**Objective for the Project**

The primary objective of this project is to develop an automated image classification system to assess corrosion levels in metallic materials, leveraging a novel dataset of corrosion images. The system will:

1. Utilize deep learning models to classify images into corrosion rating classes (e.g., 5-9) as per expert annotations.
2. Integrate domain-specific data augmentation techniques and pretrained models (like ResNet) to enhance classification accuracy.
3. Provide an accessible web-based interface where users can upload corrosion images, view classification results, and analyze related predictions, including visual highlights of key areas (e.g., using Grad-CAM).

**Front-End Design Concept**

The front-end of the application will enable:

1. **Image Uploading:** Users can upload corrosion images in supported formats (e.g., JPEG, PNG).
2. **Real-Time Classification:** Upon uploading, the image will be processed, and a corrosion rating will be displayed.
3. **Result Visualization:** Display of Grad-CAM heatmaps to highlight areas influencing the classification.
4. **User Guidance:** Include descriptions of rating classes (5-9) for better understanding of results.

**Implementation Plan**

**Back-End:**

* Train and deploy a deep learning model (ResNet-18 or ResNet-50 with data augmentation) for the classification task.
* Implement a server-side API to handle image uploads, model inference, and Grad-CAM visualizations.

**Front-End:**

* Use a framework like React.js or Vue.js for dynamic and user-friendly UI development.
* Include drag-and-drop image upload functionality.
* Display results, such as the predicted corrosion rating, confidence score, and heatmap overlays.

**Deployment:**

* Host the application on a cloud platform (e.g., AWS, Azure, or Google Cloud) with GPU support for inference.