# Alessandro **Sebastianelli, Ph.D.**

## About me

Alessandro Sebastianelli received the degree (cum laude) in electronic engineering for automation and telecommunications from the University of Sannio where he also pursed the Ph.D. degree in Information Technologies for Engineering. His field of expertise covers remote sensing and satellite data analysis, artificial intelligence for earth observation and quantum computing. He coauthored a book and several articles to reputed journals and conferences for the sector of remote sensing. He received an IEEE award for one the best the thesis in geoscience and remote sensing. He has been firstly a visiting researcher and later a research fellow at ESA. He has won an ESA OSIP proposal in August 2020. He is leading the working group on quantum computing for EO in the QUEST IEEE GRSSS technical committee.

## Personal


Alessandro Sebastianelli
Nationality: Italian
YOB: 1995
Age: 29
click me


## Areas of specialization

Remote Sensing Applications, Artificial Intelligence and Quantum Machine Learning

## Interests

`Earth Observation`, `Artificial Intelligence`, `Machine Learning`, `Deep Learning`, `Quantum Technologies`, `Digital Technologies`, `Disruptive Innovation`

## Digital Skills

OS (Excellent), Programming (Excellent), Office suite (Excellent), CAD (limited), Internet (Excellent), Web-dev (limited), Multimedia (Excellent)

## Short Resumé

**10/2022-10/2025** — **Research Fellow in Quantum Computing for Earth Observation**
European Space Agency, Φ-lab · Frascati (IT)
Technical officer of QC4EO OSIP contracts. Technical officer of ITT on QC4EO and Blockchain4EO. TEB expert evaluator. Research activities about quantum computing, quantum machine learning and quantum technologies applied to Earth Observation and space sector, with a focus on operationability.

**08/2020-10/2022** — **ESA OSIP**
European Space Agency, Φ-lab · Frascati (IT)
Co-funded activity on AI powered cross-modal adaptation techniques applied to S1 & S2 data.

**09/2019-11/2019** — **Earth Observation Engineer**
Titan4 · Rome (IT)
Work activities on satellite data and application development, mainly for structural monitoring, based on Sentinel SAR and optical satellite data. Use and validation of a tool for the measurement of displacements. The start-up was incubated in ESA BIC Lazio.

**07/2019-11/2019** — **Visiting Researcher**
European Space Agency, Φ-lab · Frascati (IT)
Creation of large remotely sensed image datasets through the implementation of automatic tools for data retrieval, collection and management in python. Processing of Sentinel data with advanced analytics (e.g Machine Learning and Deep Learning.)

## Education

**12/2019-10/2022** — **Ph.D. in Information Technologies for Engineering**
3 years, graduated · Un. of Sannio
Satellite Remote Sensing through ML and Quantum Computing Techniques.

**09/2017-10/2019** — **Master in Electronics Engineering**
2 years, 110/110 cum laude · Un. of Sannio
SAR and Optical data fusion using AI. Generation of Sentinel-2 images from despeckled Sentinel-1 data.

**09/2014-10/2017** — **Bachelor in Electronics Engineering**
3 years, 102/110 · Un. of Sannio
Use of the Differential Interferometry on Sentinel images for the land displacements measurement. Ischia earthquake and comparison with INGV data.

## Certificates & Grants

**2022** Global top 100 AI solutions for SDGs
**2022** Best UNICEF Research.
**2022** Wellcome Trust Support.
**2021** GRS 29-Italy 2020 award for the three best master's degree theses in geosciences and remote sensing
**2020** ESA OSIP co-founded Ph.D.
**2020** ESA Teamwork Excellence Award for the RACE Team through demostratig excellent use of space for the benefit of society or the environment (by the ESA DG Josef Ashbacher).

