

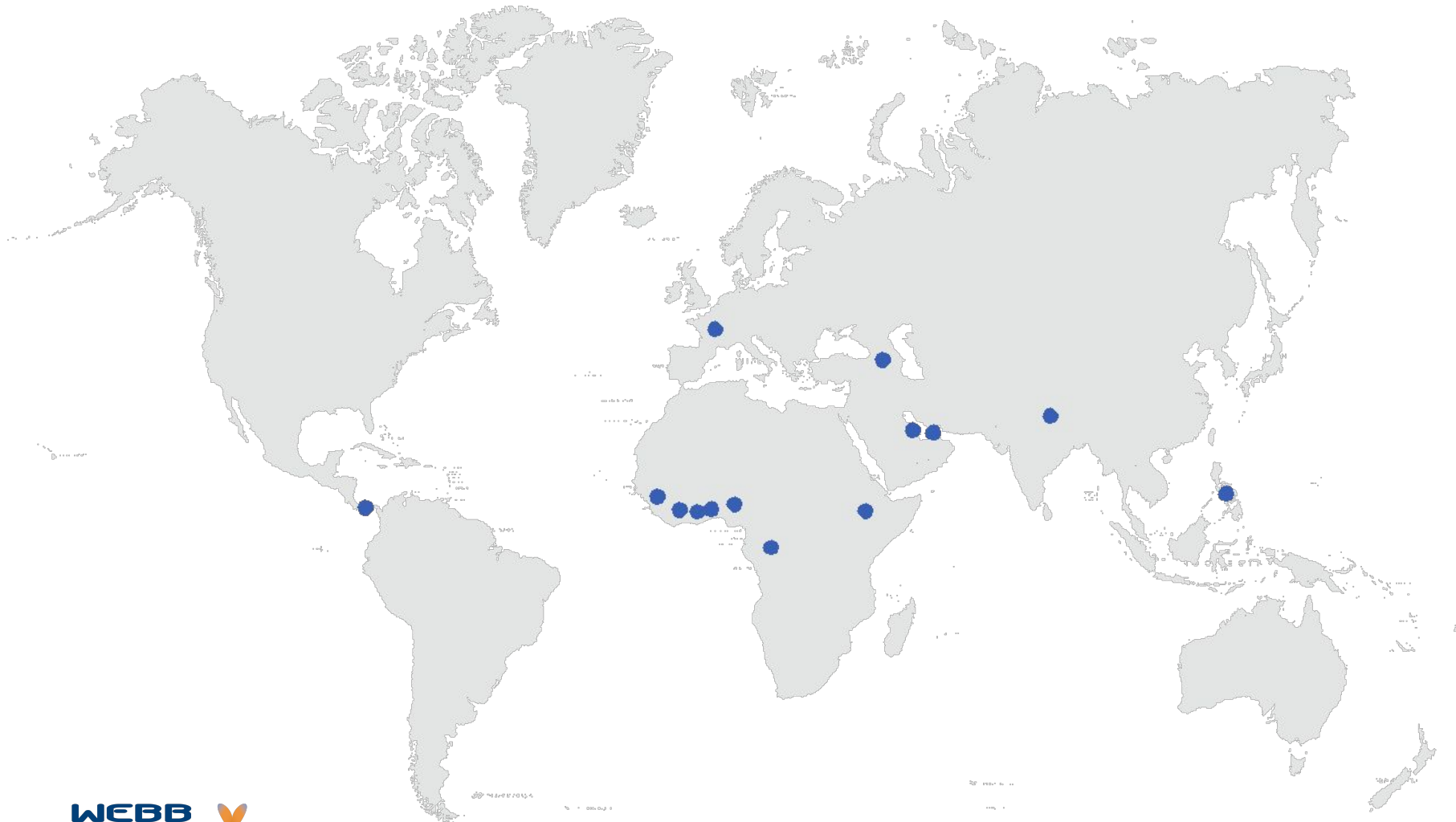
Towards A Virtual Business Environment for Trade

About Us

We believe in looking beyond barriers to shape tomorrow's international trade. We develop high-tech software and services to benefit all trade stakeholders and make their lives easier.



Our Locations



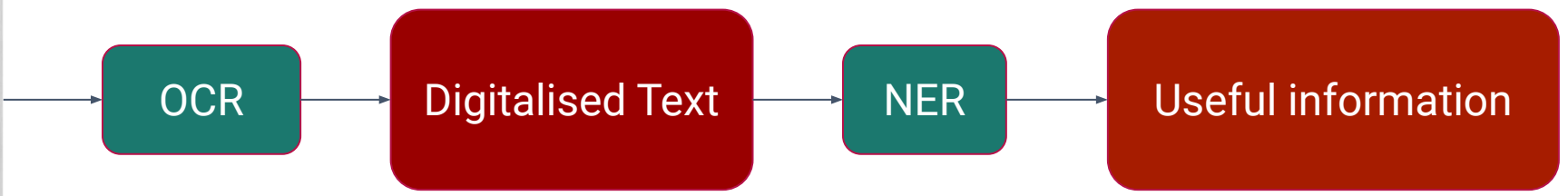
Armenia
Bahrain
Benin
Congo
Ivory Coast
Ethiopia
France
Guinea
Ghana
Nepal
Nigeria
Panama
Philippines
United Arab Emirates

Optical Character Recognition (OCR)



Information Extraction From Invoices

PDF input



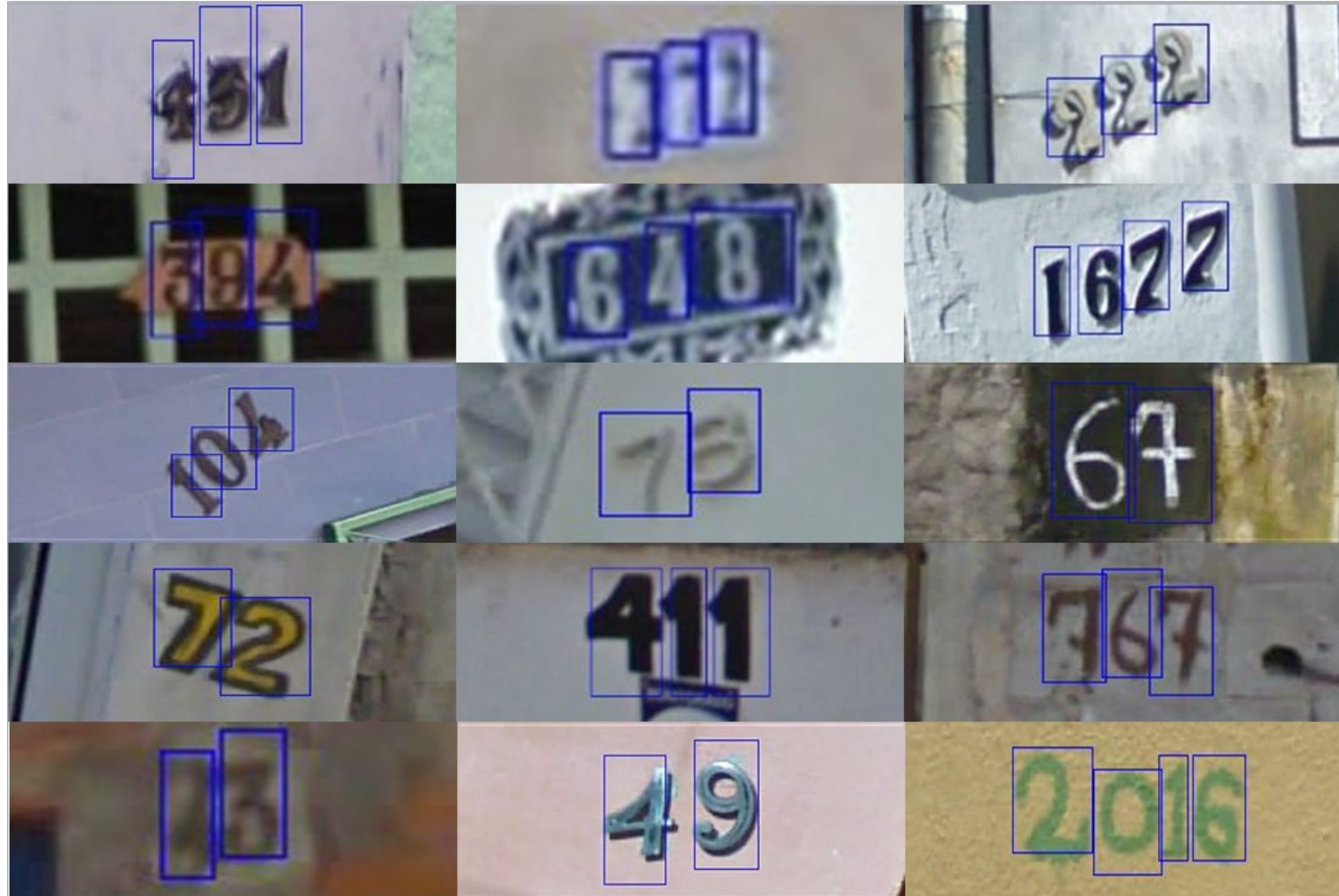
Named Entity Recognition (NER)

In the afternoon TIME of
May 10, 2017 DATE, deputy press
secretary Sarah Sanders PERSON spoke
to the President about his decision to fire
Comey PERSON and then spoke to
reporters in a televised press conference.

