



André Anjos

Signal Processing Engineer, D.Sc.

Education

- 2001–2006 **Doctor**, Federal University of Rio de Janeiro, Brazil.
D.Sc. degree from the Electronics Engineering School (Signal Processing Laboratory), Post Graduate Program (COPPE). Thesis work developed at CERN, Switzerland in the context of the ATLAS Experiment.
- 2000–2001 **Master**, Federal University of Rio de Janeiro, Brazil.
M.Sc. degree from the Electronics Engineering School (Signal Processing Laboratory), Post Graduate Program of the Federal University of Rio de Janeiro (COPPE/UFRJ). Thesis work developed at the university in the context of the ATLAS-CERN/UFRJ collaboration.
- 1994–1999 **Engineer**, Federal University of Rio de Janeiro, Brazil.
Electronics Engineering degree from the Electronics Engineering Department.
- 1989–1993 **Technician**, Federal Center of Technology, Rio de Janeiro, Brazil.
Technical course in Electronics, taken at the same time as my high-school studies.

Experience

- 2014–present **Scientific Collaborator**, Idiap Research Institute, Martigny, Switzerland.
Research on Biometrics, Security and Computing.
- Teaching:**
- Fundamentals in statistical pattern recognition, post-graduate level, at the École Polytechnique Fédérale de Lausanne (EPFL, Switzerland), EE-612
 - Guest Lecturer at State University of São Paulo, Campus Bauru, for the master level course "Special Topics in Reproducible Research Pattern Recognition and Machine Learning", June 2015
- Supervision:**
- Co-supervision of Ivana Chingovska, doctorate student.
- Project writing and involvement:**
- FP7 BEAT: contact point for Idiap, leader on 2 work packages. BEAT develops a new open-source online platform for biometric system certification and development;
 - CTI Project FEDARS: face recognition using deep architectures;
 - Hassler Project COHFACE: remote photo-plethysmography (heart-rate measurements) from webcam images, application to face anti-spoofing;
 - CTI Project 3DFingerVein: vein recognition using a finger vein imagery acquired from multiple cameras; Technical contact point;
 - IARPA Project Odin (BATL team): presentation attack detection for face recognition using Visual, NIR and Thermal cameras. Technical contact point;
 - Development and management of Bob, a framework for reproducible research in pattern recognition and machine learning.

- 2010–2013 **Post-doctoral Researcher**, Idiap Research Institute, Martigny, Switzerland.
 Research on Biometrics, Security and Computing.
Teaching:
- Fundamentals in statistical pattern recognition, post-graduate level, at the École Polytechnique Fédérale de Lausanne (EPLF, Switzerland), EE-612
- Supervision:**
- Co-supervision of Ivana Chingovska, doctorate student;
 - Co-supervision of Tiago Freitas Pereira and Jukka Mäatta, visiting students;
 - Co-supervision of Murali Mohan Chakka, trainee.
- Project writing and involvement:**
- FP7 BEAT: contact point for Idiap, leader on 2 work packages. BEAT develops a new online platform for biometric system certification and development;
 - FP7 TABULA RASA: contact point for Idiap. TABULA RASA investigates sensitiveness to spoofing attacks on biometric systems;
 - CTI Project Replay: development of database and counter-measures to spoofing. Construction of working prototypes with the industrial partner (KeyLemon);
 - Development and management of Bob, a framework for reproducible research.
- 2004–2010 **Researcher**, University of Wisconsin, Madison, USA.
 Development and construction of the ATLAS Trigger and Data-Acquisition Systems, at CERN, Switzerland.
Supervision:
- Supervision of CERN summer students (three summers);
 - Co-supervision Rodrigo Coura Torres, doctorate student.
- Achievements:**
- Design, development and maintenance of the ATLAS Trigger and Data Acquisition systems. It is currently deployed and operational on more than 5000 machines at CERN and worldwide.
- 2000–2004 **Graduate Student**, Federal University of Rio de Janeiro, Brazil.
 Design and development of a novel algorithm for fast physics triggering based on Calorimetry, Topological Mapping and Neural Networks for the ATLAS Experiment, CERN, Switzerland.
- 1994–1999 **Under Graduate Student**, Federal University of Rio de Janeiro, Brazil (includes 1 year intership at CERN, Switzerland).
 Signal Processing student.
Achievements:
- Sub-optimal filtering for particle discrimination;
 - Neural classifiers implemented in a transputer-based parallel machine;
 - Spent 1 year at CERN, Switzerland in a joint project with the university. Participated in the development of early prototypes of the 2nd level-trigger and what would be become the final design of the trigger for the ATLAS experiment.

