FIRST NAME: Davide
LAST NAME: Palmisano
DATE OF BIRTH:
E-MAIL:
GENDER:
NATIONALITY:

POSITION APPLIED FOR: Remote Sensing Data Scientist for Earth Observation

SUMMARY: Davide Palmisano received the B.Sc. and M.Sc. Degrees (both *cum laude*) in Electronic Engineering from the Polytechnic University of Bari, Italy, in 2010 and 2017,respectively, and the Ph.D. degree in ICT (Information and Communications Technologies) with specialization in Radar and Remote Sensing from Sapienza University of Rome, Italy, in 2022.

Since 2017, he has been collaborating with the National Research Council (CNR) at the Institute for Electromagnetic Sensing of the Environment (IREA). His research interests include the interpretation of Synthetic Aperture Radar (SAR) data for the retrieval of geo-/bio-physical land parameters, such as soil moisture, soil roughness, and vegetation water content. In particular, he is focusing on the combination of different data sources, e.g., intensity and interferometric SAR data, multi-frequency SAR data, and optical data for the retrieval of such parameters. During his activities he developed skills about the pre-processing of detected and interferometric SAR data and about the use of dedicated software as GAMMA and SNAP (Sentinel Application Platform). He also developed algorithms for the analysis and inversion of EO data for the retrieval of land parameters in different programming languages as Matlab, IDL, and Python.

During his collaboration he has been involved in various national and international projects, among which:

i) ESA (European Space Agency) projects:
   a. SEOM (Scientific Exploitation of Operational Missions) "Exploit-S-1 (S1 for Surface Soil Moisture)".
   b. "SARSense: Technical Assistance for Airborne Measurements during the SAR Sentinel Experiment".
   c. "SARSimHT-NG – Simulation of Hydroterra SAR System Performance in the Mediterranean and the Alps Based on Experimental Airborne SAR data" project.

ii) ASI (Italian Space Agency) projects:
   a. "SINERGY (Synthetic aperture Instrument for Novel Earth Remote-sensed MeteoroloGy and HydrologY)".

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b. "SARAGRI (Use of Multi-Frequency SAR Data for AGRIculture)".

iii) EU (European Union) project "SENSAGRI (SENtinels Sinergy for AGRIculture)".

In the context of SARAGRI he has been manager of Work Package 1103 "EO data management", where he has been responsible for the searching, downloading, processing, and quality assessment of all EO data utilized in the project, i.e., SAOCOM, ALOS-2, Sentinel-1, Sentinel-2, and COSMO-SkyMed data.

In the context of the SARSense, SARAGRI, and SARSimHT projects he has been involved in the design of ground campaign activities and the collection of *in situ* land surface parameters as soil moisture, soil roughness, vegetation geometrical (e.g., plant height, leaf dimensions and orientation, etc ...) and biophysical (i.e., biomass) parameters, and land use characterization.

In 2023, he has been among the winners of the yearly prize Italy's Best Remote Sensing Award (IEEE-GRS29), for the three best Ph. D. theses on topics of Geoscience and Remote Sensing.

Since 2023, he is adjunct professor of Digital Signal Processing and Fundamentals of Telecommunications at the Master Degree course of Electronic Engineering at Polytechnic University of Bari.

Davide Palmisano is a Member of the Institute of Electrical and Electronic Engineers (IEEE) and a peer reviewer of scientific papers for the IEEE Geoscience and Remote Sensing Letters (GRSL) and other scientific journals in the field of Remote Sensing.

The above activities have been detailed in the following (see "Work experience" section).

EDUCATION

- **Ph.D. in ICT (Information and Communications Technologies) with specialization in Radar and Remote Sensing at Sapienza University of Rome, Rome, Italy.**

Duration: October 2017 – September 2021, October 2022.

Description: The activities carried out during the Ph.D. aimed at investigating the use of dense time series of SAR data for the retrieval of Surface Soil Moisture (SSM) at high spatial resolution. The study encompasses analytic development and validation aspects, supported by experimental activity. Scientific outputs have been reported in the final dissertation, titled "Time series analysis of synthetic aperture radar for surface soil moisture retrieval at high resolution" (see ANNEX D30), and in papers published on scientific journals (see List of publications).