Optical Character Recognition in the Wild



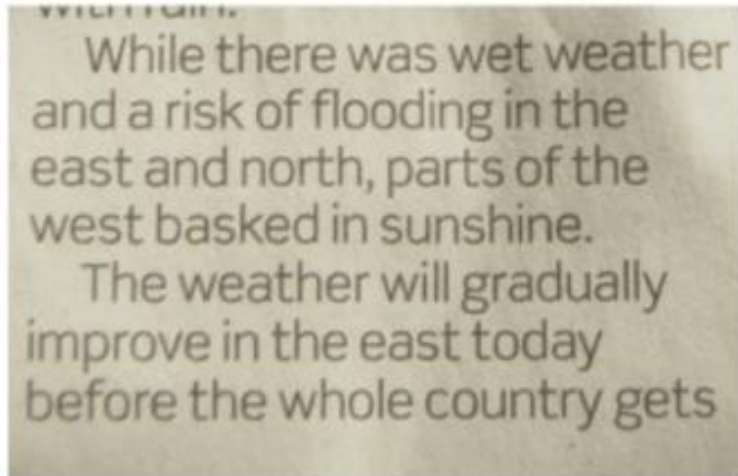
Street View House Numbers Extraction



Licence Plates Detection and Recognition



Optical Character Recognition from PDF documents



```
{  
  "textblock": [  
    {  
      "text": "While there was wet Weather\\n  
        and a risk of flooding in the\\n  
        east and north, parts of the\\n  
        west basked in sunshine.\\n  
        The weather will gradually\\n  
        improve in the east today\\n  
        before the whole country gets",  
      "left": 0,  
      "top": 0,  
      "width": 1860,  
      "height": 1200  
    }  
  ]  
}
```

OCR Engines 2019

Why should one reinvent bicycles ?

OCR Engines 2019

Why should one reinvent bicycles ?

- Accuracy
- Price

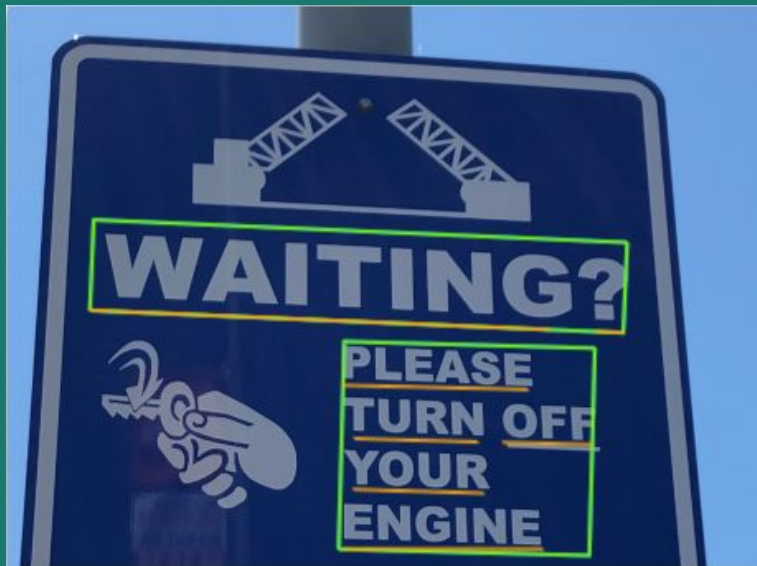
OCR Engines 2019

Why should one reinvent bicycles ?

