

Dr. Nicola Falco | Curriculum Vitae

Lawrence Berkeley National Laboratory - Climate & Ecosystem Sciences Division

1 Cyclotron Road, MS 74R-316C, Berkeley, CA 94720, USA

☎ +1 (510) 486-4703 • ✉ nicolafalco@lbl.gov • 🌐 [Personal web page](#)

Research Interests

My research interests focus on remote sensing image analysis and processing with applications in environmental monitoring and climate change. My work concentrates on the development of methodologies for data analysis, information extraction, change detection and image classification in optical and hyperspectral imagery. Following a strictly interdisciplinary approach, I'm employing knowledge from a wide spectrum of disciplines, such as image and signal processing, mathematical morphology, pattern recognition and machine learning.

Education Background

Doctor of Philosophy (Ph.D.), Joint Degree **02/2015**

Affiliation: University of Trento and University of Iceland *Trento, Italy and Reykjavik, Iceland*

Field: Information and Communication Technology (University of Trento), Electrical and Computer Engineering (University of Iceland).

Thesis Title: Advanced spectral and spatial techniques for hyperspectral image analysis and classification.

Thesis Advisers: Prof. Lorenzo Bruzzone and Prof. Jon Atli Benediktsson.

Master's Degree (M.Sc.) **03/2011**

Affiliation: University of Trento *Trento, Italy*

Field: Telecommunication Engineering.

Thesis Title: A novel technique based on morphological attribute profiles for change detection in multi-temporal very high resolution images.

Advisers: Prof. Lorenzo Bruzzone and Prof. Jon Atli Benediktsson.

Visiting Scholar **01/2010–06/2010**

Affiliation: University of Iceland *Reykjavik, Iceland*

Development of the Master's Thesis at the University of Iceland.

Bachelor's Degree (B.Sc.) **11/2007**

Affiliation: University of Trento *Trento, Italy*

Field: Telecommunication Engineering.

Thesis Title: A multi-level technique for change detection on multi-temporal very high resolution images of province of Trento.

Adviser: Prof. Lorenzo Bruzzone.

Professional Experience

Postdoctoral Fellow (current position)

10/2016–Present

Affiliation: Lawrence Berkeley National Laboratory

Berkeley (CA), United States

Department/Division: Climate & Ecosystem Sciences Division.

Adviser: Dr. Haruko Murakami Wainwright.

Postdoctoral Researcher

03/2015–09/2016

Affiliation: University of Iceland

Reykjavik, Iceland

Department/Division: Faculty of Electrical and Computer Engineering.

Adviser: Prof. Jon Atli Benediktsson.

Ph.D. Student Researcher

11/2011–02/2015

Affiliation: University of Iceland and University of Trento

Trento, Italy and Reykjavik, Iceland

Department/Division:

- Information Engineering and Computer Science (Italy),
- Faculty Electrical and Computer Engineering (Iceland).

Advisers: Prof. Lorenzo Bruzzone and Prof. Jon Atli Benediktsson.

Research Assistant

04/2011–10/2011

Affiliation: University of Iceland

Reykjavik, Iceland

Department/Division: Faculty Electrical and Computer Engineering.

Advisers: Prof. Jon Atli Benediktsson and Prof. Prashanth R. Marpu.

Research Activity - Projects

10/2016–Present: *"Watershed Function SFA"* project at LBNL, founded by U.S. Department of Energy.

03/2015–Present: *"Environmental Mapping and Monitoring of Iceland by Remote Sensing (EMMIRS)"* project at the University of Iceland, funded by the Icelandic Research Fund (RANNIS, under grant agreement no. 152266-051).

10/2013–09/2016: *"Enabling Intelligent Copernicus Services for Carbon and Water Balance Modelling of Northern Forest Ecosystems (North State)"* project at the University of Iceland, funded by the European Union's Seventh Framework Programme (FP7/2007-2013, under grant agreement no. 606962).

04/2011–3/2014: *"Change detection methods in optical remote sensing"* project at the University of Iceland, funded by the Icelandic Research Fund (RANNIS, under grant agreement no. 110043021).

Research Funds, Grants and Scholarships

2015–2018: Project *"Environmental Mapping and Monitoring of Iceland by Remote Sensing (EMMIRS)"*, Icelandic Research Fund (RANNIS), grant of excellence ID 1547154207, ISK 38.8M / USD 342K.
Role: co-author, team coordinator, researcher.

2013–2016: Project *"Enabling Intelligent Copernicus Services for Carbon and Water Balance Modelling of Northern Forest Ecosystems (North State)"*, FP7-SPACE-2013-1 ID 606962, EUR 2M / USD 2.08M.
Role: co-author, team coordinator, researcher.

