Fellow	Jobin Francis

Host Organisation	Fraunhofer Institute for Computer Graphics and Research IGD, Rostock, Germany

Scientific coordinator	Philipp Wree

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my ERCIM fellowship at Fraunhofer IGD, I was part of the Bioökonomie team and contributed to a research project focused on powdery mildew detection in strawberries using hyperspectral imaging techniques. The primary objective of the project was to develop reliable, non-destructive methods for early disease detection to support precision agriculture and sustainable crop management.

My work involved hyperspectral data curation, preprocessing, modeling, validation, and performance evaluation using advanced machine learning techniques. I developed structured data processing pipelines to handle high-dimensional spectral datasets, applied feature extraction and dimensionality reduction methods, and implemented classification models to accurately distinguish between healthy and infected samples. Rigorous validation strategies were employed to ensure robustness, generalization, and reproducibility of the results.

In addition to data analysis, I actively participated in hyperspectral data acquisition using hyperspectral cameras and complementary spectrographic sensors. This included setting up experimental configurations, calibrating equipment, and ensuring standardized acquisition protocols to maintain data quality and consistency.

I regularly took part in weekly team meetings to present progress, discuss challenges, and share knowledge with colleagues. Furthermore, I collaborated closely with interdisciplinary teams within Fraunhofer IGD and external academic and industrial partners. These interactions strengthened the methodological rigor of the project and contributed to impactful outcomes, including technical reports and scientific publications.

I also attended internal seminars, workshops, and research discussions that promoted knowledge exchange and interdisciplinary collaboration. Overall, the fellowship significantly enhanced my expertise in computational modeling, experimental research design, and industry-oriented research translation, enriching my professional and scientific development.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

During my fellowship, I have contributed to several publications that have significantly advanced in the vast domain of hyperspectral imaging which includes disease detection, food quality analysis, detection of contaminations in food materials, etc. My contributions include:

1. Non-Invasive Detection and Characterization of Powdery Mildew in Strawberries Using Hyperspectral Imaging and Deep Learning under Poly-tunnel Conditions,
   Authors and Affiliations: Jobin Francis Maximilian Pircher Philipp Wree and Ali Al Masri, Fraunhofer IGD, Joachim-Jungius-Strase 11, 18059, Rostock, Germany
   Conference: Computer Graphics and Visual Computing (CGVC) 2025, Liverpool, UK, Sep 10-11.

2. Hyperspectral Imaging Coupled with Deep Learning frameworks for Mycotoxin Detection in Wheat and Maize: Progress, Challenges, and Research Trends (2023-2025)
   Authors and Affiliations: Jobin Francis Maximilian Pircher Philipp Wree and Ali Al Masri, Fraunhofer IGD, Joachim-Jungius-Strase 11, 18059, Rostock, Germany
   Conference: 15th IEEE GRSS Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS), Barcelona, Spain, Nov 12-14.

3. Spatial Mapping of Soluble Solids Content Variability in Kiwifruit Using Hyperspectral Imaging and Chemometrics.
   Authors: Jobin Francis, Sony George, Sudhish N George, Philipp Wree, and Ali Al Masri
   Conference: 15th IEEE GRSS Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS), Barcelona, Spain, Nov 12-14.

4. Field-Ready Hyperspectral Detection of Strawberry Powdery Mildew Using Band-Selected One-Dimensional Convolutional Neural Network (1D CNN) under Polytunnel Conditions
   Journal: Computers and Graphics, Elsevier, Special Edition, IF: 2.8
   Authors: Jobin Francis, Ali Al Masri, Maximilian Pircher, and Philipp Wree
   Status: Submitted

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

1. 15th IEEE GRSS Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS), Barcelona, Spain, Nov 12-14.
2. Conference for Mechanical Engineering and Digitalization in Smart Farming', hosted by Fraunhofer IGP, Rostock, Germany (September 3–4, 2025).
3. International workshop on 'Hyperspectral Remote Sensing and AI in Agriculture', 4-5 February 2026, Campus Kirchberg, Luxembourg, Luxembourg.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

During my research exchange programme at STIIMA-CNR, I had the privilege to participate as a visiting researcher from September 24 to September 30, 2025, as part of my ERCIM Postdoctoral Fellowship. STIIMA-CNR is a leading institute in intelligent industrial technologies and advanced manufacturing systems, with strong expertise in robotics, computer vision, and digital transformation for industrial and agricultural applications.
Throughout the programme, I engaged in various scientific activities, including technical discussions, seminars, and project meetings, where I actively exchanged ideas with researchers in computer vision and machine learning. I delivered a presentation on my recent work on powdery

mildew detection in strawberries using hyperspectral imaging and deep learning techniques. I also contributed to discussions on hyperspectral-based textile classification and attended a demonstration of an agricultural robotics project focused on automatic in-field phenotyping.
I sincerely appreciate the hospitality and collaborative spirit of STIIMA-CNR during my visit. The exchange enriched scientific discussions, strengthened international collaboration, and opened promising opportunities for future joint research initiatives.

Digital unterschrieben von Philipp Wree
Datum: 2026.02.18 14:06:44 +01'00'