The Ph.D. Thesis defence has been held on February 21st, 2022. The Thesis work has been judged by the commission as "Ottimo" among the possible judgments (in increasing order) "Sufficiente", "Buono", "Molto Buono", "Ottimo", and "Ottimo (con lode)".

- **M.Sc. in Electronic Engineering from Polytechnic University of Bari, Bari, Italy.**

Duration: 2010 – 2017.

Description: The M.Sc. Thesis project has been carried out in collaboration with Keysight Technologies and Aalborg University, under the supervision of the Nonlinear Measurement and Modelling Group of Keysight Technologies Denmark. The project focus was the development of a signal-processing algorithm for the generation of a multisine test signal to be used in a measurement setup based on an innovative NVNA (Nonlinear Vector Network Analyzer) for modern high-efficiency PAs (Power Amplifiers) characterization. Specifically, the designed algorithm should be capable of mimicking the bandwidth, pdf (probability density function), and PAPR (Peak-to-Average Power Ratio) of a given digitally modulated signal of modern classes, such as LTE, W-CDMA, and DVB-T.
A multisine decomposition algorithm has been selected and implemented based on state-of-art literature; algorithm performance was not satisfactory especially in term of PAPR matching. Further investigations have revealed main drawbacks of the procedure. New features as Crest Factor increaser, OSR increaser, and Stop Criterion have been implemented to reach the desired performance. The mimicking performance has been confirmed experimentally through the characterization of a commercial RF PA for wireless applications using both the original digitally modulated signal and its multisine decomposition. Project results have been collected in a scientific paper accepted at the International Microwave and RF Conference (see List of publications).
The M.Sc. Thesis is titled "Excitation signals for characterization and modelling of nonlinear RF power amplifiers", defended on February 21st, 2017. The Thesis work has been judged by the commission with highest honours.

- **B.Sc. in Electronic Engineering from Polytechnic University of Bari, Bari, Italy.**

Duration: 2006 – 2010.

Description: The B.Sc. Thesis concerned the investigation of scientific literature about Metamaterials, i.e., synthetic materials showing properties that cannot be found in natural media. The focus has been on photonic applications. Metamaterials showing negative refractive index have been first investigated theoretically. Then, possible solutions to synthesize such materials at the various ranges of the electromagnetic spectrum, i.e., from microwave to visible spectrum, have been identified.
Various configurations of a slab waveguide with negative refractive index have been analysed using Comsol Multiphysics to investigate their electromagnetic behaviour as function of waveguide geometrical and optical parameters.
The B.Sc. Thesis is titled "Studio di strutture ottiche guidanti con metamateriali", and its defence has been held on December 14th, 2010. The Thesis work has been judged by the commission with highest honours.

TRAINING

- **14th International Summer School on Radar/SAR at Fraunhofer FHR**

Duration: July 1st to July 7th, 2023.

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Description: The event has been held in Bonn, Germany, open to students, postgraduates, and young professionals from universities and industry who are involved with radar/SAR and related areas. In engaging courses, international specialists have been teaching the fine details of radar/SAR technology – from the basics to modern systems and all the way to cutting-edge signal processing algorithms. The courses have been followed by workshops to have the chance to directly apply the new skills. The group size has been limited to 40 participants to guarantee an intensive and focused learning environment as well as a dynamic exchange of knowledge between participants and lecturers.

- **GAMMA training course**

Duration: May 2nd to 5th, 2022.
Description: The GAMMA training course has been held at GAMMA Main Office in Gümligen, near Bern, Switzerland, by the GAMMA personnel. The course covered the following aspects:

- Principle of SAR and interferometric SAR processing;
- Basic SAR and InSAR processing including geocoding;
- Advanced processing techniques;
- Practical examples.

- **9th ESA Advanced Training Course on Land Remote Sensing 2019**

Duration: September 16th to 20th, 2019.

