: *Recurrent Structures in System Identification*

Supervisor: Luis Antonio Aguirre

Credits: A total of 25 credits (375 class-hours). Graded point average: 5.0 out of 5.0.

B.S.E., Electrical Engineering

Jan. 2011 - Jan. 2016

Universidade Federal de Minas Gerais (UFMG)

Brazil

Credits: A total of 240 credits (3600 class-hours). Graded point average:¹: 4.91 out of 5.00

WORK EXPERIENCE

Postdoctoral Researcher

Fev. 2021 - Now

Department of Information Technology, Uppsala University

Uppsala, Sweden

- I am working under the supervision of Thomas Schön on the intersection of machine learning, signal processing, and control theory.

Postdoctoral Associate

Mar. 2020 - Fev. 2021

Department of Computer Science, Universidade Federal de Minas Gerais (UFMG)

Belo Horizonte, Brasil

- I worked on developing new machine learning algorithms and studying its application to engineering and health care. My position was funded by the Brazilian Agency CAPES, through the institutional internalization program (PRINT).

Google Summer of Code

May. 2017 - Aug. 2017

Software Developer

Scipy

- I have successfully completed Google Summer of Code program under the mentorship of Matt Haberland, Nikolay Mayorov and Ralf Gommers. My project was the implementation of an interior-point solver for large-scale nonlinear programming problems. The result is the method `trust-contr`, now openly available as part of the open source scientific library SciPy, in Python.

Invent Vision

Jan. 2015 - Dec. 2015

Hardware Team Intern

Belo Horizonte, Brazil

- I was part of the hardware development team and worked designing FPGA-based cameras. The major project I have worked on while there was the design and implementation of a stereo camera.

Undergraduate Researcher Intern

Jun. 2013 - Jan. 2015

Research and development project with Petrobras Oil Company, UFMG

Belo Horizonte, Brazil

- I worked on the development of methods for identification of oil well mathematical models under the supervision of Professor Luis Antonio Aguirre. My position was funded by the Petrobras Oil Company through the *Christiano Ottoni Foundation* (FCO) in the modality “*bolsa de iniciação científica*”.

¹Weighted average of my letter grade ($A = 5.0$; $B = 4.0$; $C = 3.0$; $D = 2.0$; $E = 1.0$; $F = 0.0$). Weighted according to the course number of credits.

PROFESSIONAL MEMBERSHIP

Scipy core team member

Since Nov. 2017

- I am one of the 34 SciPy core development team members². SciPy is one of the core scientific libraries in Python and I was invited to the core team for having contributed to optimization and signal processing packages with the implementation of signal filters: `iirnotch`, `iirpeak`; and optimization methods: `trust-exact`, `trust-constr`. My GitHub account: <https://github.com/antonior92> contain a complete list of my open-source contributions.

PROFESSIONAL ACTIVITIES

Peer reviewing: journal papers

- *Heart* (2021), *IEEE Transactions on Instrumentation and Measurement* (2021), *International Journal of System Science* (2021), *Proceedings of the National Academy of Sciences (PNAS)* (2020), *Automatica* (2020), *IEEE Transactions on Biomedical Engineering* (2020), *IEEE Control Systems Letters (L-CSS)* (2020), *Systems & Control Letters* (2020), *Chaos, Solutions & Fractals* (2020), *CHEST* (2020), *Journal of Electrocardiology* (2020), *Journal of Control, Automation and Electrical Systems* (2015-2018).

Peer reviewing: conference papers

- *The 25th International Conference on Artificial Intelligence and Statistics (AISTATS)* (2022), *The 19th IFAC Symposium on System Identification* (2021), *Learning for Dynamics and Control (L4DC)* (2021), *European Control Conference (ECC)* (2021), *IEEE Conference on Decision and Control (CDC)* (2020), *The 21st IFAC World Conference* (2020), *The American Control Conference* (2018), *The 12th International Conference on Modelling, Identification and Control* (2017), *The 20th IFAC World Conference* (2017).

Expert assignments

- *ELLIS (European Laboratory for Learning and Intelligent Systems) PhD Program: Recruitment evaluator* (2020)

Chair

- Co-chair at the regular session *Parameter Estimation 1* at the 19th IFAC Symposium on System Identification (2021).

