ROGERS F SILVA

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SUMMARY OF QUALIFICATIONS

- 9 years of experience: machine learning, image analysis, statistical learning, neural networks.
- 11 years of experience: algorithms for latent variable models (ICA, PCA, CCA, ISA, IVA)
- Highly skilled in Matlab, Python and R/RStudio with experience in C/C++.
- Wide experience mapping hard real-world problems into mathematical models, and optimizing solutions.
- Innovative developer: leading-edge program for multidataset multidimensional learning.

- Numerical optimization expert: constrained, combinatorial, multiobjective (Pareto), stochastic.
- Multimodal Neuroimaging: 10 years (1000+ subject datasets: functional and structural MRI, EEG, DWI, genetic).
- Prior exposure to Natural Language Processing using basic cepstral features and GMMs with EM.
- Proficient in design of experiments (DOE) using response surface methodology (RSM).
- Clear and effective writing of peer-reviewed articles, and grant proposals.

PROJECTS

- Multidataset ISA: multimodal data fusion for thousands of datasets. Developed a new latent variable model with statistical independence at a deeper layer of the neural network and interior point nonlinear-constraint optimization with L-BFGS. Result: a robust generalization of ICA, IVA and ISA models in one single algorithm. Outcomes: *1 conference paper*, *2 journal articles (1 accepted, 1 in prep.)*. Ongoing.
- COINSTAC: an open-source platform for federated data analysis. Distributed processing of decentralized data for collaborative research. Decentralization of several models, including linear regression, group PCA, group ICA, dFNC, joint ICA, and IVA. Outcomes: *1 journal article (accepted)*. Ongoing.
- Cross-frequency dependence in fMRI: multiset CCA to identify cross-frequency dependence in Hilbert transformed fMRI data. Model development and evaluation. Outcomes: *1 conference paper*, *1 journal article (in prep.)*. Ongoing.
- Record linkage: Django web app to identify linked records in SQL Server database from incomplete queries. Damerau-Levenshtein distance, SQL querying, ranking records based on classifier scores, Google Drive API for report generation. Outcomes: *application deployed for client*. Ongoing.
- Online Data Analysis: JavaScript and Django web app. Managed the concept and development: wireframe design, PostgreSQL, Python statsmodels package. Outcomes: *prototype application completed with simple multiple linear regression*.
- Medical Record Analysis: Python modules for data extraction from photocopied tabular records. Scikit-image and pandas packages, OCR, data consistency assessments and cleaning, summarization and report generation. Outcomes: *reports delivered to client for use in court*.
- Sparse ICA: combining independence and sparsity in a flexible framework for genetic SNP data. Mentoring a graduate student. Development and proof-of-concept demos. Automatic differentiation and stochastic optimization. Ongoing.
- Diffusion from BOLD-fMRI: fusion of DTI- and BOLD-fMRI-derived tensors using IVA and joint ICA. Exploring similarities and limitations of each modality. Ongoing.
- Test-Retest Reliability of Diffusion Imaging: Assess the reproducibility of diffusion indices and network measures derived from DTI and DSI data. Outcome: *1 journal article (in prep.)*. Ongoing.
- Decentralized joint ICA: joint ICA model for distributed processing of decentralized data. Algorithm development and a simulation using GARCH time-series model that demonstrated the benefit of decentralized joint ICA over regular joint ICA. Mentoring a graduate student. Outcomes: *2 conference papers, 1 journal article (in preparation)*. Ongoing.
- Decentralized IVA: extension of IVA for distributed processing of decentralized data. Mentored an undergraduate student. Outcome: *1 conference paper (accepted)*. Ongoing.
- Memory Efficient group PCA: identified connections and trade-offs between different group PCA algorithms using Pareto-optimal analysis, leading to two optimized implementations. Extensive writing contributions. Outcome: *2 journal articles*. 2014-2015.
- Multimodal Kaggle competition: designed and managed a machine learning Kaggle challenge: classify schizophrenic patients using real data features from multimodal MRI data. Outcome: *348 players (2244 entries), 1 conference paper*. 2014.
- Stochastic Neuroimaging simulation: reshuffling optimization technique for neuroimaging data using simulated annealing, conforming data samples into meaningful features (shipping this tool in the SimTB toolbox: http://mialab.mrn.org/software/simtb/). Outcome: 2 *journal articles*. 2012-2014.
- NICE: consulting feedback on the theory, interpretation and testing of nonlinear ICA using NICE. 2015.

