Leandro Augusto Frata Fernandes

Curriculum Vitae

Affiliation and Contact Information

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Summary

Leandro A. F. Fernandes holds a B.Sc. degree in Computer Science (2002) from Fundação Universidade Regional de Blumenau (FURB), an M.Sc. degree (2006), and a Ph.D. degree (2010) in Computer Science from Universidade Federal do Rio Grande do Sul (UFRGS). He was a postdoctoral researcher at UFRGS from 2010 to 2011 and at Universidade Estadual de Campinas (UNICAMP) in 2018. Today, he is a faculty member at the Universidade Federal Fluminense (UFF) in Niterói, Brazil. Since 2023, Leandro has been the Division 8 Member for NC-BR at the International Commission on Illumination (CIE). His master's thesis won the XX Brazilian Computer Society's Master's Theses Contest. Leandro's Ph.D. dissertation placed third in the XXIV Brazilian Computer Society's Ph.D. Competition. His research interests cover most aspects of visual computing and artificial intelligence, especially computer vision and the frontiers among information retrieval, extraction & organization, and machine learning applied to vision. This includes semantic modeling, multidimensional shape and pattern detection, image metrology, image-based modeling and tracking, and geometric algebra (Clifford algebra in physics) applied to visual computing. From 2015 to 2021 and again from 2025 to the present, Leandro held a Research Productivity Fellowship (PQ) from the National Council for Scientific and Technological Development (CNPq), and from 2015 to 2021 a Young Scientist of Our State Fellowship (JCNE) from the Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ). Also, he received an award in the 2020 Google Research Awards in Latin America Program for the research carried out by one of his Ph.D. students, the 2020 Elon Lages Lima Award for his book about geometric algebra, the Petrobras Inventor Award 2022, 2024, and 2025, the Petrobras Exploration and Production Efficiency and Innovation Award 2024, and the ANP Award for Technological Innovation 2025. Leandro was program co-chair of the AGACSE 2018 and SIBGRAPI 2016, general co-chair of the SIBGRAPI 2017, tutorial co-chair of the SIBGRAPI 2021 and 2022, publication and general co-chair of the IWSSIP 2020, and guest editor of special issues of the Computers & Graphics and the International Journal of Innovative Computing and Applications. He was a member of the CIE Technical Committee TC1-89 "Enhancement of Images for Colour Defective Observers" from 2012 to 2020.

Education

2018-2018 Pos-Doc (Sabbatical Leave) at UNICAMP
Supervisor: Prof. Dr. Carlile Campos Lavor

2010-2011 Post-Doc at UFRGS
Supervisor: Prof. Dr. Manuel Menezes de Oliveira Neto

2006-2010 DSc in Computer Science from UFRGS
Thesis: On the Generalization of Subspace Detection in Unordered Multidimensional Data
Advisor: Prof. Dr. Manuel Menezes de Oliveira Neto

2004-2006 MSc in Computer Science from UFRGS
Thesis: Um Método Projetivo para Cálculo de Dimensões de Caixas em Tempo Real (in Portuguese). Translation: A Projective Method for Calculating Box Sizes in Real Time.

Advisor: Prof. Dr. Manuel Menezes de Oliveira Neto

1998-2002 BSc in Computer Science from FURB
Final Project: Protótipo de Sistema Óptico de Captura do Movimento Humano, sem a Utilização de Marcações Especiais (in Portuguese). Translation: Prototype of Optical System for Human Movement Capture, without Special Markings.
Advisor: Prof. Dr. Paulo César Rodacki Gomes

Book, Book Chapter, and Technical Report

L. A. F. Fernandes, C. Lavor and M. M. Oliveira. “Álgebra Geométrica e Aplicações,” Notas em Matemática Aplicada, vol. 85, ISBN 978-85-8215-081-8, SBMAC: 2017 (book in Portuguese about geometric algebra).

