# 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 error-prone
- • 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: ❌ Defective or ✅ 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:

✅ Not Defective

# 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