Description: The Advanced Training Course on Land Remote Sensing took place at the Université catholique de Louvain, outside Brussels, Belgium. During the entire week 92 PhD students, postdocs, specialists, and experts from international agencies and the European Commission followed lectures in the morning and hands-on exercises using software tools in the afternoon.
The course was the 9th in the series of Advanced Training Course on Land Remote Sensing organized by ESA. The teachers are world-class experts in remote sensing and application to agriculture from European universities, research institutes, and industry. They share their knowledge on remote sensing principles and techniques relevant for agriculture as well as how to use dedicated algorithms and tools in particular with Sentinel data as input.
The participants were selected out of 227 applicants and represent 40 different nationalities coming from institutions of more than 30 different countries, including 19 ESA Members States and 5 Associated Member States and Cooperating States. Participants were able to use differential GPS and fisheye lens cameras for hemispherical images for Leaf Area Index determination, to take soil samples for soil moisture estimation, and see how car-mounted action cameras can be used for building up a database with crop ground-truth data.

WORK EXPERIENCE

- **Fixed-term research contract at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the SoMMet project.**

Duration: November 2023 – ongoing.
Protocol number: 331.1 IREA RIC of July 14th, 2023.

Description of project and candidate research activities

- Processing and interpretation of time series of interferometric SAR data for the retrieval of land biophysical parameters.

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- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the FOE-TIRS-Agrosensing and EXPLOIT-S1 projects.**

Duration: January 2023 – ongoing.
Protocol number: 3357 of December 16th, 2022.

Description of project and candidate research activities

- AGRO-SENSING: space, aerial, ground sensing and robotics for Precision Agriculture. CUP B55F20002150001. From January 2021 to December 2022.

A digital and green transition will be increasingly fundamental for a national strategic sector such as agri-food. Only the development, implementation and widespread adoption of new technologies will allow national agricultural production to be more sustainable (both economically and environmentally), resilient to environmental changes and responsiveness to growing international competition. In fact, these technologies make it possible to create quality products and to certify the supply chains, responding to the growing needs of consumers for healthy and "eco-friendly" products. In this context, Precision Agriculture (AP) and more generally digital agriculture represent a winning methodological approach that can only be implemented concretely with a widespread adoption of technological innovations.

The activity of CNR-IREA in the project intends to contribute to the high-resolution estimation of the space/time distribution of the surface soil moisture content of soils, which is an important piece of information for sustainable soil and water management in agriculture. The innovative part consists in using an estimation methodology based on the integration of Sentinel-1 and Sentinel-2 satellite data, capable of producing humidity maps at the "field scale". In this study, the comparison with the in situ measurements foreseen on different types of crops will allow to update the parameters of the methodology and therefore to obtain an improvement in its performance.

Note: the EXPLOIT-S-1 project is described below in the section relative to protocol number 911 of May 26th, 2020.

- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the SARAGRI and PRISCAV projects.**

Duration: June 2022 – December 2022.
Protocol number: 1361 of May 18th, 2022.

Description of project and candidate research activities

- SARAGRI - Use of Multi-Frequency SAR Data for AGRIculture. Contract ASI N. 2021-6-U.O. From April 2021 to January 2023.

SARAGRI aims to exploit the potential of multi-frequency SAR data to consolidate, improve, and validate a set of algorithms in ASI's priority areas of interest: "Agriculture" and "Validation of products derived from multi-frequency SAR data exploiting *in situ* data". The proposed algorithms are at different level of maturity – i.e., Scientific Readiness Level (SRL) – and have the common goal of contributing to water and food security through the monitoring of the following:

- Surface soil moisture (SSM) conditions;
- Water content of vegetation (VWC), as a possible indicator of crop water stress;
- Extent of irrigated areas, in order to improve the irrigation management;
- Changes in the soil roughness due to agricultural work, which is an indicator of whether or not zero-tillage practices are locally adopted.

SARAGRI objectives have been mapped into five Work Packages (WP), i.e., "EO data Management", "Algorithms", "In situ measurements", "Validation", and "Database and WebGIS".

Davide Palmisano has been involved in all WPs activities and designated as manager of the WP "EO data Management". As WP manager he has been responsible for the searching, downloading, and pre-processing of all the EO data used during the project. He designed and implemented the SAR pre-processing chain to generate interferometric products by using the GAMMA software.
He has been also responsible for SAR data quality assessment, and authored various internal report periodically sent to ASI.
As being involved in the other WPs he designed routines for the extraction, analysis, and visualization of time series of EO and ground data, and collaborated to the design and/or improvement of the algorithms proposed in SARAGRI concerning the inversion of SAR and optical data for the retrieval of SSM, Tillage detection, and VWC.

