

Anselmo Castelo Branco Ferreira
Curriculum Vitae

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Personal Data **Name** Anselmo Castelo Branco Ferreira
Date and Place of Birth 14/02/1982 - Manaus/AM - Brazil
Website <http://www.ic.unicamp.br/~anselmoferreira>

Education

- 2012-2016** **PhD degree in Computer Science**
State University of Campinas (UNICAMP), Campinas, Brazil
Title: Multi-Analysis Techniques for Digital Image Forensics
Advisor: Anderson de Rezende Rocha (IC-UNICAMP, Brazil)
Co-Advisors: Jefersson Alex dos Santos (DCC-UFMG Brazil) and Stefano Tubaro (DEIB-Polimi Italy)
Link to my thesis:
https://www.researchgate.net/publication/316890690_Multi_Analysis_Techniques_for_Digital_Image_Forensics
- 2009-2011** **Master's degree in Technology and Innovation**
State University of Campinas (UNICAMP), Limeira, Brazil
Title: A Comparative Study of Image Segmentation by the Application of Normalized Cut in Images.
Advisor: Marco Antônio Garcia de Carvalho (FT-UNICAMP)
- 2006-2008** **Degree in Technology in Telecommunications (interrupted)**
State University of Campinas (UNICAMP), Limeira, Brazil
- 2003-2005** **Degree in Technology in Informatics (completed).**
State University of Campinas (UNICAMP), Limeira, Brazil

Complementary Courses

- 2019 – 2019** Face Recognition (10h).
Udemy
- 2015 - 2015** GIT (8h).
State University of Campinas (UNICAMP), Campinas, Brazil
- 2012 - 2012** OpenCV (18h).
Brazilian Company in Agricultural Research (EMBRAPA), Campinas, Brazil.
- 2004 - 2004** Micro Computer Maintenance and Local Networks Installation. (42h).
National Service in Commercial Learning, SENAC, Brazil
- 2003 - 2003** PHP (32h).
State University of Campinas, UNICAMP, Campinas, Brazil
- 1995 - 1999** English (624h).
Brazil-USA cultural Institute (ICBEU), Manaus, Brazil

Professional Experience

1. University of Cagliari – UNICA (Italy)

2019 - Present Post Doc Fellow at the Department of Mathematics and Computer Science, developing deep learning, deep reinforcement learning and time series to image solutions for stock market forecasting.

2. Shenzhen University – SZU (China)

2017 - 2019 Post Doc Fellow at Shenzhen Laboratory of Media Content Security, researching and developing deep learning approaches by multi-analysis for multimedia forensics and classification.

3. National Laboratory of Scientific Computing – LNCC (Brazil)

2016 - 2017 Post Doc fellow, researching and developing computer vision approaches through convolutional neural networks to industry applications.

4. State University of Campinas – UNICAMP (Brazil)

2011 - 2012 Research Assistant, helping in datasets construction, experiments conduction and papers writing.

5. Limeira City Hall – PML (Brazil)

2008 - 2009 Web programmer (intern), developing several systems used in the City Hall's Intranet, such as the inventory control, software license manager, shopping system, files manager among others.

6. Bluepex Security Solutions – BLUEPEX (Brazil)

2006 - 2008 Technical Support Analyst (intern) in Linux Firewalls, Mail Servers and Anti-Spams. The support was performed via remote ssh and TELNET connections on client's appliances.

7. Limeira Center of Social Promotion- CEPROSOM (Brazil)

2006 Professor of basic informatics (intern). Lectures and speeches about tools and technology were given to ordinary people.