L. A. F. Fernandes. “Exploring lazy evaluation and compile-time simplifications for efficient geometric algebra computations.” In: Xambó-Descamps, S. (eds) *Systems, Patterns and Data Engineering with Geometric Calculi. SEMA SIMAI Springer Series*, vol 13, pp. 111-131. Springer, Cham: 2021.

P. Hung, M. Ayama, D. Bonci, H. Chen, L. Fernandes, A. Kvitle, N. Milić, R. Mochizuki, B. Nagy, S. Ohtsuka, M. Oliveira, C. Rodriguez-Pardo, T. Sakamoto, G. Sharma and J. Simon-Liedtke. “Enhancement of images for colour-deficient observers.” *Technical Report, CIE 240:2020*, 2010.

Selected Publications

Selected Journal Papers

I. M. Barcelos, T. B. Rabelo, F. Bernardini, R. S. Monteiro, and L. A. F. Fernandes. “From past to present: a tertiary investigation of twenty-four years of image inpainting.” In: *Comput. Graph.*, vol. 123, paper 104010, 2024.

R. S. Evangelista, A. L. S. Pereira, R. F. de Moraes, and L. A. F. Fernandes. “Semantic manipulation through the lens of Geometric Algebra.” In: *Comput. Vis. Image Underst.*, vol. 239, paper 103899, 2024.

R. Ripas and L. A. F. Fernandes. “Improving the planarity and sharpness of monocularly estimated depth images using the Phong reflection model.” In: *Comput. Vis. Image Underst.*, vol. 233, paper 103726, 2023.

E. V. Sousa, C. N. Vasconcelos, and L. A. F. Fernandes. “An analysis of ConformalLayers' robustness to corruptions in natural images.” In: *Pattern Recognit. Lett.*, 166(1), pp. 190-197, 2023.

C. Lavor, R. Alves, and L. A. F. Fernandes. “Linear and geometric algebra approaches for sphere and spherical shell intersections in $\mathbb{R}^n$.” In: *Expert Syst. Appl.*, vol. 187, paper 115993, 2022.

J. T. Pintas, L. A. F. Fernandes, and A. C. B. Garcia. “Feature selection methods for text classification: a systematic literature review.” In: *Artif. Intell. Rev.*, online, pp. 1-52, 2021.

E. V. Sousa and L. A. F. Fernandes. “TbGAL: a tensor-based library for geometric algebra.” In: *Adv. Appl. Clifford Algebras*, 30(2), paper 27, 2020.

I. Natal, L. Correia, A. C. Garcia and L. A. F. Fernandes. “Efficient out-of-home activity recognition by complementing GPS data with semantic information.” In: *First Monday*, 24(11), 2019.

V. S. Camargo, E. V. Castelani, L. A. F. Fernandes and F. Fidalgo. “Geometric algebra to describe the exact discretizable molecular distance geometry problem for an arbitrary dimension.” In: *Adv. Appl. Clifford Algebras*, 29(4), paper 75, 2019.

E. Vera, D. Lucio, L. A. F. Fernandes and L. Velho. “Hough transform for real-time plane detection in depth images.” In: *Pattern Recognit. Lett.*, 103(1), pp. 8-15, 2018.

L. A. F. Fernandes and M. M. Oliveira. “Handling uncertain data in subspace detection.” In: *Pattern Recognit.,* 47(10), pp. 3225-3241, 2014.

G. Taveira and L. A. F. Fernandes. “Automatic alignment and reconstruction of facial depth images.” In: *Pattern Recognit. Lett.*, 50(1), pp. 82-90, 2014.

L. A. F. Fernandes and M. M. Oliveira. “A general framework for subspace detection in unordered multidimensional data.” In: *Pattern Recognit.*, 45(9), pp. 3566-3579, 2012.

G. M. Machado, M. M. Oliveira and L. A. F. Fernandes. “A physiologically-based model for simulation of color vision deficiency.” In: *IEEE T. Vis. Comput. Gr.*, 15(6), pp. 1291-1298, 2009.