## Languages

| | | |
|---|---|---|
| **Italian** | C2 | mother tongue |
| **English** | C1 | ● ● ● ● |
| **French** | A2 | ● ○ ○ ○ |

## Additional info

**Development experience**: The complete record can be found on personal GitHub page, ESA Φ-lab page, UnisannioEOLab page (dev languages/environments - main: Python, bash and C, secondary: Java, javascript, HTML, MATLAB, Verilog).
**Scientific publications**: 47 (15 as main author, 8 as $2^{nd}$) $\sim 500$ citations, H-index of 12. A full list of my publications can be found here (click me).
**Talks**: More than 10. A full list of talks I gave can be found here (click me).
**Supervising**: More than 20 projects. A full list of supervising activities can be found here (click me).
**Events**: A full list of events I co-organized can be found here (click me).
**IEEE**: I am currently leading the working group on quantum computing for earth observation in the IEEE GRSS Techincal Committee QUEST

## Personal skills

High Experience and attitude in International Team Working. High attitude towards Problem Solving and Continuous Improvement. Results oriented, with ability of adapting to rapid changes. Hobbies: Photography, Playing Guitar.

# Detailed info (up to January 29, 2025)

**This part of my CV contains the same information of the first page, but with more details. Most of these details can also be found, including images and/or documents, on my website** `https://alessandrosebastianelli.github.io/`.

### *Awards & Certificates*

| Entity | Date | Description | URL |
|---|---|---|---|
| IEEE GRSS | 2021 | This award refers to my Master Thesis, but I was awarded during my Ph.D. and the research activities started during my master thesis have been carried on during my PhD and be significative to win the OSIP call. | click me |
| ESA OSIP | 2021 | Research Co-Sponsorship: AI Powered cross-modal adaptation techniques applied to Sentinel-1 and -2 data | click me |
| Unisannio | 2022 | Mention by the Rector of University of Sannio Prof. Gerardo Canfora about my research activities | click me |
| UNESCO/IRCAI | 2022 | Global top 100 AI solutions for SDGs Award 2022. This award refers to the Research Activity: Dengue Outbreaks Forecasting | click me |
| UNICEF | 2022 | Best UNICEF Research Award UNICEF. This award refers to the Research Activity: Dengue Outbreaks Forecasting | click me |
| WELLCOME TRUST | 2022 | Wellcome Trust Support. This award refers to the Research Activit: Dengue Outbreaks Forecasting | click me |
| ESA | 2020 | ESA Teamwork Excellence Award for the RACE Team through demostratig excellent use of space for the benefit of society or the environment (by the ESA DG Josef Ashbacher). | click me. |
| IEEE IADF | 2024 | IEEE IADF School certificate of appreciation from IEEE GRSS for my contribution to the IEEE GRSS and IADF School on Computer Vision for Earth Observation | click me. |
| Unisannio | 2024 | I have been awarded with a certificate of appreciation from Rector Gerardo Canfora (University of Sannio) for my contribution to the IEEE GRSS and IADF School on Computer Vision for Earth Observation. | click me |
| IRF | 2024 | Contribution as an external reviewer for the Icelandic Research Fund. | click me |

### *Publications*


[1] SL Ullo et al. "SAR interferometry with open Sentinel-1 data for environmental measurements: the case of Ischia earthquake". In: *2018 IEEE international conference on environmental engineering (EE)*. IEEE. 2018, pp. 1–8.

[2] Daniela A Zaidenberg et al. "Advantages and bottlenecks of quantum machine learning for remote sensing". In: *2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS*. IEEE. 2021, pp. 5680–5683.

[3] Tony De Corso et al. "Application of DInSAR technique to high coherence satellite images for strategic infrastructure monitoring". In: *IGARSS 2020-2020 IEEE International Geoscience and Remote Sensing Symposium*. IEEE. 2020, pp. 4235–4238.

[4] Alessandro Sebastianelli et al. "Airsense-to-act: A concept paper for covid-19 countermeasures based on artificial intelligence algorithms and multi-source data processing". In: *ISPRS International Journal of Geo-Information* 10.1 (2021), p. 34.

