MSCOCO & Mapillary Panoptic Segmentation Challenge 2018

Megvii (Face++)

Members

Face++ 旷视

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Outline

- Pipeline

- COCO Panoptic Segmentation
  - Proposed Method
  - Results

- Mapillary Panoptic Segmentation
  - Proposed Method
  - Results

Pipeline

Semantic
Segmentation

Stuff

Pipeline

Semantic Segmentation
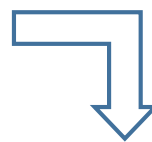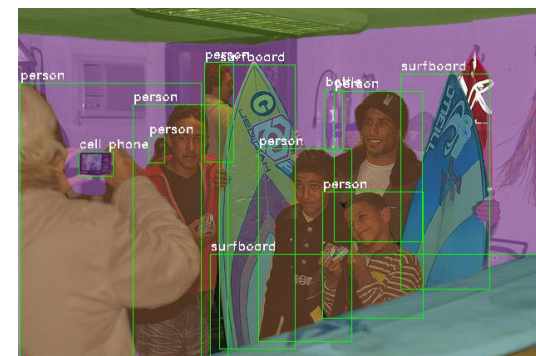
Stuff

Instance Segmentation
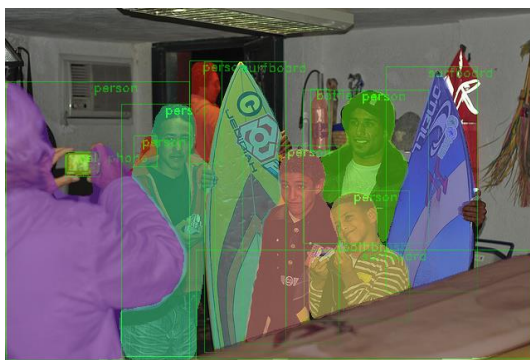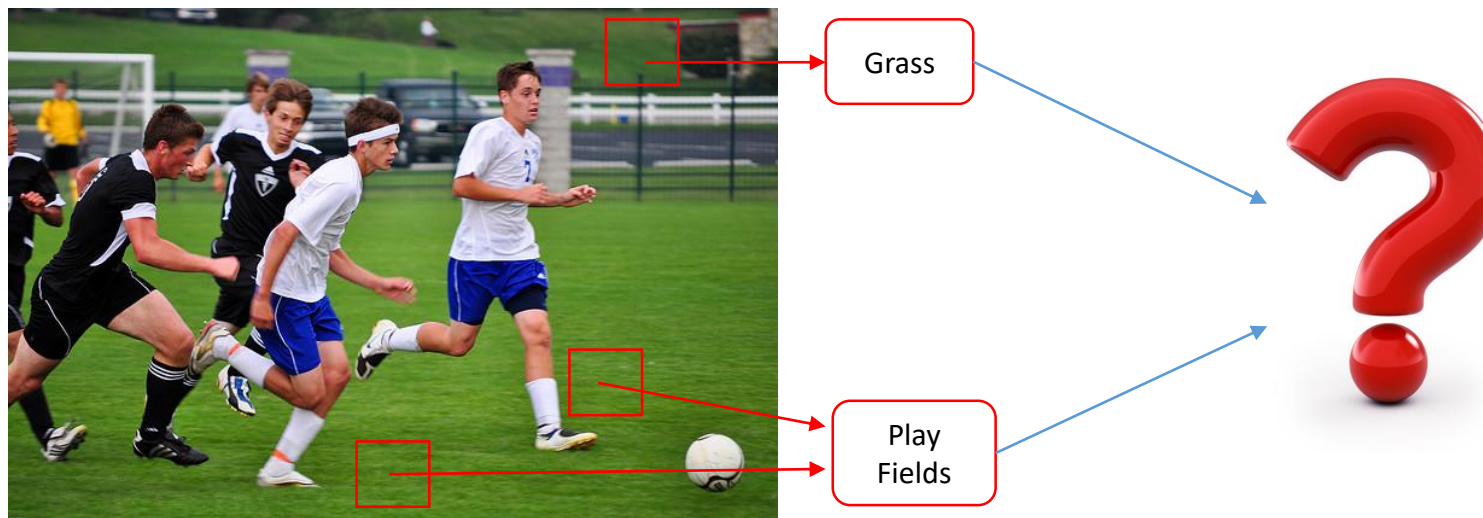
Things