2014: Travel grant, IGARSS 2014, USD 800.

2013: Travel grant, SPIE 2013, EUR250 / USD 280.

2013: Travel grant, University of Iceland, ISK 75K / USD 600.

2011: Doctoral research grant, University of Trento and University of Iceland (3 years), EUR 36.6K / USD 41K.

2010: Erasmus mundus scholarship for visiting scholars (6 months).

Awards

2015: Third prize in the Student Paper Competition of the 2015 IEEE International Geoscience and Remote Sensing Symposium (Milan, July 2015) with the paper "*Automatic Morphological Attribute Profiles*", G. Cavallaro (student), M. Dalla Mura, N. Falco, J. A. Benediktsson.

2013: Recipient of the recognition of IEEE Geoscience Remote Sensing Letters Best Reviewer.

Academic Activities

Reviewer (Journals).....

Proceedings of the IEEE.

IEEE Transaction on Geoscience and Remote Sensing.

IEEE Journal of Selected Topic in Applied Earth Observations and Remote Sensing.

IEEE Geoscience and Remote Sensing Letters.

IEEE Transaction on Cybernetics.

(Elsevier) International Journal of Applied Earth Observation and Geoinformation.

(Elsevier) Pattern Recognition Letters.

(Taylor & Francis) GIScience Remote Sensing.

(Taylor & Francis) International Journal of Remote Sensing.

(Taylor & Francis) International Journal of Remote Sensing Letters.

Professional Memberships

Since 2016: American Geophysical Union (AGU).

Since 2014: IEEE Signal Processing Society.

Since 2012: Center of Remote Sensing at University of Iceland.

Since 2011: The Institute of Electrical and Electronics Engineers, Inc. (IEEE).

Since 2011: IEEE Geoscience and Remote Sensing Society.

Since 2011: IEEE Computer Society.

Computer and Programming Skills

Programming Languages.....

- MATLAB, expert with more than 10 years of experience. Mainly used for developing algorithms and tools in image/signal processing, mathematical morphology, image classification and multi-temporal analysis.
- C++, intermediate. Mainly used for developing algorithms in image processing and change detection.
- PYTHON, academic level. Mainly used for implementing distributed systems architectures.

Software.....

- ENVI/IDL: expert with more than 10 years of experience. Mainly used for image pre-processing, image co-registration, ground truth mapping and visualization.
- ArcGIS, QGIS: beginner. Mainly used for vector data analysis.

- eCognition: beginner. Exploited for hierarchical segmentation.

Other Languages.....

L^AT_EX(expert), HTML 4 (expert), CSS (expert).

Language Skills

Italian: Native speaker.

English: Fluent.

Greek: Basic communication skills (speaking, reading, writing).

Personal Information

Nationality: Italian

Gender: Male

Public accounts: [LBNL](#), [LinkedIn](#), [Google Scholar](#), [ResearchID](#), [ResearchGate](#).

Interests and hobbies: Guitar player, Chess, Travelling, Climbing, Photography.

December 23, 2016, Berkeley.

Nicola Falco



Publications

Book Chapters.....

1. J. A. Benediktsson, G. Cavallaro, **N. Falco**, I. Hedhli, V. A. Krylov, G. Moser, S. B. Serpico, and J. Zerubia, (2017). "**Remote sensing data fusion: Markov models and Mathematical Morphology for multisensor, multiresolution, and multiscale image classification**", *Springer-Verlag London Limited*, (in prep).

Peer-reviewed International Journals.....

2. G. Cavallaro, **N. Falco**, M. Dalla Mura and J. A. Benediktsson, (2017). "**Automatic Attribute Profiles**", *IEEE Transactions on Image Processing*, vol, issue, pp., (in revision).
3. J. Xia, **N. Falco**, J. A. Benediktsson, P. Du, and J. Chanussot, (2017). "**Hyperspectral Image Classification with Rotation Random Forest via KPCA**", *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol, issue, pp., (in press).
4. **N. Falco**, P. R. Marpu, and J. A. Benediktsson, (2016). "**A Toolbox for Unsupervised Change Detection Analysis**", *International Journal of Remote Sensing*, vol .37, no. 7, pp. 1505-1526, March. DOI:10.1080/01431161.2016.1154226.
5. J. Xia, **N. Falco**, J. A. Benediktsson, P. Du, and J. Chanussot, (2016). "**Class-Separation-Based Rotation Forest for Hyperspectral Image Classification**", *IEEE Geoscience and Remote Sensing Letters*, vol 13, issue 4, pp. 585-588, April. DOI:10.1109/LGRS.2016.2528043.
6. **N. Falco**, J. A. Benediktsson, and L. Bruzzone, (2015). "**Spectral and Spatial Classification of Hyperspectral Images Based on ICA and Reduced Morphological Attribute Profiles**", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 53, no. 12, pp. 6223-6240, Nov. DOI: 10.1109/TGRS.2015.2436335.
7. **N. Falco**, J. A. Benediktsson, and L. Bruzzone, (2014). "**A Study on the Effectiveness of Different Independent Component Analysis Algorithms for Hyperspectral Image Classification**", *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 7, no. 6, pp. 2183-2199, June. DOI: 10.1109/JSTARS.2014.2329792.
8. **N. Falco**, M. Dalla Mura, F. Bovolo, J. A. Benediktsson, and L. Bruzzone, (2013). "**Change Detection in VHR Images Based on Morphological Attribute Profiles**", *IEEE Geoscience and Remote Sensing Letters*, vol. 10, no. 3, pp. 636-640, May. DOI: 10.1109/LGRS.2012.2222340.