- Accuracy
- Price
- Privacy

OCR Engine

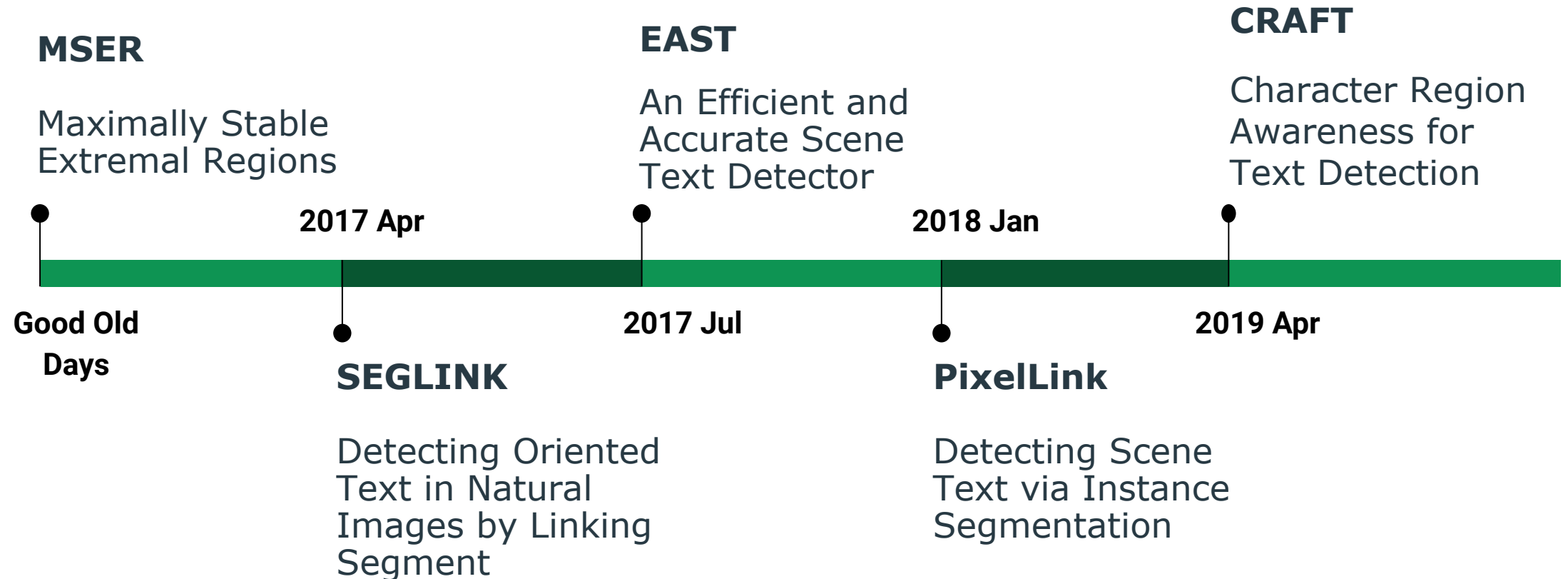
Detection



Recognition

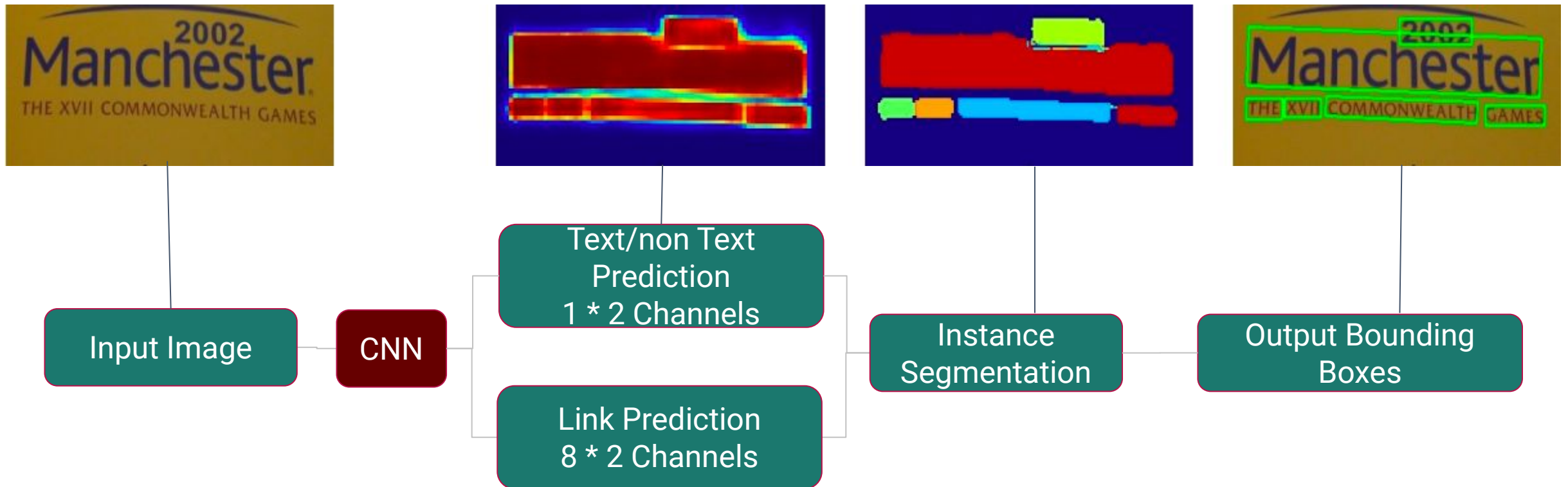
WAITING
PLEASE
TURN OFF
YOVR
ENGINE

Popular Detection Models



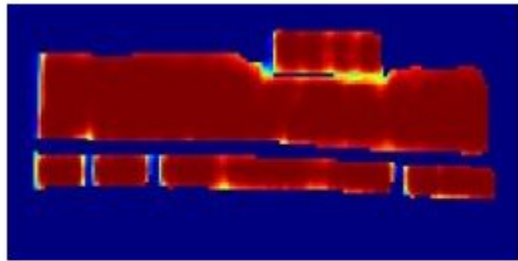
PixelLink

Prediction Pipeline

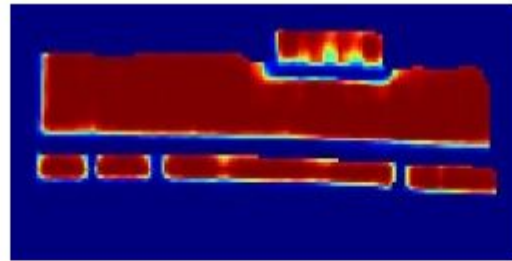


PixelLink

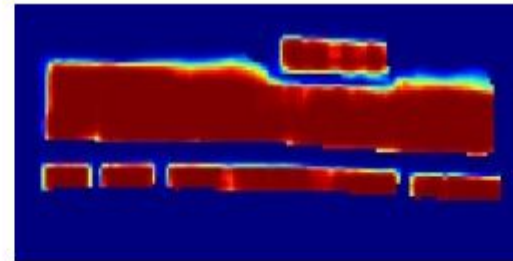
Link Heatmaps



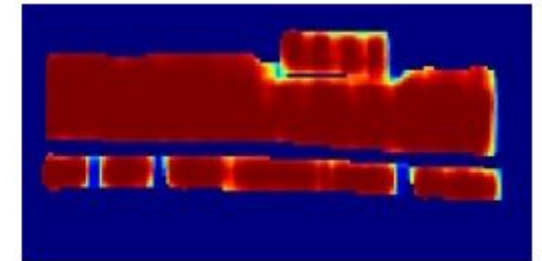
left



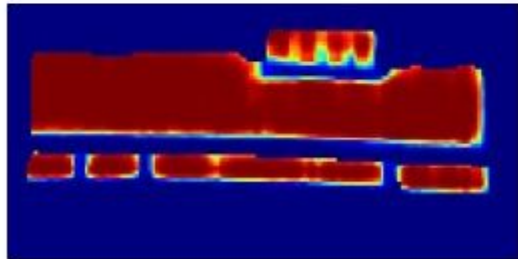
left-down



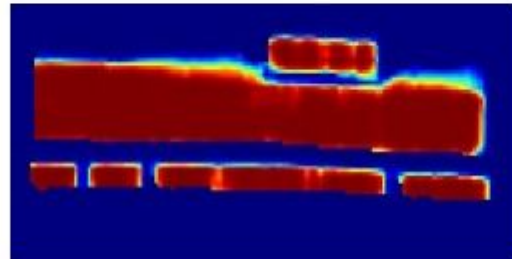
left-up



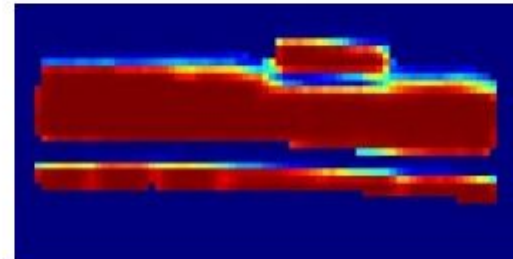
right



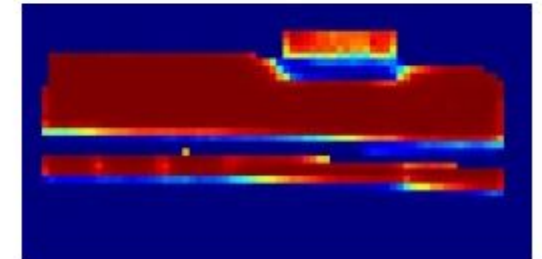
right-down



right-up



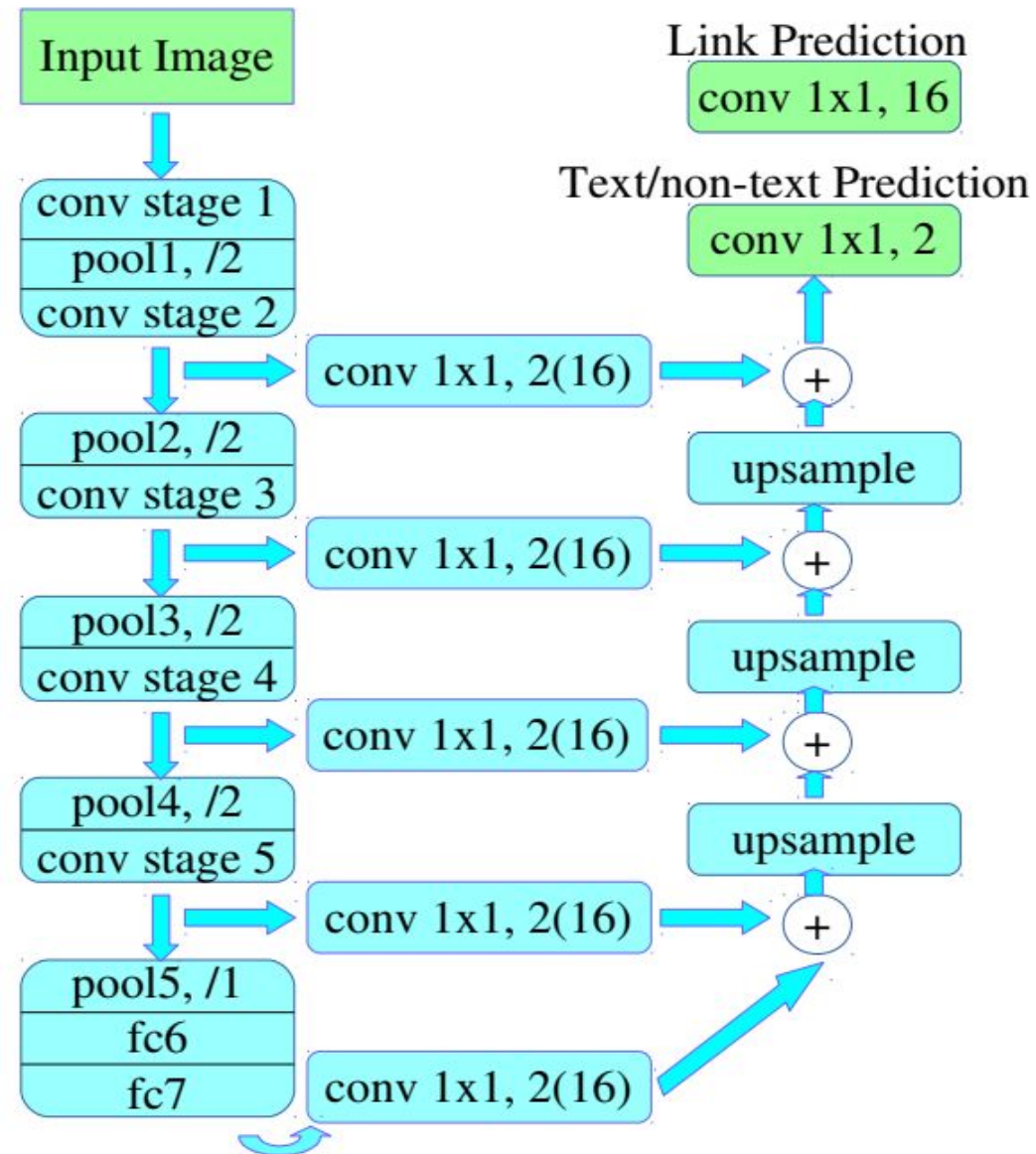
up



down

PixelLink

Model Architecture



PixelLink

Loss Function

$$L = \lambda L_{pixel} + L_{link}$$

- L - Loss
- L_{pixel} - Pixel Loss
- L_{link} - Link Loss
- λ - Importance Coefficient

$$L_{pixel} = \frac{1}{(1+r)S} W L_{pixel_CE}$$

- r - negative positive ration
- S - number of positive pixels
- W - per pixel weight matrix

$$w_i = \begin{cases} \frac{B_i}{S_i}, & \text{if pixel is positive} \\ 1, & \text{if negative pixel is selected} \\ 0, & \text{otherwise} \end{cases}$$