AWARDS

Best Ph.D. Thesis (*Grande Premio de Teses*)

2021

Universidade Federal de Minas Gerais

Belo Horizonte, Brazil

- My thesis “Learning nonlinear differentiable models for signals and systems: with applications” was awarded the best Ph.D. thesis in the area of engineering and physical sciences at the Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil. *In portuguese: Minha tese foi ganhadora do grande premio de teses da UFMG na área de ciências exatas e da terra e engenharias.*

Young Author Award (Honorable Mention)

2021

19th IFAC Symposium on System Identification

Online

- I have been one of the three finalists of the Young Author Award of the 19th IFAC Symposium on System identification. I was competing with the paper “Beyond Occams Razor in System Identification: Double-Descent when Modeling Dynamics”.

Best Poster Award

2019

SciLifeLab Science Summit

Uppsala, Sweden

- We have been awarded the best poster award for the work “Automatic Diagnosis of Short-Duration 12-Lead ECG using a Deep Convolutional Network” presented at SciLifeLab Science Summit (Uppsala, 2019).

Travel Award

2018

Machine Learning for Health (ML4H) Workshop at NeurIPS

Montreal, Canada

- We have been awarded the travel award for the work “Automatic Diagnosis of Short-Duration 12-Lead ECG using a Deep Convolutional Network” presented at Machine Learning for Health (ML4H) Workshop at NeurIPS (Montreal, 2019).

²Checked on February 20, 2020

SCHOLARSHIPS

Split-site Ph.D. Scholarship

CNPq

2019

Uppsala, Sweden

- I have been granted a scholarship from the Brazilian Agency CNPq for staying one year of my Ph.D. in Uppsala University, Sweden.

Ph.D. Scholarship

CNPq

2018-2020

Belo Horizonte, Brasil

- I have been granted a scholarship from the Brazilian Agency CNPq during my doctoral studies .

M.S. Scholarship

CAPES

2016 - 2017

Belo Horizonte, Brasil

- I have been granted a scholarship from the Brazilian Agency CAPES during my master studies.

TEACHING

Course organizer

The unreasonable effectiveness of overparameterized machine learning models - PhD level course

Uppsala University, Sweden

Fall - 2021

Lecturer

Advanced Probabilistic Machine Learning - MSc level course

Uppsala University, Sweden

Fall - 2021

Teaching assistant

Deep learning - PhD level course

Uppsala University, Sweden

Spring - 2021

Teaching assistant

Engenharia de Controle (*Control Engineering*) - BSc level course

Universidade Federal de Minas Gerais, Brazil

1st semester - 2017

Teaching assistant

Controle Digital (*Digital Control*) - BSc level course

Universidade Federal de Minas Gerais, Brazil

2nd semester - 2016

SUPERVISION

Ph.D. Co-supervisor: Daniel Gedon.

Disentangled Representation Learning in Self-Supervised Models

Uppsala University, Sweden

In progress

M.Sc. Subject reviewer: Sai Abhishek Guraja.

ADAS scenario classification of in-vehicle sensor data using ML

Uppsala University, Sweden

In progress

PUBLICATIONS

Preprints

S. Gustafsson, D. Gedon, E. Lampa, A. H. Ribeiro, M. J. Holzmann, T. B. Schön, and J. Sundstrom, "Artificial Intelligence-Based ECG Diagnosis of Myocardial Infarction in High-Risk Emergency Department Patients," *SSRN*, Jun. 2021. DOI: 10.2139/ssrn.3857655.

V. Sangha, B. J. Mortazavi, A. D. Haimovich, A. H. Ribeiro, C. A. Brandt, D. L. Jacoby, W. L. Schulz, H. M. Krumholz, A. L. P. Ribeiro, and R. Khera, "Automated Multilabel Diagnosis on Electrocardiographic Images and Signals," *medRxiv*, Sep. 2021. DOI: 10.1101/2021.09.22.21263926.

Journal Papers

S. Biton, S. Gendelman, A. H. Ribeiro, G. Miana, C. Moreira, A. L. P. Ribeiro, and J. A. Behar, "Atrial fibrillation risk prediction from the 12-lead ECG using digital biomarkers and deep representation learning," *European Heart Journal - Digital Health*, 2021, ISSN: 2634-3916. DOI: 10.1093/ehjdh/ztab071.