Research Projects

2018 – 2020

Title: Research on Digital Image Forgery Localization in Complex Situations

Grant Number: 61802262

Funding Agency: National Science Foundation of China (NSFC)

Country: China

Abstract: With the rapid development on image processing technology, tampering images without leaving obvious perceptual artifacts becomes much easier, which would lead to serious negative influences on society, politics, economy, criminal investigation, justice and diplomacy. Digital image forensics is a kind of important technique for identifying the originality and authenticity of digital images. The existing forensic methods, however, are still subjected to many constraints and far away from practical applications, and thus they cannot work well on the tricky problem of locating the tampered regions within an image forgery, especially in some complex situations. For example, the images come from different sources, the tampering

methods are diverse, and so on. In order to improve the performance of digital image forgery localization, this project will study forgery localization methods in complex situations. The main research topics are as follows: 1. deep learning-based framework for forgery localization; 2. construction of forgery localization features for small regions; 3. design of fusion strategies for forgery localization. This project is supposed to break through the key techniques for image forgery localization in practical situations, and improve the theory and solution of image forgery localization, which will further support the practical applications of image forensic techniques.

People involved: Haodong Li; Anselmo Ferreira and Jiwu Huang.

2018 - 2020

Title: Two-dimensional code anti-counterfeiting labels and key technologies based on deep features

Funding Agency: Science and Technology Innovation Commission of Shenzhen

Country: China

Abstract: In recent years, the vigorous development of online merchants has provided a new opportunity for the survival of counterfeited and shoddy products. This project intends to use the QR-code label to store the anti-counterfeiting features from the surface of the product to verify the authenticity of products from different sales channels. The consumer can photograph the surface of the product to decode the two-dimensional code label and simultaneously extract the anticounterfeiting features of the product, and can determine the authenticity of the product by comparing the label content with the extracted features. This solution can provide new approaches for product anti-counterfeiting problems and reduce production, verification and rights costs of legitimate parties, and greatly increase the cost of illegally forged goods, thereby safeguarding national economic interests.

People involved: Changsheng Chen; Li Mulin, Anselmo Ferreira and Cai Sudao.

2017-2019

Title: Multi Analysis and Deep Learning Techniques for Digital Image Forensics and Classification

Grant Number: 61332012

Funding Agency: National Science Foundation of China (NSFC)

Country: China

Abstract: With the extensive range of image acquisition devices and document generation nowadays, the establishment of computational techniques in order to recognize illegal content and assign authorship can be useful in different ways to a forensic scenario: recognizing the content can help identifying crimes in images, and establishing the owner/author can provide strong arguments to the indictment of a suspect. Different techniques have been proposed in the scientific literature to act in these ways, but often many of them fail because: (1) there is a lack of standardization, i.e., different techniques are proposed for different applications, which may require skilled personnel on each application; (2) the laboratory essence of the process, with only a limited range of known elements being considered for classification, not accounting for the unknown nature of the problems during real-world testing and (3) most of techniques proposed so far are proposed based on feature engineering, built based on patterns that are not guaranteed to happen always. In this research project, we propose to address these problems on two fronts: resilient characterization and classification. For this, we intend to use multi-analysis approaches, in which we explore several scenarios in the investigation together with data-driven characterization by Convolutional Neural Networks. We also aim at proposing the use of Open-Set classifiers in order to generate the classification taking into account the unknown, which is defined as a class not considered in the classifier training. We intend to apply the developed techniques in three image forensic applications: source attribution, digital image forgery detection and illegal content detection. At the end of this project, we aim at establishing new standards for Digital Image Forensics taking into account the real nature of this application.

People involved: Anselmo Ferreira and Jiwu Huang.

2014-2019

Title: DeepEyes: Visual Computing and Machine Intelligence Techniques for Digital Forensics and Electronic Surveillance

Grant Number: 99999.002341/2015-08

Funding Agency: Brazilian Coordination for the Improvement of Higher-Level Education

Country: Brazil

Abstract: Criminal activities vary in scope and complexity but they exist in virtually all sectors of our society. In this project, we aim at solving the three most important questions in Forensic Sciences: "who", "in what circumstances" and "how". More specifically, we focus on solving a series of problems including, but not limited to: forgery detection in images and videos; source attribution for cameras and printers; remote

sensing image analysis; complex data analysis and inference; human identification techniques; license plate recognition; and video analysis. The research is in partnership with the Brazilian Federal Police.

