STIIMA
Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato
Consiglio Nazionale delle Ricerche

RELIGHT

XNEXT

SmartLED

Multi-sensors integration for the sorting of end-of-life lamps

ACHIEVED RESULTS: X_RAY

WEBINAR, October 2nd, 2020
10:00-11:30 CEST

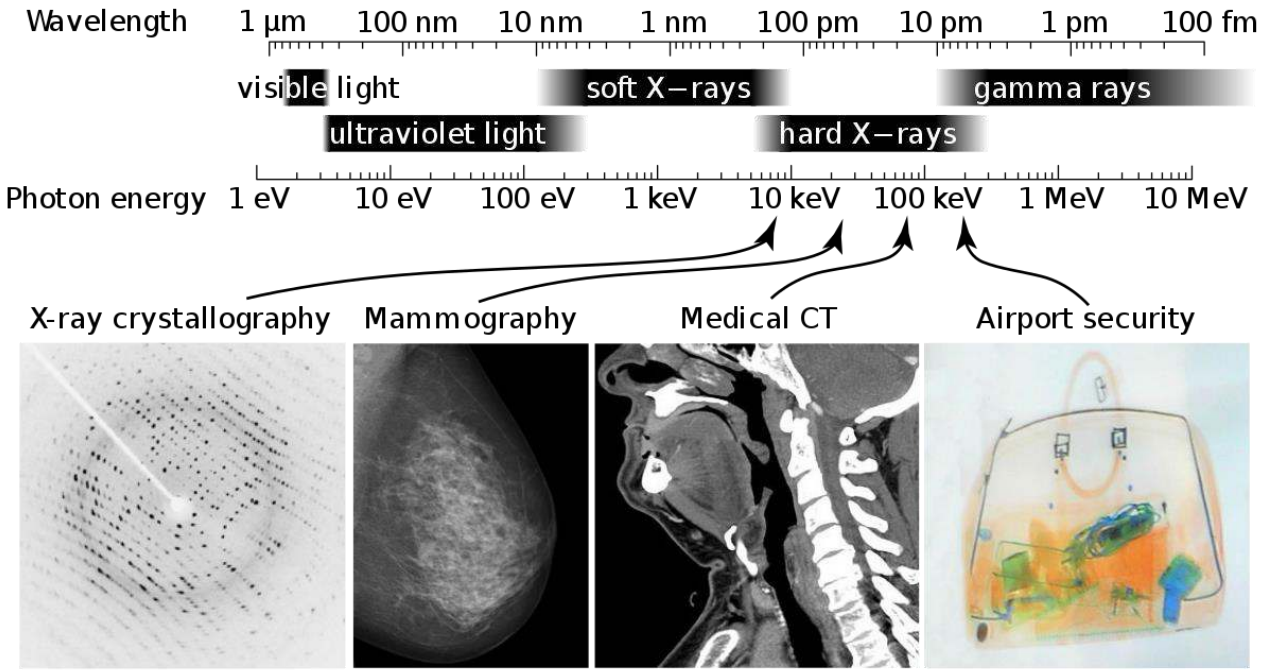
X-RAY ANALYSIS FOR ON-LINE MATERIAL CHARACTERIZATION

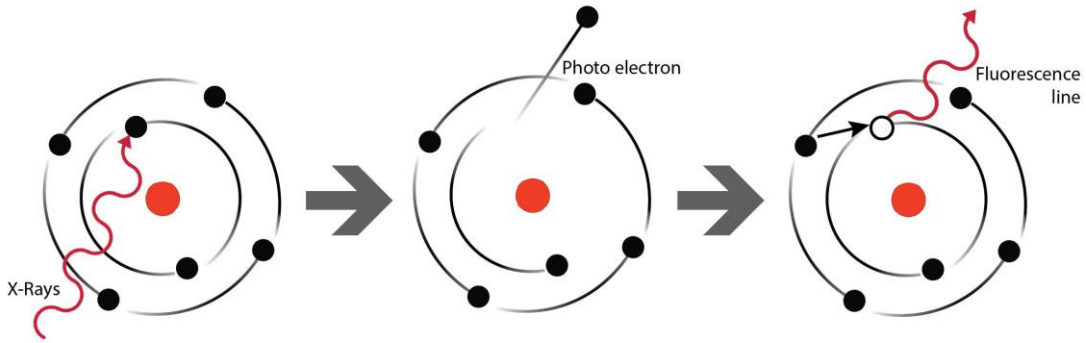
Technology ability: X-RAY ANALYSIS	Identification of objects analyzed using X-Ray **multi-energy detectors**
	Classification (group assignment)
	Wide range of applications, **fast** NDT analysis, **high accuracy** identification
Contribution to processes reconfigurability	On-line material analysis: full descriptors data storage for future analysis review
	Remote monitoring and control of the process
Technology innovation & challenges	Challenges: - Algorithms customization - Neural network training

X-RAY ANALYSIS: CONCEPT

X-RAY RADIATION

X-rays can traverse relatively thick objects without being much absorbed or scattered and are widely used to image the inside of visually opaque objects.