L. A. F. Fernandes and M. M. Oliveira. “Real-time line detection through an improved Hough transform voting scheme.” In: *Pattern Recognit.*, 41(1), pp. 299-314, 2008.

G. R. Kuhn, M. M. Oliveira and L. A. F. Fernandes. “An efficient naturalness-preserving image-recoloring method for dichromats.” In: *IEEE T. Vis. Comput. Gr.*, 14(6), pp. 1747-1754, 2008.

G. R. Kuhn, M. M. Oliveira and L. A. F. Fernandes. “An improved contrast enhancing approach for color-to-grayscale mappings.” In: *The Visual Comput.*, 24(7-9), pp. 505-514, 2008.

Selected Conference Papers

Y. P. Toledo, R. F. de Moraes, A. L. S. Pereira, S. Herold-Garcia, A. P. Quesada and L. A. F. Fernandes. “Scalable segmentation of diabetic foot ulcers.” In: Proc. IEEE Int. Symposium Comp.-Based Medical Systems (CBMS), pp. 514-520, 2024.

Y. Toledo, L. A. F. Fernandes, S. Herold-Garcia and A. P. Quesada. “U-Net-based DFU tissue segmentation and registration on uncontrolled dermoscopic images.” In: *Proc. Int. Joint Conf. Comput. Vis., Imaging and Comput. Graph. Theory Appl. (VISAPP)*, pp. 510-517, 2022.

E. V. Sousa, L. A. F. Fernandes and C. N. Vasconcelos. “ConformalLayers: a non-linear sequential neural network with associative layers.” In: *Proc. SIBGRAPI Conf. Graph., Patterns and Images*, 2021.

G. O. S. Oliveira, A. Conci, and L. A. F. Fernandes. “Using geometric graph matching in image registration.” In: *Proc. Int. Joint Conf. Comput. Vis., Imaging and Comput. Graph. Theory Appl. (VISAPP)*, pp. 87-98, 2021.

R. S. Evangelista and L. A. F. Fernandes. “The recipe for some invariant numbers and for a new projective invariant feature descriptor.” In: *Proc. Int. Joint Conf. Comput. Vis., Imaging and Comput. Graph. Theory Appl. (VISAPP)*, pp. 181-188, 2020.

J. L. Huillca and L. A. F. Fernandes. “Computing vessel velocity from single perspective projection images.” In: *Proc. IEEE Int. Conf. Image Process. (ICIP)*, pp. 325-329, 2019.

S. Herold-Garcia and L. A. F. Fernandes. “New methods for morphological erythrocytes classification.” In: *Proc. Annual Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 4068-4071, 2019.

V. N. Lourenço, G. G. Silva and L. A. F. Fernandes. “Hierarchy-of-Visual-Words: a learning-based approach for trademark image retrieval.” In: *Proc. SIBGRAPI Conf. Graph., Patterns and Images*, pp. 218-225, 2019.

A. B. Mantuan and L. A. F. Fernandes. “Spatial contextualization for closed itemset mining.” In: *Proc. IEEE Int. Conf. Data Min. (ICDM)*, pp. 1176-1181, 2018.

G. M. Netto and L. A. F. Fernandes. “Water surface reconstruction and truly random numbers generation from images of wind-generated gravity waves.” In: *Proc. IEEE Int. Conf. Image Process. (ICIP)*, pp. 2816-2820, 2017.

A. A. Araujo, J. C. Sampaio, R. S. Evangelista, A. B. Mantuan and L. A. F. Fernandes. “Accurate location of façades of interest in street view panoramic sequences.” In: *Proc. SIBGRAPI Conf. Graph., Patterns and Images*, pp. 281-288, 2015.

