# MACHINE LEARNING TECHNIQUE BASED ON OPTICAL CHARACTER RECOGNITION FOR AUTOMATED READING OF ANALOG METERS

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## Background

### 1. Introduction (or educational background)

Utility meters track consumption of electricity, water, and gas.

Accurate readings are essential for billing and resource management.


***Fig. 1*** *person struggling to read analog me*

### 2. Problem statement

**Manual reading of analog meters has major drawbacks:**

- Time-consuming and inefficient
- Error-prone
- Dangerous in hard-to-reach locations

**Digital meters exist but are not yet widely adopted due to cost.**

**Current AI-based solutions (e.g., YOLOv3–v7, CNNs) have issues:**

- Poor performance in low light or distorted images
- Difficulty detecting small or varied meter components
- Need for pre-segmentation (in CNNs)

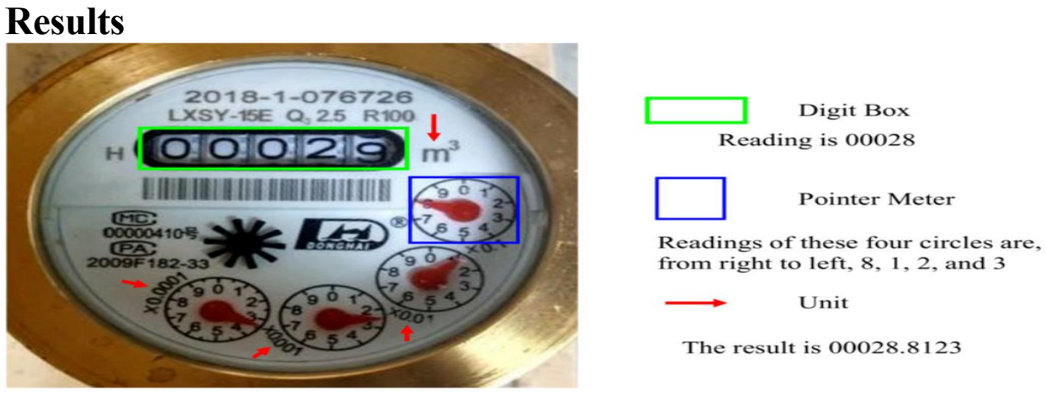
**There is a need for a hybrid, efficient, and robust ML model for real-world analog meter reading.**

## Current Work

### 1. Objectives

1. Develop a YOLOv10 model to detect and segment key regions of analog meters.
2. Train a CNN to classify odometer readings from segmented images.
3. Use YOLOv10 for angle estimation of the deal pointer for accurate readings.
4. Deploy and evaluate the models on edge devices like Raspberry Pi.

### 3. Results




**4. Fig.2** Schematic diagram of the watermeter. The weighted sum of the values of the digit box and the pointer meter indicates the water consumption.

### 5. Methodology

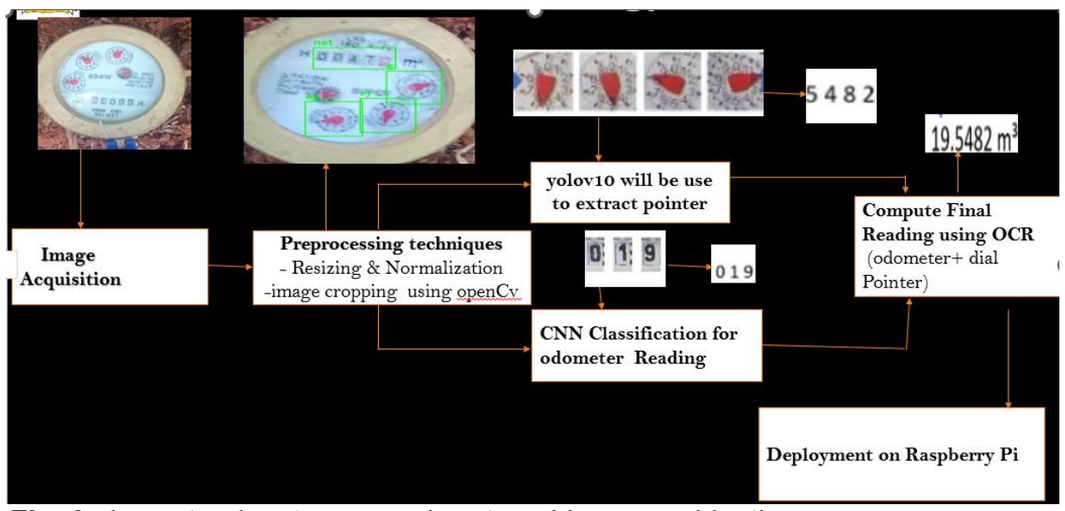



***Fig. 3*** *show step by step procedure to achieve my objectives*

## Conclusion & Expectations

- High-accuracy digit and pointer detection under variable conditions
- Significant reduction in manual labor and reading errors
- Real-time visualization and data logging

## References & Acknowledgment (if needed)

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