Real-Time Defect Detection in Check Valve Manufacturing

Using QR Code & Machine Learning

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Problem Statement

- Manual quality checks are slow and errorprone
- Incorrect products can be dispatched unknowingly
- Need for a fast, automated defect detection system

Proposed Solution

- Encode product measurements in QR codes
- Scan QR to extract measurement data
- Use ML model to predict defective products
- Display result instantly in a Streamlit app

Technologies Used

- Python (Pandas, NumPy, scikit-learn)
- OpenCV (QR decoding)
- qrcode (QR generation)
- Streamlit (Web App UI)
- Excel (Data Input)

Dataset & Features

- valve_id
- body_height
- inlet_radius
- outlet_radius
- disc_thickness
- spring_length
- Target: Defective (1) / Not Defective (0)

Model Training

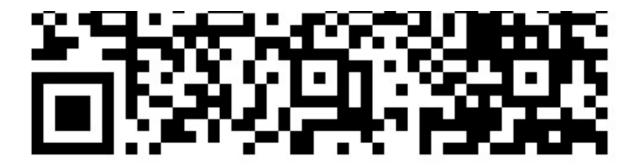
- Algorithm: K-Nearest Neighbors (KNN)
- Used GridSearchCV for hyperparameter tuning with accuracy of 0.99%
- Model saved using Pickle for prediction use

System Architecture / Flow

- 1. Prepare data from Excel
- 2. Generate QR for each product
- 3. Scan QR code using Streamlit app
- 4. Extract data and predict using ML model
- 5. Show prediction: X Defective or V Not Defective

Final Output Demo

- Upload QR code image in Streamlit app
- View extracted measurements
- View model prediction
- Example outputs for both Defective and Not Defective valves



Uploaded QR Code

Extracted Measurements:

```
"valve_id": 4
  "body_height": 49.98
  "inlet_radius": 10.1
  "outlet_radius": 9.96
  "disc_thickness": 4.99
  "spring_length": 14.93
}
```

Prediction Result:



Conclusion & Future Scope

- Project automates defect detection from QR
- Saves time and reduces manual errors
- Future: Add batch scanning, real-time dashboard, and IoT integration