Rodolfo G. **Lotte, PhD**

Remote Sensing, Computer Vision, Machine Learning, Pattern Recognition

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"Have no fear of perfection. You will never reach it." –Salvador Dali

Skills

Programming	Java, Python, C, C++, MATLAB, R, LaTeX
Cloud computing	AWS SageMaker, AWS Certified Solution Architect (SAA-C02 - on going), AWS Certified Machine Learning (MLS-C01 - on going)
Agile development	Scrum, Design Patterns, SOLID
Web	Frameworks: AngularJS, VueJS, React, Django, Flask, Bootstrap / Languages: JSF, HTML5, CCS3, Javascript
Database	PostgreSQL, PostGIS, MySQL, MongoDB
Graphical design	Adobe Photoshop, Adobe Edge, Adobe Illustrator, Adobe InDesign, Blender 3D
Remote Sensing and GIS	ArcGIS, QGIS, GDAL, OTB, LAStools, CGAL, PCL, IGL, PhotoScan, COLMAP, VisualSfM, CloudCompare, MeshLab, Surfer, IDL-ENVI, eCognition
Languages	English, Spanish, Italian, German

Education

National Institute for Space Research (INPE)

SJC, São Paulo, Brazil

PhD in Remote Sensing

Mar. 2014 - Aug. 2018

- Topic: 3-dimensional (3D) urban mapping: A study of detection and reconstruction of building's facade through Structure-from-Motion (SfM) and Convolutional Neural Network (CNN)
- Advisor: Prof. Dr. Luiz Eduardo Oliveira e Cruz de Aragão, INPE
- Advisor: Prof. Dr. Yosio Edemir Shimabukuro, INPE

Institute für Photogrammetrie (IfP)

Stuttgart, Germany

PhD extension

Jul. 2017 - Jan. 2018

- Topic: 3-dimensional (3D) urban mapping: A study of detection and reconstruction of building's facade through Structure-from-Motion (SfM) and Convolutional Neural Network (CNN)
- Advisor: Prof. Dr.-Ing. Norbert Haala, University of Stuttgart, Germany

National Institute for Space Research (INPE)

SJC, São Paulo, Brazil

MSc. in Computer Science and Engineering

Mar. 2010 - Dec. 2012

- Topic: Road extraction in airborne SAR images: An Active Countour Model approach using semiautomatic seeding
- Advisor: Prof. Dra. Cláudia Maria de Almeida, INPE
- Advisor: Prof. Dr. Sidnei João Siqueira Sant'Anna, INPE

University of Franca (UNIFRAN)

Franca, São Paulo, Brazil

B.S. in System Analysis

Mar. 2006 - Dec. 2009

- Topic: Conexionist knowledge in a image searcher system
- Advisor: Prof. Dr. Antônio Fernando Traina, UNIFRAN

Experience

Santiago & Cintra Consultoria, SCCON

São Paulo, Brazil

Computer Vision and Remote Sensing specialist

Dec. 2020 - present date

Tasks involve the elaboration of methodologies to deal with very high resolution images for multiple purposes, such as the public security, monitoring, inspection and assistance to federal institutions to combat deforestation, among others.

- **Remote sensing applications**: Data manager, autonomous image selection, autonomous image enhancement, amoung operations of land-use classification, monitoring and urban cadastre.

Bioverse Labs

São Paulo, Brazil

Machine Learning and Remote Sensing Lead

Jul. 2020 - present date

Through the use of very high resolution images, automatically identify specific tree species. The detection technique will be composed by a set of image processing operators, mainly by Machine Learning techniques, which will allow to explore the spectral, spatial and contextual properties of this species in a broad and emerging way. In addition, it is expected that the methodology has reasonable robustness and accuracy for any future modifications, experiments or replications

- **Bioverse deep-learning module**: incorporate essential procedures to train and predict over satellite images, mainly to detect and classify multiple tree species.
- **Bioverse image-processing module**: incorporate essential procedures to prepare remote sensing images mostly for automatic classification methods, in this case specifically, deep-learning approaches.

Amazon deforestation monitoring program, PRODES-AMZ

INPE, SJC, São Paulo, Brazil

Senior developement - autonomous process in Remote Sensing

Jan. 2020 - Dec. 2020

Development, research activities involving the monitoring of Amazon forest by remote sensing analysis and data.

- **Deep Learning**: by the use of aerial/orbital images, use wide used frameworks in DL (essentially tensorflow and keras), to implement procedures to classify recent deforestation areas.
- **Cloud development - AWS**: implementations of scripts in python for ec2, which makes use of remote sensing data from the own aws repositories. The tasks here also refers to the development of autonomous process on image classification, the proper use of s3 buckets, ec2, and resources.

