

ANTÓNIO R. C. PAIVA

Scientific Computing and Imaging Institute
University of Utah
72 S Central Campus Dr., WEB 4867
Salt Lake City, UT 84112

email: arpaiva@sci.utah.edu
phone: 801-587-9720
fax: 801-585-6513
<http://www.sci.utah.edu/~arpaiva/>

PROFESSIONAL EXPERIENCE

- **Research Geophysicist**, ExxonMobil Upstream Research Company, ExxonMobil Corporation, Houston, TX *Oct. 2010 – present*
- **Post-Doctoral Fellow**, Scientific Computing and Imaging Institute, University of Utah, Salt Lake City, UT *Aug. 2008 – Sep. 2010*
Advisor: Dr. Tolga Tasdizen
 - Developed machine learning methods, with emphasis on image processing applications.
 - Collaborated in the Neural Circuitry Reconstruction project.
 - Assisted in advising graduate students.
- **Research Assistant**, Computational NeuroEngineering Laboratory, University of Florida, Gainesville, FL *Aug. 2004 – July 2008*
Advisor: Dr. José C. Príncipe
(Research supported by FCT grant SFRH/BD/18217/2004.)
 - Worked in Brain-Machine Interfaces (BMI) and Information-Theoretic Learning (ITL) projects.
 - Developed methodologies for neural spike train analysis.
 - Introduced new framework to develop machine learning methods for point processes, with emphasis on neural spike trains.
- **Research Assistant**, Institute of Electronics and Telematics of Aveiro, University of Aveiro, Aveiro, Portugal *Oct. 2003 – July 2004*
Advisor: Dr. Armando Pinho
Developed image compression algorithms using vector quantization, and methodologies for microarray image compression.

EDUCATION

- **Ph.D.**, Electrical & Computer Engineering, *Aug. 2008*
University of Florida, Gainesville, FL, USA
Dissertation: “Reproducing Kernel Hilbert Spaces for Point Processes, with applications to Neural Activity Analysis.”
Advisor: Dr. José C. Príncipe

- **M.S.**, Electrical & Computer Engineering, *Dec. 2005*
University of Florida, Gainesville, FL, USA
- **Licenciatura**, Electronics & Telecommunications Engineering, *Sept. 2003*
University of Aveiro, Aveiro, Portugal

PUBLICATIONS

Book chapters and dissertation

- [1] José C. Príncipe, Jianwu Xu, Robert Jenssen, **António R. C. Paiva**, and Il Park. A reproducing kernel Hilbert space framework for information-theoretic learning. In José C. Príncipe, editor, *Information Theoretic Learning: Renyi's Entropy and Kernel Perspectives*, chapter 9. Springer, 2010.
- [2] **António R. C. Paiva**, Il Park, and José C. Príncipe. Inner products for representation and learning in the spike train domain. In Karim G. Oweiss, editor, *Statistical Signal Processing for Neuroscience and Neurotechnology*, chapter 8. Academic Press, 2010.
- [3] **António R. C. Paiva**, Il Park, and José C. Príncipe. Optimization in reproducing kernel Hilbert spaces of spike trains. In Wanpracha Chaovaitwongse, Panos M. Pardalos, and Petros Xanthopoulos, editors, *Computational Neuroscience*, chapter 1. Springer, 2010.
- [4] **António R. C. Paiva**. *Reproducing Kernel Hilbert Spaces for Point Processes, with Applications to Neural Activity Analysis*. PhD thesis, University of Florida, 2008.

Refereed journal articles

- [1] Elizabeth Jurrus, **António R. C. Paiva**, Shigeki Watanabe, James Anderson, Bryan Jones, Ross Whitaker, Erik M. Jorgensen, Robert Marc, and Tolga Tasdizen. Detection of neuron membranes in electron microscopy images using a series of neural networks. *Medical Image Analysis*, 14(6):770–783, December 2010. Impact factor: 3.093.
- [2] **António R. C. Paiva**, Il Park, and José C. Príncipe. A comparison of binless spike train measures. *Neural Computing and Applications*, 19(3):405–419, April 2010. Impact factor: 0.767.
- [3] Yiwen Wang, **António R. C. Paiva**, José C. Príncipe, and Justin C. Sanchez. Sequential Monte Carlo point process estimation of kinematics from neural spiking activity for brain machine interfaces. *Neural Computation*, 21(10):2894–2930, October 2009. Impact factor: 2.34.
- [4] **António R. C. Paiva**, Il Park, and José C. Príncipe. A reproducing kernel Hilbert space framework for spike train signal processing. *Neural Computation*, 21(2):424–449, February 2009. Impact factor: 2.34.