[5] Silvia Liberata Ullo et al. "A new mask R-CNN-based method for improved landslide detection". In: *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 14 (2021), pp. 3799–3810.

[6] Silvia Liberata Ullo et al. "Landslide geohazard assessment with convolutional neural networks using sentinel-2 imagery data". In: *IGARSS 2019-2019 IEEE International Geoscience and Remote Sensing Symposium*. IEEE. 2019, pp. 9646–9649.

[7] Alessandro Sebastianelli, Maria Pia Del Rosso, and Silvia Liberata Ullo. "Automatic dataset builder for Machine Learning applications to satellite imagery". In: *SoftwareX* 15 (2021), p. 100739.

[8] Diego Di Martire et al. "X-and C-band SAR data to monitoring ground deformations and slow-moving landslides for the 2016 Manta and Portoviejo earthquake (Manabi, Ecuador)". In: *2018 IEEE international conference on environmental engineering (EE)*. IEEE. 2018, pp. 1–6.

[9] Alessandro Sebastianelli et al. “Paradigm selection for data fusion of sar and multispectral sentinel data applied to land-cover classification”. In: *arXiv preprint arXiv:2106.11056* (2021).

[10] Maria Pia Del Rosso et al. “On-board volcanic eruption detection through cnns and satellite multispectral imagery”. In: *Remote Sensing* 13.17 (2021), p. 3479.

[11] Alessandro Sebastianelli et al. “A Deep Q-Learning based approach applied to the Snake game”. In: *2021 29th Mediterranean Conference on Control and Automation (MED)*. IEEE. 2021, pp. 348–353.

[12] Maria Pia Del Rosso, Alessandro Sebastianelli, Silvia L Ullo, et al. “Artificial intelligence applied to satellite-based remote sensing data for earth observation”. In: (2021).

[13] Rochelle Schneider et al. “Climate-based ensemble machine learning model to forecast Dengue epidemics (papers track)”. In: *Thirty-eighth International Conference on Machine Learning (ICML) 2021*. 2021.

[14] Alessandro Sebastianelli et al. “On circuit-based hybrid quantum neural networks for remote sensing imagery classification”. In: *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 15 (2021), pp. 565–580.

[15] MPD Rosso et al. “Artificial neural network”. In: *Artificial intelligence applied to satellite-based remote sensing data for earth observation*. Institution of Engineering and Technology, 2021, pp. 63–90.

[16] Alessandro Sebastianelli et al. “Principles of satellite data analysis”. In: *Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation*. Institution of Engineering and Technology, 2021.

[17] Alessandro Sebastianelli et al. “A generation problem”. In: *Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation*. Institution of Engineering and Technology, 2021.

[18] Alessandro Sebastianelli et al. “A filtering problem: SAR speckle filtering”. In: *Artificial Intelligence Applied to Satellite-Based Remote Sensing Data for Earth Observation*. 2021.

[19] SILVIA LIBERATA Ullo et al. “How to develop your network with Python and Keras”. In: *Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation*. Institution of Engineering and Technology, 2021.

[20] Maria Pia Del Rosso et al. “How to create a proper EO dataset”. In: *Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation* 98 (2021), p. 113.

[21] SILVIA LIBERATA Ullo et al. “Convolutional neural networks”. In: *Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation*. Institution of Engineering and Technology, 2021, pp. 91–111.

[22] Alessandro Sebastianelli et al. “A speckle filter for Sentinel-1 SAR ground range detected data based on residual convolutional neural networks”. In: *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 15 (2022), pp. 5086–5101.

[23] Alessandro Sebastianelli et al. “PLFM: Pixel-level merging of intermediate feature maps by disentangling and fusing spatial and temporal data for cloud removal”. In: *IEEE Transactions on Geoscience and Remote Sensing* 60 (2022), pp. 1–16.

[24] Alessandro Sebastianelli et al. “A Decision Support System Based on Machine Learning to Counteract Covid-Like Pandemic Events”. In: *IGARSS 2022-2022 IEEE International Geoscience and Remote Sensing Symposium*. IEEE. 2022, pp. 4486–4489.