- SARSimHT-NG – Simulation of Hydroterra SAR System Performance in the Mediterranean and the Alps Based on Experimental Airborne SAR Data. Contract n° 4000134680/21/NL/FF/an. From April 2022 to June 2023.

The main objective of SARSimHT-NG is to demonstrate the image formation process of Hydroterra through the exploitation of a repeat-pass hyper-temporal airborne SAR image stack acquired over short time intervals representative of the Hydroterra mission. Hydroterra was one of three mission concepts competing for Earth Explorer 10, consisting of a geosynchronous satellite to cover Africa and the Mediterranean area with a C-band SAR for an improved understanding and prediction capability of rainfall and water availability, flooding and landslides. SARSimHT-NG included the development, testing and application of processing algorithms to simulate the Hydroterra image formation process, application to the airborne image stack, followed by a quantitative assessment of the image formation process and preliminary investigations of variations in scene radar observables as a function of the changing geophysical conditions.

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The main objectives of SARSimHT are:

- To gain knowledge about the new SAR data processing and challenges using geosynchronous SAR satellite data.
- The development, testing, implementation, and application of processing algorithms to simulate the Hydroterra image formation process.
- To demonstrate the image formation process of Hydroterra and specifically the hour-long integration times using airborne SAR data.
- A quantitative assessment of the image formation process and image quality in the presence of disturbances arising from the long integration time (e.g. weather, vegetation and humidity effects).
- Preliminary investigation into the variations (e.g. trends, correlation) of radar observables as a function of the changing geophysical conditions through the comparison with ground-truth data.
- To investigate the potential to detect diurnal changes of land surface parameters (e.g. soil moisture) with simulated Hydroterra time series.
- To introduce wind effects in simulated Hydroterra data to identify and quantify to which extent defocussing of high vegetation areas affects the surrounding areas of bare soil / sparse vegetation.

In the context of project, Davide Palmisano participated to the ground campaigns and will be involved in the analysis of the airborne data set.

- PRISCAV – Attività scientifica di CAL/VAL della missione PRISMA (Precursore IperSpettrale della Missione Applicativa). Accordo Quadro CNR/ASI (n. 2018-6-Q.0), accordo attuativo 2019-5-HH.0, CUP F86C18000950005. From June 2019 to January 2023.

The objective of the project is to identify one or more sites to perform ground measurements and cal/val scientific activity to support the calibration and validation of PRISMA mission. The cal/val scientific activity has to be carried out throughout the mission lifetime to support:

- The characterization of mission payload performance;
- The test of mission performance;
- The effectiveness and efficiency of mission data usage.

The Bari unit of IREA-CNR is involved in the experimental ground measurements over the agricultural site of the Apulian Tavoliere and in the data analysis through the following activities:

- Acquiring the irradiance and radiance spectra, and computing the reflectance of bare and/or vegetated soils during the PRISMA passages in operative phase 2. The acquisitions has been carried out by an ASD Fieldspec spectrometer operating in the wavelength range of 350-2500 nm.
- Acquiring atmospheric data through the sun-photometer CIMEL. and data concerning physical properties of soil and vegetation; providing continuously soil moisture and temperature data.
- Collecting, analysing, and providing radiometric data.
- Planning and requesting PRISMA products over test sites during ground campaigns.
- Maintaining the site and organizing of the ground campaigns.
- Data analysis and comparison with PRISMA standard products for validation.

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- Analysis and reporting about results.
- Providing acquired data in a project database.

Davide Palmisano has been involved in the analysis of PRISMA spectral signatures of agricultural fields and their comparison with *in situ* measurements. In particular, he:
i) pre-processed *in situ* measurements of field spectral signatures acquired by "ASD FieldSpec" field spectroradiometer over selected fields;
ii) extracted PRISMA spectral signatures over the selected fields and, if temporally coincident, Sentinel-2 (S-2) spectral signatures for comparison;
iii) compared qualitatively and quantitatively FieldSpec, PRISMA, and S-2 signatures over the selected fields.

- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the SARAGRI project.**

Duration: June 2021 – May 2022.
Protocol number: 1176 of May 25th, 2021

Description: the research activities carried out have been already described in the section above relative to protocol number 1361 of May 18th, 2022.

- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the PRISCAV and EXPLOIT-S-1 projects.**

Duration: June 2020 – May 2021
Protocol number: 911 of May 26th, 2020

Description of project and candidate research activities

- Exploit-S-1 – Exploitation of Sentinel-1 for Surface Soil Moisture Retrieval at High Resolution. Contract 4000118762/16/I-NB. From 2016 to 2020.

The scope of Exploit-S-1 project is to demonstrate the capabilities of the S-1 mission to support systematic SSM product generation at high resolution (e.g. 500m-1000m) and at regional/continental scale. A suite of SSM retrieval methods have been developed, implemented, and validated using S-1 data. The methods are based on previous research into C-band soil moisture retrieval and have been selected from the great wealth of approaches proposed in the literature and tailored to S-1 data. The emphasis will be on implementing and comparing algorithms presenting the most promising trade-off among robustness, retrieval accuracy, and potential matching with the requirements of different applications (e.g., Numerical Weather Prediction, hydrological forecasting, drought events, ...) in terms of accuracy, resolution, and product frequency. In addition, the suitability of the algorithm to fully exploit the S-1 observational assets (e.g., dual polarization, spatial/temporal resolution, radiometric accuracy) in order to deliver a large scale mapping has been considered.

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A key component of Exploit-S-1 has been the validation activity that included local and regional scale sites (e.g., the Mediterranean basin) in order to better assess the potential for pre-operational and operational soil moisture products and services.

A further pivotal element of Exploit-S-1 has been the assessment of the optimal pre-processing of S-1 time series for SSM retrieval. This had the outreaching effect of consolidating standards for the generation of S-1 multi-temporal products well suited for other S-1 retrieval studies.
Finally, the Exploit-S-1 proposing team has been supported by an External Advisory Team (EAT) consisting of international leading experts in microwave SSM retrieval and application. Their role has been to advice the Exploit-S-1 team in all phases of the project and, particularly, in the validation phase. In addition, they supported Exploit-S-1 through making available *in situ* data collected over important validation sites of past/current cal/val activities related to low-resolution products from passive L-band and scatterometers systems (e.g., SMOS, SMAP, and ASCAT).

In the context of Exploit-S-1, Davide Palmisano has been involved in a series of collateral activities such as the investigation of S-1 interferometry for SSM retrieval.
S-1 interferometric time series have been analysed to assess the influence of SSM and vegetation on the SAR coherence and closure phase. Besides, a novel change detection approach, combining both coherent and incoherent SAR data, has been proposed.
Furthermore, an important objective of project consisted of the validation of the high resolution SSM maps generated by the SMOSAR algorithm developed by IREA-CNR. Worldwide, there exist a number of hydrologic networks, continuously recording *in situ* SSM observations, which are used to test the accuracy of retrieved SSM data. However, an important open issue is the mismatch between the point scale *in situ* observations and the spatial resolution of the satellite SSM. Such a mismatch generates the spatial representativeness error, which has been deeply investigated in the context of the project.

- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the SENSAGRI project.**

Duration: June 2019 – May 2020
Protocol number: 1044 of May 27th, 2019

Description of project and candidate research activities

- SENSAGRI – SENtinels Synergy for AGRIculture. EU H2020 – "EO-3-2016: Evolution of Copernicus Services" – Grant Agreement n° 730074. From 2016 to 2019.

SENSAGRI aimed at exploiting the synergy of optical and radar measurements to develop three prototype services capable of near real time operations: (1) Surface Soil Moisture (SSM), (2) green and brown leaf area index (LAI), and (3) crop type mapping. These prototypes shall provide a baseline for advanced services that can boost the competitiveness of the European agro-industrial sector. SENSAGRI proposes four advanced proof-of-concept services: (i) yield/biomass, (ii) tillage change, (iii) irrigation, and

and (iv) advanced crop maps. The algorithms have been developed and validated in four European agricultural test areas in Spain, France, Italy, and Poland, which are representative of the European crop diversity, and
their usefulness demonstrated in at least two non-European countries. In order to refine the specifications of the products and to iteratively assess the services, actors of the agricultural sector will be involved using a Living Lab approach. The combination of user-centred approach and of state-of-the-art algorithms will establish a sound foundation for deciding of a new Copernicus land service.
The SENSAGRI goals are here summarized:

- Combine Copernicus Sentinel-1 radar with Sentinel-2 optical and *in situ* data to develop new EO applications for the European agricultural sector.
- Develop prototype Copernicus services of SSM, green and brown LAI, and seasonal crop type mapping and use those for proof-of-concept services of advanced agricultural monitoring products.
- Validate delivered services and establish service demonstration cases to show the large application potential of the new upstream data products.
- Disseminate prototype and proof-of-concept services and interact services with the agricultural sector.

