



Opportunity of Msci Dissertation (Tesi di Laurea)

Title	Design, development and deployment of a computer-aided platform for the identification and classification of defects in digital images
Motivations and objectives of the research	<p>The objective of this research project consists in designing, developing, and deploying a Computer-Aided deFects detection, IdeNtification and classificatioN system for digital images (CAFEIN). The system will allow the automatic and precise analysis, interpretation, classification and storage, of digital images with the capability to detect defects or anomalies and classify them according to international standards. The final purpose is to produce a system for defect and anomalies detection capable of self-improvement in terms of detection and performances, but also able to cope with both cloud resources, to perform CPU-intensive tasks, and programmable devices that bring the computation near to the physical process (according to the edge-computing paradigm).</p> <p>The system will establish a large and comprehensive database of images, defects and anomalies to improve quality assurance and control for industrial manufacturing and diagnostic. It shall ensure efficiency, quality, and safety improvement for the end users with automated and early detection capabilities while reducing the user interaction for the definition of the ground truth and the correction of the predictions to improve its performances. It shall simplify the users time and expertise required for the training of the image segmentation network with scribble annotations only without a significant loss with respect to a network trained on full annotations.</p> <p>The objectives of the present thesis work are:</p> <ol style="list-style-type: none">1. Contribute to the design a computer aided defect detection and classification tool based on a combination of deep learning techniques with image processing methods to enhance and ease the defects identification and analysis of digital images2. Develop and implement a framework for the automatic and precise analysis, interpretation, classification and storage, of digital images with the capability to detect defects or anomalies and classify them according to international standards
Activities	<ol style="list-style-type: none">i) Development of deep learning techniques for image processing, whose objective is the semi-supervised segmentation and classification of defects in digital imagesii) Develop an iterative interaction training for segmentation editing networks and compare it to state-of-the art interactive segmentation algorithmsiii) The platform shall achieve 'maximum learning performance' with 'minimum user interaction'
Required competencies and skills	<ol style="list-style-type: none">i) Interest in developing innovative algorithms to tackle real applications;ii) Good knowledge of image processing techniques and algorithms;iii) Good knowledge of Python programming or a willingness to learn before starting the assignment.

Composition of the research group	Number of Full Professors: 1 Number of Associate Professor: 1
Names of the research director	Enrico Zio
E-mail address, and web-page	Email: enrico.zio@polimi.it Email: piero.baraldi@polimi.it www.lasar.polimi.it
Duration of the dissertation	
Total thesis duration	Approximately 9 Months. At most 1 pending exam.

Starting date: April 2021