[25] Pietro Di Stasio et al. “Early detection of volcanic eruption through artificial intelligence on board”. In: *2022 IEEE International Conference on Metrology for Extended Reality, Artificial Intelligence and Neural Engineering (MetroXRAINE)*. IEEE. 2022, pp. 714–718.

[26] Maria Pia Del Rosso et al. “A demo setup testing onboard CNNs for Volcanic Eruption Detection”. In: *2022 IEEE International Conference on Metrology for Extended Reality, Artificial Intelligence and Neural Engineering (MetroXRAINE)*. IEEE. 2022, pp. 719–724.

[27] Francesco Mauro et al. “SEN2DWATER: A Novel Multispectral and Multitemporal Dataset and Deep Learning Benchmark for Water Resources Analysis”. In: *IGARSS 2023-2023 IEEE International Geoscience and Remote Sensing Symposium*. IEEE. 2023, pp. 297–300.

[28] Veronica Wairimu Muriga et al. “A Machine Learning Approach to Long-Term Drought Prediction using Normalized Difference Indices Computed on a Spatiotemporal Dataset”. In: *arXiv e-prints* (2023), arXiv–2302.

[29] Dario Spiller et al. “Analysis of COVID-19 first wave in the US based on demographic, mobility, and environmental variables”. In: *arXiv preprint arXiv:2302.14649* (2023).

[30] Alessandro Sebastianelli et al. “On Quantum Hyperparameters Selection in Hybrid Classifiers for Earth Observation Data”. In: *IEEE Geoscience and Remote Sensing Letters* 20 (2023), pp. 1–5.

[31] Francesco Mauro et al. “Estimation of Ground NO2 Measurements from Sentinel-5P Tropospheric Data through Categorical Boosting”. In: *2023 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering (MetroXRAINE)*. IEEE. 2023, pp. 1116–1121.

[32] A Sebastianelli et al. “A classification problem”. In: *Artificial Intelligence Applied to Satellite-Based Remote Sensing Data for Earth Observation*. Institution of Engineering and Technology, 2021, pp. 159–206.

[33] Silvia Liberata Ullo et al. “Enhancing Earth Observation with Hybrid Quantum Neural Networks”. In: *AGU Fall Meeting Abstracts*. Vol. 2023. 2023, IN01–1.

[34] Francesco Mauro et al. "A Hybrid MLP-Quantum Approach in Graph Convolutional Neural Networks for Oceanic Niño Index (ONI) Prediction". In: *IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium*. IEEE. 2024, pp. 812–816.

[35] Luigi Russo et al. "Using Multi-Temporal Sentinel-1 and Sentinel-2 data for water bodies mapping". In: *arXiv preprint arXiv:2402.00023* (2024).

[36] Francesco Mauro et al. "QSpeckleFilter: a Quantum Machine Learning approach for SAR speckle filtering". In: *arXiv preprint arXiv:2402.01235* (2024).

[37] Alessandro Sebastianelli et al. "A reproducible ensemble machine learning approach to forecast dengue outbreaks". In: *Scientific Reports* 14.1 (2024), p. 3807.

[38] Francesca De Falco et al. "Towards Efficient Quantum Hybrid Diffusion Models". In: *arXiv preprint arXiv:2402.16147* (2024).

[39] S Mair et al. "Towards Strategies to Avoid Barren Plateaus". In: *Proceedings of Quantum Techniques in Machine Learning (QTML 2023)*. 2023, pp. 1–4.

[40] F De Falco et al. "Towards Quantum Diffusion Models". In: *Proceedings of Quantum Techniques in Machine Learning (QTML 2023)*. 2023, pp. 1–4.

[41] Marc Tomás-Cruz et al. "Deep unfolding for hypersharpening using a high-frequency injection module". In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*. 2023, pp. 2105–2114.