- [5] Jian-Wu Xu, **António R. C. Paiva**, Il Park, and José C. Príncipe. A reproducing kernel Hilbert space framework for information-theoretic learning. *IEEE Transactions on Signal Processing*, 56(12):5891–5902, December 2008. Impact factor: 1.64.
- [6] Il Park, **António R. C. Paiva**, Thomas B. DeMarse, and José C. Príncipe. An efficient algorithm for continuous-time cross correlation of spike trains. *Journal of Neuroscience Methods*, 128(2):514–523, March 2008. Impact factor: 2.24.
- [7] Jeongho Cho, **António R. C. Paiva**, Sung-Phil Kim, Justin C. Sanchez, and José C. Príncipe. Self-organizing maps with dynamic learning for signal reconstruction. *Neural Networks*, 20(2):274–284, March 2007. Impact factor: 2.0.
- [8] Armando J. Pinho, **António R. C. Paiva**, and António J. R. Neves. On the use of standards for microarray lossless image compression. *IEEE Transactions on Biomedical Engineering*, 53(3):563–566, March 2006. Impact factor: 2.30.

Articles in refereed conference proceedings

- [1] Luke Hoglebe, **António R. C. Paiva**, Elizabeth Jurrus, Cameron Christensen, Michael Bridge, Julie R. Korenberg, and Tolga Tasdizen. Trace driven registration of neuron confocal microscopy stacks. In *Proceedings of the IEEE International Symposium on Biomedical Imaging*, Chicago, IL, USA, April 2011.
- [2] **António R. C. Paiva** and José C. Príncipe. A fixed point update for kernel width adaptation in information theoretic criteria. In *Proceedings of the International Workshop on Machine Learning for Signal Processing*, Kittilä, Finland, August 2010.
- [3] **António R. C. Paiva** and Il Park. Which measure should we use for unsupervised spike train learning? In *Proceedings of the International Workshop on Statistical Analysis of Neuronal Data, SAND5*, Pittsburgh, PA, USA, May 2010. Abstract.
- [4] **António R. C. Paiva** and Tolga Tasdizen. Detection of salient image points using principal subspace manifold structure. In *Proceedings of the International Conference on Pattern Recognition, ICPR-2010*, Istanbul, Turkey, August 2010.
- [5] **António R. C. Paiva**, Elizabeth Jurrus, and Tolga Tasdizen. Using sequential context for image analysis. In *Proceedings of the International Conference on Pattern Recognition, ICPR-2010*, Istanbul, Turkey, August 2010.
- [6] Mojtaba Seyedhosseini, **António R. C. Paiva**, and Tolga Tasdizen. Image parsing with a three-state series neural network classifier. In *Proceedings of the International Conference on Pattern Recognition, ICPR-2010*, Istanbul, Turkey, August 2010.
- [7] **António R. C. Paiva** and Tolga Tasdizen. Fast semi-supervised image segmentation by novelty selection. In *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing*, Dallas, TX, USA, March 2010.