EDUCATION

Ph.D. in Computer Engineering (with Distinction)   May/2017
The University of New Mexico   Albuquerque, NM
Biomedical Image Processing track   GPA: 3.81/4.0

- Thesis: "Multidataset Independent Subspace Analysis: A Framework for Analysis of Multimodal, Multi-subject Brain Imaging Data"
- Courses in: Advanced machine learning, Pattern recognition, Statistical inference, Bayesian learning, Spatiotemporal statistics, MCMC, Gene microarray analysis, etc.

M.Sc. in Computer Engineering   Dec/2011
The University of New Mexico   Albuquerque, NM
Image Processing track   GPA: (see Ph.D.)

- Graduate Minor in Statistics.
- Graduate Minor in Mathematics.

B.Sc. in Electrical Engineering   Dec/2003
Catholic University (PUCRS)   Porto Alegre, Brazil
Computer architecture track   GPA: 3.5/4.0
  - Thesis: "Deployment of Digital Filter Banks for Acoustic Tuning of Musical Instruments."
  - Instructor of a special topics seminar: "Introduction to object-oriented programming."

B.Sc. in Computer Science   (50% complete) 1999-2005
Federal University (UFRGS)   Porto Alegre, Brazil
  - Courses in: operations research, operating systems, SQL data bases, software engineering, computational logic, computer architecture and organization, and data structures.

PUBLICATIONS (COMPLETE LIST BELOW)

  - 10 **journals**: 2 as first author, 8 as co-author.   1 **book chapter**: as first author
  - 10 **conference papers**: (4 as first-author, 6 as co-author).   9 **abstracts**: (8 as first-author, 1 as co-author).

RELEVANT PROFESSIONAL EXPERIENCE

Postdoctoral Fellow   Spring 2017 – Present
Medical Image Analysis Lab, The Mind Research Network (MRN)   Albuquerque, NM
  - Conduct and manage research on data analysis methods.
  - Develop new latent variable models and algorithms for exploratory data analysis of multiple datasets (ICA, PCA, CCA, ISA, IVA, MISA) utilizing numerical optimization techniques.
  - Publish scientific articles on peer-reviewed journals and conferences.
  - Review relevant scientific literature, and implement/test novel models for statistical signal processing, machine learning, and brain image analysis.
  - Provide feedback on linear algebra, optimization, and simulations to peers and collaborators.
  - Collaborate in the preparation of grant proposals.
  - Reviewer for NeuroImage, IEEE Trans. Image Processing, Journal of Neuroscience Methods.

Data Scientist   Spring 2017 – Present
Datalytic Solutions   Albuquerque, NM
  - Execute data analysis and web development projects for external and internal clients.
  - Python, web frameworks, JavaScript, SQL

Research Fellow   05/2016 – 07/2016
Mellon Institute, CNBC / University of Pittsburgh / Carnegie Mellon University   Pittsburgh, PA
  - Multimodal Neuroimaging Training Program (MNTP) – Diffusion Imaging group.

Visiting Fellow   04/2016 – 05/2016
Martinos Center, MGH / Harvard University / MIT   Boston, MA
  - MGH/HST Multimodality Short Course.

Graduate Research Assistant   Spring 2007 – Fall 2016
Medical Image Analysis Lab, The Mind Research Network (MRN)   Albuquerque, NM
  - Developed a new latent variable model for analysis of multiple datasets (MISA)
  - Developed a novel simulation framework to test hypotheses and validate image analysis systems.
  - Recruited subjects and performed data collection at an MRI scanner.
  - Provided technical support in lab activities (e.g., courses sponsored by MIALab).