Pipeline

Semantic Segmentation

Stuff

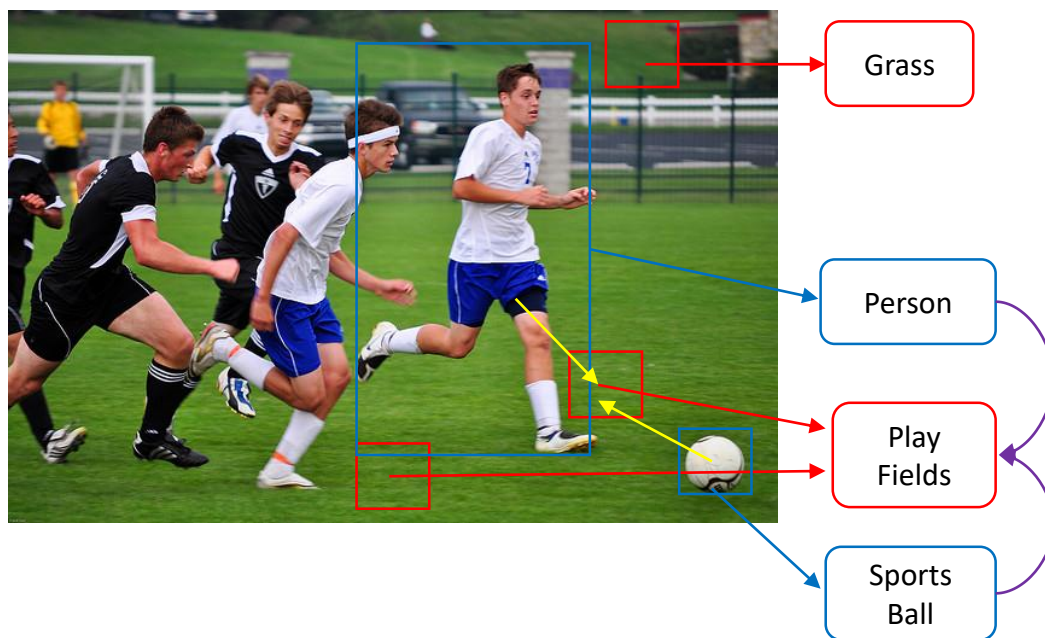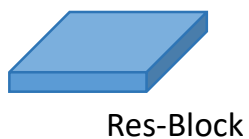