- [8] Elizabeth Jurrus, **António R. C. Paiva**, Shigeki Watanabe, Ross Whitaker, Erik M. Jorgensen, and Tolga Tasdizen. Serial neural network classifier for membrane detection using a filter bank. In *Proceedings of the Workshop on Microscopic Image Analysis with Applications in Biology, MIAAB-2009*, Bethesda, MD, USA, September 2009.
- [9] Kannan U. Venkataraju, **António R. C. Paiva**, Elizabeth Jurrus, and Tolga Tasdizen. Automatic markup of neural cell membranes using boosted decision stumps. In *Proceedings of the IEEE International Symposium on Biomedical Imaging, ISBI-2009*, Boston, MA, USA, June 2009.
- [10] **António R. C. Paiva**, Il Park, and José C. Príncipe. Peri-event cross-correlation over time for analysis of interactions in neuronal firing. In *Proceedings of the International Conference IEEE Engineering in Medicine and Biology Society, EMBC-2008*, Vancouver, BC, Canada, August 2008.
- [11] **António R. C. Paiva**, Il Park, and José C. Príncipe. Reproducing kernel Hilbert spaces for spike train analysis. In *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, ICASSP-2008*, Las Vegas, NV, USA, April 2008. Invited paper.
- [12] **António R. C. Paiva**, Il Park, and José C. Príncipe. Innovating signal processing for spike train data. In *Proceedings of the International Conference IEEE Engineering in Medicine and Biology Society, EMBC-2007*, Lyon, France, October 2007. Abstract.
- [13] Shalom Darmanjian, **António R. C. Paiva**, and José C. Príncipe. Hierarchical decomposition of neural data using boosted mixtures of Hidden Markov Chains and its application to a BMI. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2007*, Orlando, FL, USA, August 2007.
- [14] Yiwen Wang, **António R. C. Paiva**, José C. Príncipe, and Justin C. Sanchez. A Monte Carlo sequential estimation of point process optimum filtering for brain machine interfaces. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2007*, Orlando, FL, USA, August 2007.
- [15] Sudhir Rao, **António R. C. Paiva**, and José C. Príncipe. A novel weighted LBG algorithm for neural spike compression. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2007*, Orlando, FL, USA, August 2007.
- [16] Il Park, **António R. C. Paiva**, José C. Príncipe, and John G. Harris. A closed form solution for multiple-input spike based adaptive filters. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2007*, Orlando, FL, USA, August 2007.
- [17] **António R. C. Paiva**, Sudhir Rao, Il Park, and José C. Príncipe. Spectral clustering of synchronous spike trains. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2007*, Orlando, FL, USA, August 2007.

- [18] Il Park, **António R. C. Paiva**, Thomas B. DeMarse, and José C. Príncipe. An efficient computation of continuous-time correlogram of spike trains. In *Proceedings of the Computational and Systems Neuroscience meeting, COSYNE-2007*, Salt Lake City, UT, USA, February 2007. Abstract.
- [19] **António R. C. Paiva**, José C. Príncipe, and Justin C. Sanchez. Gravity transform for input conditioning in brain machine interfaces. In *Proceedings of the International Conference IEEE Engineering in Medicine and Biology Society, EMBC-2006*, New York City, NY, September 2006.
- [20] Jian-Wu Xu, Puskal Pokharel, **António R. C. Paiva**, and José Príncipe. Nonlinear component analysis based on correntropy. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2006*, Vancouver, BC, Canada, July 2006.
- [21] Yiwen Wang, **António R. C. Paiva**, and José C. Príncipe. A monte carlo sequential estimation for point process optimum filtering. In *Proceedings of the IEEE International Joint Conference on Neural Networks, IJCNN-2006*, Vancouver, BC, Canada, July 2006.
- [22] **António R. C. Paiva**, Jian-Wu Xu, and José C. Príncipe. Kernel principal components are maximum entropy projections. In *Proceedings of the International Conference on Independent Component Analysis and Blind Source Separation, ICA-2006*, pages 846–853, Charleston, SC, March 2006. Acceptance ratio: 55%.
- [23] António J. R. Neves, Armando J. Pinho, and **António R. C. Paiva**. Lossless bit-plane compression of microarray images using 3D context models. In *Proceedings of the IASTED International Conference on Visualization, Imaging and Image Processing, VIIP-2005*, Benidorm, Spain, September 2005.
- [24] **António R. C. Paiva**, José C. Príncipe, and Justin C. Sanchez. Compression of spike data using the self-organizing map. In *Proceedings of the International IEEE-EMBS Conference on Neural Engineering*, pages 233–236, Arlington, VA, March 2005.
- [25] **António R. C. Paiva** and Armando J. Pinho. Evaluation of some reordering techniques for image VQ index compression. In *Proceedings of the International Conference on Image Analysis and Recognition, ICIAR-2004*, volume LNCS 3211, pages 302–309, Porto, Portugal, September 2004. Springer-Verlag.

