DEEP LEARNING FOR AUTOMATED CORROSION DETECTION

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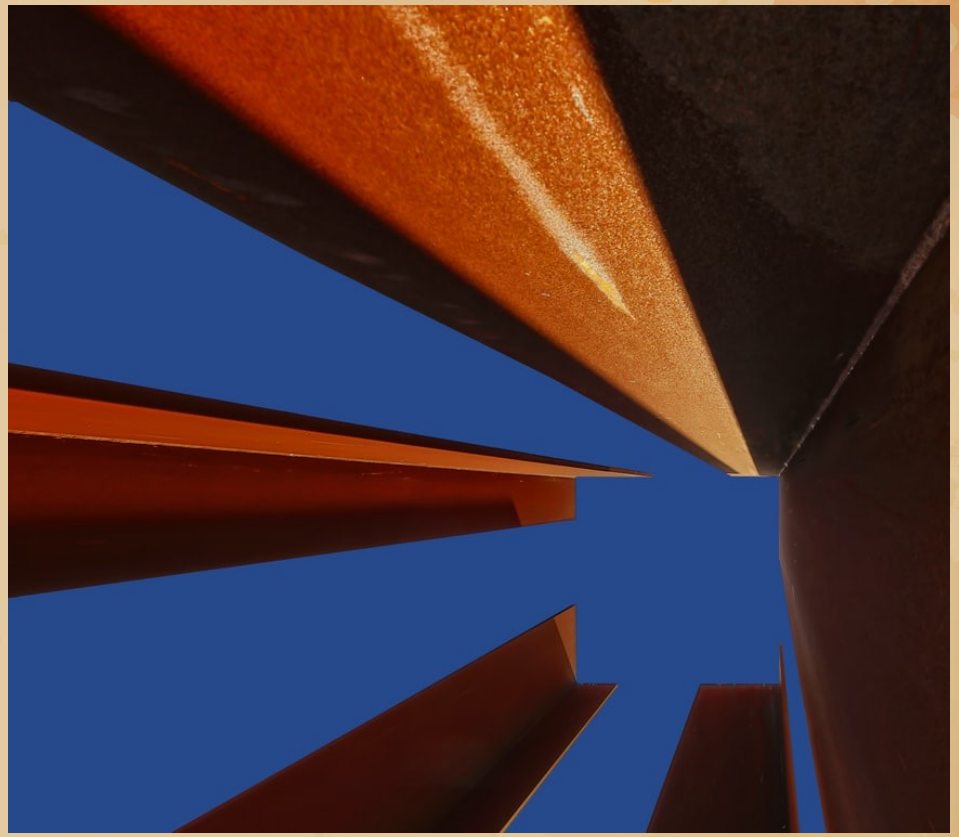
WHAT IS CORROSION?

“Corrosion is defined as the deterioration of a material, usually a metal, because of reaction with its environment.”

Chilingarian, 1989; Popoola, Grema, Latinwo, Gutti, Balogun, 2013.



NACE INTERNATIONAL

$2,500,000,000,000

Bye Bye ! ! See you never again !