Geopixel Soluções em Geotecnologias e TI

Parque Tecnológico, SJC, São Paulo, Brazil

Technical Lead in Remote Sensing

Jun. 2019 - Dec. 2019

Assistance, research and management of activities involving remote sensing geoprocessing and facilities to the land-use aerial monitoring.

- **ITCG, Mapping**: This was a mapping project, executed by a team of 10 members, all geoprocessing analysts, where the whole state of Paraná (approximately 199,315 km^2) was mapped in 13 classes of land use and coverage. Personally, my tasks in this project involves project management, guiding and support on GIS and Remote Sensing operations.
- **COPENER, Mapping**: This was a mapping project, executed by a team of 8 members, all geoprocessing analysts, where 22 classes were mapped. Personally, my tasks in this project involves project management, guiding and support on GIS and Remote Sensing operations.
- **L'Oreal, Mapping**: This was a mapping project, executed by a team of 10 members, all geoprocessing analysts, where 13 classes were mapped, but the interest was to map forests of Carnaúba, a special tree responsible to produce a particular ingredient, the Carnaúba wax. Personally, my tasks in this project involves project management, guiding and support on GIS and Remote Sensing operations.

Brazilian Space Weather Monitor Program, EMBRACE

INPE, SJC, São Paulo, Brazil

System Analyst – Datainfo & Astrophysics Research

Abr. 2018 - Jun. 2019

Solutions mostly in Java, full-stack resolution in MVC development, using technologies to receive raw data, store it in databases (PostgreSQL), queue files to be processed on demand and in line (RabbitMQ), share the results of any processing via JSF, Primefaces, JPA, Highcharts, etc.

- **Total Electron Content, TEC**: Brazilian space weather application which aims the estimative of ionosphere density throw GNSSs signals. Improvements has been made in the current TEC application available in <TEC-1>. This current development is an extension of the same TEC already published, with an series of fixed issues and better estimatives.
- **Interplenatary Medium, Solar Wind**: Monitoring the physical parameters of the solar plasma and estimate the possible effects that changes in the space weather condition <Read More>.

Brazilian Space Weather Monitor Program, EMBRACE

INPE, SJC, São Paulo, Brazil

System Analyst – Indra Company & Astrophysics Research

Apr. 2015 - Jul. 2017

Solutions mostly in Java, full-stack resolution in MVC development, using technologies to receive raw data, store it in databases (PostgreSQL), queue files to be processed on demand and in line (RabbitMQ), share the results of any processing via JSF, Primefaces, JPA, Highcharts, etc.

- **Interplenatary Medium, Solar Wind**: Monitoring the physical parameters of the solar plasma and estimate the possible effects that changes in the space weather condition <Read More>.
- **Total Eletronic Content Improved, TEC**: Brazilian space weather application which aims the estimative of ionosphere density throw GNSSs signals. Improvements has been made in order to get more accurate estimatives of TEC.
- **Total Solar Irradiance, TSI**: Brazilian space weather application which aims the daily solar activities. The TSI application uses Neural Nets and Image Process techniquies to estimate and predict physical solar values <Read More>.
- **User Space Weather Workshop, Portal**: Website for Space Weather User Workshop <Read More>.
- **Space Weather Monitor, SWMonitorUser**: Brazilian public portal for downloading data related to space weather, such as magnetometers, ionograms, gnss, and many other monitoring products <Read More>.
- **EMBRACE Mobile**: Development of EMBRACE applications for mobile devices, which now allow the users to be notify with alerts and the current space weather condiction. The app is free for download at Google play.

Tools for Open Multi-risk assessment using Earth Observation data, TOLOMEO

Università degli studi di Pavia, Pavia, Italy

Affiliate Researcher in Remote Sensing

Jul. 2013 - Jan. 2014

- **BREC Road Extractor Operator**: Development of roads network extractor in radar images, using C++ language within InterIMAGE plataform (PUC/Rio)
- **BREC Road Cross Detection**: Development filters of polygons to detect intesection or cross paths of roads, using C++ language within InterIMAGE plataform (PUC/Rio)

Tools for Open Multi-risk assessment using Earth Observation data, TOLOMEO

Leibniz Universität Hannover, Hannover, Germany

Affiliate Researcher in Remote Sensing

Jan. 2013 - Jul. 2013

- **Network Snakes**: Study of a methodology to extract road centerlines based in a non-parametric algorithm called Active Contour Models or Snakes

Brazilian Space Weather Monitor Program, EMBRACE

INPE, SJC, São Paulo, Brazil

System Analyst – CTIS Tecnlogia S.A. & Astrophysics Research

Jan. 2011 - Dec. 2012

Solutions mostly in Java, full-stack resolution in MVC development, using technologies to receive raw data, store it in databases (PostgreSQL), queue files to be processed on demand and in line (RabbitMQ), share the results of any processing via JSF, Primefaces, JPA, Highcharts, etc.

