X-RAY Weld Flaw Detection App

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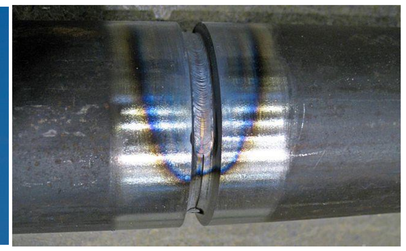
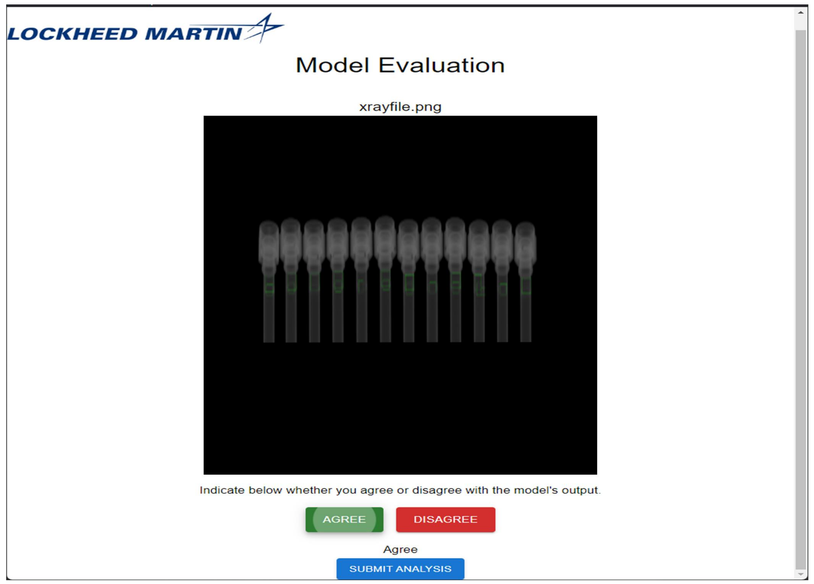
Project Description

Lockheed Martin, in its quest to engineer exceptional aircraft, demands perfection in every aspect of production. However, human welding inevitably introduces microscopic flaws that often go unnoticed, posing significant risks to aircraft integrity. To address this critical issue, we propose the development of a comprehensive standalone application. This full-stack solution will leverage advanced imaging technology to analyze X-ray scans, accurately detect even the tiniest imperfections, ensuring the highest standards of safety and quality in aerospace manufacturing.



Objectives

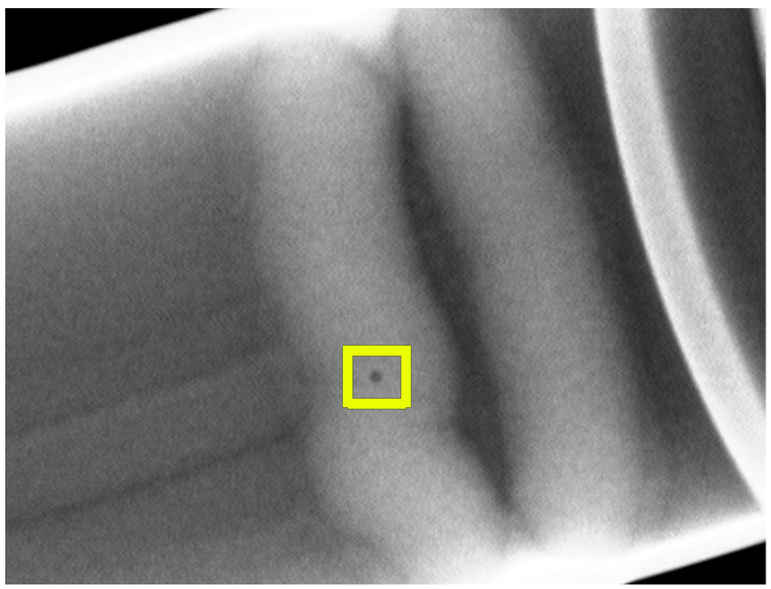
- Create a Convolutional Neural Network Model capable of identifying flaws
- Provide a simple User Interface
- Provide a deployable end to end application
- Provide a system that encourages user input for computer analysis



This image has been altered for security purposes and does not represent actual output.

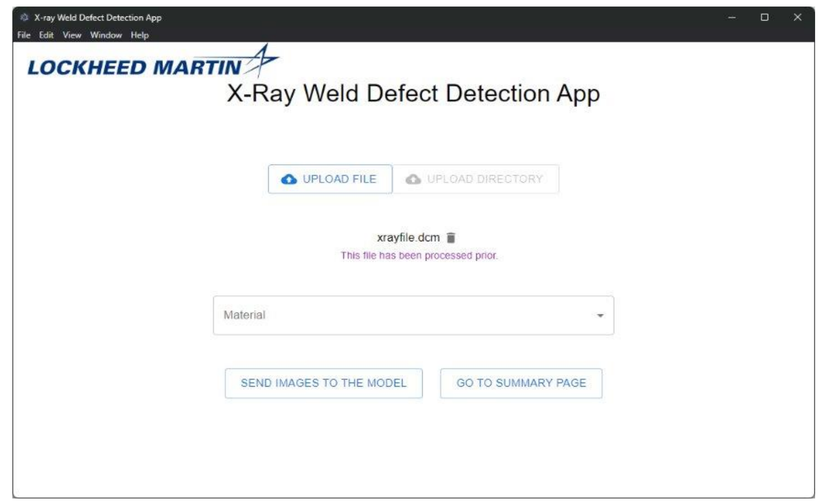
X-Ray Data

To meet the CNN's requirement for uniform image sizes, we segmented larger X-ray images, originally around 16,000 by 14,000 pixels, into consistent sub-images of 224 by 224 pixels—the preferred size for our model.



CNN

We utilized Keras for our CNN to address class imbalance by applying differential class weights, enhancing detection sensitivity. The CNN, trained on both original and altered sub-images, distinguishes between flawed and flawless areas effectively. This method not only refined detection capabilities but also improved the model's recall and accuracy by using the initial training weights as a foundation for further learning.



React and Electron for Deployable Application Development:

We combined React for a responsive UI with Electron to create a standalone desktop application, ensuring broad compatibility and user-friendly functionality.

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