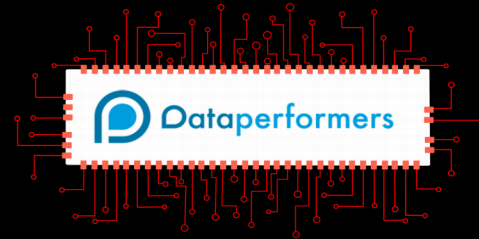




Case Study



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TABLE OF CONTENTS

01 CASE SUMMARY

02 PROBLEM STATEMENT
REQUIREMENTS

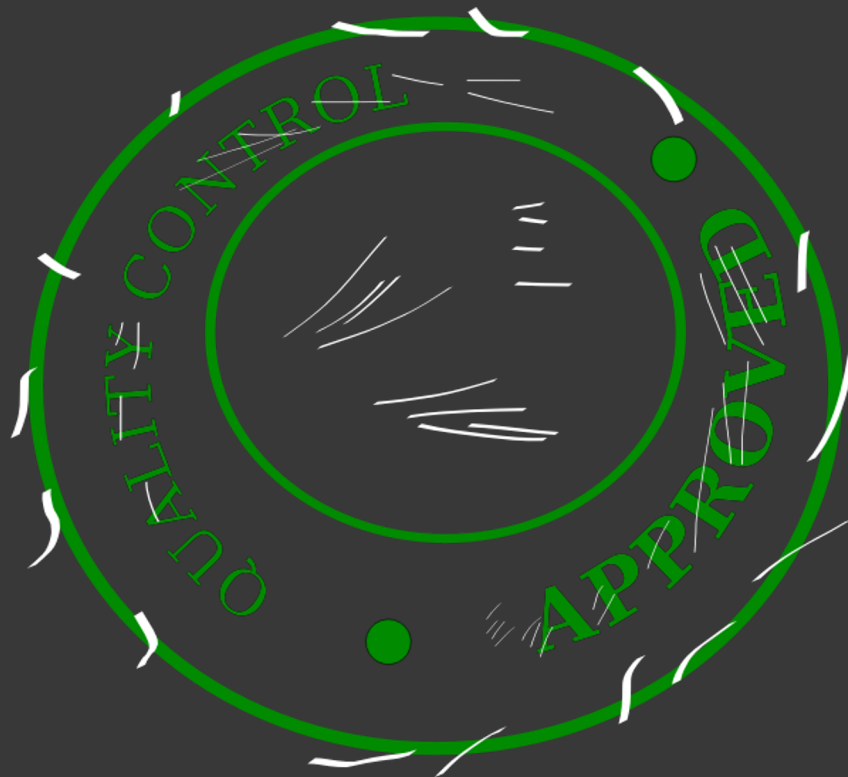
03 IDEATION AND PLANNING

04 SOLUTION



CASE SUMMARY

Shipping out a defective product can impact the image and reputation of a company. Dataperformers looking to improve the product quality control by using AI-powered software. Dataperformers challenging anyone to develop an accurate and precise ML model that is capable to process the product image and identify if it is defective





DATAPERFORMERS

- Dataperformers is one of Canada's top artificial intelligence companies powering various industry sectors.
- Recently, they released Macula Ai - a computer vision inspection tools.
- This case study objective is to train highly accurate models with very low requirements
- The deliverable is to submit a functioning proof of concepts

PROBLEM STATEMENT

- Develop and train a machine learning model that improves the company's computer vision software. The objective is to build a model that can recognize and label products as "defective" or "not defective", with accuracy and precision.
- The outlined objective should be achieved with the data provided by the company
- The data is limited and contains minority class (defective products)

REQUIREMENTS

- Detecting defects in the products
- Low cost detecting system
- High accuracy model
- Improves computer vision model
- Reduce human intervention to test quality control
- Reduce false positives
- Performs consistently in different environments (light, angle, etc.)

LIMITATIONS

- Some pictures can be taken from different angle, at different lightning and resolution
- There is not a lot of data available
- Data is skewed (it means that data contains underrepresented class)

SOLUTION

- Our solution was to use Keras ImageDataGenerator and other libraries to grayscale, augment images and oversample defective data.
- We split the data into training and testing (90% training, 10% testing), train model with both centered and angled images).
- Finally, test the data and evaluate accuracy and precision, adjust design as needed and iterate
- Our Jupyter Notebook can be found under the "Data Submission Folder"

IDEAS

Primary ideas:

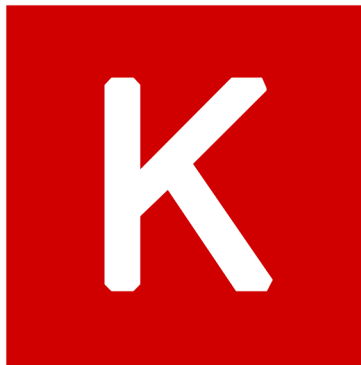
1. **Imbalance Data:** can be solved using class weights. It's a technique where during training of the model, particular class (in our case “defective”) receives higher weight. In this way model “learns” more from the imbalanced class.
2. **Small Training Set:** can be solved by image augmentation. It's a technique where we perform “acrobatics” with the image. We can rotate, skew, reflect image and resupply it to the training algorithm. It creates synthetic variability of the data.
3. **Perspective Uncertainty:** we do not know how image is take, and can not control it. One of the approaches to account for it is to use skewing and shifting of image to train model to recognize images in such conditions. We also can feed all the data together.

PLAN

1. We combined data set 1 and 2
2. We fed data to Kera's ImageDataGenerator to buffer, resize images and apply random transformations.
 - a. At this stage we tackled the problem of variability
 - b. We used image augmentation capabilities provided by ImageDataGenerator
3. We created multiple layers for our neural network, namely: 2x 2D convolution layer, flattening layer, dense layer.
 - a. At this stage we used class_weight parameter to tackle the problem of imbalance classification
 - b. We also checked accuracy to evaluate overall design

TECHNOLOGY

- Tensorflow
- Keras



CONCLUSION

Our model obtained a accuracy of about 80%.

Improve the solution

- The challenge of this problem was in image preprocessing
- Therefore major improvements is to work with image colors to expose the features that we are interested in
- It would be possible to add additional layers or models to identify the position of object on image
- It is expected that object identification before analyzing it's condition would make the greatest impact



THANK
YOU

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