ML Final Project: Water Meter Recognition

LEARNING MACHINE GROUP

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Contends

Introduction

Task description

00537

Annotations

Coordinates of bounding box

$(x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4)$,"000092","00093"

Digits

Introduction

Challenges:



A universal solution for tasks like this:

Segmentation: DB + **Recognition**: CRNN

My Solution:

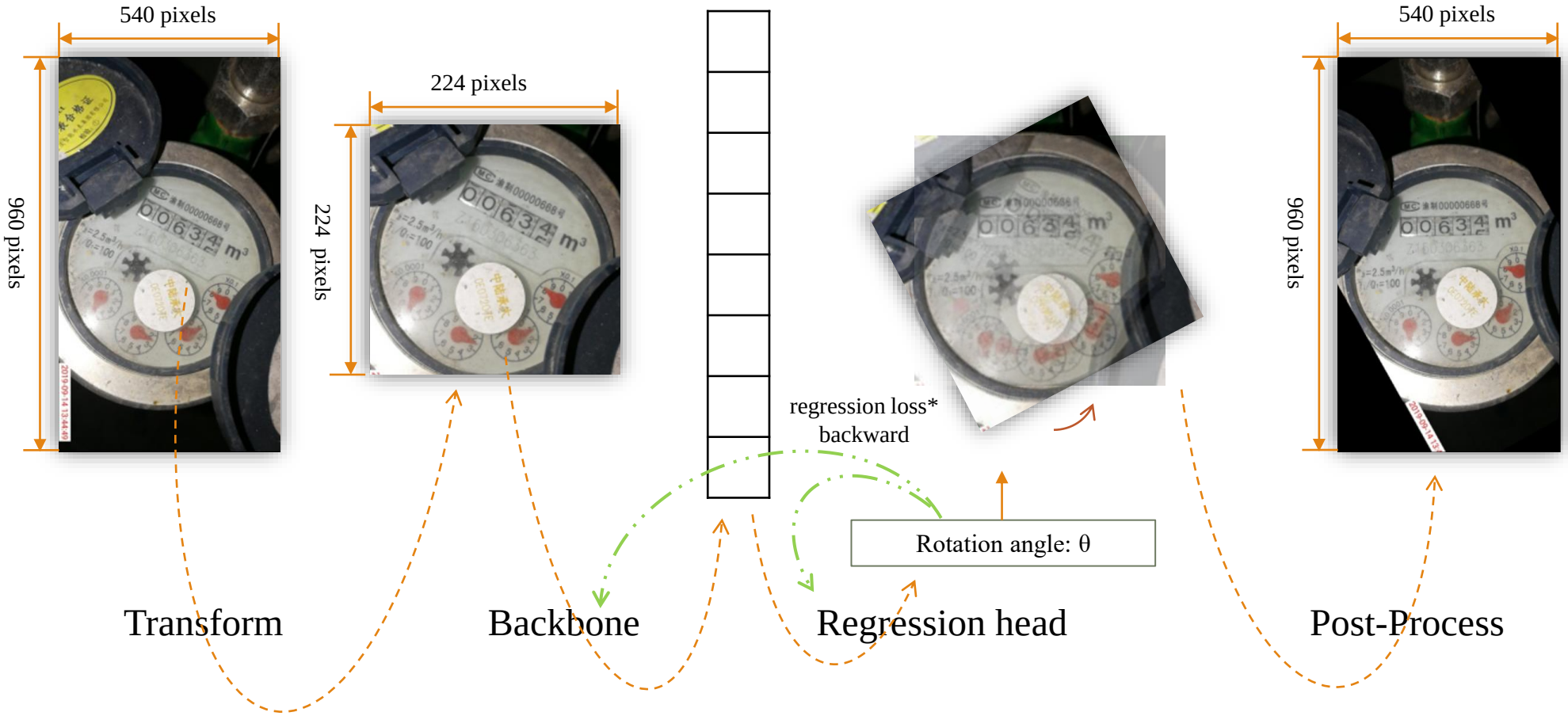



00202

Rotation Regression Object Detection Recognition

3-Stage Network

I. Rotation Regression Network



regression loss = MAE Loss(y_pred, y_real) or Smooth L1 Loss(y_pred, y_real), **y_real is computed from label**