PixelLink

Loss Function

$$L = \lambda L_{pixel} + L_{link}$$

- L - LOSS
- L_{pixel} - Pixel Loss
- L_{link} - Link Loss
- λ - Importance Coefficient

$$L_{link} = \frac{L_{link_pos}}{rsum(W_{pos_link})} + \frac{L_{link_neg}}{rsum(W_{neg_link})}$$

- L_{link_pos} - Loss for positive pixels
- L_{link_neg} - Loss for negative pixels

$$L_{link_pos} = W_{pos_link} L_{link_CE}$$

$$L_{link_neg} = W_{neg_link} L_{link_CE}$$

CRAFT

Prediction map



E.A.I.E.P

優質電池製造公司總部位於上海

SHANGHAI ROAD 76242 BUILDING 43

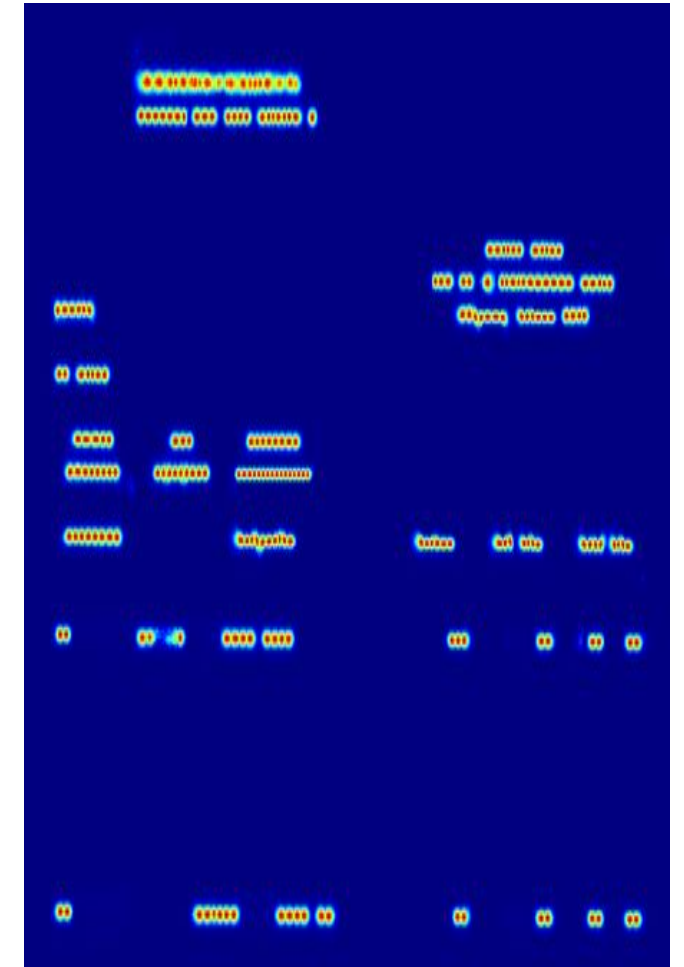
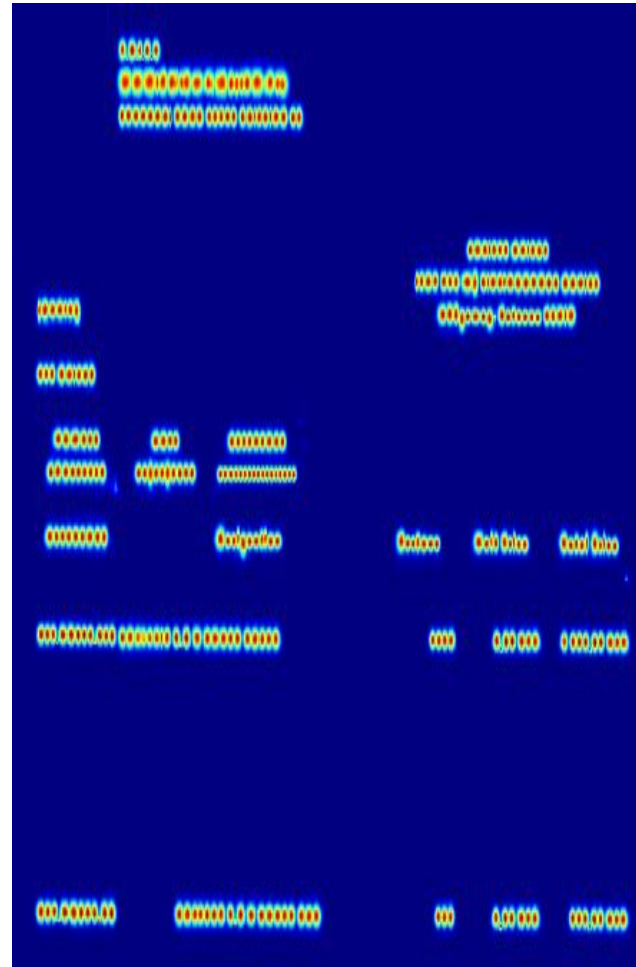
INVOICE

STE ANISAL

| NUMBER | DATE | REFERENCE |
|-----------|------------|-------------------|
| CHN6578FR | 11/07/2017 | CHN6578FR11072017 |

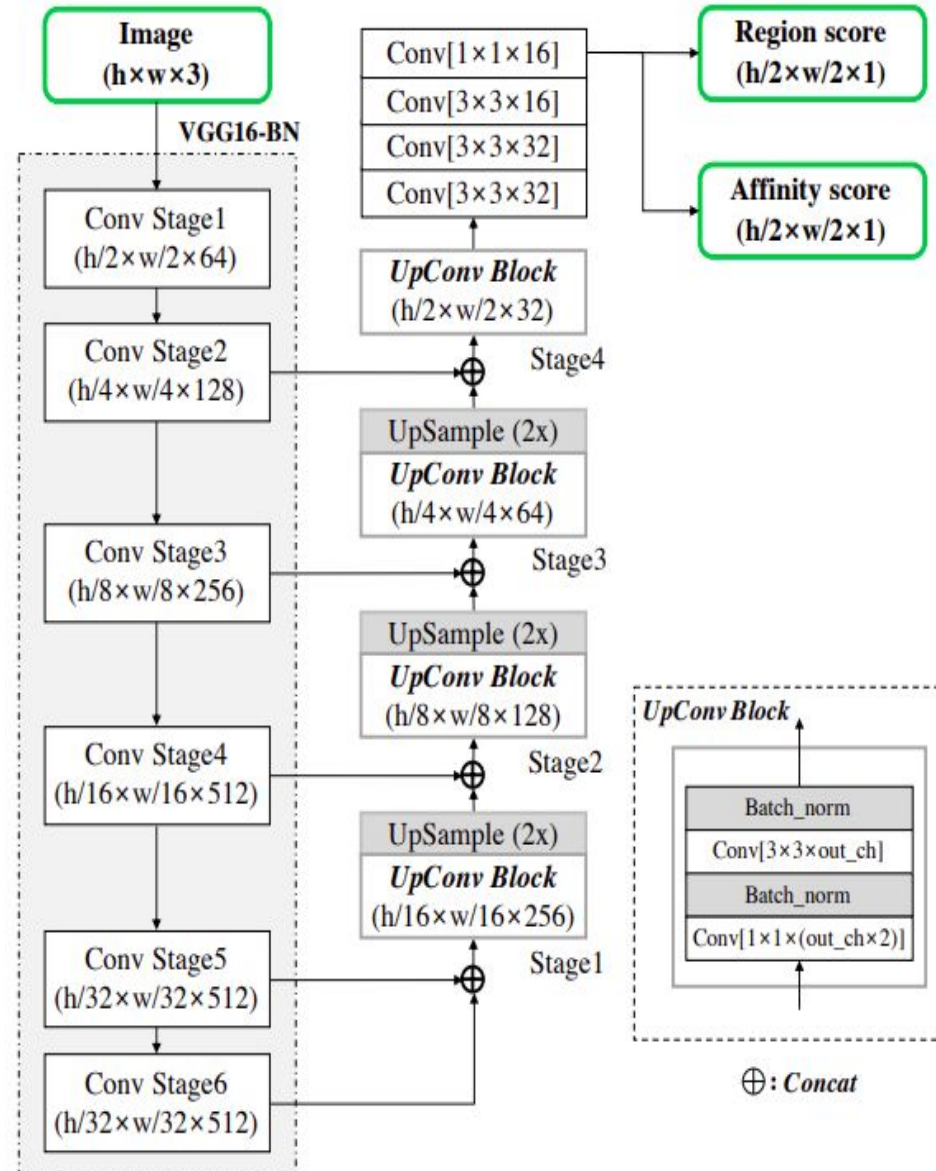
| REFERENCE | Designation | Cartons | Unit Price | Total Price |
|---------------|---------------------------|---------|------------|--------------|
| AST.NO956.R26 | BATTERIE 1.2V COVER PAPER | 1650 | 2,00 USD | 3 300,00 USD |
| AST.NO521.R6 | BATTERY 1.2V COVER PVC | 200 | 2,50 USD | 500,00 USD |