E. M. Lima, A. H. Ribeiro, G. M. Paixão, M. H. Ribeiro, M. M. P. Filho, P. R. Gomes, D. M. Oliveira, E. C. Sabino, B. B. Duncan, L. Giatti, S. M. Barreto, W. Meira, T. B. Schön, and A. L. P. Ribeiro, "Deep neural network estimated electrocardiographic-age as a mortality predictor," *Nature Communications*, vol. 12, 2021. DOI: 10.1038/s41467-021-25351-7.

G. M. M. Paixão, E. M. Lima, P. R. Gomes, D. M. Oliveira, M. H. Ribeiro, J. S. Nascimento, A. H. Ribeiro, P. W. Macfarlane, and A. L. P. Ribeiro, "Electrocardiographic Predictors of Mortality: Data from a Primary Care Tele-Electrocardiography Cohort of Brazilian Patients," *Hearts*, vol. 2, no. 4, pp. 449–458, Dec. 2021. DOI: 10.3390/hearts2040035.

W. Meira Jr, A. L. P. Ribeiro, D. M. Oliveira, and A. H. Ribeiro, “Contextualized Interpretable Machine Learning for Medical Diagnosis,” *Communications of the ACM*, 2020. DOI: 10.1145/3416965.

G. M. M. Paixão, L. G. S. Silva, P. R. Gomes, E. M. Lima, M. P. F. Ferreira, D. M. Oliveira, M. H. Ribeiro, A. H. Ribeiro, J. S. Nascimento, J. A. Canazart, L. B. Ribeiro, E. J. Benjamin, P. W. Macfarlane, M. S. Marcolino, and A. L. Ribeiro, “Evaluation of Mortality in Atrial Fibrillation: Clinical Outcomes in Digital Electrocardiography (CODE) Study,” *Global Heart*, vol. 15, no. 1, p. 48, Jul. 2020, ISSN: 2211-8179. DOI: 10.5334/gh.772.

A. H. Ribeiro, M. H. Ribeiro, G. M. M. Paixão, D. M. Oliveira, P. R. Gomes, J. A. Canazart, M. P. S. Ferreira, C. R. Andersson, P. W. Macfarlane, W. Meira Jr., T. B. Schön, and A. L. P. Ribeiro, “Automatic diagnosis of the 12-lead ECG using a deep neural network,” *Nature Communications*, vol. 11, no. 1, p. 1760, 2020. DOI: 10/drkd. arXiv: 1904.01949.

A. H. Ribeiro, K. Tiels, J. Umenberger, T. B. Schön, and L. A. Aguirre, “On the smoothness of nonlinear system identification,” *Automatica*, vol. 121, p. 109158, Nov. 2020. DOI: 10.1016/j.automatica.2020.109158. arXiv: 1905.00820.

P. Virtanen, R. Gommers, T. E. Oliphant, M. Haberland, T. Reddy, D. Cournapeau, E. Burovski, P. Peterson, W. Weckesser, J. Bright, S. J. van der Walt, M. Brett, J. Wilson, K. J. Millman, N. Mayorov, A. R. J. Nelson, E. Jones, R. Kern, E. Larson, C. J. Carey, Í. Polat, Y. Feng, E. W. Moore, J. VanderPlas, D. Laxalde, J. Perktold, R. Cimrman, I. Henriksen, E. A. Quintero, C. R. Harris, A. M. Archibald, A. H. Ribeiro, F. Pedregosa, P. van Mulbregt, and S. 1. Contributors, “SciPy 1.0—Fundamental Algorithms for Scientific Computing in Python,” *Nature Methods*, vol. 17, no. 3, pp. 261–272, 2020. DOI: 10/ggj45f. arXiv: 1907.10121.