Patent Application

Portable Analysis System / Sistema Portátil de Análise (in Portuguese)
US 2023 0170060 A1 | USPTO - United States Patent and Trademark Office | June 1, 2023
BR 10 2021 023976-0 A2 | INPI - Instituto Nacional de Propriedade Intelectual | June 13, 2023

Methods for Measuring Oil Dispersion Capacity on Water Surface / Método para Medição da Capacidade de Dispersão de Óleos em Superfície D'Água (in Portuguese)
US 2025 0173887 A1 | USPTO - United States Patent and Trademark Office | May 29, 2025
BR 10 2023 017295-4 A2 | INPI - Instituto Nacional de Propriedade Intelectual | March 11, 2025

System and Method for Calculating the Percentage of Surface Area from Image Processing / Sistema e Método para Cálculo do Percentual de Área de Superfícies a Partir do Processamento de Imagens (in Portuguese)
US 2025 0336079 A1 | USPTO - United States Patent and Trademark Office | October 30, 2025
BR 10 2024 008194-3 A2 | INPI - Instituto Nacional de Propriedade Intelectual | October 28, 2025

Distinctions and Awards

2025 ANP Award for Technological Innovation (Prêmio ANP de Inovação Tecnológica 2025, in Portuguese)
From the National Agency of Petroleum, Natural Gas, and Biofuels (Brazil)

Petrobras Inventor Award 2025 (Prêmio Inventor Petrobras 2025, in Portuguese)
From Petróleo Brasileiro S.A.

2025 Provincial CITMA Award (Premio CITMA Provincial 2025, in Spanish)
From Ministerio de Ciencia, Tecnología y Medio Ambiente en Matanzas (Cuba)

Honorable Mention in the SBBD Demos 2024
The 2024 Brazilian Symposium on Databases (SBBD)
Rodrigo Piva, Matheus A. Cruz, Paola Braga, Rodrigo Dias, Paulo Siqueira, Willian A. Trevizan, Candida M. de Jesus, André M. Souza, Rodrigo Salvador, Leandro A. F. Fernandes, Flavia C. Bernardini, Elaine P. M. de Sousa, Daniel de Oliveira, and Marcos Bedo

Exploration and Production Efficiency and Innovation Award 2024 (Prêmio Eficiência e Inovação do P&E 2024, in Portuguese)
From Petróleo Brasileiro S.A.

Petrobras Inventor Award 2024 (Prêmio Inventor Petrobras 2024, in Portuguese)
From Petróleo Brasileiro S.A.

Petrobras Inventor Award 2022 (Prêmio Inventor Petrobras 2022, in Portuguese)
From Petróleo Brasileiro S.A.

CNPq Research Productivity Fellowship
National Council for Scientific and Technological Development (CNPq)
2015/2018 (Level 2), 2018/2021 (Level 2), 2025/Current (Level C)

FAPERJ Young Scientist of Our State Fellowship
Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ)
2015/2018, 2018/2021

Best Paper on Pattern Recognition and Related Fields
2021 SIBGRAPI – Conference on Graphics, Patterns and Images
Eduardo Vera Sousa, Leandro A. F. Fernandes, and Cristina Nader Vasconcelos

Winner of the Elon Lages Lima Award
The 2020 edition of the award was established jointly by the Brazilian Mathematical Society (SBM) and the Brazilian Society for Applied and Computational Mathematics (SBMAC) for Brazilian bibliographic production in Mathematics and Applications
Book “Álgebra Geométrica e Aplicações” (in Portuguese, about geometric algebra)
Leandro A. F. Fernandes, Carlile Lavor, and Manuel M. Oliveira

LARA – Latin America Research Award, Ph.D. Level
2020 Google Research Awards in Latin America Program
Yanexis Pupo-Toledo (Ph.D. Student) and Leandro A. F. Fernandes (Advisor)

Best Computer Vision/Image Processing/Pattern Recognition Main Track Paper Award
2019 SIBGRAPI – Conference on Graphics, Patterns and Images
Vítor N. Lourenço, Gabriela G. Silva, and Leandro A. F. Fernandes

Best Work Award in the Workshop of Undergraduate Works
2019 SIBGRAPI – Conference on Graphics, Patterns and Images
Vítor N. Lourenço, Gabriela G. Silva, and Leandro A. F. Fernandes (advisor)