Research Assistant   03/2001 – 09/2003
MetroPOA Networks Communication Lab, Catholic University (PUCRS)   Porto Alegre, Brazil
  - Object-oriented programming with Delphi
  - OO software engineering using UML.

NOTEWORTHY

  - Presented at MILA's Deep Learning Summer School (Jun/30/2017): "Multidataset Independent Subspace Analysis." http://videolectures.net/deeplearning2017_silva_subspace_analysis/
  - Work featured on Psychology Today (Sep/05/2017): "Will Big Data Save Psychiatry?" https://www.psychologytoday.com/articles/201709/will-big-data-save-psychiatry
  - Winner of the UNM ASA DataFest hackathon (Apr/21-23/2017), "The Visards" Team ("Best in Show" award). http://www.dailylobo.com/article/2017/04/data-fest-recap

RELATED EXPERIENCE, SKILLS, AND MEMBERSHIPS

- scikit-image, ggplot2, LASSO, SAS, LaTeX, Git, virtual environments, JIRA.
- Fluent in English, Portuguese, Spanish.
- Student Member: IEEE, Organization for Human Brain Mapping (OHBM).

RELATED COURSES, AWARDS

- Web scrapping and content mining with Python (Practical Programming, Aug/2017)
- JavaScript 101 with Google Script (Fullstack Academy, Aug/2017).
- FMRI Analysis Courses: NIBL (UNC), NC (2017)
    MRN (LBERI), NM (2012).
- Summer Schools: Deep Learning and Reinforcement Learning at University of Montreal (MILA) (2017),
    Mathematics in Brain Imaging at UCLA (NITP) (2008).
- Business Plan and Entrepreneurship course (Summer 2005).
- DELL Short Course on Linux Cluster Setup (Spring 2004)

- Research Assistantship Award by UNM Electrical and Computer Engineering Dept. (Fall 2006).
- Conference support awards: San Francisco, Barcelona, China, Toronto, Quebec-City, Hawaii, Pittsburgh (2008-2017).
- Top-of-the-class Student Award in Electrical Engineering (Class of 2003).

EMPLOYMENT HISTORY

Consulting Engineer   Spring 2006
Maquinas Medianeira   Porto Alegre, Brazil
Lecturer   Fall 2005
Contestado University   Contestado, Brazil
- Taught an undergraduate level class on robotics. Prepared class notes, homeworks and exams.

Electrical Engineer   10/2003 – 08/ 2005
MURI Assembly Systems   Porto Alegre, Brazil
- Designed, supervised deployment of assembly lines for Brose Chicago, Magneti Marelli, DANA, Whirlpool.
- Interacted directly with clients to assess their needs and identify solutions.
- Consulting services to peers in different departments and in new incoming projects.

Volunteer Laboratory Assistant   08/1999 – 07/2000
Automation and Systems Control Group, Catholic University (PUCRS)   Porto Alegre, Brazil

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PUBLICATION LIST

Journal

[1] B.T. Baker, A. Abrol, **R.F. Silva**, E. Damaraju, A.D. Sarwate, V.D. Calhoun, S.M. Plis "Decentralized Temporal Independent Component Analysis: Leveraging fMRI Data in Collaborative Settings," NeuroImage, 2018. (Submitted)

[2] H. Gazula, B.T. Baker, E. Damaraju, S.M. Plis, S.R. Panta, **R.F. Silva**, V.D. Calhoun, "Decentralized Analysis of Brain Imaging Data: Voxel-based Morphometry and Dynamic Functional Network Connectivity," Front Neuroinform, 2018. (Submitted)

[3] J. Ming, E. Verner, A. Sarwate, R. Kelly, C. Reed, T. Kahleck, **R.F. Silva**, S. Panta, J. Turner, S.M. Plis, V.D. Calhoun, "COINSTAC: Decentralizing the future of brain imaging analysis," F1000 Research, eCollection, 2017, PMID: 29123643.