G. M. M. Paixão, E. M. Lima, P. R. Gomes, M. P. Ferreira, D. M. Oliveira, M. H. Ribeiro, A. H. Ribeiro, J. Nascimento, J. A. Canazart, G. Cardoso, L. B. Ribeiro, and A. L. P. Ribeiro, “Evaluation of mortality in bundle branch block patients from an electronic cohort: Clinical Outcomes in Digital Electrocardiography (CODE) study,” *Journal of Electrocardiology*, Sep. 2019, ISSN: 0022-0736. DOI: 10/dcgk.

A. H. Ribeiro and L. A. Aguirre, ““Parallel Training Considered Harmful?”: Comparing series-parallel and parallel feedforward network training,” *Neurocomputing*, vol. 316, pp. 222–231, Nov. 2018, ISSN: 0925-2312. DOI: 10/gfhwnk.

Conference Papers

J. N. Hendriks, F. K. Gustafsson, A. H. Ribeiro, A. G. Wills, and T. B. Schön, “Deep Energy-Based NARX Models,” *Proceedings of the 19th IFAC Symposium on System Identification (SYSID) - IFAC-PapersOnLine*, vol. 54, no. 7, pp. 505–510, 2021. DOI: 10.1016/j.ifacol.2021.08.410. arXiv: 2012.04136.

A. H. Ribeiro, J. N. Hendriks, A. G. Wills, and T. B. Schön, “Beyond Occam’s Razor in System Identification: Double-Descent when Modeling Dynamics,” in *Proceedings of the 19th IFAC Symposium on System Identification (SYSID) - IFAC-PapersOnLine*, vol. 54, Elsevier, 2021, pp. 97–102. DOI: 10.1016/j.ifacol.2021.08.341. arXiv: 2012.06341.

A. H. Ribeiro and T. B. Schon, “How convolutional neural networks deal with aliasing,” in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, IEEE, 2021, pp. 2755–2759. DOI: 10.1109/ICASSP39728.2021.9414627.

D. M. Oliveira, A. H. Ribeiro, J. A. O. Pedrosa, G. M. Paixao, A. L. P. Ribeiro, and W. Meira Jr, “Explaining end-to-end ECG automated diagnosis using contextual features,” in *Machine Learning and Knowledge Discovery in Databases. European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD)*, ser. Lecture Notes in Computer Science}, vol. 12461, Ghent, Belgium: Springer, Sep. 2020, pp. 204–219. DOI: 10.1007/978-3-030-67670-4_13.

A. H. Ribeiro, K. Tiels, L. A. Aguirre, and T. B. Schön, “Beyond exploding and vanishing gradients: Attractors and smoothness in the analysis of recurrent neural network training,” in *Proceedings of the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, PMLR, vol. 108, 2020, pp. 2370–2380. arXiv: 1906.08482.

C. Andersson, A. H. Ribeiro, K. Tiels, N. Wahlström, and T. B. Schön, “Deep Convolutional Networks in System Identification,” *Proceedings of the 58th IEEE Conference on Decision and Control (CDC)*, pp. 3670–3676, Sep. 2019. DOI: 10.1109/CDC40024.2019.9030219. arXiv: 1909.01730.

A. H. Ribeiro and L. A. Aguirre, “Lasso Regularization Paths for NARMAX Models via Coordinate Descent,” in *2018 Annual American Control Conference (ACC)*, Jun. 2018, pp. 5268–5273, ISBN: 2378-5861. DOI: 10/gf7ssz.

A. H. Ribeiro and L. A. Aguirre, “Shooting Methods for Parameter Estimation of Output Error Models,” *Proceedings of the 20th IFAC World Congress. IFAC-PapersOnLine*, vol. 50, no. 1, pp. 13998–14003, Jul. 2017, ISSN: 2405-8963. DOI: 10/gfjwmp.

A. H. Ribeiro and L. A. Aguirre, “Selecting transients automatically for the identification of models for an oil well,” *Proceedings of the 2nd IFAC Workshop on Automatic Control in Offshore Oil and Gas Production. IFAC-PapersOnLine*, vol. 48, no. 6, pp. 154–158, 2015. DOI: 10/gfjwq8.

Workshop papers, conference abstracts and extended abstracts

J. N. Hendriks, F. K. Gustafsson, A. H. Ribeiro, A. G. Wills, and T. B. Schön, “Deep Energy-Based NARX Models,” *Workshop on Nonlinear System Identification*, 2021.