The research activities of Davide Palmisano have focused on the exploitation of Sentinel-1 (S-1) data for the retrieval of biophysical land parameters as surface soil moisture (SSM) and identification of agricultural crops. Moreover, during the collaboration additional activities took place in support of the research group.
The activities aimed to investigate i) the use of high incidence angles for SSM retrieval over agricultural fields and ii) the sensitivity of S-1 interferometric coherence and phase to crop structure and SSM.

- SARSense: Technical Assistance for Airborne Measurements during the SAR Sentinel Experiment. Contract n° 4000125444/18/NL/LF. 2019.

SARSense was an ESA project funded in preparation for the forthcoming ROSE-L mission. The objective was to investigate the use of L- and C-band SAR data for surface parameter retrieval over agricultural areas at high resolution (i.e., 0.1-1.0 km). The project included a campaign over the study site of Selhausen, Germany, which was carried out in 2019. The Metasensing airborne SAR system collected L- and C-band data during a six-days campaign. Concurrently soil moisture and vegetation parameters were measured on the ground.

The candidate's activity has been involved in the 2019 ground campaign and supported the interpretation of the airborne SAR data. It also included the analysis of S-1 data acquired during the airborne acquisitions.

- Hydroterra (former G-Class) phase-0 Science and Requirement. Contract n° 4000127280/19/NL/CT. From May 2019 to June2020.

Hydroterra (G-CLASS) has been one of the three candidate missions for ESA Earth Explorer (EE10) selected for Phase 0 studies together with the Dedalus and Harmony missions. Hydroterra consists of a radar in geosynchronous orbit over Africa and Europe to observe and understand key processes of the daily water

cycle, to improve prediction capability of intense rainfall and related flooding and landslides, and to enable the near real time prediction of ground motion.
In the context of the collaboration with the G-CLASS/Hydroterra Science Team, Davide Palmisano contributed to the proposal of forward backscattering model to simulate the SAR response of agricultural targets characterized by biophysical variables as SSM and VWC. The task constitutes a deliverable of the project.

- MOIST – Managing and Optimizing Irrigation by Satellite Tools. Contract 7049-000048. From 2017 to 2020.

MOIST has the objective of providing satellite based product for intelligent irrigation management. Davide Palmisano investigated a down scaling approach to derive SSM retrieval at high resolution, i.e. ~100-300 m, starting from the lower resolution IREA-CNR SSM products at ~1 km.

- **Research Grant at National Research Council – Institute for Electromagnetic Sensing of the Environment (CNR-IREA) in the context of the SENSAGRI project.**

Duration: June 2018 – May 2019
Protocol number: 597 of May 7th, 2018

Description: the research activities carried out have been already described in the section above relative to protocol number 1044 of May 27th, 2019.

- **Research Grant at Sapienza University of Rome – Department of Information, Electronics and Telecommunications (DIET) in the context of the SINERGY project.**

Duration: June 2017 – May 2018

Description of project and candidate research activities

- SINERGY (Synthetic aperture Instrument for Novel Earth Remote-sensed MeteoroloGy and HydrologY). Contract n° F82F16001040005.

SINERGY aimed at investigating and demonstrating the scientific readiness of methods for applying GeoSAR data in the field of meteorology and hydrology.

The candidate's activity dealt with the impact assessment of high incidence angles (i.e., higher than 40°) on SSM retrieval over crops. The issue is relevant because GeoSARs are characterized by very large swath (up to 1000 km) that can cover very high incidence angles.

