

## **Abstract**

This doctoral dissertation explores the use of active thermography as a non-destructive evaluation (NDE) technique for assessing welded joints, focusing on its applicability, advantages, and limitations. The research encompasses a comprehensive review of non-destructive testing (NDT) methods and their evolution, with a specific emphasis on active thermography and its integration into modern quality assurance processes.

The methodology combines analytical formulations, experimental validations, and novel applications of active thermography. Specific applications include spot weld quality assessment, microstructural property evaluation, and anisotropy analysis in additive manufactured components. Advanced methods, such as gradient imaging and artificial intelligence, are employed to enhance defect detection accuracy and material characterization.

Key findings demonstrate the potential of active thermography to improve defect detection and quality control in welded structures, offering a non-invasive, efficient, and precise approach. This work concludes with recommendations for future research and applications of thermography in diverse industrial settings.