# Machine Part or Batch Label Recognition with MNIST Handwritten Digit Recognition

Enhancing Inventory Tracking and Reducing Errors in Manufacturing

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**Use Case:** Manufacturing parts and batches are often labeled by hand, making traditional tracking methods prone to errors and delays.

**Solution:** A digit recognition model trained on MNIST can identify and convert these handwritten labels into digital data directly from photos or scans.

**Benefits:** This solution automates data entry, reduces errors, and speeds up inventory tracking, ultimately improving operational efficiency.

# PROBLEM:

**Title:** Problem Statement: Handwritten Labels in Manufacturing

**Content:**

- Parts or batches often have handwritten labels for identification.
- Manually entering this information is time-consuming and prone to errors.
- Need for automated recognition to improve efficiency and accuracy.

# Parts with handwritten labels.

# SOLUTION:

**Title:** Automated Recognition with MNIST

**Content:**

- Train a model using MNIST data to recognize handwritten digits.
- The model recognizes batch numbers or part IDs from photos or scans.
- Simplifies data entry and enhances inventory tracking accuracy.

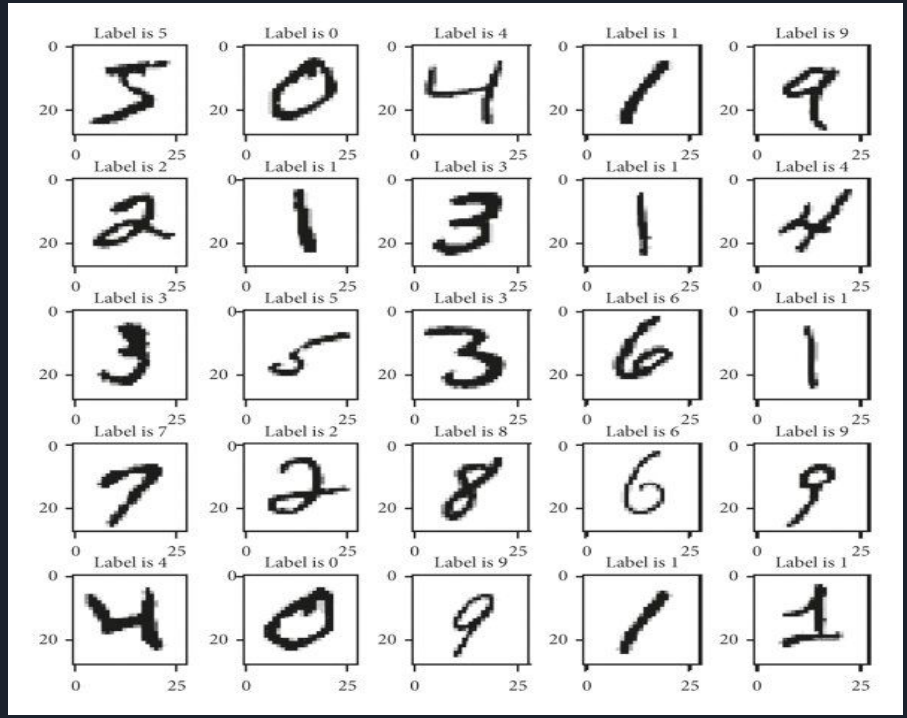
# MNIST Data Set Introduction

**TITLE:** MNIST Dataset

Contains 70,000 images of handwritten digits (0-9).

- Images are 28x28 grayscale pixels, ideal for training recognition models.
- Commonly used for digit recognition tasks.

# SAMPLE OF MNIST DATASET:



# Technical Workflow:

**Title:** Technical Workflow for Label Recognition

**Content:**

- Step 1: Capture photo of the part label.
- Step 2: Preprocess the image (grayscale conversion, noise reduction).
- Step 3: Run digit recognition model trained on MNIST.
- Step 4: Output recognized label for inventory entry.

# Model Training & Recognition Process:

**Content:**

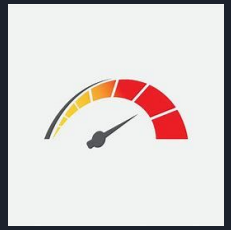
- MNIST model training process: image preprocessing,KNN,NAIVE-BAYES,NON-NAIVE BAYES models training and validation.
- Recognition process: model outputs digits from image, post-processed to form batch/part ID.

# Benefits of MNIST-based Recognition:

Key Benefits of MNIST-based Recognition for Manufacturing

**Content:**

- Automated, fast data entry.
- High accuracy and reduced human error.
- Real-time inventory updates.