People involved: Anselmo Castelo Branco Ferreira, Anderson Rocha, Siome Goldenstein, Jefferson Alex dos Santos, Siovani Felipussi, William Robson Schwartz, Jacques Wainer, Edson Borin, David Menotti Gomes, Arnaldo Albuquerque de Araújo, Nelson Luis Saldanha da Fonseca, Flavio de Barros Vidal, Dibio Leandro Borges, Ricardo da Silva Torres, André Luiz da Costa Morisson, Paulo Max Gil Innocencio Reis, Jorge de Albuquerque Lambert, Helio Pedrini.

Journal Reviewer

1. Taylor and Francis Australian Journal of Forensic Sciences

2017 - today

2. Elsevier Digital Signal Processing

2017 - today

3. Elsevier Journal of Visual Communication and Image Representation

2015 - today

4. Springer Multimedia Tools and Applications

2015 - today

5. IEEE Transactions on Information Forensics and Security

2014 - today

Research Topics

1. Computer Languages
2. Information Systems
3. Computer Vision
4. Machine Learning

Idioms

Fluent English
Native Portuguese
Basic Spanish
Basic Italian

Awards

2013 IFS-TC Image Forensics Challenge best forgery maker- localization phase, IEEE

2017 Best paper of Elsevier Journal of Visual Communication and Image Representation (JVCI)

2017 Best thesis in computer science from State University of Campinas (UNICAMP)

Publications

Journal papers

S. CARTA, A. FERREIRA, D. R. RICUPERO, M. SAIA and R. SAIA. **A Combined Entropy-based Approach for a Proactive Credit Scoring**. Elsevier Engineering Applications of Artificial Intelligence (EAI). Volume 87. 2020. Impact Factor: 3,52

S. CARTA, A. CORRIGA, A. FERREIRA, D. R. RICUPERO and R. SAIA. **A Holistic Auto-Configurable Ensemble Machine Learning Strategy for Financial Trading**. MDPI Computation. Volume 7, number 4. 2019.

C.CHEN, M. LI, A. FERREIRA, J. HUANG and R. CAI. **A Copy-Proof Scheme based on the Spectral and Spatial Barcoding Channel Models**. IEEE Transactions on Information Forensics and Security (TIFS). Volume 15, number 1. Pages 1056-1071, 2020. Impact Factor: 6,21

A. FERREIRA, S. FELIPUSSI, R. PIRES, S. AVILA, G. SANTOS, J. LAMBERT, J. HUANG and A. ROCHA, **Eyes in the Skies: A Data-driven Fusion Approach to Identifying Drug Crops from Remote Sensing Images**. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS) [ACCEPTED]. Impact Factor: 3,39.

B. LI, W. WEI, A. FERREIRA and S. TAN. **ReST-Net: Diverse Activation Modules and Parallel Sub-nets-based CNN for Spatial Image Steganalysis**. IEEE Signal Processing Letters. Volume 25, number 5. Pages 650-654, 2018. Impact Factor: 3,26.

A. FERREIRA and G. GIRALDI. **Convolutional Neural Network Approaches to Granite Tiles Classification**. Elsevier Expert Systems with Applications (ESWA). Volume 84. Pages 1-11. 2017. Impact Factor: 4,29.

A. FERREIRA, L. BONDI, L. BAROFFIO, P. BESTAGINI, J. HUANG, J. A. dos SANTOS, S. TUBARO and A. ROCHA. **Data-Driven Feature Characterization Techniques for Laser Printer Attribution**. IEEE Transactions on Information Forensics and Security (TIFS). Volume 12, number 8. Pages 1860-1873. 2017. Impact Factor: 6,21.