| |
|---------------------------------|
| SOCIETE ANISAL |
| ILOT 643 M/ ZINZINDOHOUE DANIEL |
| Gbégamey- Cotonou BENIN |



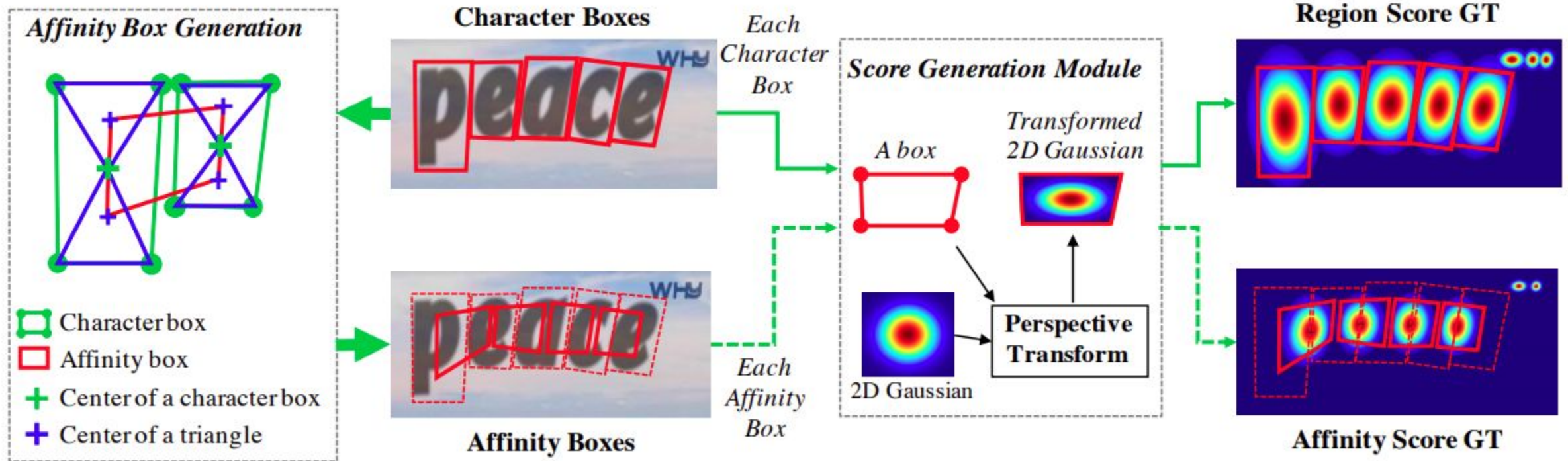
CRAFT

Model Architecture



CRAFT

Data Generation

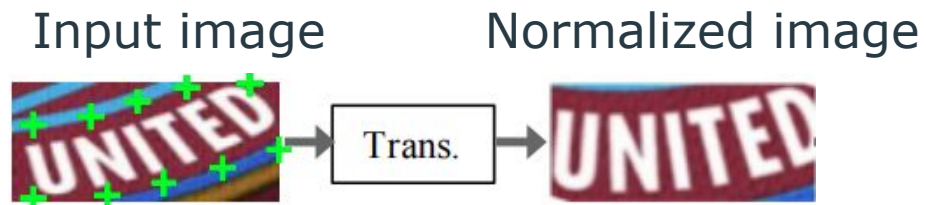


Recognition

Main Stages

Transformation

Normalization of input image using spatial transformation network (TPS)



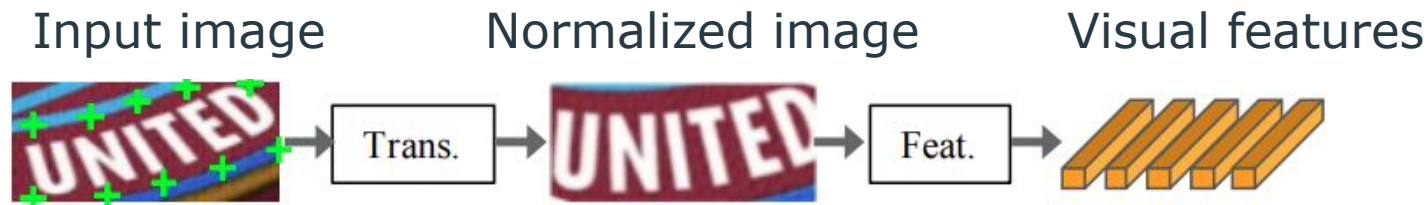
Recognition

Main Stages

Transformation

Feature extraction

Mapping the input image to representation that focuses on attributes that are more relevant to character recognition
(VGG, Resnet, RCNN)



Recognition

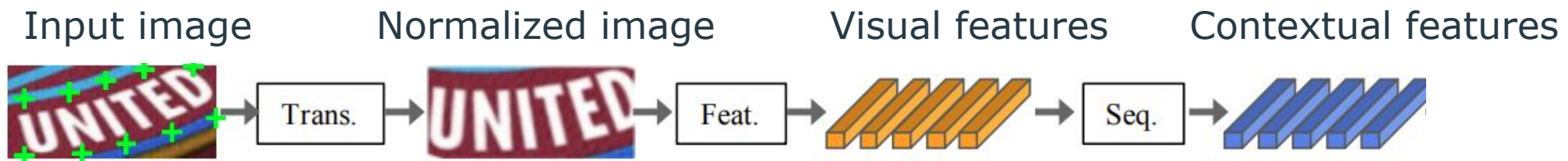
Main Stages

Transformation

Feature extraction

Sequence modeling

Capturing the contextual information within a sequence of characters for the next stage to predict each character more robustly, rather than doing it independently (BiLSTM)



