Project Design Phase-I
Solution Architecture

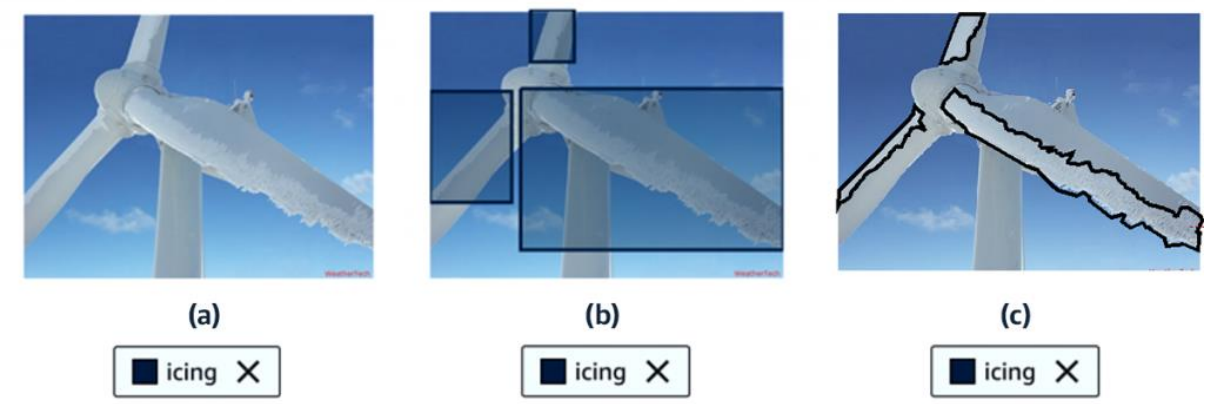
Date	22 Oct 2022
Team ID	PNT2022TMID28832
Project Name	Predicting the energy output of wind turbine based on weather condition
Maximum Marks	4 Marks

Solution Architecture:

Keeping wind turbines operational also means keeping them well maintained. One of the steps in maintenance is regular visual inspection. Wind farm operation and maintenance companies started to utilize drones with attached cameras to perform visual inspections.

There are typically three types of image recognition. The first one is Multi-Label Image Classification. In Multi-Label Image Classification, the image is treated as a whole to label the scene.

For example, Figure 1.a shows an image of a turbine that has icing. Hence, the result of the label would be “icing” and attributed to the whole scene. This method is simple and requires the least amount of data to train compared to other methods.



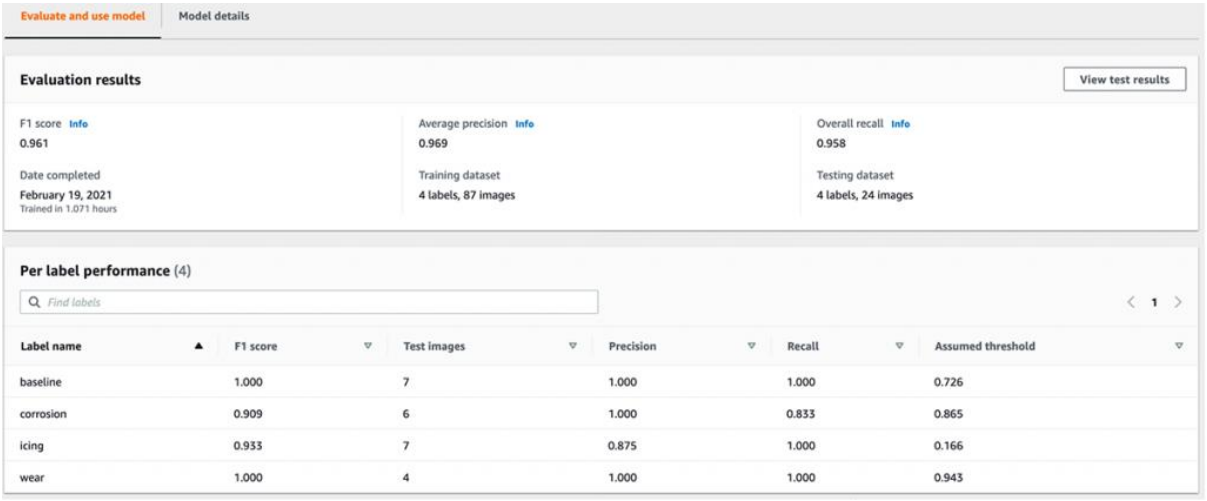
As of today, Amazon Rekognition only supports Multi-Label Image Classification and Object Detection with Bounding Box. You can use Amazon SageMaker to perform Semantic Segmentation.

three example issues (labels) on the wind turbines. These are wear, icing, and corrosion

You can improve the Amazon Rekognition Custom Labels model by including a baseline label class which can represent “no issue” condition.

Preparing a dataset, labelling, training, and deploying Amazon Rekognition is out of the scope of this blog.