3-Stage Network

II. Object Detection Network

Preparation

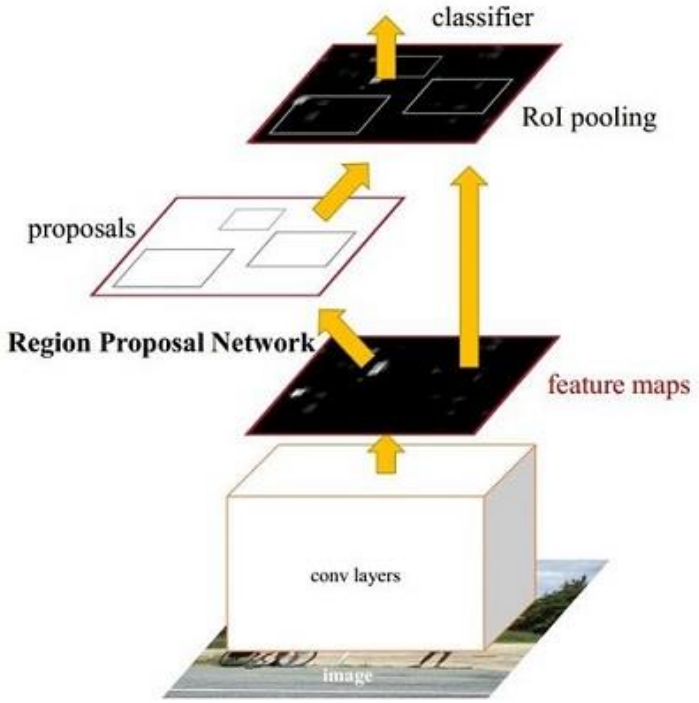
$(x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4)$,"000092","00093"

coordinates (rotation) transformation

$(x_1', y_1', x_2', y_2', x_3', y_3', x_4', y_4')$,"000092","00093"

to ‘xyxy’ bounding box format

(x_1', y_1', x_3', y_3'),"000092","00093"



Faster RCNN

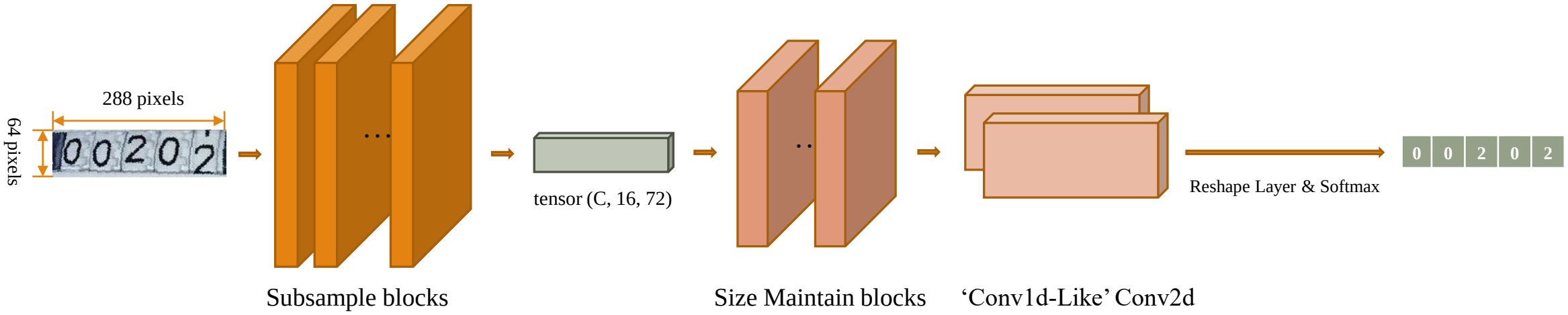
3-Stage Network

III. Digits Recognition Network

ConvNet

Fixed length → convolution only works not bad.