Patents

- US20150970333 Method and internet-connected server for reviewing a computer-executable experiment (filed), cf. *EU FP7 BEAT Project*.
- WO2016053683 A data-network connected server, a device, a platform and a method for conducting computer-executable experiments (filed), cf. *EU FP7 BEAT Project*.

Computer skills

- Operating Systems Proficiency in Linux (and other unices), Mac OSX and Microsoft Windows
- Administration Advanced system and network management. Concepts of networking, firewalling, internet publishing, protocols and architectures
- Programming Advanced knowledge on several structured and object-oriented languages programming. Advanced knowledge on concurrent and parallel programming
- Software Management Advanced experience on building and integrating large software projects, managing releases and software policies, as well as working with collaboration tools for revision control, building, documenting and describe
- Databases Extensive experience with the use and development of databases

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Languages

- Portuguese **Mater language.**
English **Proficient**, Read, write and speak fluently.
French **Proficient**, *certified C1-level*, Read, write and speak fluently.
Spanish **Basic**, Basic communication skills, can read well.

Off-work

- Sports Alpine skiing, Biking, Tennis, Swimming
Music Various percussion instruments and *brazilian cavaquinho*
Computing Explore new techniques and tools

Quick remarks on publications

- H-Index = 19. See my [Google Scholar page](#)
Articles ~30% are journals. I authored and co-authored more than 90 publications. I'm first author on ~25% of the publications listed on the next section.
Most Cited The 2 most cited articles are collaboration articles from the ATLAS experiment, CERN. They are written by many authors and provide similar impact.
Idiap The first article written by me while at Idiap has 112 citations (published on October 2011). It is my 3rd most cited work.
Ph.D. The seventh most cited article (38 citations) corresponds to my Ph.D. thesis journal article.

Publications (reverse chronological order)

André Anjos, Laurent El-Shafey, and Sébastien Marcel. Beat: An open-source web-based open-science platform, April 2017.

Aythami Morales, Julian Fierrez, Ruben Tolosana, Javier Ortega-Garcia, Javier Galbally, Marta Gomez-Barrero, André Anjos, and Sébastien Marcel. Keystroke biometrics ongoing competition. *IEEE Access*, 4:7736–7746, November 2016.

Ivana Chingovska, Nesli Erdogmus, André Anjos, and Sébastien Marcel. Face recognition systems under spoofing attacks. In *Face Recognition Systems Under Spoofing Attacks*, chapter 8, pages 165–194. Springer International Publishing, 1st edition edition, February 2016.

Ivana Chingovska and André Anjos. On the use of client identity information for face anti-spoofing. *IEEE Transactions on Information Forensics and Security, Special Issue on Biometric Anti-spoofing*, 10(4):787–796, February 2015.

Ivana Chingovska, André Anjos, and Sébastien Marcel. Biometrics evaluation under spoofing attacks. *IEEE Transactions on Information, Forensics and Security*, 9(12), August 2014.

Tiago de Freitas Pereira, Jukka Komulainen, André Anjos, José Mario De Martino, Abdenour Hadid, Matti Pietikainen, and Sébastien Marcel. Face liveness detection using dynamic texture. *EURASIP Journal on Image and Video Processing*, 2014:2, January 2014.

André Anjos, Ivana Chingovska, and Sébastien Marcel. Anti-spoofing: Face databases. In Stan Z.Li and Anil Jain, editors, *Encyclopedia of Biometrics*. Springer US, 2nd edition edition, 2014.