CORROSION CONTROL METHODS

Cathodic Protection

Anodic Protection

Internal and External Protective Coatings

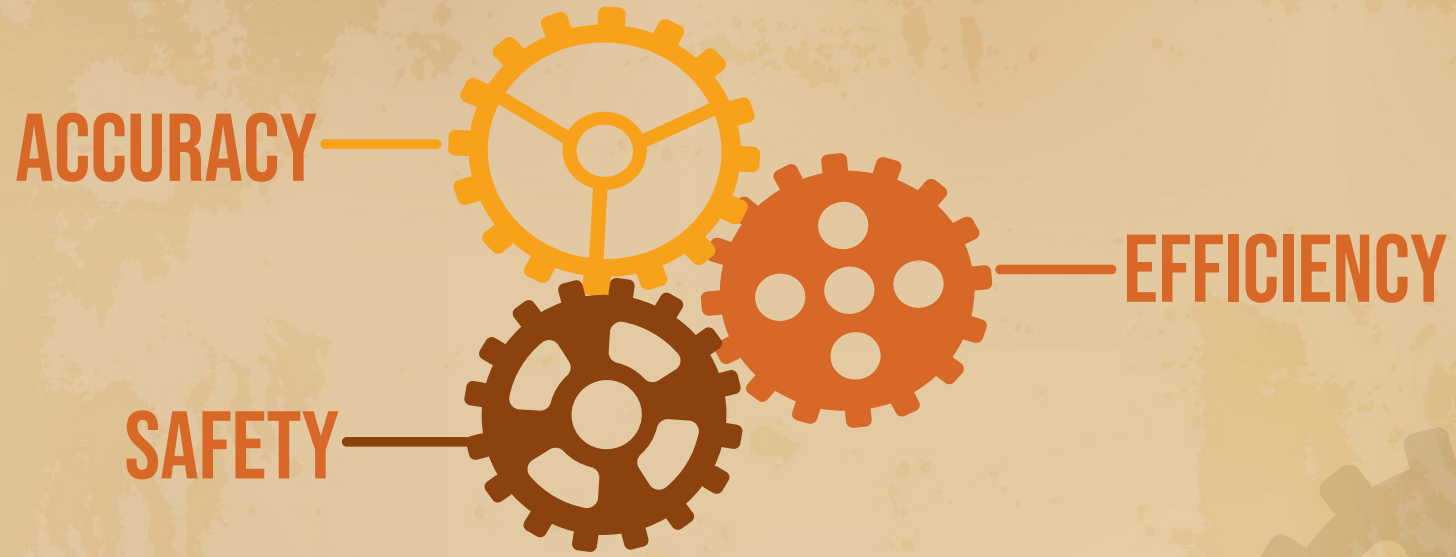
Inhibitors

Corrosion Monitoring and Inspections

CHALLENGES

CHALLENGES

GOALS



METHODOLOGY

Data Collection

Data Exploration