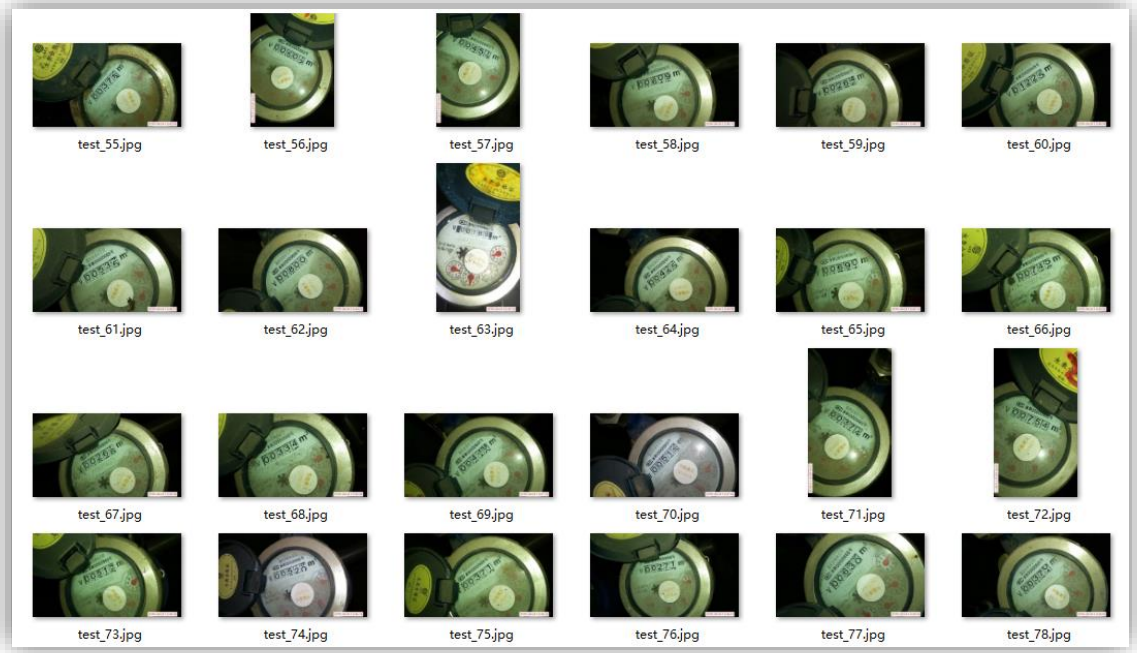
↓ (Casually designed by myself)