A. H. Ribeiro, J. N. Hendriks, A. G. Wills, and T. B. Schön, “Beyond Occam’s Razor in System Identification: Double-Descent when Modeling Dynamics,” in *Workshop on Nonlinear System Identification*, 2021.

A. H. Ribeiro and T. B. Schön, “Overparametrized Regression Under L2 Adversarial Attacks,” in *Workshop on the Theory of Overparameterized Machine Learning (TOPML)*, Apr. 2021.

D. M. Oliveira, A. H. Ribeiro, J. A. O. Pedrosa, G. M. M. Paixao, A. L. Ribeiro, and W. M. Jr, “Explaining black-box automated electrocardiogram classification to cardiologists,” in *2020 Computing in Cardiology (CinC)*, vol. 47, 2020. DOI: 10.22489/CinC.2020.452.

A. H. Ribeiro, D. Gedon, D. M. Teixeira, M. H. Ribeiro, A. L. P. Ribeiro, T. B. Schon, and W. M. Jr, “Automatic 12-lead ECG classification using a convolutional network ensemble,” in *2020 Computing in Cardiology (CinC)*, 2020. DOI: 10.22489/CinC.2020.130.

A. H. Ribeiro, C. Andersson, K. Tiels, N. Wahlstrom, and T. B. Schon, “Deep Convolutional Networks are Useful in System Identification,” *Workshop on Nonlinear System Identification*, 2019.

G. Paixao, L. G. S. e Silva, P. R. Gomes, M. Ferreira, D. Oliveira, M. H. Ribeiro, A. H. Ribeiro, J. Nascimento, G. Cardoso, R. Araujo, B. Santos, J. Canazart, L. Ribeiro, and A. L. Ribeiro, “Clinical Outcomes in Digital Electrocardiography: Evaluation of Mortality in Atrial Fibrillation (Code Study),” *Circulation. Abstracts from American Heart Association’s.*, vol. 138, no. Suppl.1, A16594–A16594, Nov. 2018.

A. H. Ribeiro, M. H. Ribeiro, G. Paixão, D. Oliveira, P. R. Gomes, J. A. Canazart, M. Pifano, W. Meira Jr., T. B. Schön, and A. L. Ribeiro, “Automatic Diagnosis of Short-Duration 12-Lead ECG using a Deep Convolutional Network,” *Machine Learning for Health (ML4H) Workshop at NeurIPS*, 2018. arXiv: 1811.12194.

National Conference Papers (in Portuguese)

A. H. Ribeiro and L. A. Aguirre, “Relações Estáticas de Modelos NARX MISO e sua Representação de Hammerstein,” in *XX Congresso Brasileiro de Automática*, 2014.

OTHER LINKS

Lattes CV (0898576944135254)	lattes.cnpq.br/0898576944135254
ORCID (0000-0003-3632-8529)	orcid.org/0000-0003-3632-8529
SCOPUS (57191699148)	www.scopus.com/authid/detail.uri?authorId=57191699148
Google Scholar (Antonio H. Ribeiro)	scholar.google.com.br/citations?user=5t_sZdMAAAAJ
DBLP (202/1699)	dblp.org/pid/202/1699.html
Microsoft Academic (2582984012)	academic.microsoft.com/author/2582984012

ADDITIONAL EDUCATION

Mini-course on Nonlinear System Identification	2019
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- I took part on the 3 days mincourse on nonlinear system identification to take place on Eindhoven University of Technology.

Probabilistic Graphical Models Specialization	2018
<i>Coursera</i>	<i>Stanford</i>

- I have successfully completed the 3 online courses about probabilistic graphical models offered by *Stanford*: “Representation”, “Inference”, “Learning”.

Deep Learning Specialization	2018
<i>Coursera</i>	<i>deeplearning.ai</i>

- I have successfully completed the 5 online courses about deep learning offered in Coursera: “Neural Networks and Deep Learning”, “Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization”, “Structuring Machine Learning Projects”, “Convolutional Neural Networks”, “Sequence Models”.

LANGUAGE CERTIFICATES

Certificate in Advanced English (Council of Europe Level C1)	<i>Cambridge English Language Assessment, 2014</i>
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