- **Total Electron Content, TEC**: Development team member of the TEC application, which consisted a work since the acquisition of raw data in the EMBRACE servers until the visualized component, so called TECMap. The TECMap shows the overview of the ionospheric layer from South America GNSS network data. <Read More>
- **Ionosphere**: Development team member of the Ionograms application, which shows the profile of the ionosphere from data collected from numerous ionosondes spread all over brazilian territory. <Read More>
- **Scintilation**: Development team member of the Scintilation application, which, as well as the application of TEC, graphically shows the ionospheric scintillation by calculating the S4 component. The ionospheric scintillation is also performed by data from South America GNSS network. <Read More>
- **Magnetosphere**: Development team member of the Magnetosphere application, that through data from magnetometers installed in Brazil, aims to monitor the behavior of the Earth's magnetosphere (geomagnetic components H, D, Z). <Read More>
- **High solar frequency, Callisto**: Development team member of the high frequency solar (Callisto) application, which through data from Callisto antenna, aims to monitor specific frequencies sun for identification of significant solar activity. <Read More>

Extracurricular Activity

Pattern Recognition and Computer Vision (Lecture)

Stuttgart, Germany

Stuttgart Universität

Oct. 2017

FF-225 Laser I - Princípios Físicos (Lecture) *SJC, São Paulo, Brazil*

Instituto Tecnológico de Aeronáutica, ITA *Ago. 2014*

Principles in ERDAS IMAGINE I and II *SJC, São Paulo, Brazil*

Santiago e Cintra Geo-Tecnologias *Oct. 2014*

Processing of laser scanner data (LiDAR) *Lages, Santa Catarina, Brazil*

Universidade do Estado de Santa Catarina, UDESC *Jul. 2011*

Rich Internet Applications using Adobe Flex + .Net *Franca, São Paulo, Brazil*

University of Franca, UNIFRAN *Mar. 2009*

Publications

Periodics *2021*

Publications

- Ferreira, Matheus Pinheiro F.; **Lotte, Rodolfo G.**; D'Elia, Francisco V.; Stamatopoulos, Christos; Kim, Do-Hyung; Ribeir, Maria B. N.; Benjamind, Adam R. Accurate mapping of Brazil nut trees (Bertholletia excelsa) in Amazonian forests using WorldView-3 satellite images and convolutional neural networks. Ecological Informatics. v. 63. p. 101302. 2021.

Congress and Periodics *2019*

Publications

- Wagner, Fabien H.; Sanchez, Alber; Tarabalka, Yuliya; **Lotte, R. G.**; Ferreira, Matheus P.; Aidar, Marcos PM; Gloor, Emanuel; Phillips, Oliver L; Aragao, Luiz EOC. Using the U-net convolutional network to map forest types and disturbance in the Atlantic rainforest with very high resolution images. Remote Sensing in Ecology and Conservation 5.4. 360-375. 2019.
- **Lotte, R.G.**; Aragão, L. E. O. C.; Shimabukuro, Y. E. Toward smart cities through autonomous detection and reconstruction: the brazilian panorama on the 3D mapping. XIX Simpósio Brasileiro de Sensoriamento Remoto. Santos, São Paulo, Brazil. 2019.

Congress and Periodics *2018*

Publications

- Romero-Hernandez, E., Denardini, C. M., Takahashi, H., Gonzalez⊠Esparza, J. A., Nogueira, P. A. B., de Padua, M. B., **Lotte, R. G.**, Negreti, P. M. S., Jonah, O. F., Resende, L. C. A., Rodriguez-Martinez, M., Sergeeva, M. A., Barbosa Neto, P. F., De La Luz, V., Monico, J. F. G., Aguilar-Rodriguez, E. Daytime ionospheric TEC weather study over Latin America. Journal of Geophysical Research: Space Physics.
- **Lotte, R.G.**; Haala, N.; Karpina, M.; Aragão, L.; Shimabukuro, Y. 3D Façade Labeling over Complex Scenarios: A Case Study Using Convolutional Neural Network and Structure-From-Motion. DOI: `https://doi.org/10.3390/rs10091435`. Special Issue in Deep Learning for Remote Sensing. Remote Sensing, 10(9), 1435. 2018