André Anjos, Jukka Komulainen, Sébastien Marcel, Abdenour Hadid, and Matti Pietikainen. Face anti-spoofing: Visual approach. In Sébastien Marcel, Mark Nixon, and Stan Z.Li, editors, *Handbook of Biometric Anti-Spoofing*, chapter 4, pages 65–82. Springer-Verlag, 2014.

Ivana Chingovska, André Anjos, and Sébastien Marcel. Anti-spoofing: Evaluation methodologies. In Stan Z.Li and Anil Jain, editors, *Encyclopedia of Biometrics*. Springer US, 2nd edition edition, 2014.

Ivana Chingovska, André Anjos, and Sébastien Marcel. Evaluation methodologies. In Sébastien Marcel, Mark Nixon, and Stan Z.Li, editors, *Handbook of Biometric Anti-Spoofing*, chapter 10, pages 185–204. Springer-Verlag, 2014.

Stan Z.Li, Javier Galbally, André Anjos, and Sébastien Marcel. Evaluation databases. In Sébastien Marcel, Mark Nixon, and Stan Z.Li, editors, *Handbook of Biometric Anti-Spoofing*, chapter Appendix A, pages 247–278. Springer-Verlag, 2014.

André Anjos, Murali Mohan Chakka, and Sébastien Marcel. Motion-based counter-measures to photo attacks in face recognition. *IET Biometrics*, July 2013.

I. Chingovska, J. Yang, Z. Lei, D. Yi, S. Z. Li, O. Kähm, C. Glaser, N. Damer, A. Kuijper, A. Nouak, J. Komulainen, T. Pereira, S. Gupta, S. Khandelwal, S. Bansal, A. Rai, T. Krishna, D. Goyal, M.-A. Waris, H. Zhang, I. Ahmad, S. Kiranyaz, M. Gabbouj, R. Tronci, M. Pili, N. Sirena, F. Roli, J. Galbally, J. Fierrez, A. Pinto, H. Pedrini, W. S. Schwartz, A. Rocha, A. Anjos, and S. Marcel. The 2nd competition on counter measures to 2d face spoofing attacks. In *International Conference on Biometrics 2013*, June 2013.

Ivana Chingovska, André Anjos, and Sébastien Marcel. Anti-spoofing in action: joint operation with a verification system. In *Computer Vision and Pattern Recognition Conference - Biometrics Workshop*, June 2013.

Tiago de Freitas Pereira, André Anjos, José Mario De Martino, and Sébastien Marcel. Can face anti-spoofing countermeasures work in a real world scenario? In *International Conference on Biometrics 2013*, June 2013.

Jukka Komulainen, Abdenour Hadid, Matti Pietikäinen, André Anjos, and Sébastien Marcel. Complementary countermeasures for detecting scenic face spoofing attacks. In *International Conference on Biometrics 2013*, June 2013.

André Anjos, Laurent El Shafey, Roy Wallace, Manuel Günther, Chris McCool, and Sébastien Marcel. Bob: a free signal processing and machine learning toolbox for researchers. In *ACM Multimedia 2012*, pages 1449–1452, 2012.

Ivana Chingovska, André Anjos, and Sébastien Marcel. On the effectiveness of local binary patterns in face anti-spoofing. In *IEEE International Conference of the Biometrics Special Interest Group*, 2012.

Tiago de Freitas Pereira, André Anjos, José Mario De Martino, and Sébastien Marcel. Lbp-top based countermeasure against facial spoofing attacks. In *International Workshop on Computer Vision With Local Binary Pattern Variants*, 2012.

André Anjos and Sébastien Marcel. Counter-measures to photo attacks in face recognition: a public database and a baseline. In *International Joint Conference on Biometrics 2011*, October 2011.

Murali Mohan Chakka, André Anjos, Sébastien Marcel, et al. Competition on counter measures to 2-d facial spoofing attacks. In *International Joint Conference on Biometrics 2011*, October 2011.

R.C. Torres, A. Anjos, and J.M. Seixas. Automatizing the online filter test management for a general-purpose particle detector. *Computer Physics Communications*, October 2009.