Image Preprocessing

Data Modeling

DATA

STEEL: CORROSION

STEEL: NO CORROSION

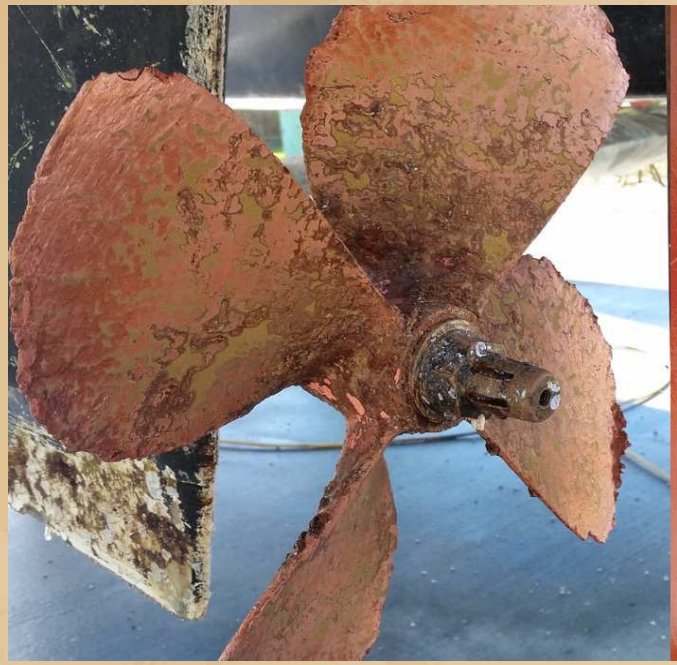
DATA

SHIP HULL: CORROSION

SHIP HULL: NO CORROSION

DATA

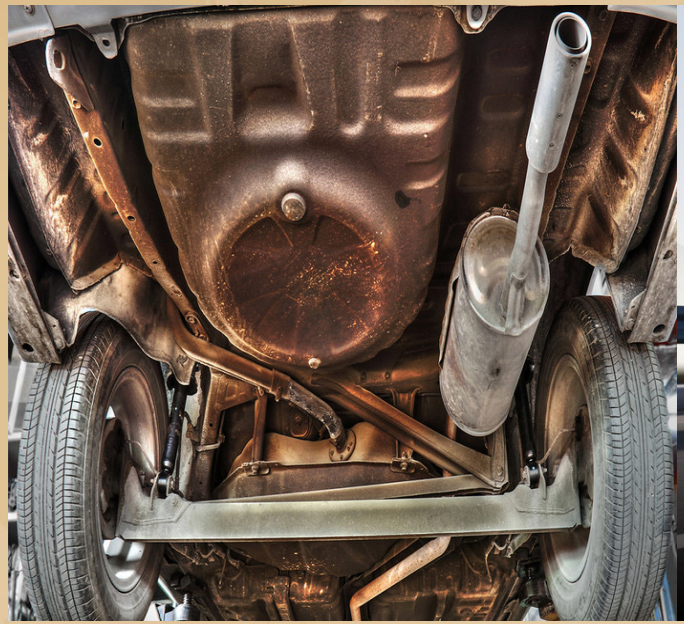
SHIP PROPELLERS: CORROSION



SHIP PROPELLERS: NO CORROSION