- **Internship at Intel Mobile Communications Denmark, Aalborg, Denmark.**

Duration: September 2015 – September 2016
Description: Internship period spent in the Next Generation Standards (NGS) group of Intel, in Aalborg,

Denmark, working on a 5G LLS (Link Level Simulator) implemented in Matlab. Core of the group research activity was on receiving algorithm for the downlink process. After a one-month period of training on the LTE (UMTS Long Term Evolution) standard of 4G networks, my research activity has been focused on implementation of new channel coding techniques, for the first half of the internship. Turbo-Code, LDPC (Low Density Parity Check) Code, and Polar Code have been investigated from the point of view of performance (BLER, BLock Error Rate), and encoding and decoding complexity. During the second part of the internship, the research activity has been focused on implementation of interference cancellation algorithms. After the state-of-the-art investigation, an interference cancellation algorithm, based on iterative process, has been selected and implemented in the 5G LLS. Performance of the interference cancellation algorithm has been boosted thanks to a properly estimation of the covariance matrix used by the receiving filter.

- **Research Grant at Polytechnic University of Bari in the context of the MASSIME project (Sistemi di sicurezza meccatronici innovative (cablati e wireless) per applicazioni ferroviarie, aerospaziali e robotiche".**

Duration: January – December 2014

Description: Inside the MASSIME project "Sistemi di sicurezza meccatronici innovativi (cablati e wireless) per applicazioni ferroviarie, aerospaziali e robotiche", my research activity has been focused on a market review of CMOS (Complementary Metal-Oxide-Semiconductor) image sensors and cameras for industrial applications. The selected camera is part of the setup of an optical LASER triangulation system for the acquisition of the binary geometry (profile).

List of publications:

Journal publications:

- Balenzano, A.; Satalino, G.; Lovergine, F.P.; D'Addabbo, A.; Palmisano, D.; Grassi, R.; Ozalp, O.; Mattia, F.; Nafría García, D.; Paredes Gómez, V. Sentinel-1 and Sentinel-2 Data to Detect Irrigation Events: Riaza Irrigation District (Spain) Case Study. Water 2022, 14, 3046. https://doi.org/10.3390/w14193046.
- D. Palmisano, G. Satalino, A. Balenzano and F. Mattia, "Coherent and Incoherent Change Detection for Soil Moisture Retrieval From Sentinel-1 Data," in *IEEE Geoscience and Remote Sensing Letters*, vol. 19, pp. 1-5, 2022, Art no. 2503805, doi: 10.1109/LGRS.2022.3154631.
- A. Balenzano, F. Mattia, G. Satalino, F. P. Lovergine, D. Palmisano, M. W. J. Davidson, "Dataset of Sentinel-1 surface soil moisture time series at 1 km resolution over Southern Italy," Data in Brief, Volume 38, 2021, https://doi.org/10.1016/j.dib.2021.107345.
- A. Balenzano, F. Mattia, G. Satalino, F. P. Lovergine, D. Palmisano, J. Peng, P. Marzahn, U. Wegmüller, O. Cartus, K. Dąbrowska-Zielińska, J. P. Musial, M. W. J. Davidson, V. R. N. Pauwels, M. H. Cosh, H. McNairn, J. T. Johnson, J. P. Walker, S. H. Yueh, D. Entekhabi, Y. H. Kerr, T. J. Jackson,

- "Sentinel-1 soil moisture at 1 km resolution: a validation study", Remote Sensing of Environment, Volume 263, 2021. https://doi.org/10.1016/j.rse.2021.112554.
- Mengen, D.; Montzka, C.; Jagdhuber, T.; Fluhrer, A.; Brogi, C.; Baum, S.; Schüttemeyer, D.; Bayat, B.; Bogena, H.; Coccia, A.; Masalias, G.; Trinkel, V.; Jakobi, J.; Jonard, F.; Ma, Y.; Mattia, F.; Palmisano, D.; Rascher, U.; Satalino, G.; Schumacher, M.; Koyama, C.; Schmidt, M.; Vereecken, H. The SARSense Campaign: Air- and Space-Borne C- and L-Band SAR for the Analysis of Soil and Plant Parameters in Agriculture. Remote Sens. 2021, 13, 825. https://doi.org/10.3390/rs13040825.
- D. Palmisano, F. Mattia, A. Balenzano, G. Satalino, N. Pierdicca and A. V. M. Guarnieri, "Sentinel-1 Sensitivity to Soil Moisture at High Incidence Angle and the Impact on Retrieval Over Seasonal Crops," in *IEEE Transactions on Geoscience and Remote Sensing*, vol. 59, no. 9, pp. 7308-7321, Sept. 2021, doi: 10.1109/TGRS.2020.3033887.