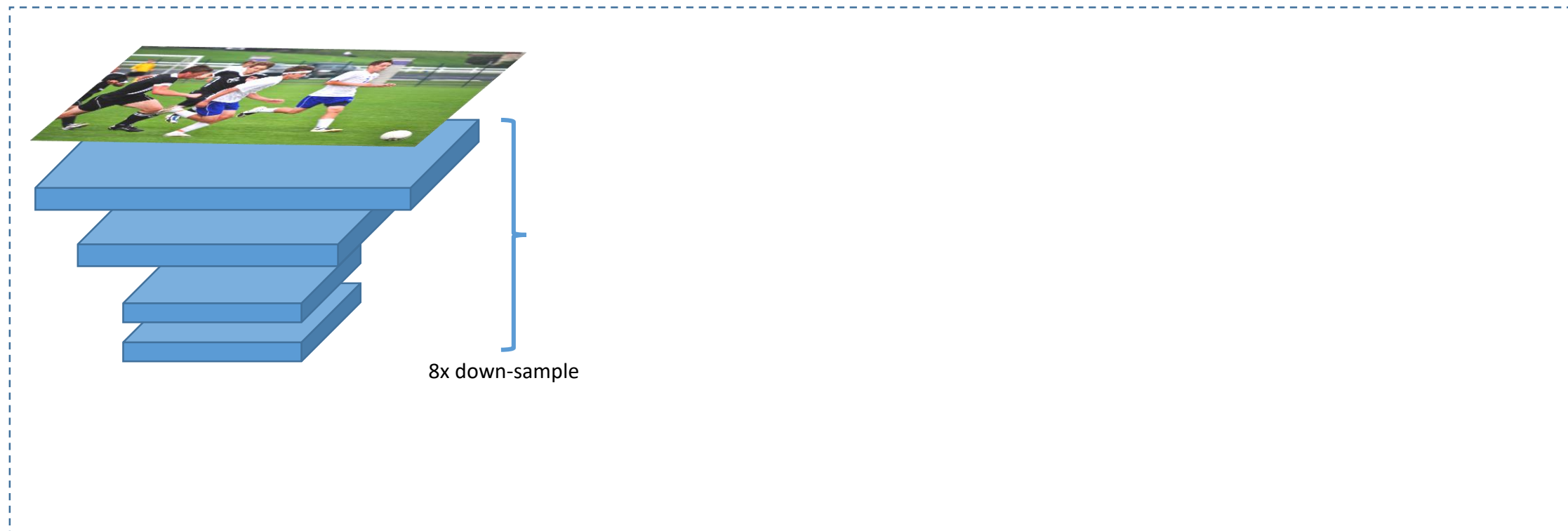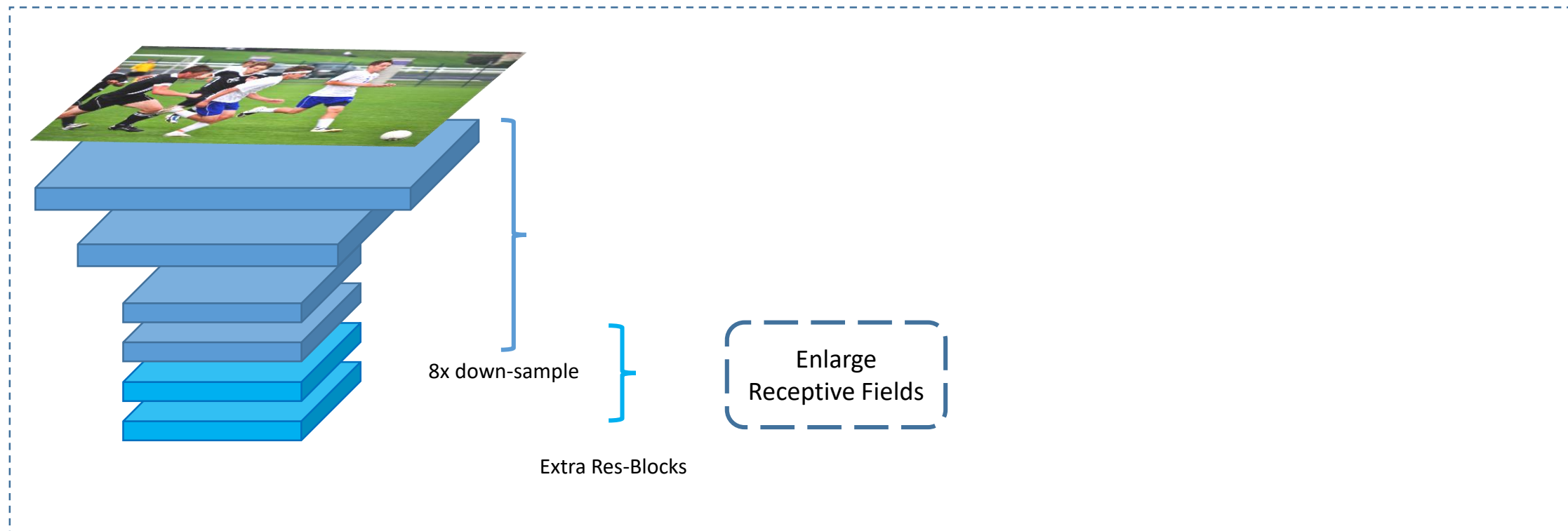Instance Segmentation