[4] **R.F. Silva**, S.M. Plis, J. Sui, M.S. Pattichis, T. Adalı, V.D. Calhoun, "Blind Source Separation for Unimodal and Multimodal Brain Networks: A Unifying Framework for Subspace Modeling," IEEE JSTSP, vol. 10 (7), pp.1134-1149, 2016.

[5] D.A. Bridwell, S.Rachakonda, **R.F. Silva**, G.D. Pearlson, V.D. Calhoun, "Spatiospectral decomposition of multi-subject EEG: evaluating blind source separation algorithms on real and realistic simulated data," Brain Topography, pp. 1-15, 2016. PMID: 26909688

[6] S. Rachakonda, **R.F. Silva**, J. Liu, "Memory efficient PCA methods for large group ICA," Frontiers in Neuroscience, Brain Imaging Methods, vol. 10, p.17, 2016.

[7] V.D. Calhoun, **R.F. Silva**, T. Adalı, S. Rachakonda, "Comparison of PCA approaches for very large group ICA," in NeuroImage, vol. 118, pp. 662-666, 2015.

[8] **R.F. Silva**, S.M. Plis, T. Adali, and V.D. Calhoun, "A statistically motivated framework for simulation of stochastic data fusion models applied to multimodal neuroimaging," NeuroImage, vol. 102 Pt 1, pp. 92-117, 2014.

[9] V.D. Calhoun, V. Potluru, R. Phlypo, **R.F. Silva**, B. Pearlmutter, A. Caprihan, S.M. Plis, and T. Adalı, "Independent component analysis for brain fMRI does indeed select for maximal independence," PLoS ONE, vol. 8, 2013.

[10] E. Allen, E. Erhardt, E. Damaraju, W. Gruner, J. Segall, **R.F. Silva**, M. Havlicek, S. Rachakonda, J. Fries, R. Kalyanam, A. Michael, J. Turner, T. Eichele, S. Adelsheim, A. Bryan, J. R. Bustillo, V. P. Clark, S. Feldstein, F. M. Filbey, C. Ford, K. Hutchison, R. Jung, K. A. Kiehl, P. Kodituwakku, Y. Komesu, A.R. Mayer, G.D. Pearlson, J. Phillips, J. Sadek, M. Stevens, U. Teuscher, R.J. Thoma, and V.D. Calhoun, "A baseline for the multivariate comparison of resting state networks," Frontiers in Systems Neuroscience, vol. 5, p. 12, 2011.

Book Chapter

[1] **R.F. Silva**, S.M. Plis, "How to integrate data from multiple biological layers in mental health?," in Personalized and Predictive Psychiatry - Big Data Analytics in Mental Health, Ed.1, Springer-Nature, 2018. (In Prep.)

Conference

[1] M. Yaesoubi, **R.F. Silva**, V.D. Calhoun, "In-between and cross-frequency dependence-based summarization of resting-state fMRI data," in Proc. IEEE SSIAI 2018 (Accepted), Las Vegas, NV, 2018.

[2] N.P. Wojtalewicz, **R.F. Silva**, V.D. Calhoun, A.D. Sarwate, S.M. Plis, "Decentralized Independent Vector Analysis," in Proc. IEEE ICASSP 2017, New Orleans, LA, 2017.

[3] H. Imtiaz, A.D. Sarwate, B. Baker, **R.F. Silva**, S.M. Plis, V.D. Calhoun, "Differentially private source separation for distributed data using independent component analysis," in Proc. IEEE CISS 2016, Princeton, NJ, 2016.

[4] B.T. Baker, **R.F. Silva**, V.D. Calhoun, A.D. Sarwate, S.M. Plis, "Large scale collaboration with autonomy: decentralized data ICA," in Proc. IEEE MLSP 2015, Boston, MA, 2015.

[5] **R.F. Silva**, S.M. Plis, T. Adalı, and V.D. Calhoun, "Multidataset Independent Subspace Analysis Extends Independent Vector Analysis," in Proc. IEEE ICIP 2014, Paris, France, 2014.