International Conference Abstracts and Proceedings.....

9. **N. Falco**, G. Pedersen, O. K. Vilmundardóttir, J. M.-C. Belart, F. S. Sigurmundsson and J. A. Benediktsson, (2016). "**Unsupervised Change Detection for Geological and Ecological Monitoring via Remote Sensing: Application on a Volcanic Area**", *AGU Fall Meeting*, San Francisco, California. (Abstract)
10. **N. Falco**, G. Cavallaro, Prashanth R. Marpu and J. A. Benediktsson, (2016). "**Unsupervised Change Detection Analysis to Multi-channel Scenario Based on Morphological Contextual Analysis**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 3374-3377. DOI: 10.1109/IGARSS.2016.7729872.
11. G. Cavallaro, M. Dalla Mura, E. Carlinet, T. Géraud, **N. Falco** and J. A. Benediktsson, (2016). "**Region-Based Classification of Remote Sensing Images With The Morphological Tree of Shapes**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*,

pp. 5087-5090. DOI:10.1109/IGARSS.2016.7730326.

12. **N. Falco**, G. Cavallaro and J. A. Benediktsson, (2016). "**Supervised Classification Approach for Plant Functional Type Estimation Using Hyperspectral Remote Sensing Data**", *Living Planet Symposium - ESA*, Prague, Czech Republic. (Abstract)
13. T. Häme, T. Mutanen, S. Quegan, E. Kantzas, A. Mäkelä, F. Minunno, J. A. Benediktsson, **N. Falco**, K. Arnason, R. Storbvold, J. Haarpaintner, C. Davids, V. Elsakov, and J. Rasinmäki, (2016). "**North State - Improving Carbon Balance Modeling of Northern Forest Ecosystems through Copernicus Data**", *Living Planet Symposium - ESA*, Prague, 3Czech Republic. (Abstract)
14. G. B. M. Pedersen, O. K. Vilmundardóttir, **N. Falco**, F. S. Sigurmundsson, R. Rustowicz, J. M.-C. Belart, G. Gisladóttir, and J. A. Benediktsson, (2016). "**Environmental mapping and monitoring of Iceland by remote sensing (EMMIRS)**", *EGU General Assembly*, vol. 18, Vienna, Austria. (Abstract)
15. O. K. Vilmundardóttir, F. S. Sigurmundsson, G. B. M. Pedersen, **N. Falco**, R. Rustowicz, G. Gisladóttir, and J. A. Benediktsson, (2016). "**Habitat mapping using hyperspectral images in the vicinity of Hekla volcano in Iceland**", *EGU General Assembly*, vol. 18, Vienna, Austria. (Abstract)
16. G. Pedersen, J. M.-C. Belart, O. K. Vilmundardóttir, **N. Falco**, F. S. Sigurmundsson, R. Rustowicz, S. Tarquini, M. de M. Vitturi, G. Gisladóttir, and J. A. Benediktsson, (2016). "**The Landscape Evolution at Hekla Volcano, Iceland : Integrating Remote Sensing Data from the Past 70yr**", *EGU General Assembly*, vol. 18, Vienna, Austria. (Abstract)
17. G. Cavallaro, M. Dalla Mura, **N. Falco**, and J. A. Benediktsson, (2015), "**Automatic Morphological Attribute Profiles**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 2604 - 2607. DOI: 10.1109/IGARSS.2015.7326345.
18. P. Ghamisi, G. Cavallaro, J. A. Benediktsson, **N. Falco**, (2015). "**An Advance Classifier for the Joint Use of LiDAR and Hyperspectral Data: Case Study in Queensland, Australia**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 2354-2357, 2015. DOI: 10.1109/IGARSS.2015.7326281.
19. T. Häme, T. Mutanen, Y. Rauste, O. Antropov, M. Molinier, S. Quegan, E. Kantzas, A. Mäkelä, F. Minunno, J. A. Benediktsson, **N. Falco**, K. Arnason, R. Storbvold, J. Haarpaintner, V. Elsakov, and J. Rasinmäki, (2015). "**Enabling Intelligent Copernicus Services for Carbon and Water Balance Modeling of Boreal Forest Ecosystems-North State**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 2048-2051, 2015. DOI: 10.1109/IGARSS.2015.7326203.
20. G. Cavallaro, **N. Falco**, M. Dalla Mura, L. Bruzzone, and J. A. Benediktsson, (2015). "**Automatic Threshold Selection for Profiles of Attribute Filters Based on Granulometric Characteristic Functions**", in *Proceeding of 12th International Symposium on Mathematical Morphology (ISMM)*, pp. 169-181, 2015. DOI 10.1007/978-3-319-18720-4_15.
21. **N. Falco**, L. Bruzzone, and J. A. Benediktsson, (2014). "**An ICA Based Approach to Hyperspectral Image Feature Reduction**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 3470-3473. DOI: 10.1109/IGARSS.2014.6947229.
22. **N. Falco**, J. A. Benediktsson, and L. Bruzzone, (2013). "**Extraction of Spatial Features in Hyperspectral Images Based on the Analysis of Differential Attribute Profiles**", in *Proceeding SPIE 8892, Image and Signal Processing for Remote Sensing XIX*, vol. 8892, p. 88920O-88920O-9. DOI: 10.1117/12.2029199.