Non-refereed publications

- [1] Elizabeth Jurrus, **António R. C. Paiva**, Shigeki Watanabe, Ross Whitaker, Erik M. Jorgensen, and Tolga Tasdizen. Serial neural network classifier for membrane detection using a filter bank. SCI Technical Report UUSCI-2009-006, SCI Institute, University of Utah, June 2009.
- [2] **António R. C. Paiva** and Tiago J. Martins Duarte. Architectures for open access hotspots. Revista do DETUA – Universidade de Aveiro, January 2004.

Articles submitted and in-preparation

- [1] **António R. C. Paiva** and Tolga Tasdizen. Fingerprint image segmentation using data manifold characteristic features. Submitted.
- [2] **António R. C. Paiva**, Il Park, José C. Príncipe, and Justin C. Sanchez. Instantaneous cross-correlation analysis of neural ensembles with high temporal resolution. Book chapter, Submitted.
- [3] Mojtaba Seyedhosseini, **António R. C. Paiva**, and Tolga Tasdizen. Fast AdaBoost training using weighted novelty selection. August 2011.

PATENTS AND INVENTION DISCLOSURES

- Antonio R. C. Paiva and Tolga Tasdizen, “Weighted Novelty Selection for Fast Kernel and Graph Methods,” University of Utah Invention Disclosure U-4920, July 2010.
- Tolga Tasdizen and Antonio R. C. Paiva, “Image pattern recognition,” PCT/US2009/64259 (reference for international patent application), Nov 2009.
- Tolga Tasdizen and Antonio R. C. Paiva, “Robust Fingerprint Analysis using Manifold Topology,” University of Utah Invention Disclosure U-4549, Nov 2008.

HONORS AND AWARDS

- Certificate of Outstanding Achievement, University of Florida, 2008
- Certificate of Outstanding Achievement, University of Florida, 2007
- Certificate of Outstanding Achievement, University of Florida, 2006
- Certificate of Outstanding Achievement, University of Florida, 2005
- Eng. Ferreira Pinto Basto award, Alcatel Portugal, SA, October 6, 2004 (Best graduating student in major, out of 90.)
- Merit scholarship 2001/2002, University of Aveiro, May 22, 2003
- Merit scholarship 2000/2001, University of Aveiro, June 8, 2002
- Dr. Vale Guimarães award, Aveiro Civil Government, October 1, 2001 (2nd best university student in academic year 2000/2001, out of $\approx 10,000$.)
- Merit scholarship 1999/2000, University of Aveiro, June 2, 2001
- Merit scholarship 1998/1999, University of Aveiro, May 10, 2000

TEACHING EXPERIENCE

- Prepared and presented lectures for the course “Neural Networks for Signal Processing,” Spring 2008, at the University of Florida, whenever the course instructor was absent.
- Prepared and presented lectures for the course “Digital Image Processing,” Fall 2008, at the University of Utah, whenever the course instructor was absent.

GRANTS

- **Recipient**, Ph.D. scholarship SFRH/BD/19217/2004, Fundação para a Ciência e a Tecnologia (FCT), Ministério da Ciência, Tecnologia e Ensino Superior, Portugal, Nov. 2004 – July 2008, in excess of 134,000 euros.

PRESENTATIONS AND POSTERS

- **Poster**, “Which measure should we use for unsupervised spike train learning?,” International Workshop on Statistical Analysis of Neuronal Data, (SAND5), Pittsburgh, PA, USA, May 21, 2010
- **Poster**, “Fast Semi-Supervised Image Segmentation by Novelty Selection,” International Conference on Acoustics, Speech and Signal Processing, (ICASSP), Dallas, TX, USA, March 17, 2010
- **Presentation**, “Peri-event Cross-Correlation over Time for Analysis of Interactions in Neuronal Firing,” International IEEE Conference on Engineering in Medicine and Biology Society, (EMBC), Vancouver, Canada, August, 2008
- **Presentation**, “Reproducing Kernel Hilbert Spaces for Spike Train Analysis,” International Conference on Acoustics, Speech and Signal Processing (ICASSP), Las Vegas, NV, USA, April 2, 2008
- **Presentation**, “Spectral Clustering of Synchronous Spike Trains,” International Joint Conference on Neural Networks (IJCNN), Orlando, FL, USA, August 13, 2007
- **Presentation**, “Gravity Transform for Input Conditioning in Brain Machine Interfaces,” International IEEE Conference on Engineering in Medicine and Biology Society, New York, NY, USA, September 1, 2006
- **Presentation**, “Modeling of Synchronized Burst in Dissociated Cortical Tissue: An Exploration of Parameter Space,” World Congress on Computational Intelligence (WCCI), Vancouver, BC, Canada, July 19, 2006
- **Presentation**, “Nonlinear Component Analysis Based on Correntropy,” World Congress on Computational Intelligence (WCCI), Vancouver, BC, Canada, July 18, 2006