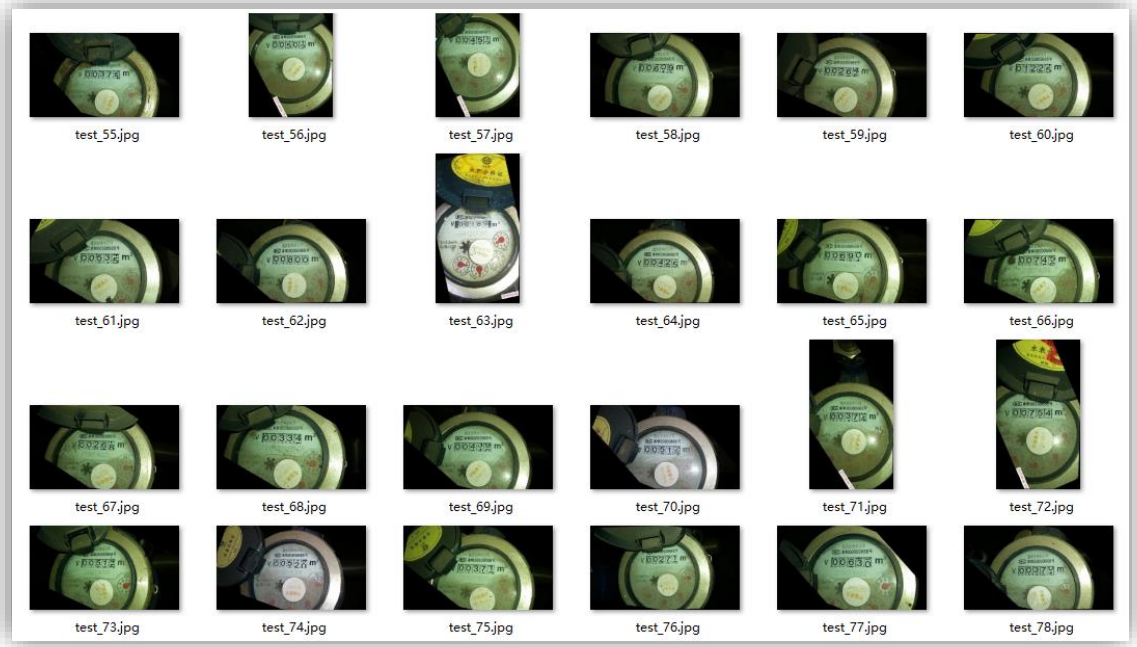
ConvNetwork Architecture

Performance Evaluation

I. Rotation Regression Network Evaluation



Before processing



After processing

Metrics:

Train Set:
Deviation angle <= 5° 95.5%+
Deviation angle <=10° 99.0%+

Valid Set:
Deviation angle <= 5° 93.5%+
Deviation angle <=10° 98.5%+

Performance Evaluation

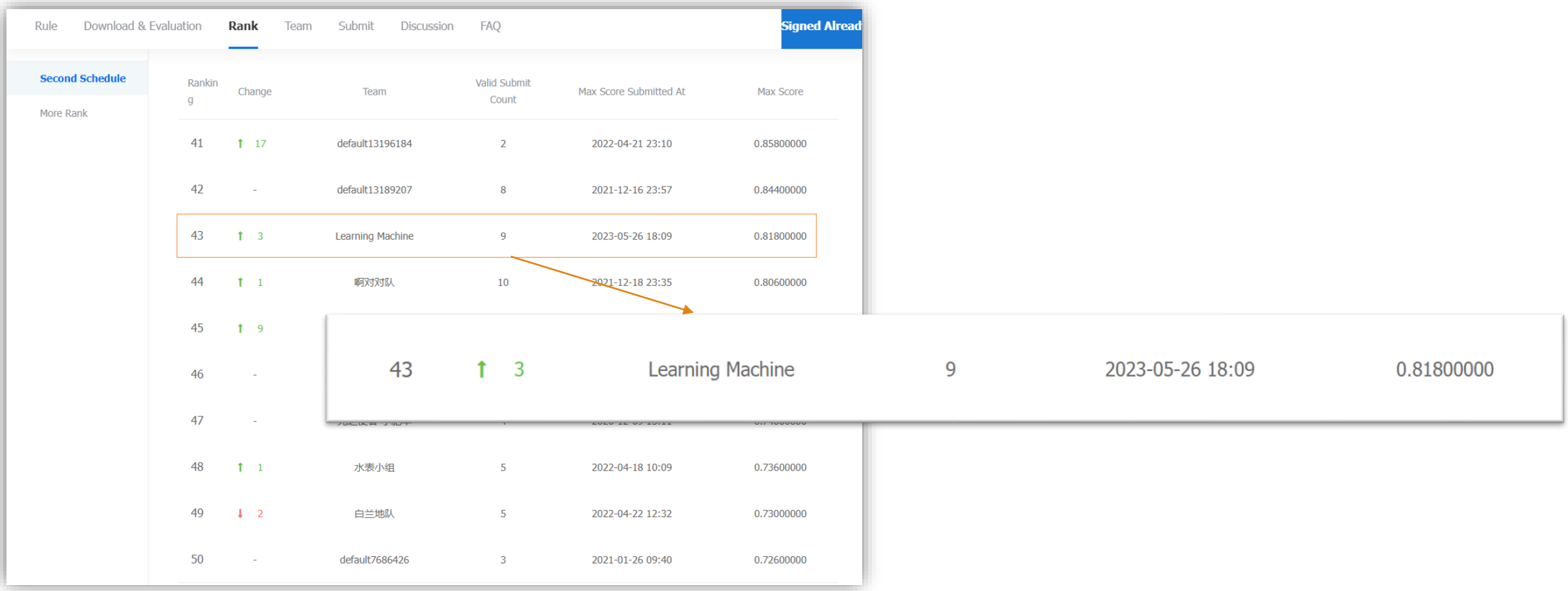
II. Object Detection Network Evaluation

Metrics:

