GRETSI XXXI[e] Colloque Francophone de Traitement du Signal et des Images

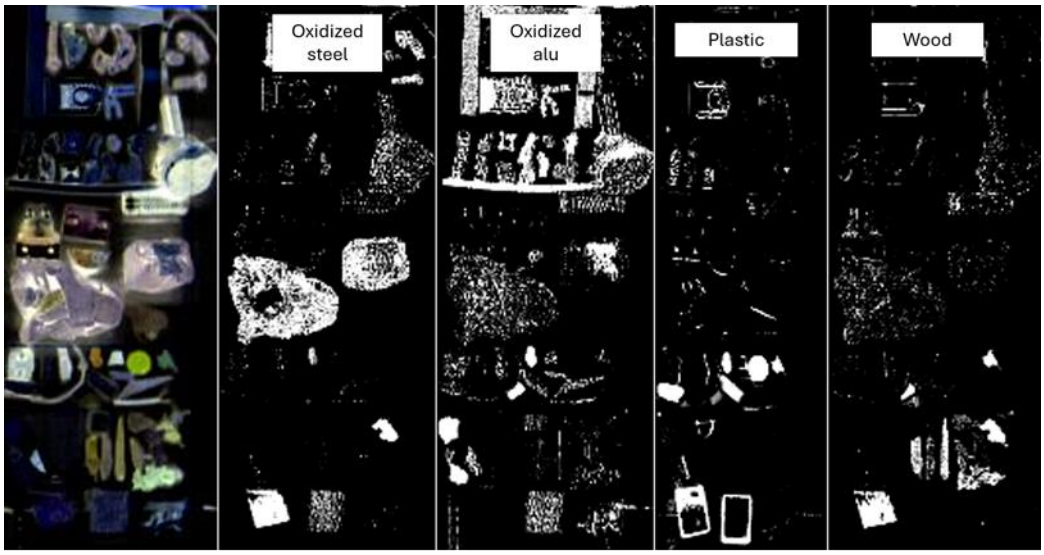
6-10 September 2027, Rennes (France)

Special session:

Industrial Applications of Multimodal Image Processing

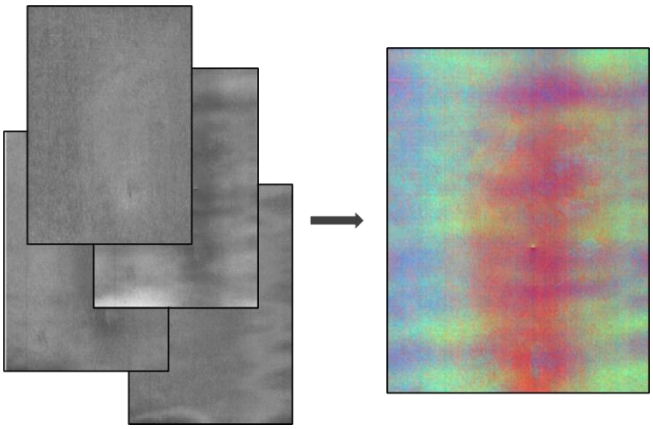
Image processing plays a central role in many industrial applications such as quality control, anomaly detection, automation, and process supervision. These systems still rely largely on RGB image analysis, for which tools and methods, in particular deep learning–based approaches, are now mature. However, in real industrial environments, RGB imaging suffers from significant limitations: sensitivity to lighting conditions, difficulties with reflective or textured surfaces, lack of information about material composition, and a purely 2D representation that is sometimes insufficient to properly capture object or surface geometry.

To overcome these limitations, many applications are moving toward the exploitation of complementary information sources, leading to the analysis of so-called multimodal images. These data may include depth maps for geometric description, multi- or hyperspectral imaging (infrared, ultraviolet, terahertz, X *etc*.) to gain access to information on materials, ultrasonic imaging, or thermal imaging, which is commonly used for anomaly detection and production monitoring. Combining these modalities makes it possible to significantly improve the robustness, accuracy, and reliability of industrial vision systems, particularly for segmentation, object detection, surface inspection, and process monitoring tasks.



Hyperspectral components identification.

However, the joint exploitation of multimodal data raises specific challenges that are strongly related to industrial constraints, including heterogeneous acquisition rates, spatial or temporal misalignment between sensors, increased computational cost and memory usage, as well as strict latency and availability requirements. Robustness to partially or completely missing modalities is also a major issue for systems deployed under operational conditions.



Multiple field (PoV) aggregation

In this context, the special session focuses on works addressing multimodal fusion strategies suited to these constraints, at different stages of the processing pipeline. Contributions may cover the combination of closely related or aligned modalities, early fusion between representations extracted (or learned) from each modality, or interactions between different latent spaces (weighting). The harmonization of heterogeneous information through alignment mechanisms, concatenation, shared representations, or translation between latent spaces may also be addressed.

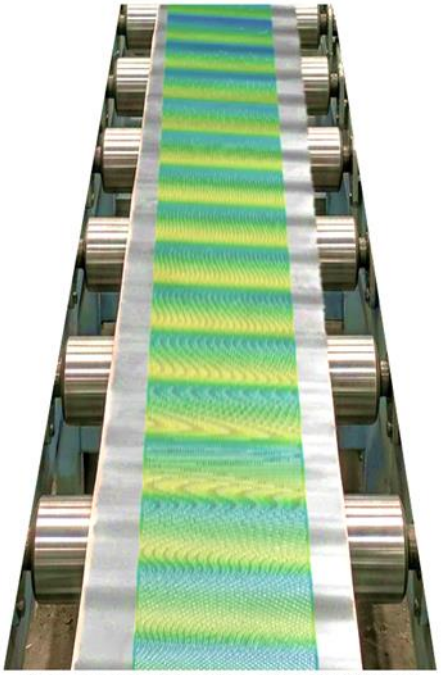
Topics and domains of interest include, but are not limited to:

- Pattern and object recognition
- Surface characterization and inspection
- Any kind of image (raster, vector, point cloud…)
- Anomaly detection and safety controls
- Measurement of product properties
- Automated quality control
- Supervision and monitoring of industrial processes
- Cartography, remote sensing, transportation…

Contacts:

- Benoit Marchand (Benoit.MARCHAND@arcelormittal.com)
- Julien Langlois (julien.langlois@arcelormittal.com)

Do not hesitate to send a contribution proposal (title, authors, abstract) to us before the end of October 2026 for a full submission of the article (4 pages) in February/March 2027.



Process monitoring camera VS 3D point cloud