DATA

CARS: CORROSION



CARS: NO CORROSION

DATA

OIL AND GAS PIPELINE: CORROSION

OIL AND GAS PIPELINE: NO CORROSION

DATA

CONCRETE REBAR: CORROSION

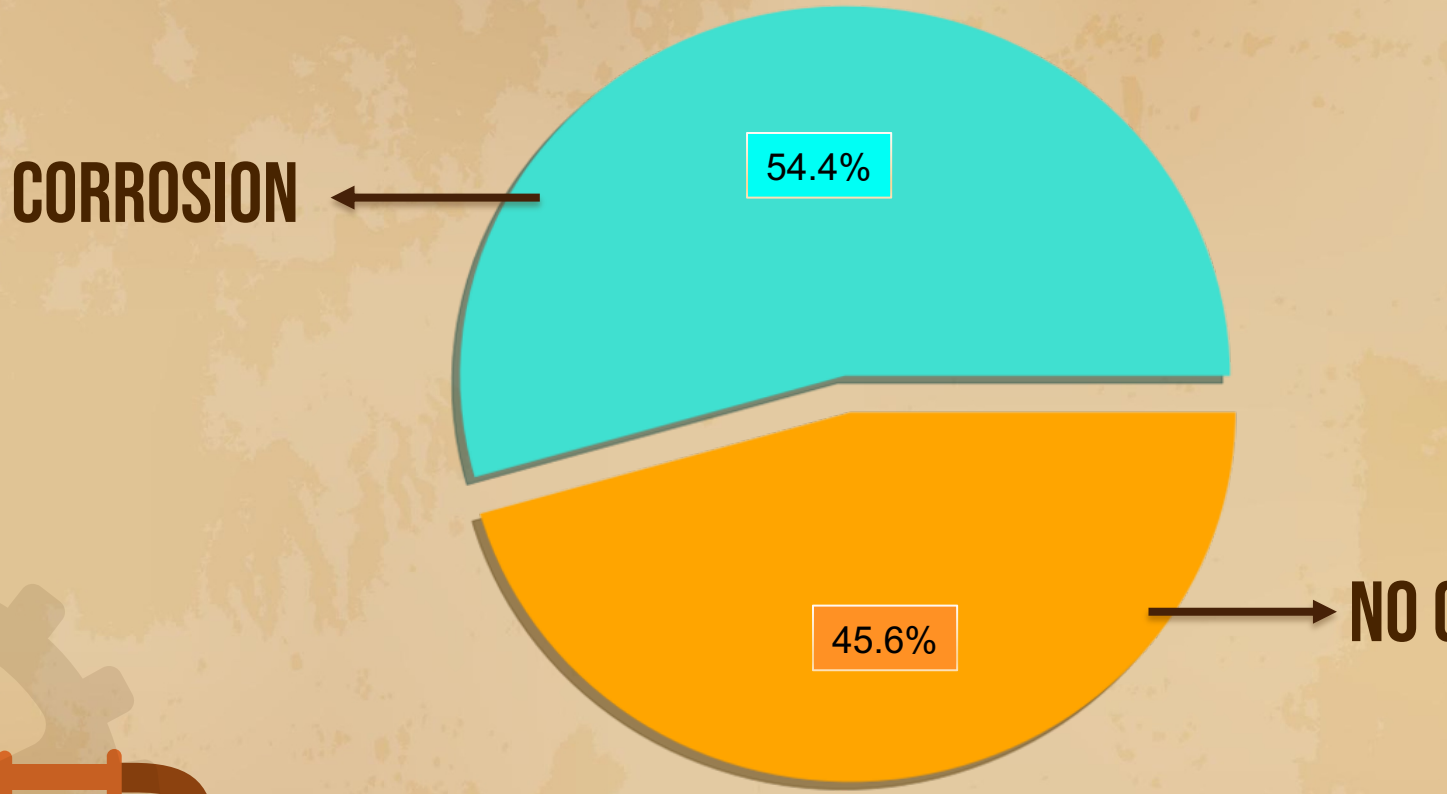
CONCRETE REBAR : NO CORROSION

DATA

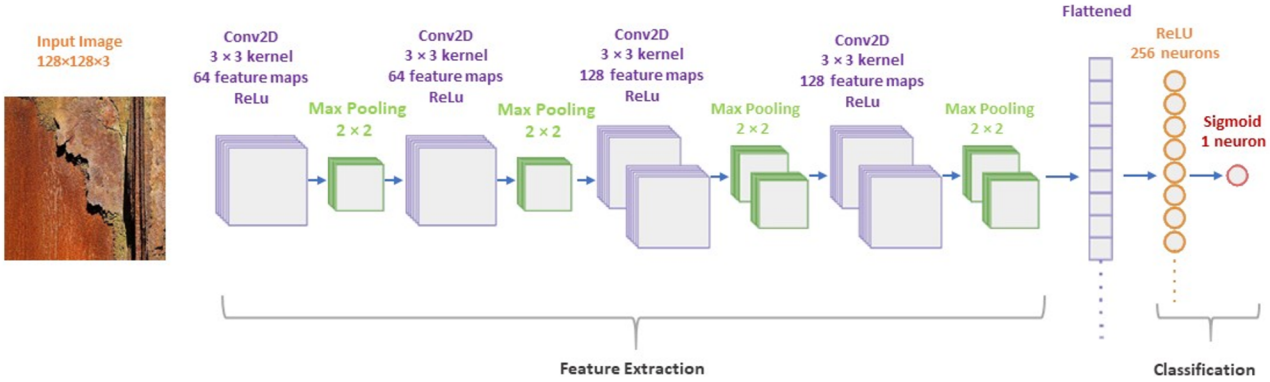