Congress and Symposium *2017*

Publications

- **Lotte, R.G.**; Almeida, C.M.; Mitishita, E. A. Uma rotina metodológica para reconstrução 3D e extração de parâmetros geométricos de edificações em baixo nível de detalhamento a partir de dado LiDAR aerotransportado. Anais XVIII Simpósio Brasileiro de Sensoriamento Remoto - SBSR, Santos-SP, Brasil, 29 a 30 de maio de 2017
- **Lotte, R.G.**; Almeida, C.M. Uma breve revisão sobre metodologias para a reconstrução 3D de ambientes urbanos pelo uso de nuvem de pontos. Anais XVIII Simpósio Brasileiro de Sensoriamento Remoto - SBSR, Santos-SP, Brasil, 29 a 30 de maio de 2017

Congress and Symposium *2015*

Publications

- **Lotte, R.G.**; Almeida, C.M.; Valeriano, M. M. Aquisição do índice TWI para avaliação de suscetibilidade a movimentos de massa na região de São Sebastião-SP. Anais XVII Simpósio Brasileiro de Sensoriamento Remoto - SBSR, João Pessoa-PB, Brasil, 25 a 29 de abril de 2015
- Siani, S. M. O., Campos, J., França, D. G. M., **Lotte, R.G.**, Amaral, S., Monteiro, A. M. V., Körting, T. S. Land-cover classification of an intra-urban environment using high-resolution images and geographic object-based image analysis: the case of APA Mananciais do Rio Paraíba do Sul. Anais XVII Simpósio Brasileiro de Sensoriamento Remoto - SBSR, João Pessoa-PB, Brasil, 25 a 29 de abril de 2015
- Franca, D. G., **Lotte, R.G.**, de Almeida, C. M., Siani, S. M., Korting, T. S., Fonseca, L. G., da Silva, L. T. (2015, March). Object-based image analysis for urban land cover classification in the city of Campinas-SP, Brazil. InUrban Remote Sensing Event (JURSE), 2015 Joint (pp. 1-4). IEEE

Congress and Symposium *2013*

Publications

- **Lotte, R.G.**; Sant'Anna, S.J.S.; Almeida, C.M. Roads centre-axis extraction in airborne SAR images: An approach based on Active Contour Model with the use of semi-automatic seeding. International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XL-1/W1. 207-212. doi:10.5194/isprsarchives-XL-1-W1-207-2013
- Sant'Anna, N.; De Nardin, C.; Takahashi, H.; Costa, J. E. R.; Batista, I. S.; Ivo, A. S.; Gomes, V. C.; **Lotte, R.G.**; Pereira, F. O.; Salgueiro, M. P. IT Capabilities of Brazilian Space Weather Program. IX European Space Weather Week – ESWW'9. Brussels, Belgium. 5-9 November, 2012
- **Lotte, R.G.**; Almeida, C.M.; Silva, J.D.S. Identification of seed points for road extraction in airborne SAR images: a self-organizing maps-based approach. Proceedings of the X Brazilian Congress on Computational Intelligence – CBIC'2011. Fortaleza, CE: Federal University of Ceara – UFCE, 2011
- **Lotte, R.G.**; Almeida, C.M.; Sant'Anna, S.J.S.; Freitas, C.C.; Silva, J.D.S. Rural roads detection in airborne SAR images using a SOM unsupervised neural network. Proceedings of the XI Graduate Programme Workshop on Applied Computer Sciences of INPE – XI WORCAP. São José dos Campos, SP: INPE, 2011

Congress and Symposium *2012*

Publications

- Sant'Anna, N.; De Nardin, C.; Takahashi, H.; Costa, J. E. R.; Batista, I. S.; Ivo, A. S.; Gomes, V. C.; **Lotte, R.G.**; Pereira, F. O.; Salgueiro, M. P. IT Capabilities of Brazilian Space Weather Program. IX European Space Weather Week – ESWW'9. Brussels, Belgium. 5-9 November, 2012

Congress and Symposium *2011*

Publications

- **Lotte, R.G.**; Almeida, C.M.; Silva, J.D.S. Identification of seed points for road extraction in airborne SAR images: a self-organizing maps-based approach. Proceedings of the X Brazilian Congress on Computational Intelligence – CBIC'2011. Fortaleza, CE: Federal University of Ceara – UFCE, 2011
- **Lotte, R.G.**; Almeida, C.M.; Sant'Anna, S.J.S.; Freitas, C.C.; Silva, J.D.S. Rural roads detection in airborne SAR images using a SOM unsupervised neural network. Proceedings of the XI Graduate Programme Workshop on Applied Computer Sciences of INPE – XI WORCAP. São José dos Campos, SP: INPE, 2011