Honorable Mention in the Waldyr Rodrigues Jr. Best Poster Award
The 2018 Conference on Applied Geometric Algebras in Computer Science and Engineering (AGACSE)
Marcelo Santos Carielo and Leandro A. F. Fernandes

Best Computer Graphics/Visualization M.Sc. Dissertation Award
2017 SIBGRAPI – Conference on Graphics, Patterns and Images
Eduardo Vera Sousa, Luiz Velho (co-advisor), and Leandro A. F. Fernandes (advisor)

Best Technological Innovation Ph.D. Thesis Award
2014 SBGames – Brazilian Symposium on Computer Games and Digital Entertainment
André Luiz Brandão, Esteban Clua (advisor), Leandro A. F. Fernandes (co-advisor)

Best Image Processing Ph.D. Thesis Award
2011 SIBGRAPI – Conference on Graphics, Patterns and Images
Leandro A. F. Fernandes and Manuel M. Oliveira (advisor)

Third place in the 2011 Brazilian Computer Society's Ph.D. Theses Contest
2011 Congresso da Sociedade Brasileira de Computação (CSBC)
Leandro A. F. Fernandes and Manuel M. Oliveira (advisor)

Best Paper Award
2008 Symposium on Virtual and Augmented Reality (SVR)
Vitor F. Pamplona, Leandro A. F. Fernandes, João Prauchner, Luciana P. Nedel, and Manuel M. Oliveira

First Place in the 2007 Brazilian Computer Society's Master's Theses Contest
2007 Congresso da Sociedade Brasileira de Computação (CSBC)
Leandro A. F. Fernandes and Manuel M. Oliveira (advisor)

Professional Services

Member of the International Commission

Division 8 Member for NC-BR at the International Commission on Illumination (CIE) since 2023.

Member of Technical Committee

Member of the CIE (International Commission on Illumination) Technical Committee TC1-89 “Enhancement of Images for Colour Defective Observers” from 2012 to 2020.

Edited Journal Special Issues

Co-guest editor of the Special Section on SIBGRAPI 2022 Tutorials at the Computers & Graphics (CAG).

Co-guest editor of the Special Section on SIBGRAPI 2016 at the Computers & Graphics (CAG).

Co-guest editor of the Special Issue on IWSSIP 2020 at the International Journal of Innovative Computing and Applications (IJICA).

Guest editor of the Special Issue “Vision Sensors: Image Processing Technologies and Applications” at Sensors.

Management of Scientific Events

Tutorial co-chair of the 2021 and 2022 Conference on Graphics, Patterns and Images (SIBGRAPI).

Co-organizer of mini symposiums about geometric algebra at the 2019 and 2021 Congresso Nacional de Matemática Aplicada e Computacional (CNMAC).

General co-chair and program co-chair of the 2020 International Conference on Systems, Signals and Image Processing (IWSSIP).

Program co-chair of the 2018 Conference on Applied Geometric Algebras in Computer Science and Engineering (AGACSE).

General co-chair of the 2017 Conference on Graphics, Patterns and Images (SIBGRAPI).

Program co-chair of the 2016 Conference on Graphics, Patterns and Images (SIBGRAPI).

Edited Conference Proceedings

Co-editor of the Proceedings of the 2020 International Conference on Systems, Signals and Image Processing (IWSSIP).

Referee Service for Journals

Acted as a referee for IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Image Processing, IEEE Transactions on Neural Networks and Learning Systems, Pattern Recognition, Pattern Recognition Letters, Machine Vision and Applications, and Computers & Graphics, among others.

Research Collaborators

Carlile Campos Lavor (UNICAMP, Brazil)
Cristina Nader Vasconcelos (Google Brain, Canada; UFF, Brazil)
Luis Martí Orosa (INRIA, Chile)
Luiz Velho (IMPA, Brazil)
Manuel Menezes de Oliveira Neto (UFRGS, Brazil)