STAINLESS STEEL: CORROSION

STAINLESS STEEL: NO CORROSION

TRAINING DATA



CNN MODEL

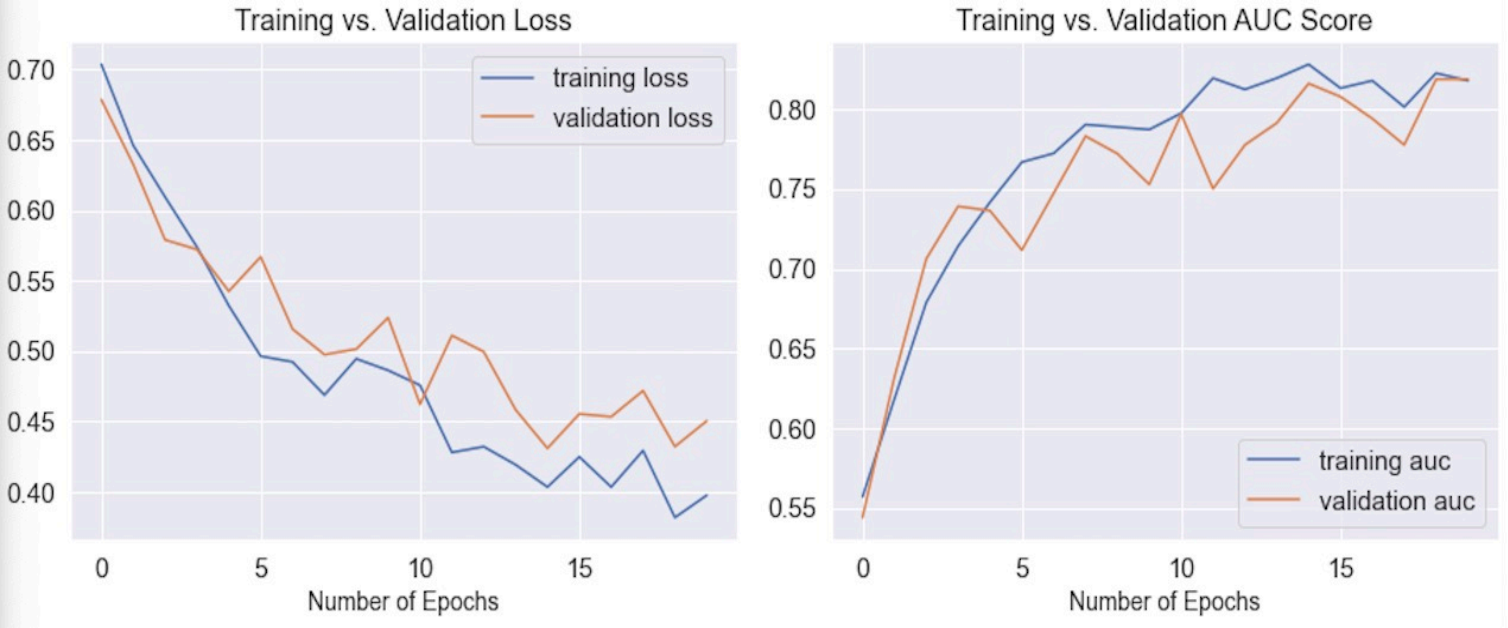


Optimizer: Adam

Loss Function: Binary Cross-entropy

RESULTS

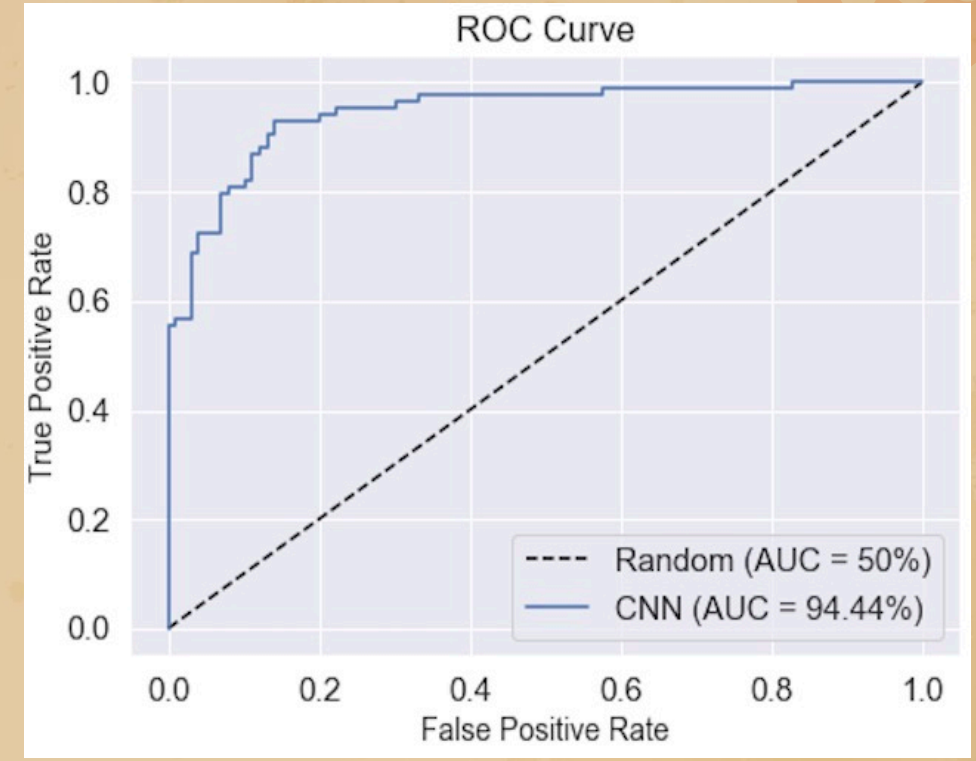
TRAINING VS. VALIDATION: LOSS & ACCURACY SCORE