Conference publications:

- A. Balenzano, F. Mattia, G. Satalino, F. P. Lovergine, D. Palmisano, *et al.*, "SAR derived products for *agriculture," 43rd Canadian Symposium on Remote Sensing, July 11 to 14, Quebec City, Canada.*
- F. Mattia, A. Balenzano, G. Satalino, F. P. Lovergine, A. D'Addabbo, D. Palmisano, *et al.*, "Multi-Frequency Sar Data for Agriculture," *IGARSS 2022 - 2022 IEEE International Geoscience and Remote Sensing Symposium*, 2022, pp. 5176-5179, doi: 10.1109/IGARSS46834.2022.9884627.
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- SARAGRI DEL 04 "Sixth Progress Report", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, O. Ozalp, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (October 2022).
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- SARAGRI DEL 04 "Fourth Progress Report", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, O. Ozalp, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (April 2022).
- SARAGRI DEL 02 "Intermediate Report", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (February 2022).
- SARAGRI DEL 04 "Second Progress Report", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (October 2021).
- SARAGRI DEL 04 "First Progress Report", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (July 2021).

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- SARAGRI DEL 01 "Project Plan", F. Mattia, A. Balenzano, G. Satalino, D. Palmisano, F. Lovergine, R. Grassi, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, V. Paredes Gómez, D. Nafria (February 2022).
- SARSense Final Report "SARSense: Technical Assistance for Airborne Measurements during the SAR Sentinel Experiment"; C. Montzka, C. Brogi, M. Matveeva, D. Mengen, S. Baum, B. Bayat, H. Bogena, A. Coccia, V. Graf, J. Jakobi, Y. Ma, F. Mattia, D. Palmisano, P. Rademske, U. Rascher, G. Satalino, M. Schmidt, B. Siegmann (2020).
- Exploits-S-1 deliverable "Future S-1 User Requirements (D3.1A)"; U. Wegmuller, O. Cartus, M. Santoro, F. Mattia, G. Satalino, A. Balenzano, F. Lovergine, D. Palmisano, J. Peng, P. Marzahn, J. Musial, K. Dabrowska-Zielinska (2019).
- Exploits-S-1 deliverable "Validation v2 (D2.8 and D2.8A)"; A. Balenzano, F. Mattia, G. Satalino, F. Lovergine, D. Palmisano, J. Peng, P. Marzahn, O. Cartus, U. Wegmuller, J. Musial, K. Dabrowska-Zielinska (2019).

Participation to conferences as speaker:

- D. Palmisano, G. Satalino, A. Balenzano, and F. Mattia, "Surface soil moisture retrieval from C-band SAR data combining coherent and incoherent change detection," 14th European Conference on Synthetic Aperture Radar, July 25-27, 2022, Leipzig, Germany.
- D. Palmisano *et al.*, "Sensitivity of Sentinel-1 Interferometric Coherence to Crop Structure and Soil Moisture," *IGARSS 2019 - 2019 IEEE International Geoscience and Remote Sensing Symposium*, July 28 – August 2, 2019, Yokohama, Japan.
- D. Palmisano, A. Balenzano, G. Satalino, F. Mattia, N. Pierdicca and A. Monti-Guarnieri, "Sentinel-1 Sensitivity to Soil Moisture at High Incidence Angle and its Impact on Retrieval," *IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium*, July 22-27, 2018, Valencia, Spain.

Mother tongue: Italian
Other languages: English (independent user)
I hereby declare that I have a solid command of the English language, which allows me to communicate effectively in both written and spoken contexts. I'm comfortable using English in professional environments, participating in meetings, drafting emails, and holding conversations with international colleagues or clients.
Digital competence: Word, Excel, and Power Point. Programming languages: C, C++, C#, Python, Matlab, Scilab, IDL. Software: GAMMA, Comsol Multiphysics, LabView.
Soft skills: motivated, accurate, self-organized, broad-minded, versatile.

I authorize the use of my personal data in compliance with Legislative Decree 196/03.
Date
August 4th, 2025.

Signature
Davide Palmisano