The ATLAS Collaboration. The atlas online high level trigger framework: experience reusing offline software components in the atlas trigger. In *Computing in High Energy and Nuclear Physics, Prague, Czech Republic, 21 - 27 Mar 2009*, 2009.

The ATLAS Collaboration. Atlas trigger and data acquisition: capabilities and commissioning. In *11th Pisa Meeting on Advanced Detectors on Frontier Detectors For Frontier Physics, La Biodola, Italy, 24 - 30 May 2009*, 2009.

The ATLAS Collaboration. Atlas trigger for first physics and beyond. In *Physics at LHC 2008 29 September - October 4, 2008 Split, Croatia*, 2009.

The ATLAS Collaboration. Atlas trigger status and results from commissioning operations. In *Advanced Computing on High-Energy Physics 2008, Erice, Sicily, Italy*, 2009.

The ATLAS Collaboration. Commissioning of the atlas high level trigger with single beam and cosmic rays. In *Computing in High Energy and Nuclear Physics, Prague, Czech Republic, 21 - 27 Mar 2009*, 2009.

The ATLAS Collaboration. Configuration and control of the atlas trigger and data acquisition. In *The 1st international conference on Technology and Instrumentation in Particle Physics*, 2009.

The ATLAS Collaboration. The atlas experiment at the cern large hadron collider. *Journal of Instrumentation*, (S08003), August 2008.

André Anjos. Trigger systems. In *Experimental High-Energy Physics and Associated Technologies Workshop*, 2008.

The ATLAS Collaboration. Expected performance of the atlas experiment detector, trigger, physics. Technical Report 2008–020, CERN Open Documentation, 2008.

The ATLAS Collaboration. Readiness of the atlas trigger and data acquisition system for the first lhc beams. In *11th Topical Seminar On Innovative Particle And Radiation Detectors, Siena, Italy*, 2008.

André Anjos on behalf of the ATLAS Collaboration. The daq/hlt system of the atlas experiment. In *International Workshop on Advanced Computing and Analysis Techniques in Physics Research*, 2008.

Thiago Ciodaro Xavier, André Rabello Anjos, and José Manoel de Seixas. Discriminação neural de partículas para um detector submetido a uma alta taxa de eventos. *Learning and Nonlinear Models - Revista da Sociedade Brasileira de Redes Neurais (SBRN)*, 4(2):79–92, October 2007.

The ATLAS Collaboration. Alignment data streams for the atlas inner detector. In *Computing for High-Energy Physics*, 2007.

The ATLAS Collaboration. The atlas event builder. In *IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2007.

The ATLAS Collaboration. The atlas trigger - commissioning with cosmic rays. In *International Conference on Computing in High Energy and Nuclear Physics*, 2007.

The ATLAS Collaboration. The atlas trigger - high-level trigger commissioning and operation during early data taking. In *International Europhysics Conference on High Energy Physics*, 2007.

The ATLAS Collaboration. Integration of the trigger and data acquisition systems in atlas. In *IEEE Real-time conference*, 2007.

The ATLAS Collaboration. Performance of the final event builder for the atlas experiment. In *15th IEEE Real Time Conference 2007*, 2007.

André Anjos on behalf of the ATLAS Collaboration. The configuration system of the atlas trigger. In *IEEE Real-time conference*, 2007.

Rodrigo Coura Torres, José Manoel Seixas, André Rabello dos Anjos, and Danilo Vannier Cunha. Online electron/jet neural high-level trigger over independent calorimetry information. In *XI International Workshop on Advanced Computing and Analysis Techniques in Physics Research*, 2007.

The ATLAS Collaboration. The atlas data acquisition and trigger : concept, design and status. *Nucl. Phys. B, Proc. Suppl.*, 172:178–182, November 2006.

André Anjos on behalf of the ATLAS Collaboration. Deployment of the atlas high-level trigger. *IEEE Transactions on Nuclear Science*, 53:2144–2149, August 2006.

A. Anjos, R.C. Torres, J.M. Seixas, B.C. Ferreira, and T.C. Xavier. Neural triggering system operating on high resolution calorimetry information. *Nuclear Instruments and Methods in Physics Research*, 559:134–138, April 2006.