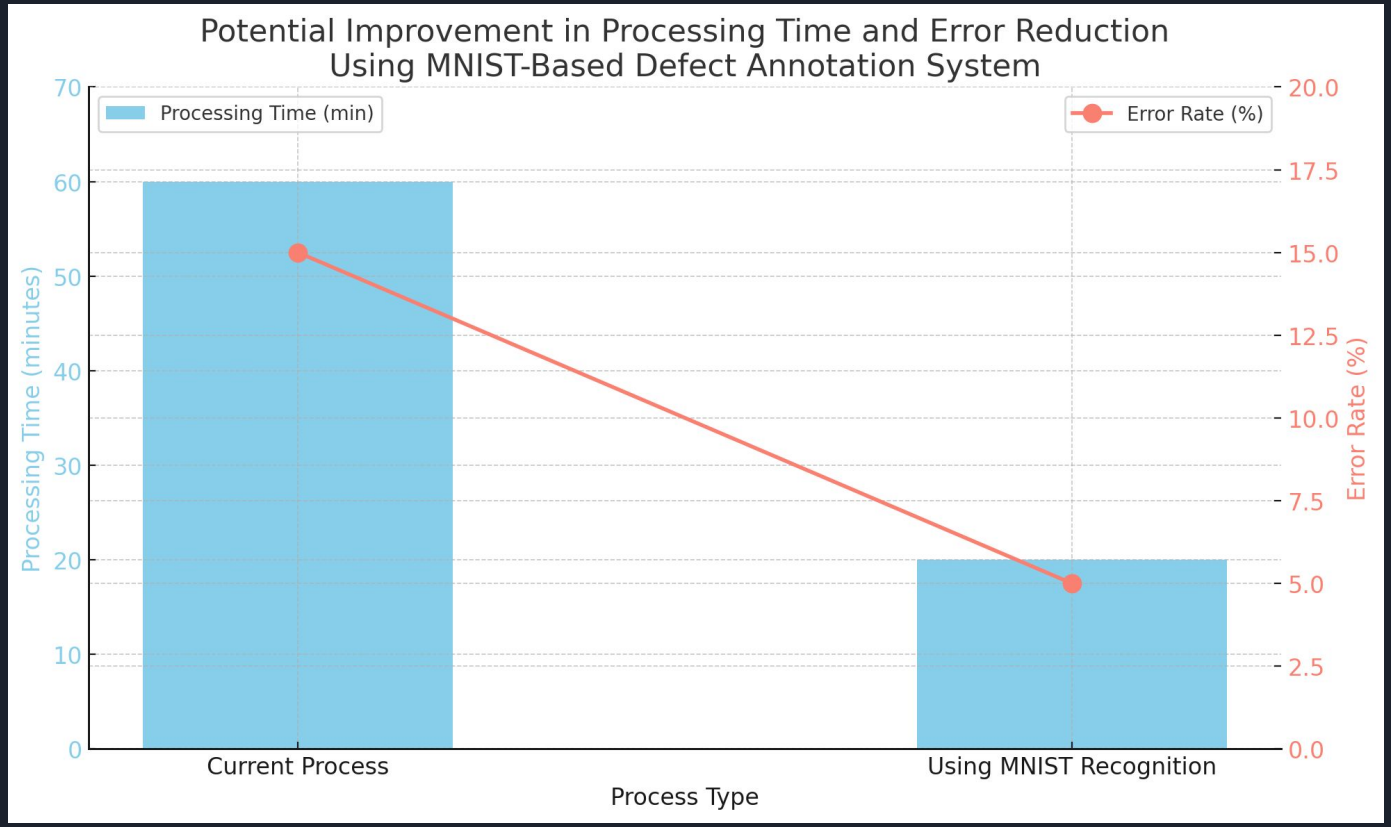
# RESULTS:

**TITLE:** Results and Potential Impact

**Content:**

- Increased efficiency in data handling.
- Reduction in inventory errors.
- Scalable solution for other handwritten information in manufacturing.

# Graph showing potential improvement in processing time or reduction in errors.



# MODEL COMPARISON:

## KNN

**Process:** Flatten the images into a 784-dimensional vector, and calculate the Euclidean distance between vectors.

**OUTPUT:**Predict the digit by identifying the majority label among the KKK nearest neighbors .

Accuracy: 96.84%

## Naive-Bayes

Assumption: Each pixel is treated as an independent feature.

Calculation: For each pixel intensity in a given class (like digit “3”), calculate its likelihood assuming Gaussian distribution.

Accuracy: - 62.64%

## Non-Naive Bayes

Accuracy: 75.32%

# SUMMARY:

- **Machine Part or Batch Label Recognition using MNIST Handwritten Digit Recognition** is a system designed to automate the recognition and digitization of handwritten labels on parts or batches in manufacturing.
- This process helps streamline inventory tracking and reduces human error by leveraging a machine learning model trained on the MNIST dataset, which consists of thousands of labeled images of handwritten digits.

# THANKYOU