

# Optical Quality Control of 16 Cylinder Head

Function : #Production Process Optimisation | Industry : #Manufacturing

## Goal

- To ensure manufacturing precision and reliability.
- To quickly identify cracks, porosities, or surface imperfections on the cylinder head using computer vision.
- To separate defective cylinder heads from those meeting quality standards based on computer vision results.

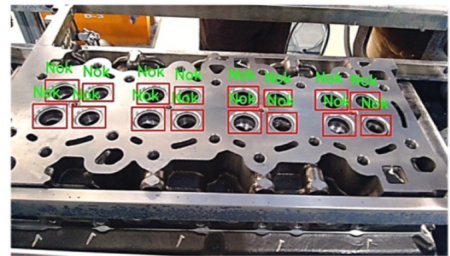
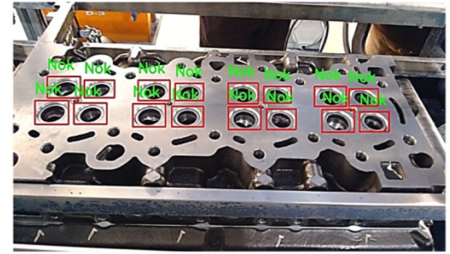
## Technique

- Image augmentation
- Image classification
- Object detection
- Computer vision
- Deep learning
- Surface Defect Analysis

## Impact

- Early defect identification and process optimization contribute to lower production costs.
- Predictive maintenance based on data science models minimizes downtime and prevents unexpected failures.
- Automation reduces manual effort, leading to quicker inspections and improved production efficiency.

## Result



## Value Points

Understand the what, why, when, where & how

### Data Preprocessing

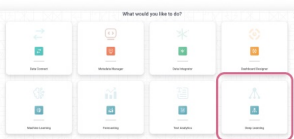
Data pre-processing using image augmentation and enhancement techniques



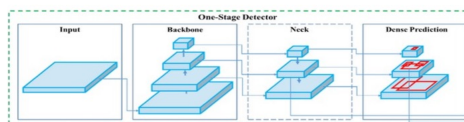
Image pre-processing using augmentation techniques and labelling

Image augmentation generates additional data for model to learn. Image labelling is preprocessing step for model building.

### Object Detection Analysis



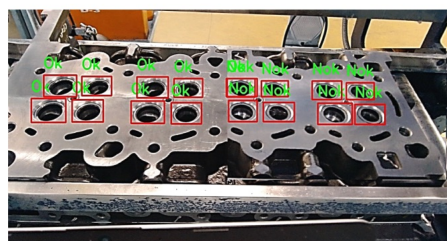
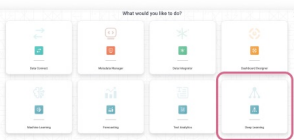
Model	Size (Pixels)	mAP @0.5:0.95	mAP @0.5	Time CPU b1 (ms)	Time V100 b1 (ms)	Time V100 b32 (ms)	Params (M)	FLOPS @640 (B)
YOLOv5n	640	28.0	45.7	45	6.6	0.6	1.9	4.5
YOLOv5s	640	37.4	56.8	98	6.4	0.9	7.2	16.5
YOLOv5m	640	45.4	64.1	224	8.2	1.7	21.2	49.0
YOLOv5l	640	49.0	67.3	430	10.1	2.7	46.5	109.1
YOLOv5x	640	50.7	68.9	766	12.1	4.8	86.7	205.7



Perform object detection using YOLOv5 to classify and detect bearing condition

Object detection is a computer vision technique for locating instances of objects in images or videos.

### Comparative Analysis



Comparative Study using deep learning architectures

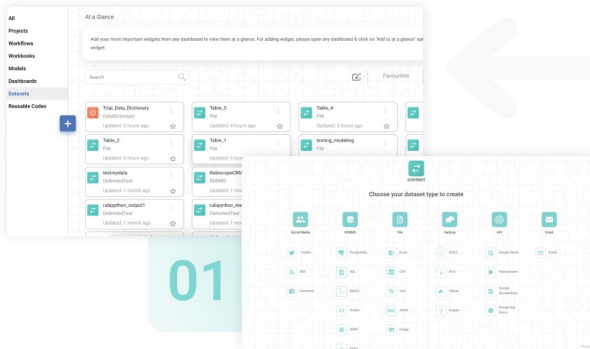
Conducting a comparative analysis of different deep learning architectures to discern the intricacies of each model for locating objects.