André Anjos on behalf of the ATLAS Collaboration. A configuration system for the atlas trigger. *Journal of Instrumentation, Institute of Physics Publishing and Sissa*, (P05004), February 2006.

André Anjos. *Sistema Online de Filtragem em um Ambiente com Alta Taxa de Eventos*. PhD thesis, COPPE/UFRJ, 2006.

The ATLAS Collaboration. Atlas high level trigger infrastructure, roi collection and event building. In *15th International Conference on Computing In High Energy and Nuclear Physics*, 2006.

The ATLAS Collaboration. Studies with the atlas trigger and data acquisition pre-series setup. In *15th International Conference on Computing In High Energy and Nuclear Physics*, 2006.

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A. Anjos, R. C. Torres, B. C. Ferreira, T. C. Xavier, , and J. M. de Seixas. Discriminação neural de elétrons no segundo nível de trigger do atlas. In *XXVI Encontro Nacional de Física de Partículas e Campos*, 2005.

A. Anjos, R. C. Torres, B.C. Ferreira, T.C. Xavier, J.M Seixas, and D.O. Damazio. Otimização do sistema de trigger do segundo nível do atlas baseado em calorimetria. In *XXVI Encontro Nacional de Física de Partículas e Campos*, 2005.

The ATLAS Collaboration. Implementation and performance of a tau lepton selection within the atlas trigger system at the lhc. In *9th ICATPP Conference on Astroparticle, Particle, Space Physics, Detectors and Medical Physics Applications*, 2005.

The ATLAS Collaboration. Muon reconstruction and identification for the event filter of the atlas experiment. In *9th ICATAPP Conference on High Energy Physics*, 2005.

André Anjos on behalf of the ATLAS Collaboration. Configuration of the atlas trigger. In *14th IEEE NPSS Real Time Conference*, pages 990–994, 2005.

André Anjos on behalf of the ATLAS Collaboration. The second level trigger of the atlas experiment at cern's lhc. *IEEE Transaction on Nuclear Science*, 51(3):909–914, July 2004.

J.T. Baines, C.P. Bee, A. Bogaerts, M. Bosman, D. Botterill, B. Caron, A. Anjos, F. Etienne, S. González, K. Karr, W. Li, C. Meessen, G. Merino, A. Negri, J. L. Pinfold, P. Pinto, Z. Qian, F. Touchard, P. Werner, S. Wheeler, F.J. Wickens, W. Wiedenmann, , and G. Zobernig. An overview of the atlas high-level trigger dataflow and supervision. *IEEE Transaction on Nuclear Science*, 51(3):361–366, June 2004.

The ATLAS Collaboration. Algorithms for the atlas high-level trigger. *IEEE Transactions on Nuclear Science*, 51(3):367–374, June 2004.

The ATLAS Collaboration. Atlas tdaq data collection software. *IEEE Transactions on Nuclear Science*, 51:585–590, June 2004.