The incident x-ray photon could be **absorbed or reflected**, according to material composition.

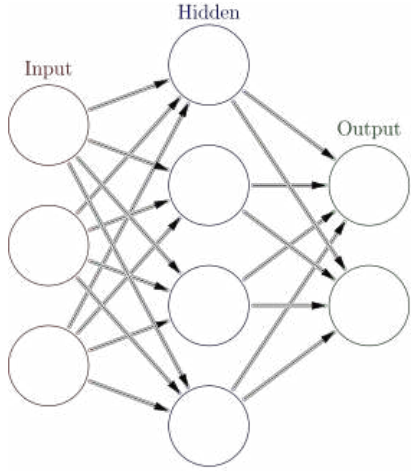
XSpectra® counts the X-ray photon in number and energy for each pixel. The energy response obtained is then elaborated by a sophisticated algorithm that identifies in real time the correspondent material.

X-RAY ANALYSIS: SAMPLE CLASSIFICATION

NEURAL NETWORK

Mathematical methodology for classification.

Known input lamps are classified, so that neural network finds the hidden parameters that identify the relationships inside each class and uses it for the subsequent sorting.



Neural network
Training set

Sample
Under test

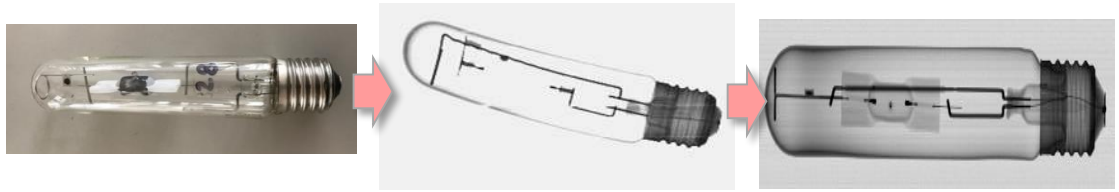
Data acquisition

Data storage

Data analysis
1. Calibration
2. Noise reduction
3. Background removal
4. Descriptor identification

Image Classification
Image analysis
Descriptors classification

IMAGE PRE-PROCESSING OPERATIONS



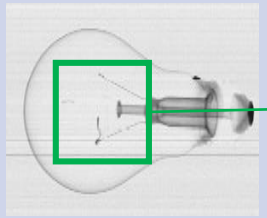
X-RAY ANALYSIS : RESULTS

HSI SENSOR

X-RAY SENSOR
INTERNAL
MORPHOLOGY

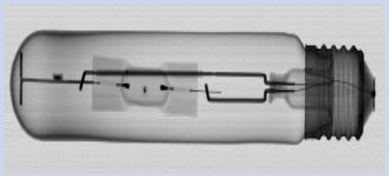
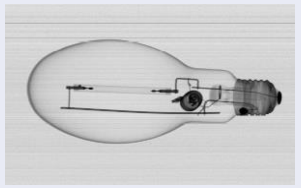
HID incandescent

INCANDESCENT

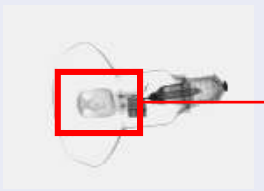
VISIBLE IMAGE	X-RAY IMAGE
	

METALLIC FILAMENT

HDI

VISIBLE IMAGE	X-RAY IMAGE
	
	

HALOGEN

VISIBLE IMAGE	X-RAY IMAGE
	
	

INNER GLASS BULB

X-RAY ANALYSIS : RESULTS

HSI SENSOR

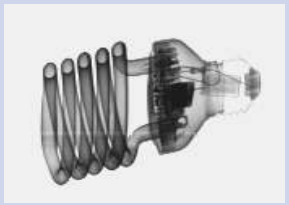
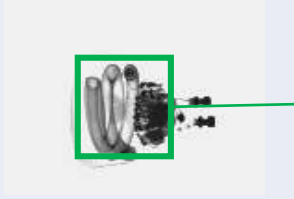
X-RAY SENSOR

INTERNAL MORPHOLOGY

LED

CFL - compact

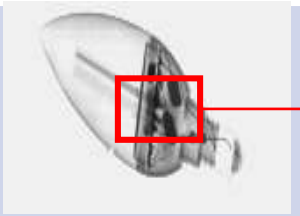
CFL

VISIBLE IMAGE	X-RAY IMAGE
	
	

GLASS TUBES

LED & LED RETROFIT

VISIBLE IMAGE	X-RAY IMAGE
	
	

VISIBLE IMAGE	X-RAY IMAGE
	
	

LED POINTS

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PROJECT OVERVIEW

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