[6] **R.F. Silva**, E. Castro, N. Gupta, M. Cetin, M. Arbabshirani, V. Potluru, S.M. Plis, and V.D. Calhoun, "The Tenth Annual MLSP Competition: Schizophrenia Classification Challenge," in Proc. IEEE MLSP 2014, Reims, France, 2014.

[7] E.A. Allen, E.B. Erhardt, E. Damaraju, W. Gruner, J.M. Segall, **R.F. Silva**, M. Havlicek, S. Rachakonda, J. Fries, R. Kalyanam, A.M. Michael, A. Caprihan, J.A. Turner, T. Eichele, S. Adelsheim, A. Bryan, J. Bustillo, V.P. Clark, S. Feldstein-Ewing, F.M. Filbey, C. Ford, K. Hutchison, R.E. Jung, K.A. Kiehl, P. Kodituwakku, Y. Komesu, A.R. Mayer, G.D. Pearlson, J. Phillips, J. Sadek, M. Stevens, U. Teuscher, R.J. Thoma, and V.D. Calhoun, "A baseline for the multivariate comparison of resting state networks," in Biennial Conference on Resting State / Brain Connectivity, Milwaukee, WI, 2010.

[8] **R.F. Silva** and V.D. Calhoun, "Identification of Brain Image Biomarkers by Optimized Selection of Multimodal Datasets," in Proc. ISMRM 2008, Toronto, Canada, 2008.

[9] **R.F. Silva** and V.D. Calhoun, "Identification of Brain Imaging Biomarkers by Optimized Selection of Multimodal Independent Components," in Proc. IEEE SSIAI, Santa Fe, NM, 2008.

[10] V.D. Calhoun, **R.F. Silva**, and J. Liu, "Identification of Multimodal MRI and EEG Biomarkers Using Joint-ICA and Divergence Criteria," in Proc. IEEE MLSP 2007, Thessaloniki, Greece, 2007.

Abstract

[1] **R.F. Silva**, S.M. Plis, M.S. Pattichis, T. Adali, V.D. Calhoun. "Incorporating Second-Order Statistics in Multidataset Independent Subspace Analysis," in Proc OHBM, Honolulu, HI, 2015.

[2] **R.F. Silva**, S.M. Plis, T. Adalı, and V.D. Calhoun, "Multidataset Independent Subspace Analysis," in Proc. OHBM, Hamburg, Germany, 2014.

[3] **R.F. Silva** and V.D. Calhoun, "A Statistically Motivated Simulation Framework for Data Fusion Models Applied to Neuroimaging," in Proc. OHBM, Seattle, WA, 2013.

[4] V.D. Calhoun, V. Potluru, R. Phlypo, **R.F. Silva**, B. Pearlmutter, A. Caprihan, S.M. Plis, and T. Adalı, "Independent component analysis for brain fMRI does indeed select for maximal independence," in Proc. OHBM, Seattle, WA, 2013.

[5] **R.F. Silva** and V.D. Calhoun, "An Assessment of the Limitations of Joint ICA in Multimodal Data Fusion," in Proc. OHBM, Beijing, China, 2012.

[6] **R.F. Silva** and V.D. Calhoun, "Validating Divergence as a Tool for Assessment of Group Differences in a JICA Fusion Framework," in Proc. OHBM, Quebec-City, CA, 2011.

[7] **R.F. Silva** and V.D. Calhoun, "Evaluating Joint Histograms in a JICA Fusion Framework: Feature Extraction and Component Selection," in Proc. OHBM, Barcelona, Spain, 2010.

[8] **R.F. Silva** and V.D. Calhoun, "Divergence Measurements for the Optimal Identification of Multimodal Biomarkers," in Proc. OHBM, San Francisco, CA, 2009.

[9] **R.F. Silva**, J.G. Silveira, R. Balbinot, "Plataforma DeskEaD para Aplicações de Educação a Distância (DeskDE Platform for Distance Education Applications)," in Proc. 4th RNP2 Workshop, 2003, Catholic University (PUCRS), Porto Alegre, Brazil.

REFERENCES

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