A. FERREIRA, S. FELIPUSSI, C. ALFARO, P. FONSECA, J. E. VARGAS-MUNOZ, J. A. dos SANTOS and A. ROCHA. **Behavior Knowledge Space-Based Fusion for Copy-Move Forgery Detection**. IEEE Transactions on Image Processing (TIP). Volume 25, number 10. Pages 4729-4742. 2016. Impact Factor: 6,79.

A. FERREIRA, J. A. dos SANTOS and A. ROCHA. **Multidirectional and Multiscale Multi-Perturbation Approaches for Blind Forensic Median Filtering Detection**. IOS Journal of Intelligent Data Analysis (JIDA). Volume 20. Pages S17-S36. 2016. Impact Factor: 0,61.

E. SILVA, T. CARVALHO, A. FERREIRA and A. ROCHA. **Going deeper into copy-move forgery detection: exploring image telltales via multi-scale analysis and voting processes**. Elsevier Journal of Visual Communication and Image Representation (JVCI). Volume 29. Pages 16-32. 2015. Impact Factor: 2,25.

A. FERREIRA, L. C. NAVARRO, G. PINHEIRO, J. A. dos SANTOS and A. ROCHA. **Laser Printer Attribution: Exploring new Features and Beyond**. Elsevier Forensic Science International (FSI). Volume 247. Pages 105 - 125. 2015. Impact Factor: 1,99.

E. MORAIS, A. FERREIRA, S.A. CUNHA, R.M.L BARROS, A. ROCHA and S. GOLDENSTEIN. **A multiple camera methodology for automatic localization and tracking of futsal players**. Elsevier Pattern Recognition Letters, (PRL), Volume 39. Pages 21-30, 2014. Impact Factor: 2,81.

Conference papers

A. FERREIRA, H. CHEN, B. LI and J. HUANG. An Inception-Based Data-Driven Ensemble Approach to Camera Model Identification. In IEEE International Workshop on Information Forensics and Security (WIFS), Hong Kong, Hong Kong, pages 1-7. 2018.

A. FERREIRA and A. ROCHA. A Multiscale and Multi-Perturbation Blind Forensic Technique for Median Detecting. In Progress in Pattern Recognition, Image Analysis, Computer Vision, and Applications Iberoamerican Congress on Pattern Recognition, Puerto Vallarta, Mexico. 2014.

A. FERREIRA and M. A. G. CARVALHO. A Comparative Study of Image Segmentation by Application of Normalized Cut on Graphs. In Conference on Graphics, Patterns and Images- Workshop of Thesis and Dissertations Conference on Graphics, Patterns and Images-Workshop of Thesis and Dissertations Ouro Preto, Brazil. 2012.

T. CARVALHO, F. COSTA, E. SILVA, A. FERREIRA and A. ROCHA. Besides the obvious: the forensic image analysis and investigation of implicit and explicit content from digital photos (in Portuguese). In Brazilian Symposium of Information Security and Computational Systems. Curitiba, Brazil. 2012.

E. MORAIS, A. FERREIRA, S. GOLDENSTEIN and A. ROCHA. Automatic tracking of indoor soccer players using videos from multiple cameras. In Conference on Graphics, Patterns and Images. Ouro Preto, Brazil, 2012.

M. A. G. CARVALHO, A. FERREIRA, A. L. COSTA and R. M. CESAR JUNIOR,. 2010. Image Segmentation using Component Tree and Normalized Cut. In Conference on Graphics, Patterns and Images, Gramado, Brazil. 2010.

M. A. G. CARVALHO, A. FERREIRA and A. L. COSTA. Image Segmentation using Quadtree-Based Similarity Graph and Normalized Cut. In Iberoamerican conference on Progress in pattern recognition, image analysis, computer vision and applications. São Paulo, Brazil, 2010.

Extended Abstracts

A. FERREIRA and A. ROCHA. A Multiscale and Multi-Perturbation Blind Forensic Technique for Median Detecting. In Annals of IC-UNICAMP IX Workshop of Thesis, Dissertations and ongoing Scientific Initiations. Campinas, Brazil, 2014.