[42] Alessandro Sebastianelli et al. "Quanv4EO: Empowering Earth Observation by means of Quanvolutional Neural Networks". In: *arXiv preprint arXiv:2407.17108* (2024).

[43] Francesca De Falco et al. "Quantum Hybrid Diffusion Models for Image Synthesis". In: *KI-Künstliche Intelligenz* (2024), pp. 1–16.

[44] Andrea Ceschini et al. "From Graphs to Qubits: A Critical Review of Quantum Graph Neural Networks". In: *arXiv preprint arXiv:2408.06524* (2024).

[45] Alessandro Sebastianelli et al. "Machine learning forecast of surface solar irradiance from meteo satellite data". In: *Remote Sensing of Environment* 315 (2024), p. 114431.

[46] Luigi Russo et al. "SEN12-WATER: A New Dataset for Hydrological Applications and its Benchmarking". In: *arXiv preprint arXiv:2409.17087* (2024).

[47] Simona Reale et al. *Benchmarking of a new data splitting method on volcanic eruption data*. 2024. arXiv: 2410.06306 [cs.CV]. URL: https://arxiv.org/abs/2410.06306.

## *Talks and presentations*

| Organizer | Date | Description | URL |
|---|---|---|---|
| ESA | 2020 | $\phi$-Week Side event organizer | click me |
| IEEE | 2020 | Paper presentation at IEEE IGARSS2020 | click me |
| IEEE | 2021 | Paper presentation at MED2022 | click me |
| IEEE | 2021 | Poster Presenter at GTTI2021 | click me |
| MDPI | 2022 | Talk at IJGI Webinar The Rise of Artificial Intelligence for Space Applications | click me |
| Sapienza | 2022 | Talk at La Sapienza DIAG | click me |
| GTTI | 2022 | Poster Presenter at GTTI2022 | click me |
| IEEE | 2022 | Papers presentation at IEEE MetroXRAINE2022 | click me |
| ECMWF | 2022 | Speaker at the ECMWF-ESA workshop | click me |
| Unisannio | 2022 | Speaker at CUSAS Workshop | click me |
| CINECA | 2022 | Talk at High Performance Computing and Quantum Computing 5th | click me |
| CINECA | 2023 | Talk and hands-on session at Introduction to Quantum Computing School | click me |
| Unipavia | 2024 | Seminar on Quantum Machine Learning for Earth Observation | click me |
| IEEE | 2024 | Talk on QC4EO at IEEE GRSS IADF School | click me |
| Unibari | 2024 | Talk on QC4EO at Quantum 2024 - Summer School on Quantum Science and Technologies | click me |

## *Supervising activities*

Teaching support:

- Lessons of Remote Sensing for "Reti di Telecomunicazioni" course: how to download and elaborate satellite data with classic and AI-based techniques
- Support to Ph.D. course: Optical and Radar Remote Sensing
- Exam commissions: "Reti di Telecomunicazioni" and "Teoria ed Elaborazione dei Segnali"

Supervising activities:

- Jan 2021: Massachusetts Institute of Technology student co-supervisor University of Sannio, Benevento, Italy. I worked as a Tutor to support three MIT students in the development of their project: 1. Quantum Artificial Intelligence applied to Remote Sensing data and 2. Infrastructural monitoring using satellite data.
- Jan 2020: Massachusetts Institute of Technology student co-supervisor University of Sannio, Benevento, Italy ESA, ESRIN, Φ-Lab, Frascati, Rome, Italy.I worked as a Tutor to support two MIT students in the development of their project: 1. Landslides detection based on artificial intelligence algorithms, 2. Infrastructural monitoring using satellite data and 3. Country development measurement using satellite data
- Jan 2019: Massachusetts Institute of Technology student co-supervisor University of Sannio, Benevento, Italy. I worked as a Tutor to support two MIT students in the development of their project: Landslides detection based on artificial intelligence algorithms.