Recognition

Main Stages

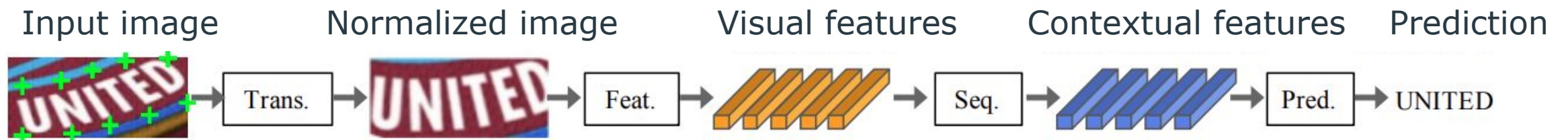
Transformation

Feature extraction

Sequence modeling

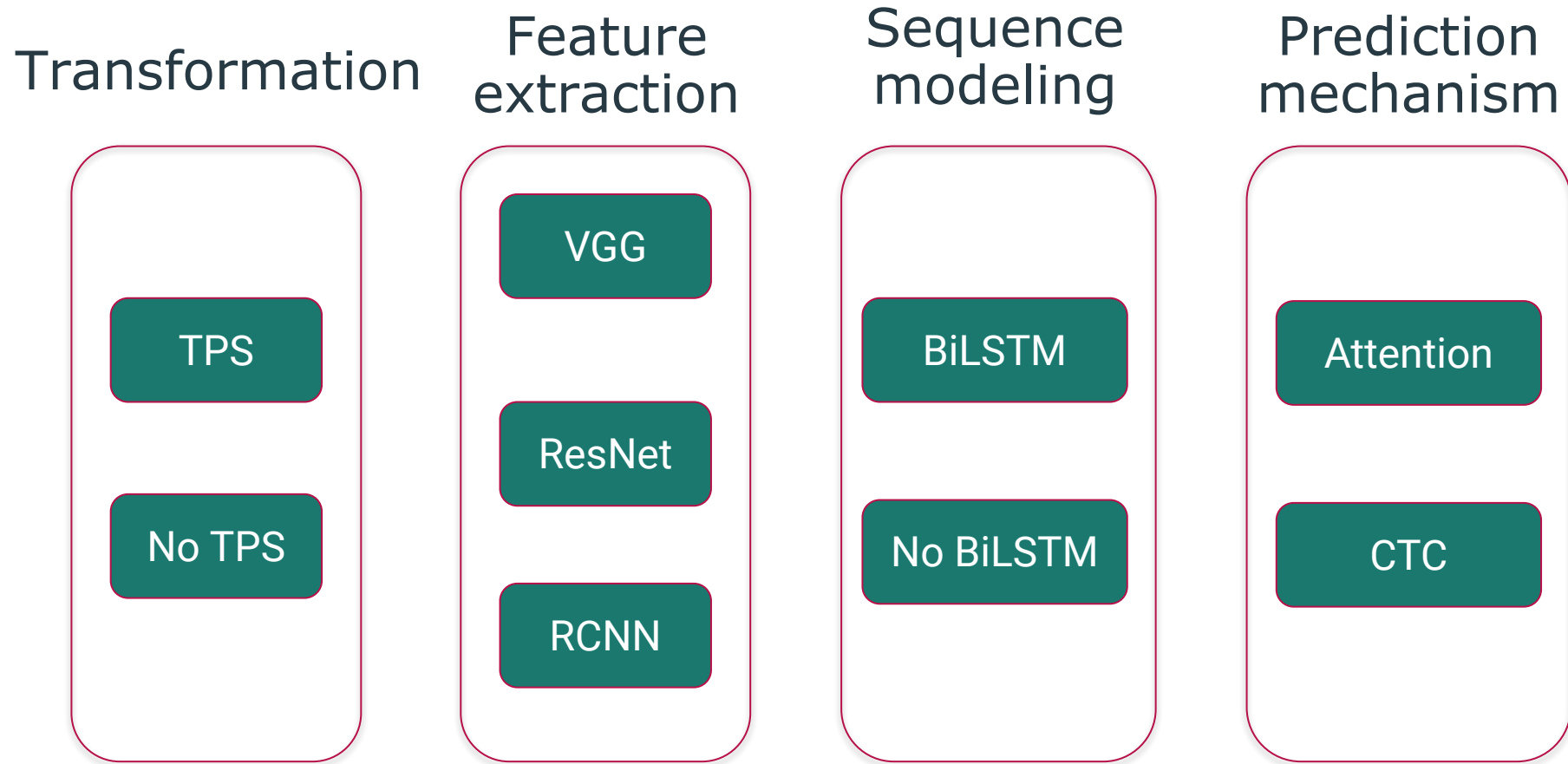
Estimating the output character sequence from the identified features of an image
(Attention, CTC)

Prediction



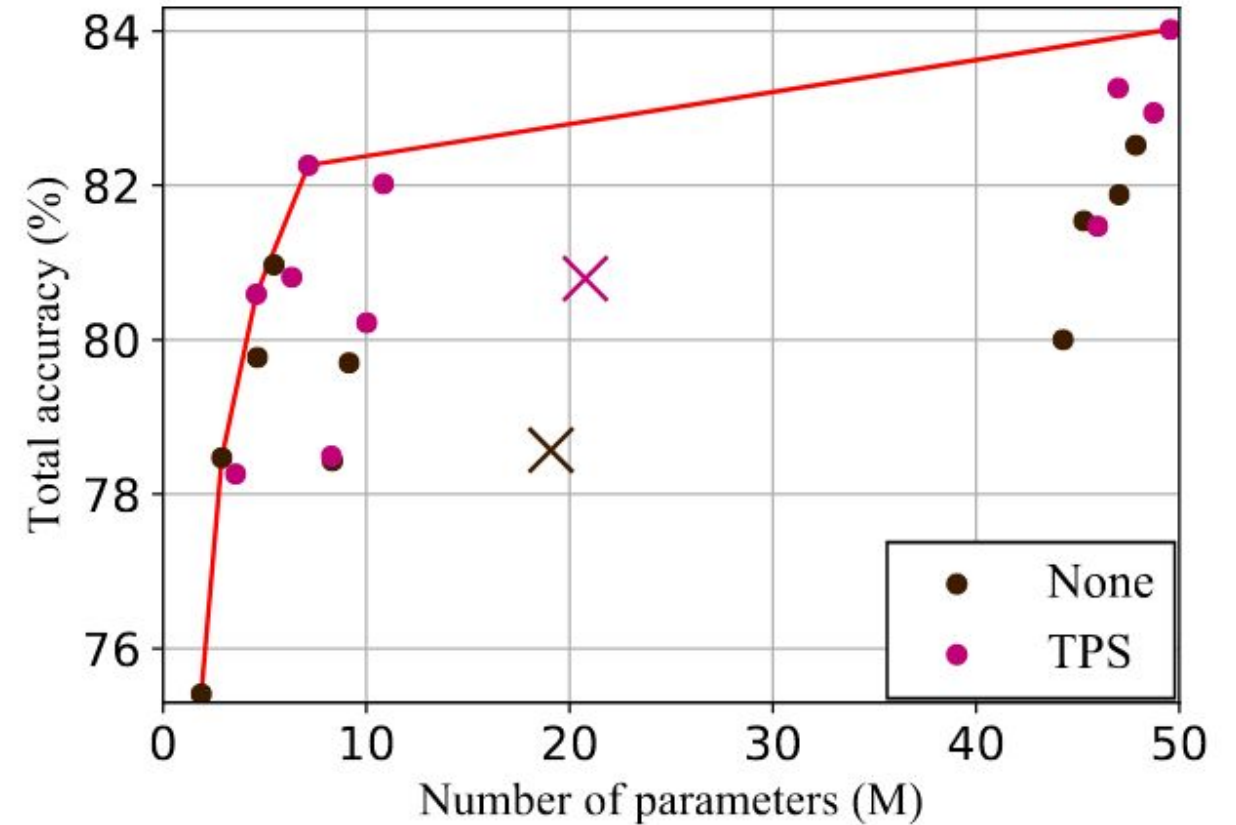
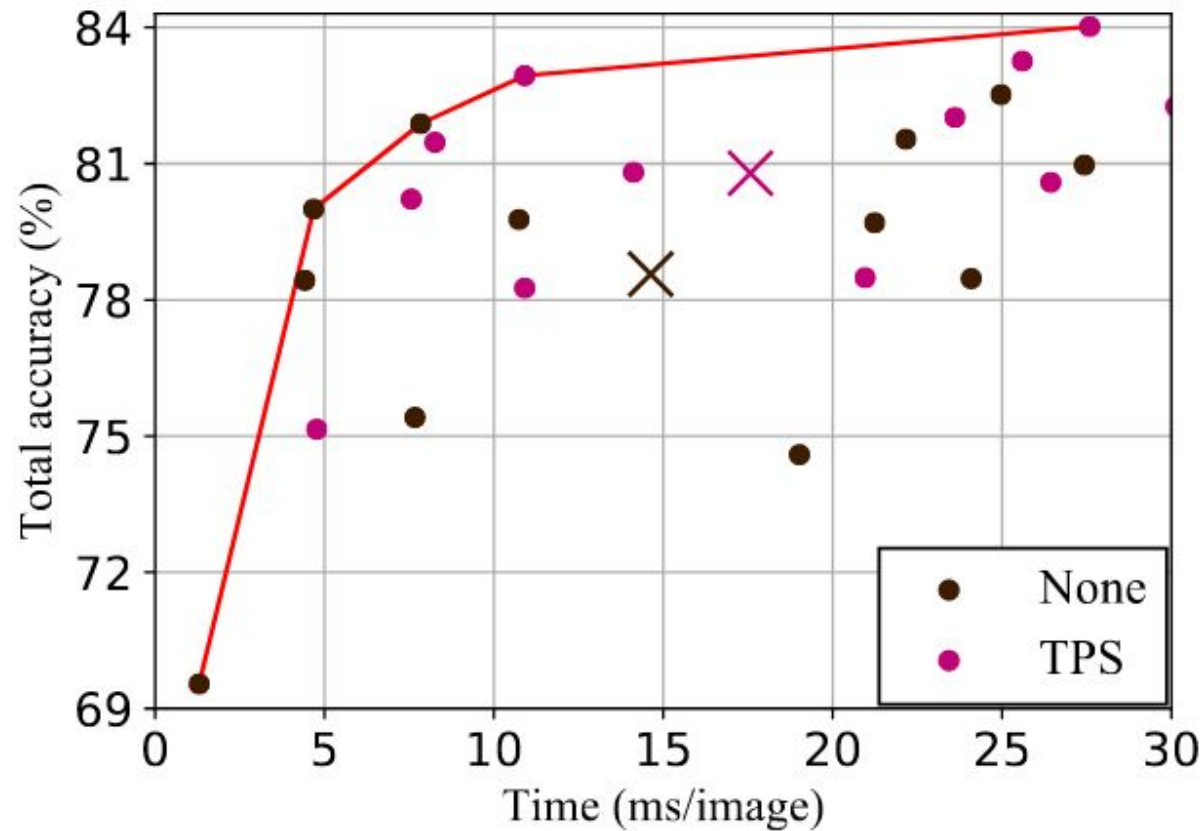
Recognition