23. **N. Falco**, L. Bruzzone, and J. A. Benediktsson, (2013). "**A Comparative Study of Different ICA Algorithms for Hyperspectral Image Analysis**", in *Proceeding of 5th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*.
24. **N. Falco**, P. R. Marpu, and J. A. Benediktsson, (2012). "**Comparison of ITPCA and IRMAD for Automatic Change Detection Using Initial Change Mask**", in *Proceeding of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 6769-6772. DOI: 10.1109/IGARSS.2012.6352610.
25. **N. Falco**, M. Dalla Mura, F. Bovolo, J. A. Benediktsson, and L. Bruzzone, (2010). "**Study on the Capabilities of Morphological Attribute Profiles in Change Detection on VHR Images**", in *Proceeding SPIE 7830, Image and Signal Processing for Remote Sensing XVI*, vol. 7830, pp. 783016-783016-10. DOI: 10.1117/12.866178.

Theses.....

N. Falco, (2015). "**Advanced Spectral and Spatial Techniques for Hyperspectral Image Analysis and Classification**", *PhD dissertation*, Faculty of Electrical and Computer Engineering, University of Iceland & Department of Information Engineering and Computer Science, University of Trento, Trento, Italy, February.

N. Falco, (2011). "**A Novel Technique Based on Morphological Attribute Profiles for Change Detection in Multitemporal VHR Images**", *Master's thesis*, Department of Information Engineering and Computer Science, University of Trento, Trento, Italy, March.

N. Falco, (2007). "**A Multi-level Technique for Change Detection in Multi-temporal Very High Resolution Images of the Province of Trento**", *Bachelor's thesis*, Department of Information Engineering and Computer Science, University of Trento, Trento, Italy, November (in Italian).

Conference Presentations.....

12/2016: Oral presentation: "**Unsupervised Change Detection for Geological and Ecological Monitoring via Remote Sensing: Application on a Volcanic Area**", *AGU Fall Meeting*, San Francisco, California.

07/2016: Oral presentation: "**Unsupervised Change Detection Analysis to Multi-channel Scenario Based on Morphological Contextual Analysis**", *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Beijing, China.

05/2016: Poster presentation: "**Supervised Classification Approach for Plant Functional Type Estimation Using Hyperspectral Remote Sensing Data**", *Living Planet Symposium - ESA*, Prague, Czech Republic.

07/2015: Oral presentation: "**An Advance Classifier for the Joint Use of LiDAR and Hyperspectral Data: Case Study in Queensland, Australia**", *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Milan, Italy.

07/2014: Oral presentation: "**An ICA Based Approach to Hyperspectral Image Feature Reduction**", *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Quebec City, Canada.

09/2013: Oral presentation: "**Extraction of Spatial Features in Hyperspectral Images Based on the Analysis of Differential Attribute Profiles**", *SPIE 8892, Image and Signal Processing for Remote Sensing XIX*, Dresden, Germany.

06/2013: Poster presentation: "**A Comparative Study of Different ICA Algorithms for Hyperspectral Image Analysis**", *5th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*, Gainesville, USA.

07/2012: Oral presentation: "**Comparison of ITPCA and IRMAD for Automatic Change Detection Using Initial Change Mask**", *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Munich, Germany.