Thesis co-relator:

- Master Thesis Co-Relator - Francesco Mauro. Master Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2022. Climate Change Impact Evaluation on levels of water resources through deep learning techniques.
- Bachelor Thesis Co-Relator - Pietro Di Stasio. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2022. Use of Sentinel-5P data for the early detection of volcanic eruptions through on-board Artificial Intelligence.
- Bachelor Thesis Co-Relator - Giovanni Pagnozzi. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2022. Analysis of large strategic structures using the PyGMTSAR tool on Sentinel-1 data.
- Bachelor Thesis Co-Relator - Simona Reale. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2021. Performance analysis of a new splitting method for datasets in machine learning models. Case study: detection of volcanic eruptions.
- Bachelor Thesis Co-Relator - Luigi Russo. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2021. Development of a Machine Learning model based on the "categorical boosting" technique for the correlation between tropospheric NO2 and NO2 on the ground.
- Bachelor Thesis Co-Relator - Tony De Corso. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2020. Application of DInSAR technique to high coherence satellite images for strategic infrastructure monitoring: Morandi Bridge.
- Bachelor Thesis Co-Relator - Morena Gismondi. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2020. Use of Sentinel-5P data for the analysis of the correlation between NO2 levels and mobility data in areas with a high number of infections due to Covid-19. Case study: Lombardy Region.
- Bachelor Thesis Advisor - Luca Mignone. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2020. Use of differential interferometry on Sentinel-1 images for the measurement of earthquake-induced ground displacements.
- Bachelor Thesis Advisor - Gianluca Di Cosmo. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2020. Use of Sentinel-5P data for the analysis of the correlation between NO2 levels and the number of infections due to Covid-19. Case study: Wuhan area.
- Bachelor Thesis Co-Relator - Francesco Mauro. Bachelor Degree in Electronic Engineering for Automation and Telecommunications, University of Sannio, Engineering Department, 2020. Analysis of the correlation between Sentinel-5P data and epidemiological data. Case study: spread of Covid-19 in the Lombardy region.

## ***Personal Skills***

*Languages*

| LANGUAGE | UNDERSTANDING | | SPEAKING | | WRITING |
|---|---|---|---|---|---|
| | Listening | Reading | Spoken Interaction | Spoken Production | |
| Italian | | | mother tongue | | |
| English | C1 Proficient | C1 Proficient | C1 Proficient | C1 Proficient | C1 Proficient |
| Fench | A2 Basic | A2 Basic | A2 Basic | A2 Basic | A2 Basic |

*Team working and problem solving*: I worked in different research groups providing fundamental results and contributing to the resolution of technical problems with elasticity.

*Working in a international environment*: I participated in numerous international conferences and collaborations, giving several talks and posters. I am currently working in an international environment and so I am comfortable working in the international environment.

*Communication and scientific marketing*: I give a good number of talks and posters. I co-organized and conducted multiple international symposia and wrote several articles.

*Digital Skills*:

- Basic digital competence: Operating systems (Excellent), Programming languages (Excellent), Word processing (Excellent), Electronic spreadsheet (Excellent), CAD skills (Limited), Internet skills (Excellent), Web-site creation (Limited), Multimedia (Excellent),
- Programming languages known: Python, Java, C, Arduino, (C++) chiBios, Matlab, Simulink, Latex, C+ (good knowledge), P5.JS and JavaScript (basic knowledge), Processing, Labview, Ladder, SCADA, Verilog, VHDL, Mathematica, Pascal (basic knowledge).
- Software applications: Matlab, Labview, Eclipse, Word, Excel, PowerPoint, Arduino, Photoshop, SNAP, Mathematica, RSLogic, RSView, Unity, Quartus Prime, QGIS, Jupyter Notebook, Google Colaboratory, Google Earth Engine.

*Hobbies*: Photography, playing the guitar self-taught

The undersigned Alessandro Sebastianelli authorizes the processing of personal data contained in my curriculum vitae based on art. 13 of Legislative Decree 196/2003 and art. 13 of EU Regulation 2016/679 relating to the protection of individuals (GDPR).

Date and signature: