

Hypernym discovery : Recurrent Mapping Model(4)

RMM 구현 및 실험

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Overview

- **Recurrent Mapping Model – Hypernym discovery**
 - Loss Function
 - Results

- **Scene Text**
 - Resnet50-FPN result
 - Feature works

Recurrent Mapping Models - Hypernym Discovery

- Loss Function

$$\diamond \mathcal{L} = - \sum_{x \in \mathcal{X}_{train}} \frac{1}{|Q_x|} \sum_{y \in Q_x} \log \frac{\exp(s_y)}{\sum_{y' \in Q_x \cup C_x} \exp(s_{y'})}$$

- x : hyponym(query), y : hypernym candidates
- Q_x : gold hypernym set of x (positive sample), C_x : negative hyponym set of x

Dataset

Query hyponym(x)		Target hypernym(y)
word	type	
blackfly	Concept	homopterous insect, insect, edit, horse, wait, ...
Turonian	Entity	technical specification, geologic timescale, physical property, geological period, unit of time, city, English, beach, ...

Recurrent Mapping Models - Hypernym Discovery

- Loss Function

$$\diamond \mathcal{L} = -\sum_{x \in \mathcal{X}_{train}} \frac{1}{|\mathcal{Q}_x|} \sum_{y \in \mathcal{Q}_x} \log \frac{\exp(s_y)}{\sum_{y' \in \mathcal{Q}_x \cup \mathcal{C}_x} \exp(s_{y'})}$$

hypernym	homopterous insect	insect	edit	horse	wait
$\frac{\exp(s_y)}{\sum_{y' \in \mathcal{Q}_x \cup \mathcal{C}_x} \exp(s_{y'})}$	0.6	0.2	0.05	0.02	0.13
log	-0.5108	-1.6094	-2.9957	-3.9120	-2.0402
$\sum_{y \in \mathcal{Q}_x}$	-2.1202				
$-\frac{1}{ \mathcal{Q}_x }$	1.0601				

Recurrent Mapping Models - Hypernym Discovery

- Loss Function

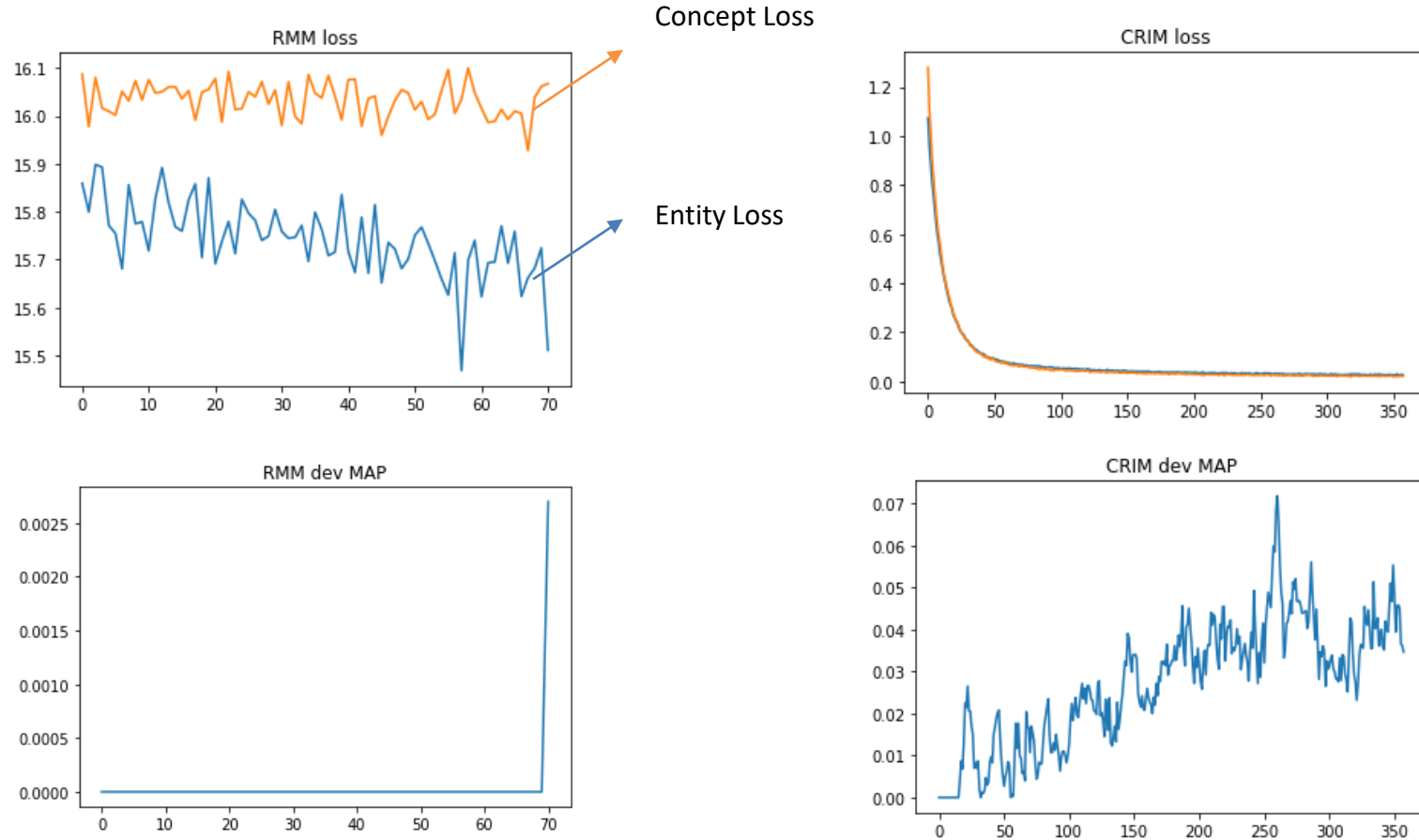
$$\diamond \mathcal{L} = - \sum_{x \in \mathcal{X}_{train}} \frac{1}{|\mathcal{Q}_x|} \sum_{y \in \mathcal{Q}_x} \log \frac{\exp(s_y)}{\sum_{y' \in \mathcal{Q}_x \cup \mathcal{C}_x} \exp(s_{y'})}$$

hypernym	homopterous insect	insect	edit	horse	wait
$\frac{\exp(s_y)}{\sum_{y' \in \mathcal{Q}_x \cup \mathcal{C}_x} \exp(s_{y'})}$	0.05	0.02	0.6	0.2	0.13
log	-2.9957	-3.9120	-0.5108	-1.6094	-2.0402
$\sum_{y \in \mathcal{Q}_x}$	-6.9077				
$-\frac{1}{ \mathcal{Q}_x }$	3.45385				

Recurrent Mapping Models - Hypernym Discovery

- Issue

- Recurrent Mapping Model isn't trained.



Recurrent Mapping Models - Hypernym Discovery

- Issue

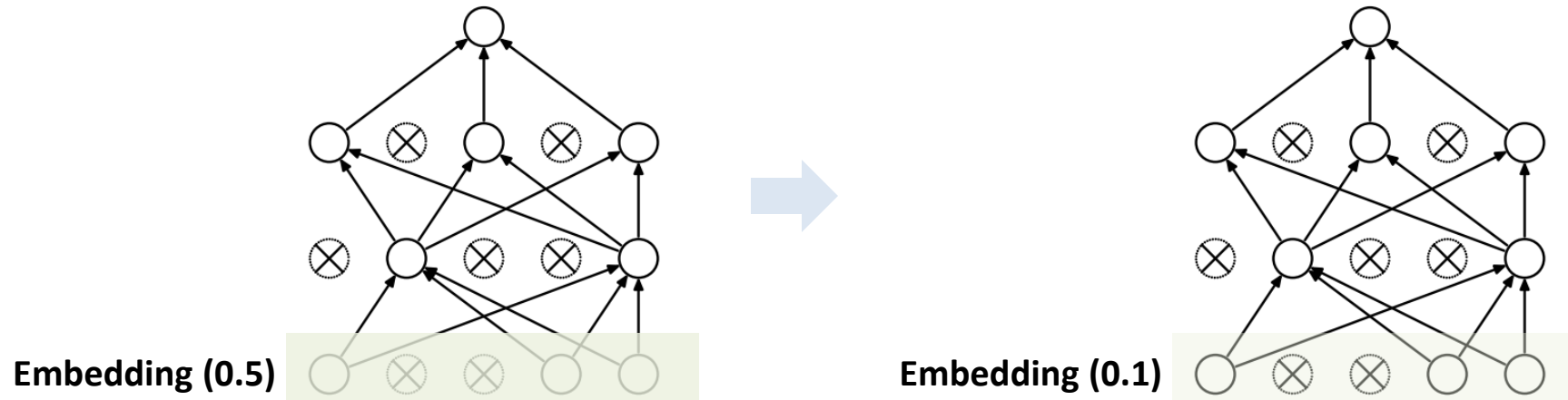
- Batch size

$$\diamond \mathcal{L} = - \sum_{x \in \mathcal{X}_{train}} \frac{1}{|\mathcal{Q}_x|} \sum_{y \in \mathcal{Q}_x} \log \frac{\exp(s_y)}{\sum_{y' \in \mathcal{Q}_x \cup \mathcal{C}_x} \exp(s_{y'})}$$

- The loss was too high with **full-batch**
 - Not trained in **mini-batch**.
 - Check the input/output process of the loss function.

Recurrent Mapping Models - Hypernym Discovery

- Issue - Dropout
 - Dropout is applied each mapping function.

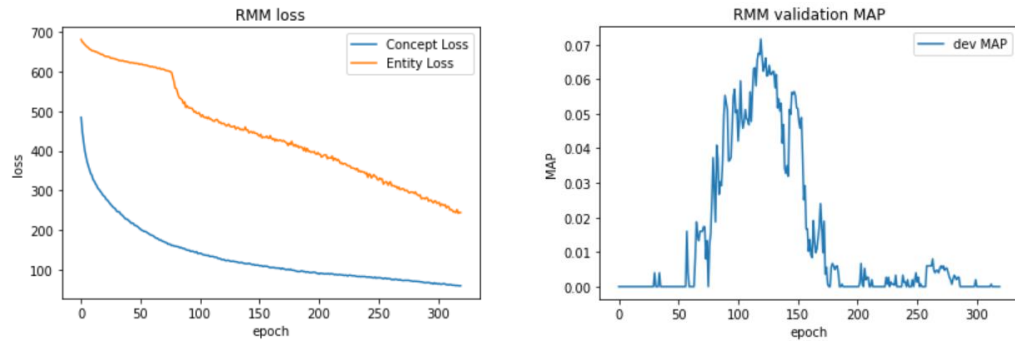


- Dropout rate is **too high**.
- **Reduce** the dropout rate.
- **Change** the dropout applied layer. (after **transformation matrix** or **projection matrix**)

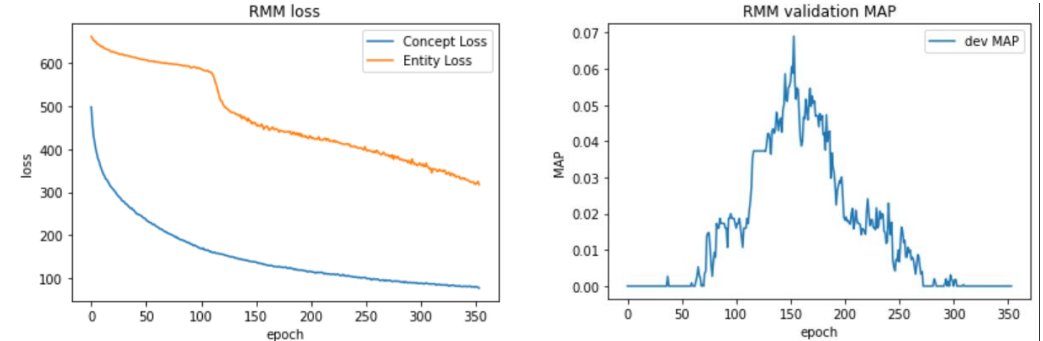
Recurrent Mapping Models - Hypernym Discovery

- Result – option : batch size

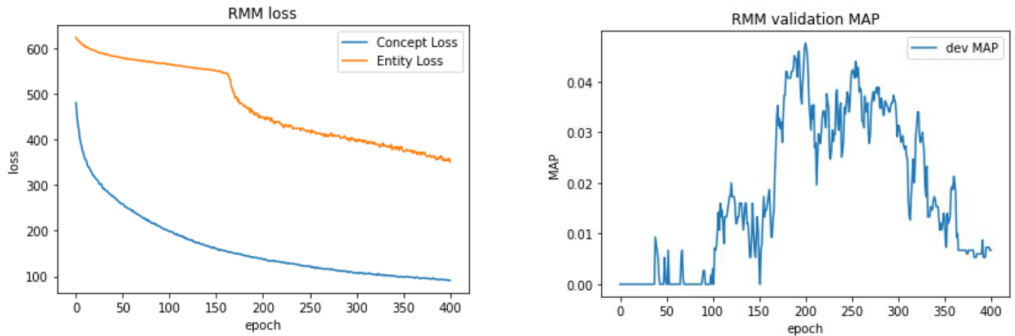
16 batch 1000-neg



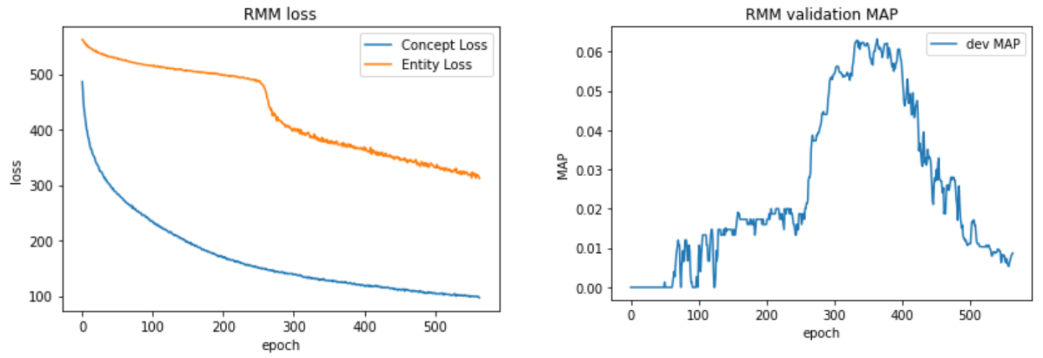
32 batch 1000-neg



64 batch 1000-neg



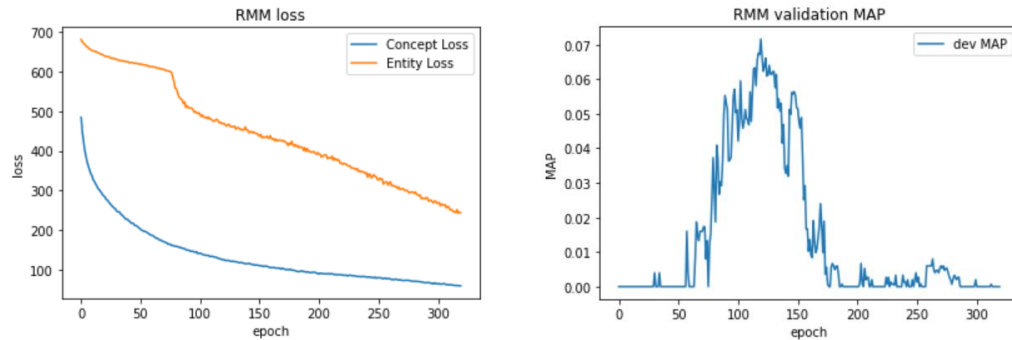
128 batch 1000-neg



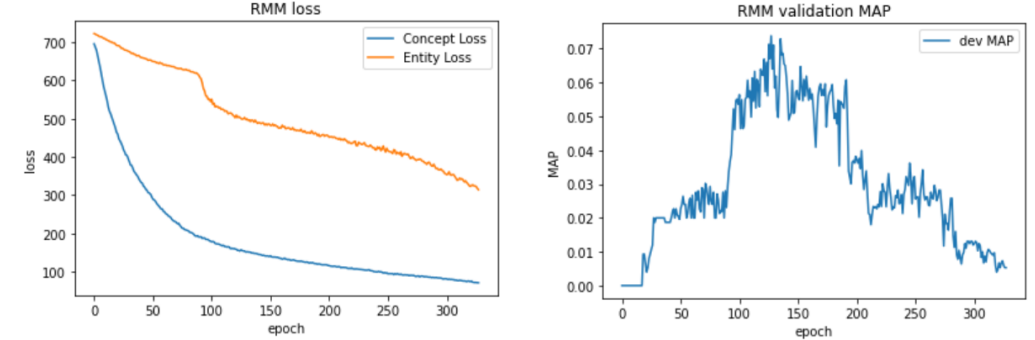
Recurrent Mapping Models - Hypernym Discovery

- Result – option : level, negative samples with 16 batch size

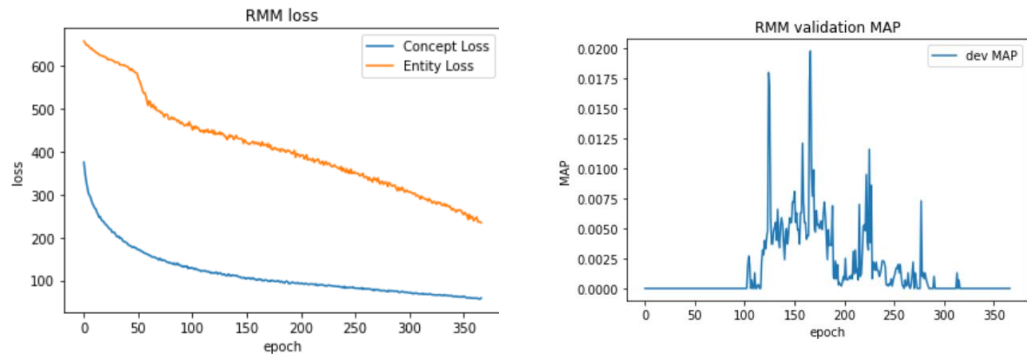
2-level 1000-neg



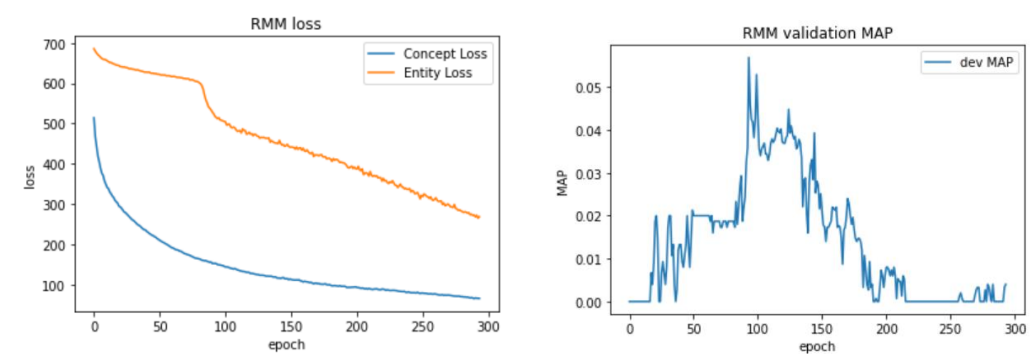
3-level 1000-neg



100-negative samples

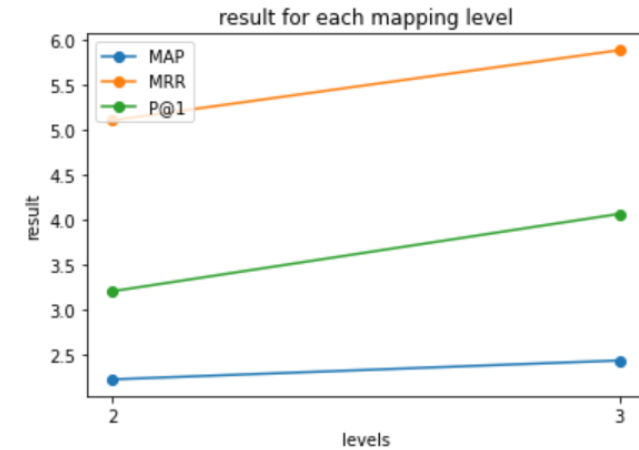
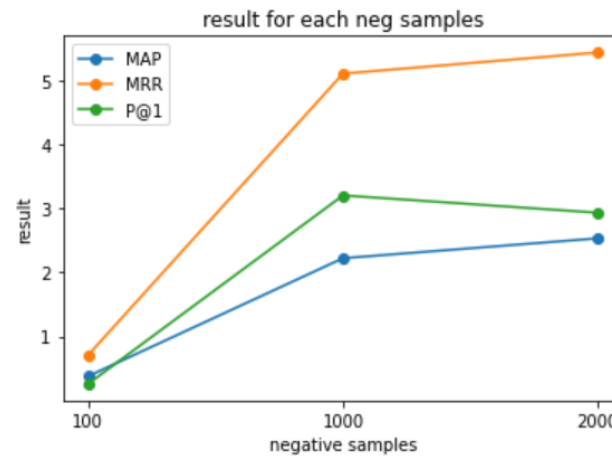
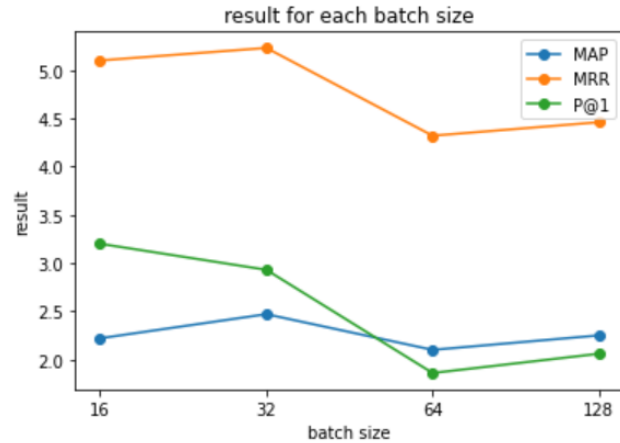


2000-negative samples



Recurrent Mapping Models - Hypernym Discovery

- Result – Test result



- Batch size 32, more negative samples, more levels was the best for this experiment.

Recurrent Mapping Models - Hypernym Discovery

- Result – Test result

level – batch size – negative samples	MAP	MRR	P@1
2 – 16 – 1000	2.22	5.10	3.20
2 - 32 - 1000	2.47	5.23	2.93
2 – 64 - 1000	2.10	4.32	1.86
2 – 128 – 1000	2.25	4.46	2.06
3 – 16 – 1000	2.43	5.88	4.06
2 – 16 – 2000	2.53	5.43	2.93
2 – 16 – 100	0.38	0.71	0.26
Proposed RMM	27.12	39.07	23.41

- Increasing window size of skip-gram model.

Future

- **Last week**

- Check loss function.
- RMM experiments with embeddings.
- CRIM experiments with embeddings.
- Other task dataset – hypernym detection (BLESS, EVAL ..)

- **Future works**

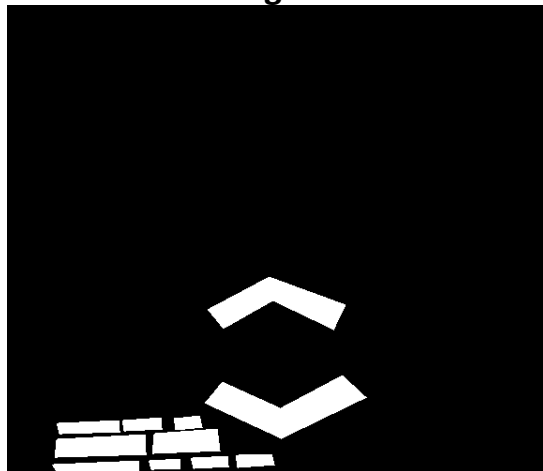
- Increase window size of embeddings.
- Other task dataset – hypernym detection (BLESS, EVAL ..)

Scene Text

- TotalText

- Images
- GT_pixel
- GT_region
- txt_format

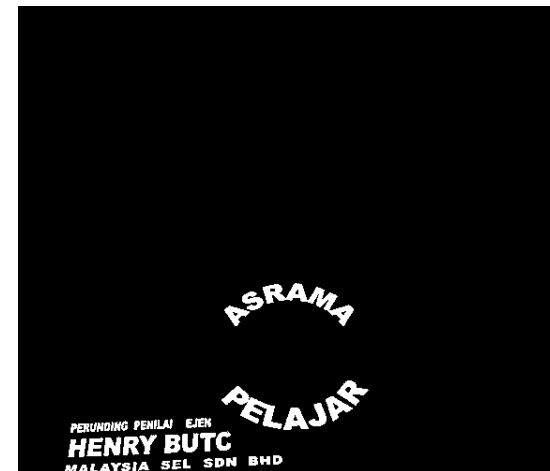
Region



Images



Pixel



```
x: [[214 280 362 349 284 231]], y: [[325 290 320 347 316 346]], ornt: [u'c'], transcriptions: [u'ASRAMA']
x: [[230 292 358 384 293 211]], y: [[402 430 395 419 463 425]], ornt: [u'c'], transcriptions: [u'PELAJAR']
x: [[ 53 120 121 56]], y: [[446 443 456 458]], ornt: [u'h'], transcriptions: [u'PERUNDING']
x: [[123 165 166 125]], y: [[443 440 453 455]], ornt: [u'h'], transcriptions: [u'PENILAI']
x: [[168 179 179 167]], y: [[439 439 452 453]], ornt: [u'#'], transcriptions: [u'#']
x: [[178 206 209 180]], y: [[441 438 451 454]], ornt: [u'h'], transcriptions: [u'EJEN']
x: [[ 53 148 149 51]], y: [[463 458 480 483]], ornt: [u'm'], transcriptions: [u'HENRY']
x: [[157 225 228 155]], y: [[457 452 476 479]], ornt: [u'm'], transcriptions: [u'BUTC']
x: [[ 48 141 142 53]], y: [[490 486 499 498]], ornt: [u'm'], transcriptions: [u'MALAYSIA']
x: [[151 185 185 154]], y: [[486 484 495 496]], ornt: [u'h'], transcriptions: [u'SEL']
x: [[196 236 237 199]], y: [[483 481 493 495]], ornt: [u'h'], transcriptions: [u'SDN']
x: [[244 283 286 246]], y: [[480 479 491 494]], ornt: [u'm'], transcriptions: [u'BHD']
```

ornt : orientation

c : curve

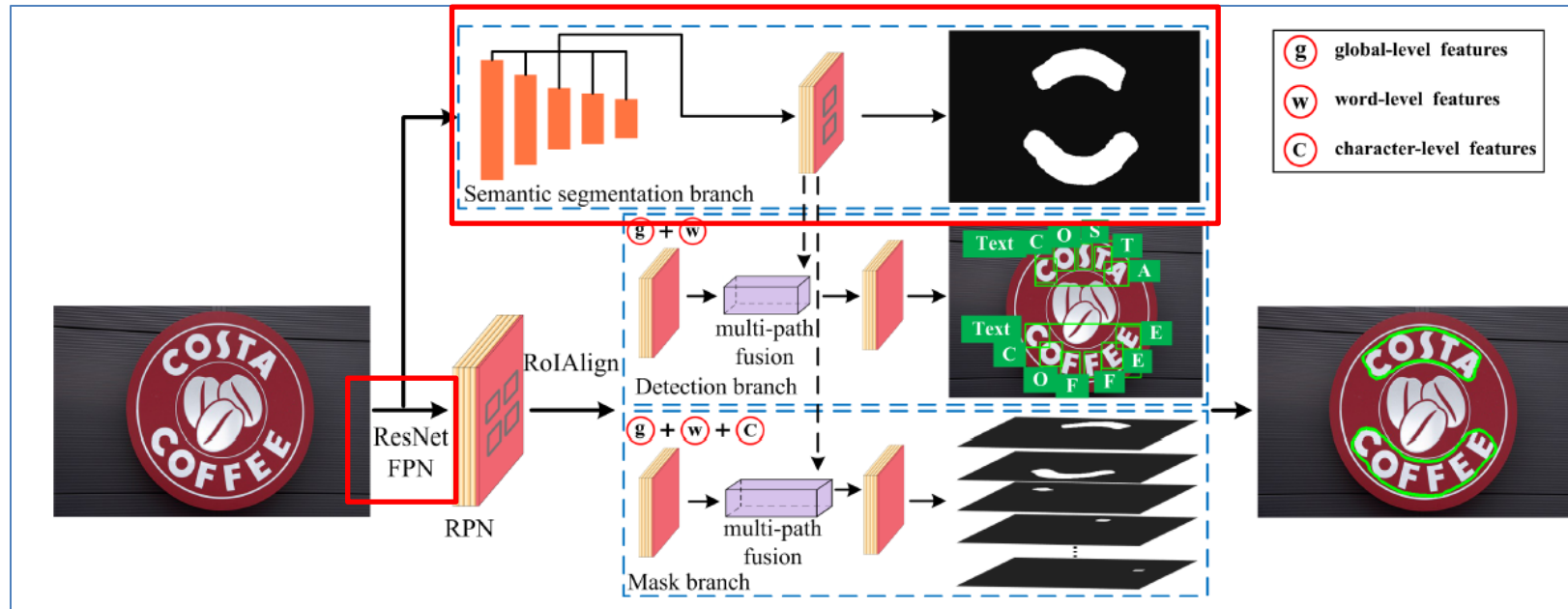
h : horizontal

m : multi-oriented

: don't care

Scene Text

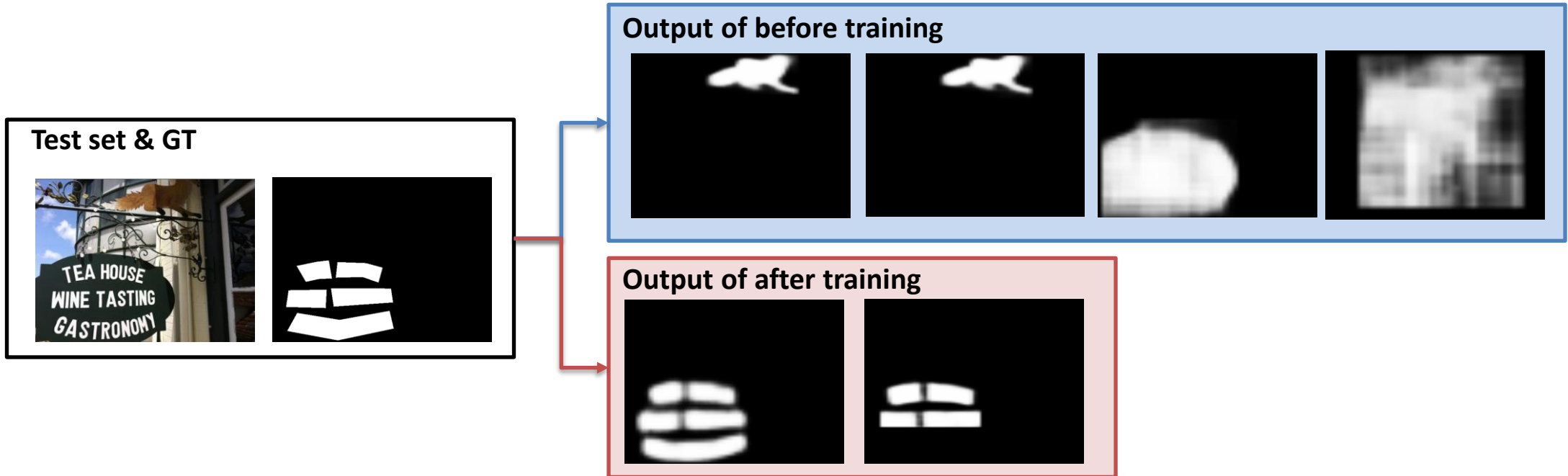
- TextFuseNet – FPN



- ResNet-50 Feature Pyramid Networks.
- Using pre-trained models.

Scene Text

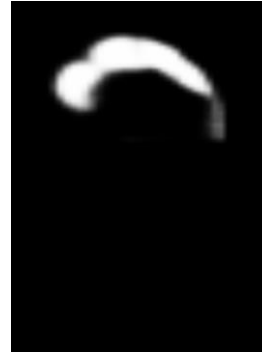
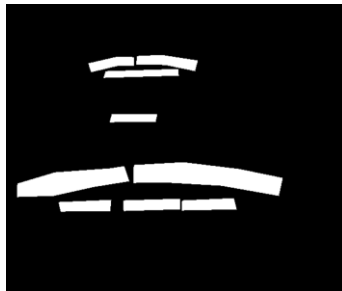
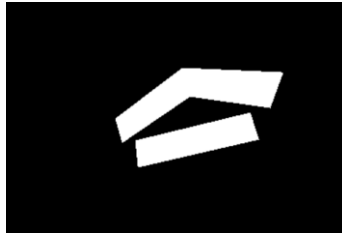
- TextFuseNet - FPN



- Before training, detection of real objects
- After training, detection of word regions.

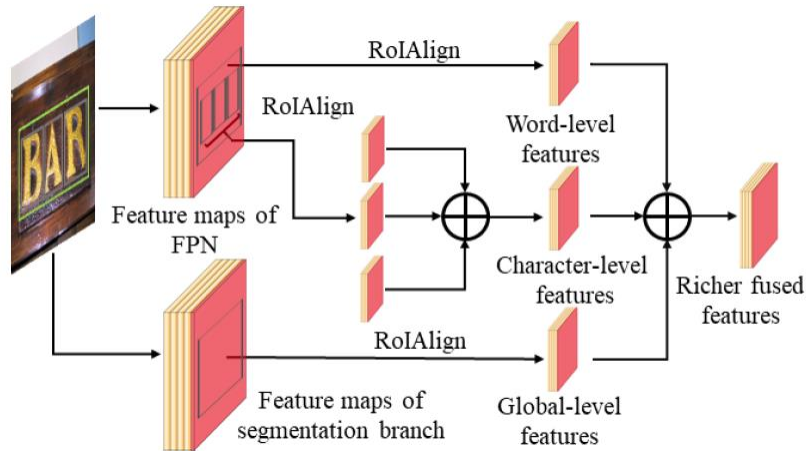
Scene Text

- TextFuseNet – FPN (some test datasets)



Scene Text

- TextFuseNet –
 - Multi-path fusion



- Using feature maps of FPN and **output of RPN**.
- Using feature maps of **segmentation branch**.

Thank you