RESULTS

94.44%

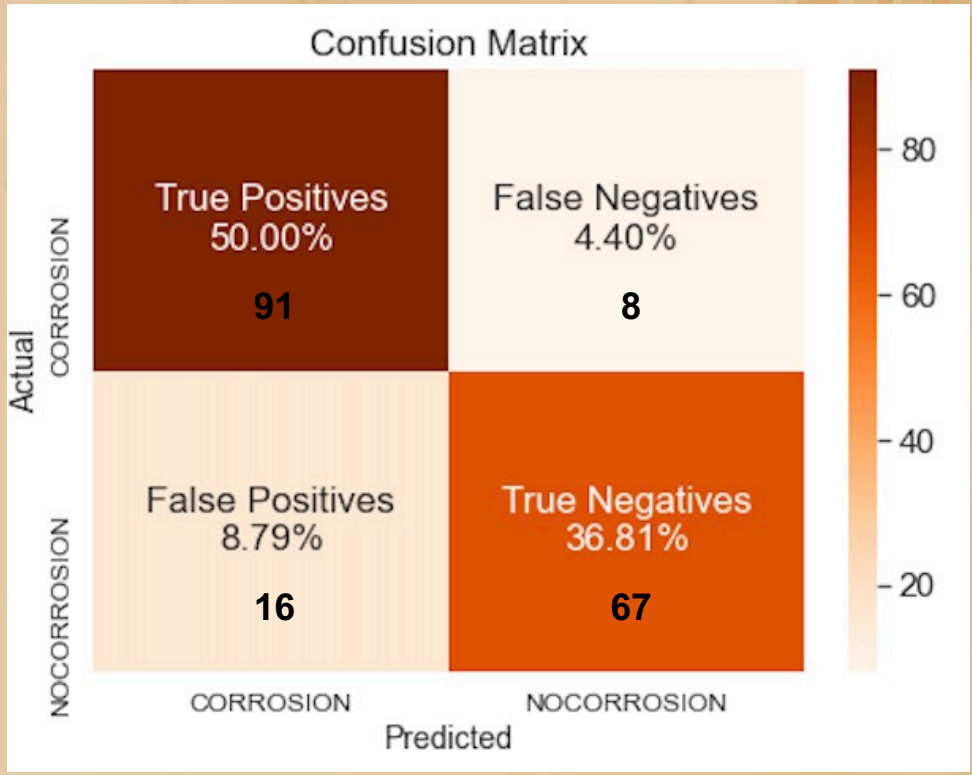
AUC



RESULTS

92%

RECALL



CONCLUSION

1. The results confirm that the implemented deep learning CNN algorithm is a promising tool for automated detection of corrosion.

2. By giving a wide variety of corrosion images, our model can efficiently find the corrosion issues with high accuracy.

3. A high accuracy automated corrosion detection model can reduce the cost of corrosion inspections and chances of human life in danger.

FUTURE WORK

DATA QUANTITY

Increase the number and diversity in the dataset

"it was found that there is a need for 65,000 labeled images required to achieve an essentially human-level accuracy for an A. I model " – Nush, Drummond in NACE Corrosion 2019

DATA QUALITY

Increase the quality of corrosion image labelling

MODELLING

Include image segmentation and use U-net CNN architecture for modelling

THANKS!

Do you have any questions?

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