mAP = 0.85 mAP(IoU > 0.5) = 0.99 mAP(IoU > 0.75) = 0.97

Performance Evaluation

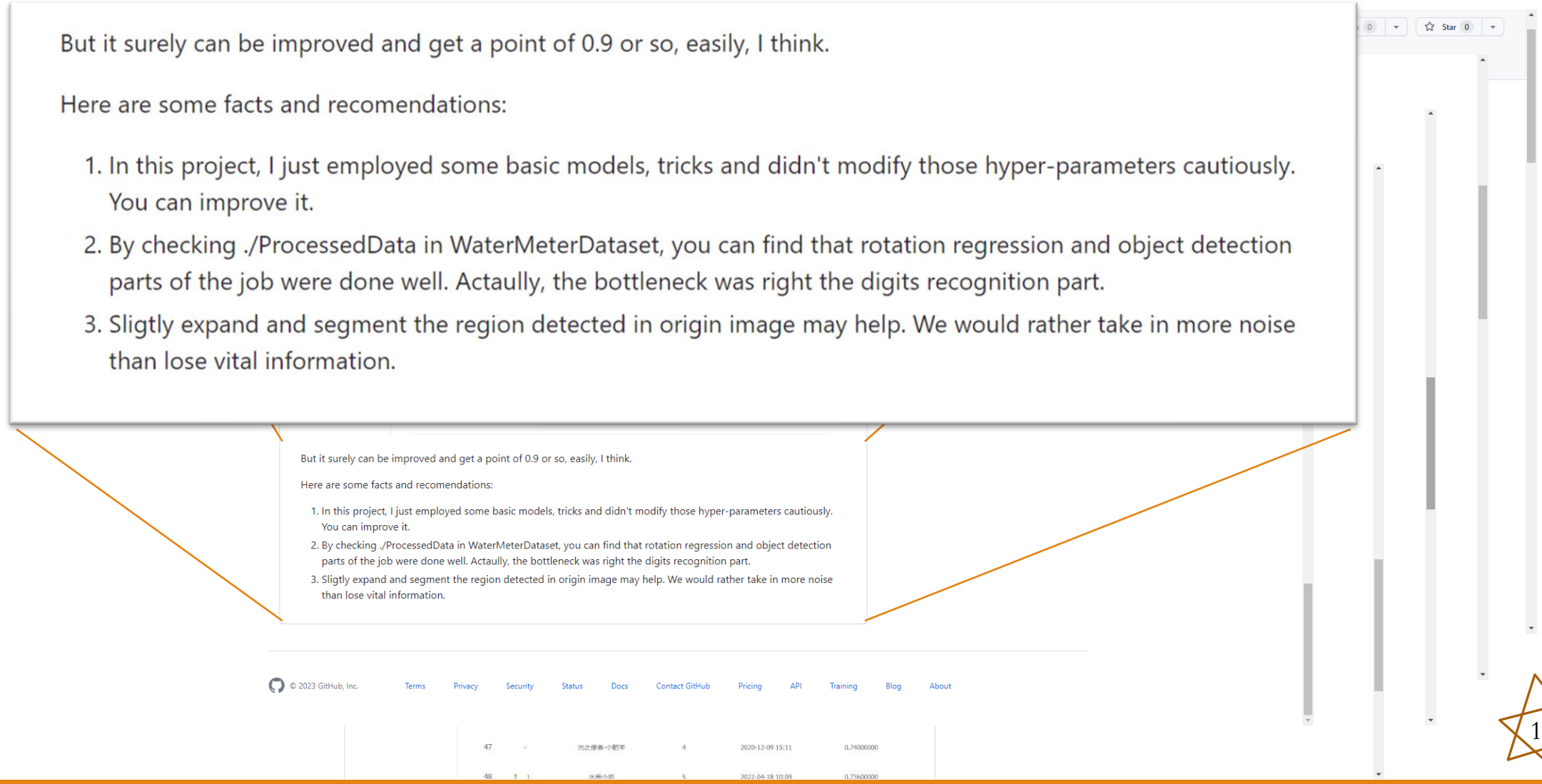
III. Digits Recognition Network Evaluation



Bottleneck: **Digits Recognition**, overfitting problem

End Part

Code available at: https://github.com/iaoqian/water_meter_recognition



Thank you!