Inspection is a part of safety, missing actual problems would have bigger impact than incorrectly identifying issues in safety. For this reason, you may want to maximize recall while tuning your model.

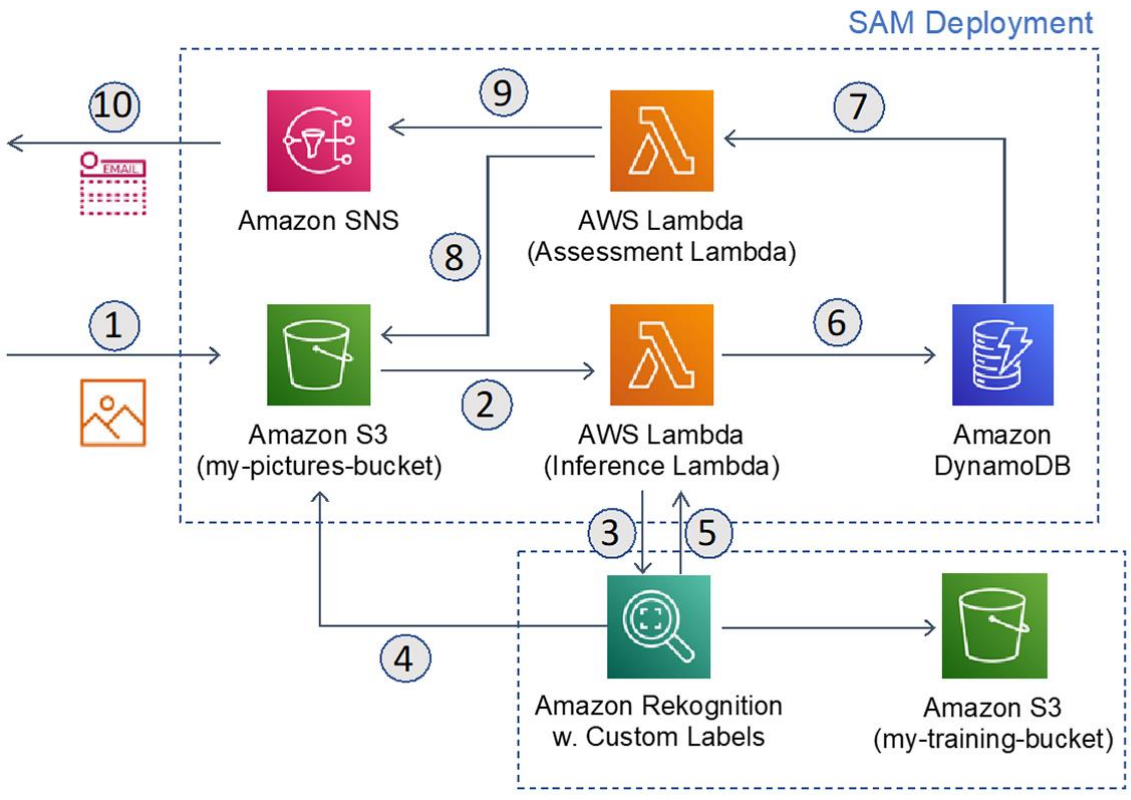


Deployment:

It use both AWS CLI and AWS SAM, so install and configure the AWS CLI and AWS SAM CLI. The application build process also requires the installation of Docker and Python.

You can select one of the pictures from the validation dataset.

Solution Architecture Diagram:



Step 1: The images are first put in to Amazon S3 (my-pictures-bucket).

Step 2: which invokes AWS Lambda (Inference Lambda).

Step 3: The Inference Lambda function calls Amazon Rekognition Custom Labels API

Step 4: To infer the image (object) stored in my-pictures-bucket S3 bucket.

Step 5: Hence, Amazon Rekognition should have IAM permissions and bucket policies to perform action such as GetObject from that S3 bucket. The JSON response with labeled data is received by the Inference Lambda

Step 6: And added as an Item to Amazon DynamoDB table.

Step 7:The DynamoDB table has Partition Key of ID and the Sort Key timestamp. The item has two Attributes object key for the image file and the inference output from the Amazon Rekognition. Amazon DynamoDB Streams invokes another Lambda function called Assessment Lambda.

Step 8: This Lambda function represents the stage where the decision logic comes into play. The Assessment Lambda will assess the results of the inference in the DynamoDB table. If the inference results meet the conditions, the Lambda function will take an action, accordingly. For simplicity, our Assessment Lambda checks the issue lists to be alerted, which is an input from the deployment; MyLabelListToBeNotified. However, you can use any business logic. If one of the alert requiring labels is found in the list, the Assessment Lambda first signs the URL of the image object in the my-pictures-bucket

Step 9: And then invokes the Amazon SNS.

Step 10: Amazon SNS sends an email about the issue (label), details (confidence), and the signed link to the original image object for further review.