A. FERREIRA and M. A. G. CARVALHO. A Comparative Study of Image Segmentation by Application of Normalized Cut on Graphs (in Portuguese). In Annals of II UNICAMP Symposium of Signal Processing. Campinas, Brazil, 2011.

M. A. G. CARVALHO, A. FERREIRA, T. PINTO and R. M. CESAR JUNIOR. Image Segmentation Using Watershed and Normalized Cut. In Symposium on Computer Graphics and Image Processing. Rio de Janeiro, Brazil, 2009.

Lectures

A. FERREIRA. Forensic Approaches in Computer Vision to Authenticate and Pointing the Source of Documents (in Portuguese). University of Sao Paulo, Sao Paulo, Brazil. 2014

A. FERREIRA. Forensic Analysis of Documents: state of the art and new challenges (in Portuguese). State University of Santa Catarina, Ibirama, Brazil. 2013.

A. FERREIRA and M. A. G. CARVALHO. A Comparative Study of Image Segmentation by Application of Normalized Cut on Graphs (in Portuguese). State university of Campinas, Campinas, Brazil. 2011.

A. FERREIRA. Image Segmentation and Spectral Graph Theory. State university of Campinas, Campinas, Brazil, 2010.

A. FERREIRA. Image Segmentation Using Spectral Graph Theory (in Portuguese). State university of Campinas, Campinas, Brazil, 2010.

Technical Reports

A. FERREIRA and G. GIRALDI. Multi-Analysis Techniques through Convolutional Neural Networks for Classifying Granite Images (in Portuguese). LNCC – Petrópolis, Brazil, 2017.

Oral and Poster Presentations

Oral presentation at IEEE Workshop on Information Forensics and Security. 2018. **An Inception-Based Data-Driven Ensemble Approach to Camera Model Identification.** Hong Kong, China.

Poster presentation at Conference on Graphics, Patterns and Images. 2012. **A Comparative Study of Image Segmentation by Application of Normalized Cut on Graphs.** Ouro Preto, Brazil.

Oral Presentation at II UNICAMP Symposium in Signal Processing. 2011. **A Comparative Study of Image Segmentation by Application of Normalized Cut on Graphs (in Portuguese).** Campinas, Brazil.

Poster presentation at Conference on Graphics, Patterns and Images. 2010. **Image Segmentation Using Component Tree and Normalized Cuts.** Gramado, Brazil.

Oral Presentation at I UNICAMP Graduate Workshop. 2010. **Image Segmentation Using Spectral Graph Theory.** Limeira, Brazil.

Oral Presentation at II UNICAMP Graduate Workshop. 2010. **Image Segmentation using Spectral Graph Theory (In Portuguese).** Limeira, Brazil.

Poster presentation at XXII Brazilian Symposium on Computer Graphics and Image Processing. 2009. **Image Segmentation Using Watershed and Normalized Cut.** Rio de Janeiro, Brazil.

Other Kinds of Publications

A. ROCHA, A. FERREIRA, E. SILVA, F. COSTA, T. CARVALHO. 2011. **Bridging the Multidisciplinary Borders for Dealing with Fake Images and Videos in the XXI Century (in Portuguese).** Itweb.

Academic References

Dr. Anderson de Rezende Rocha: My former PhD advisor in Brazil, Microsoft fellow researcher, IEEE member and one of the pioneers in digital image forensics in Brazil.

E-mail: anderson.rocha@ic.unicamp.br

Dr. Stefano Tubaro: My former PhD co-advisor in Italy, IEEE member and one of the pioneers in digital image forensics in Italy.

E-mail: stefano.tubaro@polimi.it

Dr. Jiwu Huang, my former supervisor in China, IEEE fellow member and one of the pioneers in digital image forensics in China. E-mail:

E-mail: jwhuang@szu.edu.cn