# Multi Persona DSML Platform

For all your data needs- Data Engineering, Data Science, Data Visualisation, IoT



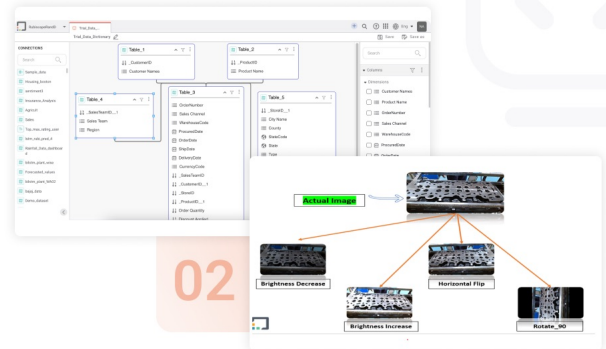
## Data Connect



01

Optical quality control

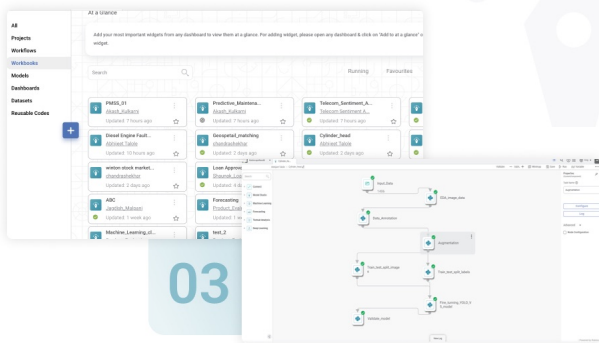
## Metadata Manger



02

Comprehensive Data Operations, encompassing Metadata Management

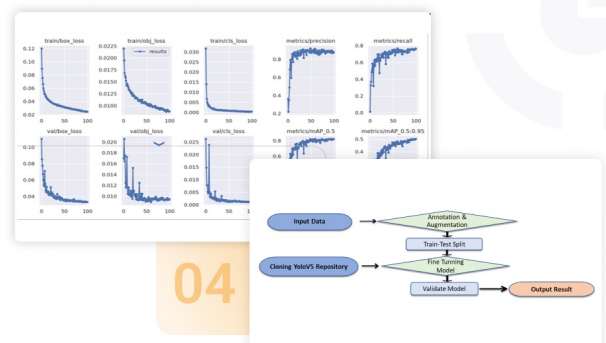
## Model Studio



03

Modelling, encompassing the selection and configuration of models

## Visualisation



04

Viz Ops, Illustrating The Core Trends And Graphical Representations

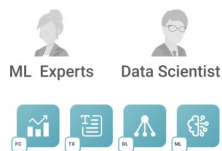
## Agile Data Science

Encapsulating best practices, tools and methods

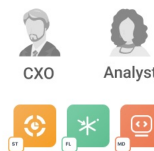
### Data Ops



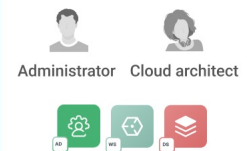
### ML Ops



### Viz Ops



### Tech Ops



### Ideate

- What is the goal?
- How can you leverage the data?
- What do you want to predict?

### Acquire

- How is data sampled?
- Which data is relevant?
- Any data privacy issue?

### Explore

- Plot the data
- Are there anomalies?
- Are there patterns?

### Model

- Build a model
- Fit the model
- Validate the model

### Present

- What did we learn?
- Do the results make sense?
- Can we tell a story?

### Deploy

- Where to Deploy?
- What is the Structure of Pipeline?
- How to Optimise and Scale?