- The ATLAS Collaboration. The base-line dataflow system of the atlas trigger and daq. *IEEE Transactions on Nuclear Science*, 51(3):470–475, June 2004.
- The ATLAS Collaboration. Studies for a common selection software environment in atlas : from the level-2 trigger to the offline reconstruction. *IEEE Transactions on Nuclear Science*, 51(3):915–920, June 2004.
- The ATLAS Collaboration. Architecture of the atlas high level trigger event selection software. *Nucl. Instrum. Methods Phys. Res.*, 518(1–2):537–541, February 2004.
- A. Anjos and J.M. Seixas. Os filtros de alto nível do experimento atlas. In *XXVI Encontro Nacional de Física de Partículas e Campos*, 2004.
- The ATLAS Collaboration. Design, deployment and functional tests of the on-line event filter for the atlas experiment at lhc. In *Nuclear Science Symposium and Medical Imaging Conference*, 2004.
- The ATLAS Collaboration. Implementation and performance of the high level trigger electron and photon selection for the atlas experiment at the lhc. In *IEEE Nuclear Science Symposium and Medical Imaging Conference*, 2004.
- The ATLAS Collaboration. Online muon reconstruction in the atlas level-2 trigger system. In *Nuclear Science Symposium and Medical Imaging Conference*, 2004.
- The ATLAS Collaboration. Performance of the atlas daq dataflow system. In *Computing in High Energy Physics and Nuclear Physics*, 2004.
- The ATLAS Collaboration. Portable gathering system for monitoring and online calibration at atlas. In *Computing in High Energy Physics and Nuclear Physics 2004*, 2004.
- A. Anjos and J.M. Seixas. Neural particle discrimination for triggering interesting physics channels with calorimetry data. *Nuclear Instruments And Methods In Physics Research A - Accelerators, Spectrometers, Detectors And Associated Equipment*, 502:713–715, August 2003.
- The ATLAS Collaboration. An overview of algorithms for the atlas high level trigger. *IEEE Transactions on Nuclear Science*, 51(3 (2004)):367–374, June 2003.
- The ATLAS Collaboration. The algorithm steering and trigger decision mechanism of the atlas high level trigger. In *Conference for Computing in High-Energy and Nuclear Physics*, 2003.
- The ATLAS Collaboration. Architecture of the atlas online physics-selection software at lhc. In *Conference on Astroparticle, Particle, Space Physics, Detectors and Medical Physics Applications*, 2003.
- The ATLAS Collaboration. The atlas hlt, daq and dcs technical design report. Technical report, CERN Publication, 2003.
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- The ATLAS Collaboration. The dataflow system of the atlas trigger and daq. In *Conference for Computing in High-Energy and Nuclear Physics*, 2003.
- The ATLAS Collaboration. Experience with multi-threaded c++ applications in the atlas dataflow software. In *Conference for Computing in High-Energy and Nuclear Physics*, 2003.
- The ATLAS Collaboration. A new implementation of the region-of-interest strategy for the atlas second level trigger. In *Conference for Computing in High-Energy and Nuclear Physics*, 2003.
- A. Anjos and J.M. Seixas. Redes neurais especialistas para a separação elétron-jato usando calorímetros multi-camadas e multi-segmentados. In *XXII Encontro Nacional de Física de Partículas e Campos*, 2001.

André Anjos. *Sistema neuronal rápido de decisão baseado em calorimetria de altas energias*. PhD thesis, COPPE/UFRJ, 2001.

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André Rabello dos Anjos and José Manoel de Seixas. Integrando plataformas e algoritmos para o segundo nível de trigger do experimento atlas. In *Encontro Nacional de Física de Partículas e Campos*, 1999.

J.M. Seixas, L.P. Caloba, A.R. Anjos, B. Kastrup, A.C.H. Dantas, and R. Linhares. A neural online triggering system based on parallel processing. *IEEE Transactions on Nuclear Science*, 45(4):1814–1818, August 1998.

André Rabello dos Anjos, Augusto Dantas, and José Manoel de Seixas. Um protótipo do sistema de validação do nível 2 para as condições do Lhc. In *Encontro Nacional de Física de Partículas e Campos*, pages 32–33, 1998.

J. M. Seixas, A. R. Anjos, C. B. Prado, L. P. Calôba, A. C. H. Dantas, and J. C. R. Aguiar. Neural classifiers implemented in a transputer based parallel machine. In *International Meeting on Vector and Parallel Processing (VECPAR)*, 1998.

André Rabello dos Anjos. *Sistema de classificação baseado em uma máquina com sistema distribuído*. PhD thesis, Departamento de Eletrônica/UFRJ, 1997.

J.M. Seixas, L.P. Calôba, A.R. Anjos, A.C.H. Dantas, and R. Linhares. Fast neural decision system based on dsps and parallel processing. In *International Conference on Signal Processing Applications and Technologies, San Diego, USA*, pages 1629–1633, 1997.

J.M. Seixas, L.P. Calôba, and A.R. Anjos. Particle discrimination using sub-optimal filtering techniques. In *Congresso Brasileiro de Automatica (CBA), São Paulo, Brasil*, pages 635–640, 1996.