- **Presentation**, “Kernel Principal Components are maximum entropy projections,” International Conference on Independent Component Analysis and Blind Source Separation (ICA), Charleston, SC, USA, March 6, 2006
- **Presentation**, “Compression of Spike Data using the Self-Organizing Map,” 2nd International IEEE–EMBS Conference on Neural Engineering, Arlington, VA, USA, March 2006

CONFERENCES ATTENDED

- Neural Information Processing Systems (NIPS), *Dec 2010*
Vancouver, BC, Canada
- International Workshop on Statistical Analysis of Neuronal Data (SAND5), *May 2010*
Pittsburgh, PA, USA
- IEEE International Conf. on Acoustics, Speech and Signal Processing (ICASSP), *Mar. 2010*
Dallas, TX, USA
- International Joint Conference on Neural Networks (IJCNN), *Aug. 2007*
Orlando, FL, USA
- World Congress on Computational Intelligence (WCCI), *July 2006*
Vancouver, BC, Canada
- Intl. Conf. on Independent Component Analysis and Blind Source Sep. (ICA), *Mar. 2006*
Charleston, SC, USA
- IST Mobile Communications Summit, *June 2003*
Aveiro, Portugal

REVIEW SERVICE

Journals

- Pattern Recognition
 - 2010 : 1
- Journal of Neuroscience methods
 - 2010 : 1
- IEEE Transactions on Biomedical Engineering
 - 2006 : 1
 - 2007 : 3
- Neural Computing & Applications

- 2007 : 1
- 2008 : 1
- EURASIP Journal on Advances in Signal Processing
 - 2009 : 1
- Neural Processing Letters
 - 2010 : 1
- Pattern Recognition Letters
 - 2007 : 1
- Journal of Zhejiang University – Science C (Computers & Electronics)
 - 2010 : 1
- Journal of Zhejiang University – Science A (Applied Physics & Engineering)
 - 2009 : 1

Conferences (Number of papers in parentheses.)

- Intl. Joint Conf. on Neural Networks (IJCNN), 2011 (2)
- Intl. Conf. of the IEEE Engineering in Medicine and Biology Society (EMBC), 2010 (1)
- Intl. Conf. on Pattern Recognition (ICPR), 2010 (8)
- Intl. Joint Conf. on Neural Networks (IJCNN), 2009 (3)
- Intl. Symp. on Neural Networks (ISNN), 2009 (1)
- Intl. Conf. of the IEEE Engineering in Medicine and Biology Society (EMBC), 2009 (2)
- Microscopic Image Analysis with Applications in Biology (MIAAB), 2009 (1)
- Intl. Joint Conf. on Neural Networks (IJCNN), 2008 (1)
- Intl. Conf. on Artificial Neural Networks (ICANN), 2009 (2)
- IEEE Intl. Symp. on Circuits and Systems (ISCAS), 2006 (1)

PROFESSIONAL ORGANIZATIONS

- IEEE Member *Jan. 2005 – present*

COMPUTER SKILLS

- Operating systems: Windows, Linux, and Mac OSX.

- Productivity software: Microsoft Office and L^AT_EX.
- Programming languages: C, C++, Bash, Pascal, Basic.
- Analysis and simulation software: Matlab, SAS, R.
- Web development: HTML, PHP, CSS, SQL.
- Server management: HTTP, DHCP, NIS, SQL.

OTHER ACTIVITIES

- **Team member**, Micro-Rato robotics contest – Cyber-Rato category (simulation), University of Aveiro, Portugal *May 2004*
 - Best student team from the Electronics & Telecommunications Engineering Department, University of Aveiro.
- **Team member**, Micro-Rato robotics contest – Cyber-Rato category (simulation), University of Aveiro, Portugal *May 2003*
 - Best team from the University of Aveiro.

LANGUAGES

- Portuguese – native
- English – fluent
- French – basic
- Spanish – basic