Possible Architecture



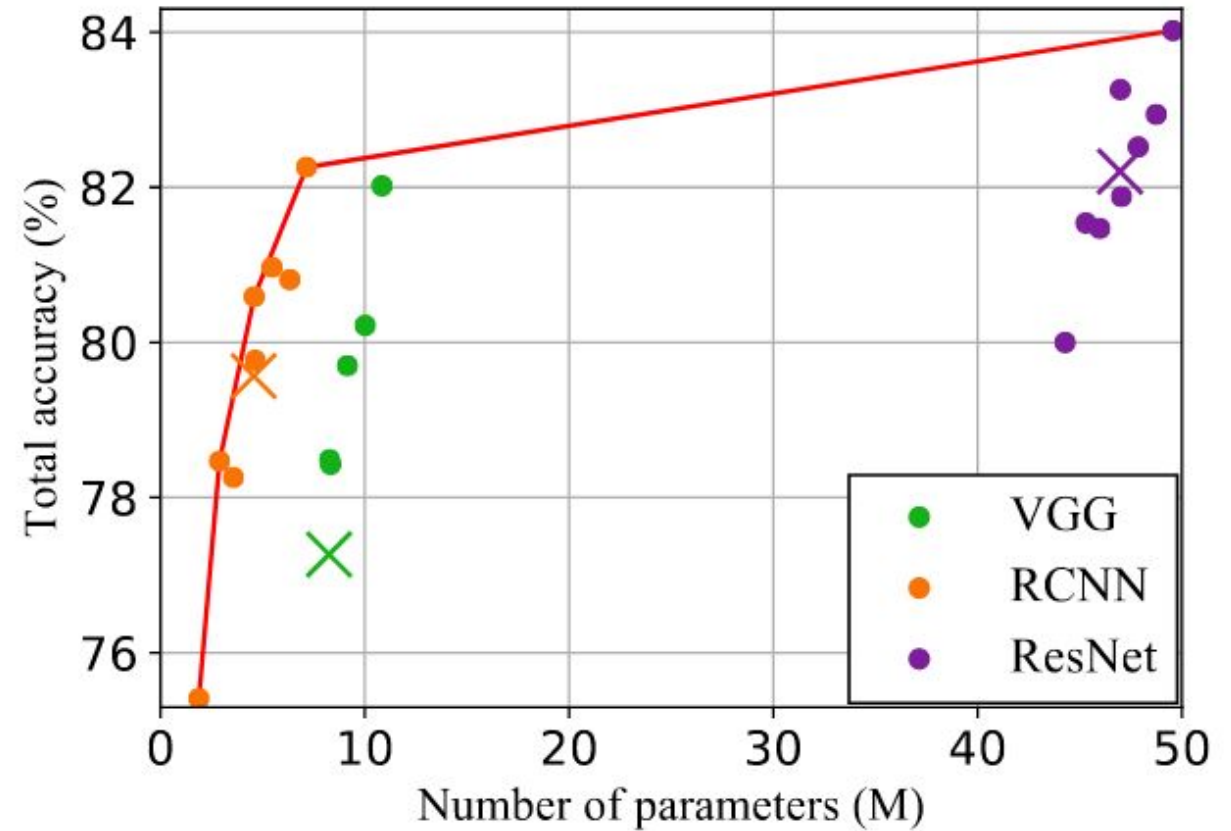
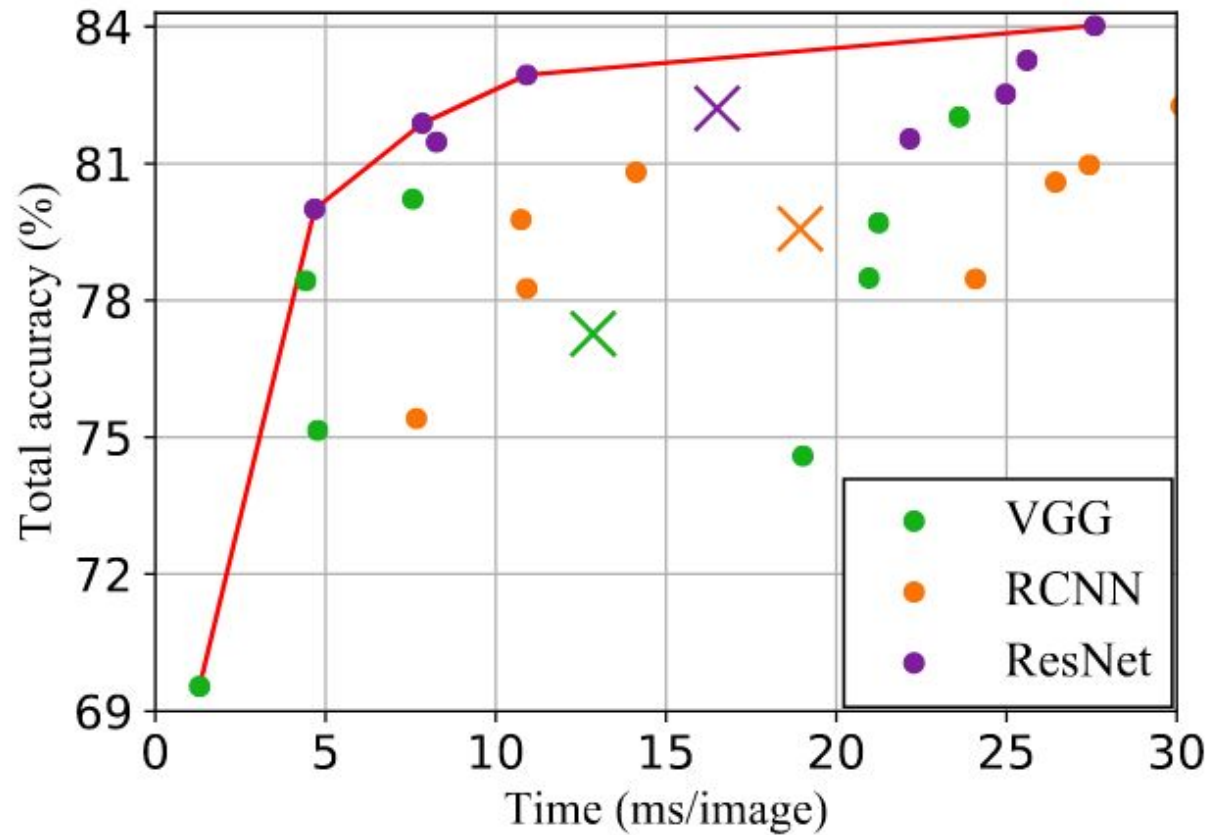
Recognition

TPS / non TPS comparison



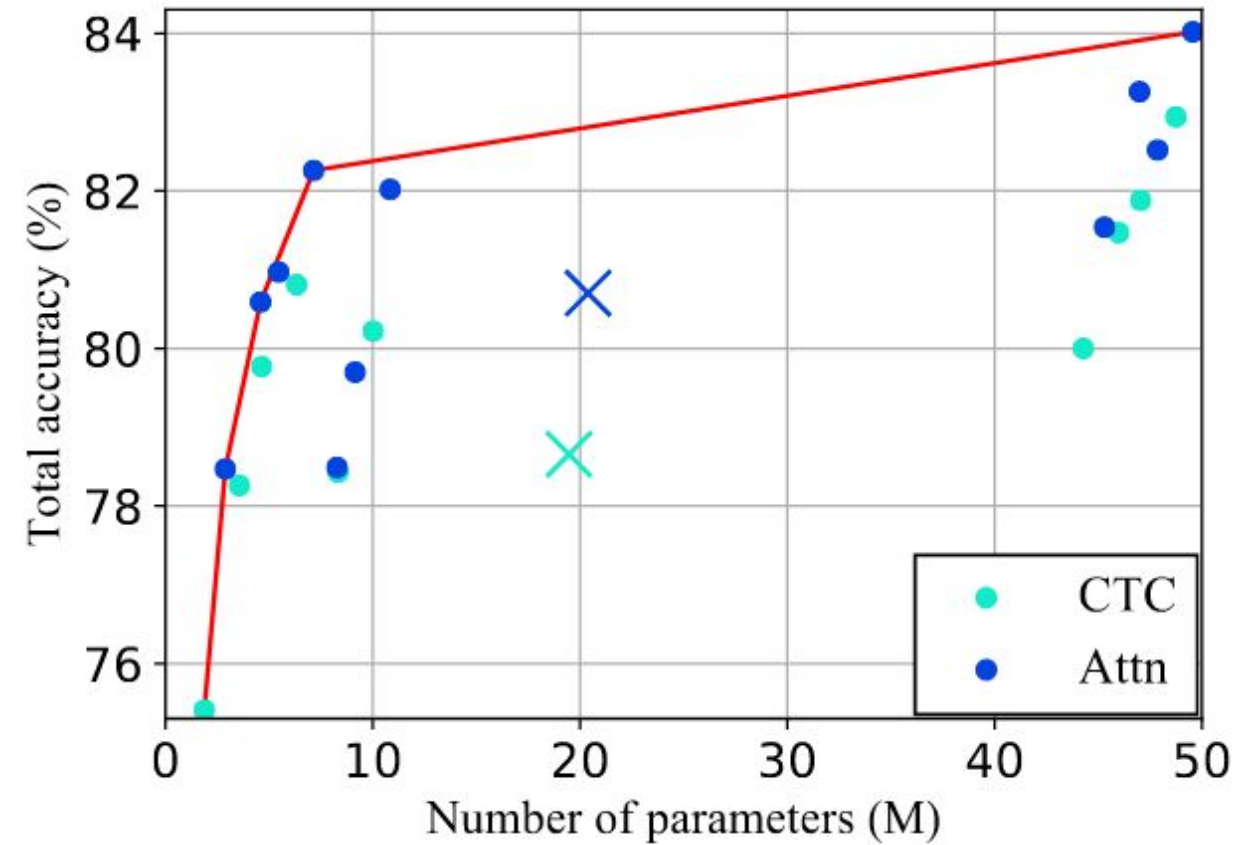
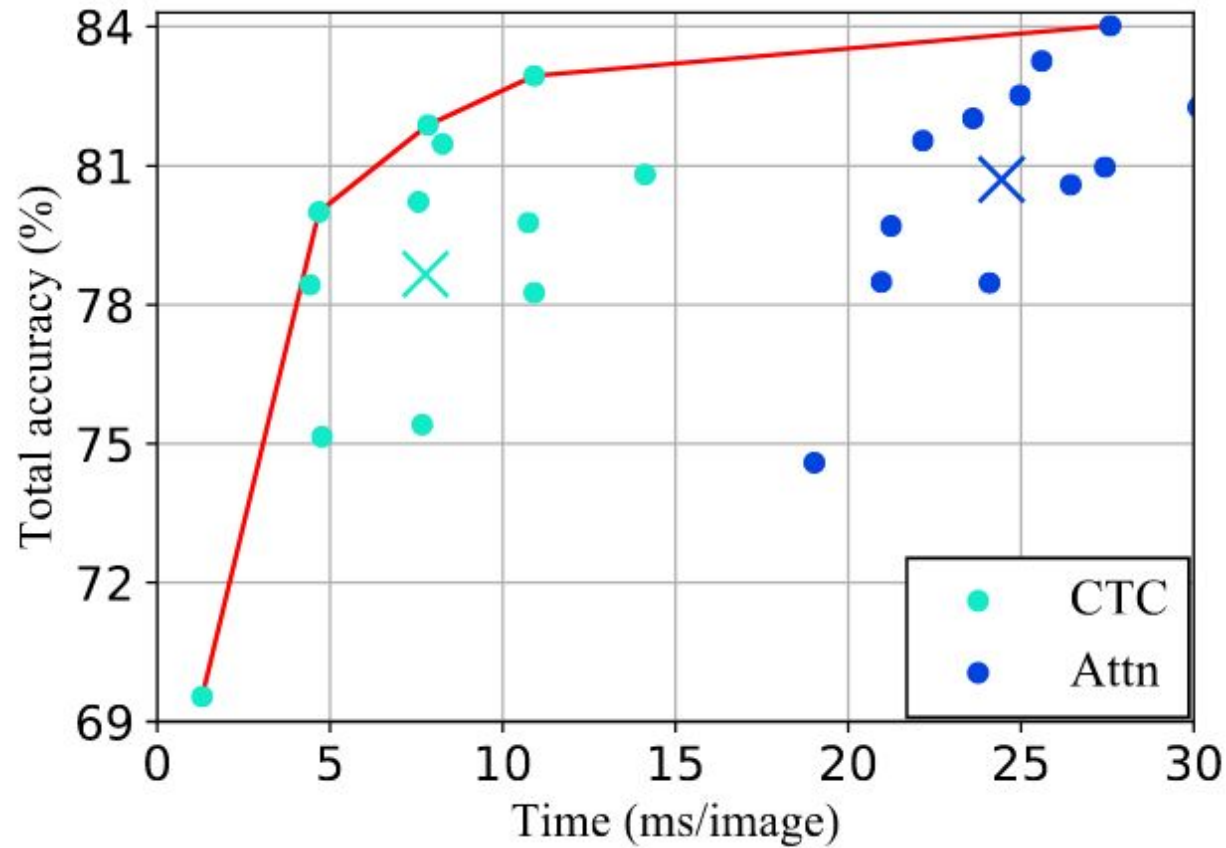
Recognition

Feature extractor comparison



Recognition

Prediction step comparison



Questions ?

Clovai results

| | | | | | | | | | | | | | | | | |
|-----|--------|--------|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|------|
| TPS | VGG | None | CTC | 80.0 | 78.0 | 90.1 | 89.7 | 88.7 | 87.5 | 65.1 | 60.6 | 65.5 | 57.0 | 75.1 | 4.8 | 7.3 |
| | | | Attn | 82.9 | 82.3 | 92.0 | 91.7 | 90.5 | 89.2 | 69.4 | 64.2 | 73.0 | 62.2 | 78.5 | 21.0 | 8.3 |
| | | BiLSTM | CTC | 84.6 | 83.8 | 93.3 | 92.9 | 91.2 | 89.4 | 72.4 | 66.8 | 74.0 | 66.8 | 80.2 | 7.6 | 10.0 |
| | | | Attn | 86.2 | 85.8 | 93.9 | 93.7 | 92.6 | 91.1 | 74.5 | 68.9 | 76.2 | 70.4 | 82.0 | 23.6 | 10.8 |
| | RCNN | None | CTC | 82.8 | 81.7 | 92.0 | 91.6 | 89.5 | 88.4 | 69.8 | 64.6 | 71.3 | 61.2 | 78.3 | 10.9 | 3.6 |
| | | | Attn | 85.1 | 84.0 | 93.1 | 93.1 | 91.5 | 90.2 | 72.4 | 66.8 | 75.6 | 64.9 | 80.6 | 26.4 | 4.6 |
| | | BiLSTM | CTC | 85.1 | 84.3 | 93.5 | 93.1 | 91.4 | 89.6 | 73.4 | 67.7 | 74.4 | 69.1 | 80.8 | 14.1 | 6.3 |
| | | | Attn | 86.3 | 85.7 | 94.0 | 94.0 | 92.8 | 91.1 | 75.0 | 69.2 | 77.7 | 70.1 | 82.3 | 30.1 | 7.2 |
| | ResNet | None | CTC | 85.0 | 85.7 | 94.0 | 93.6 | 92.5 | 90.8 | 74.6 | 68.8 | 75.2 | 71.0 | 81.5 | 8.3 | 46.0 |
| | | | Attn | 87.1 | 87.1 | 94.3 | 93.9 | 93.2 | 91.8 | 76.5 | 70.6 | 78.9 | 73.2 | 83.3 | 25.6 | 47.0 |
| | | BiLSTM | CTC | 87.0 | 86.9 | 94.4 | 94.0 | 92.8 | 91.5 | 76.1 | 70.3 | 77.5 | 71.7 | 82.9 | 10.9 | 48.7 |
| | | | Attn | 87.9 | 87.5 | 94.9 | 94.4 | 93.6 | 92.3 | 77.6 | 71.8 | 79.2 | 74.0 | 84.0 | 27.6 | 49.6 |