Things

Post Processing

All

Hard Example
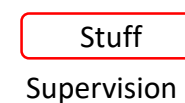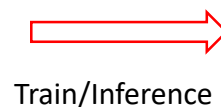
Solution: Object as Context

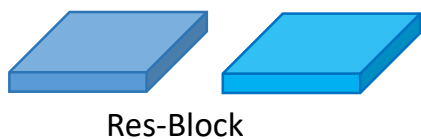# Object Context Network

8x down-sample

Res-Block

Object Context Network

8x down-sample

Extra Res-Blocks

Enlarge
Receptive Fields

Res-Block

Object Context Network

Lack of Context

Stuff

Single Task

Res-Block Feature Extractor Train/Inference Stuff Supervision
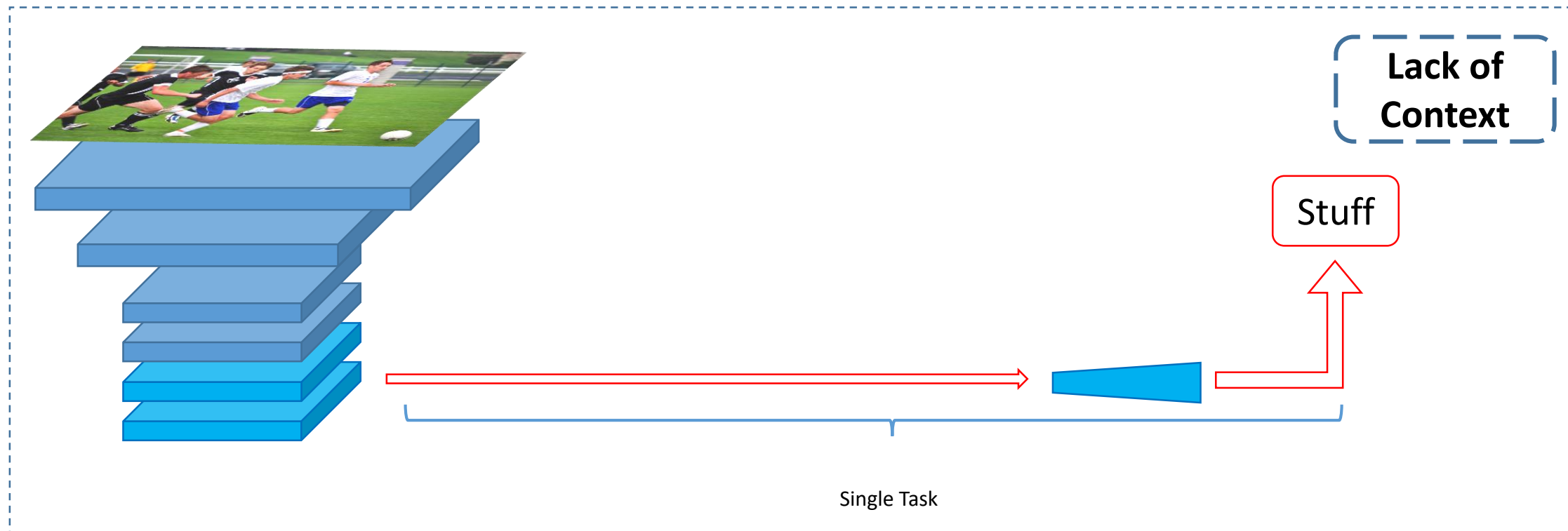
Object Context Network
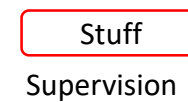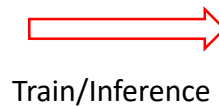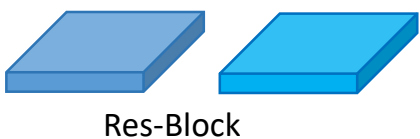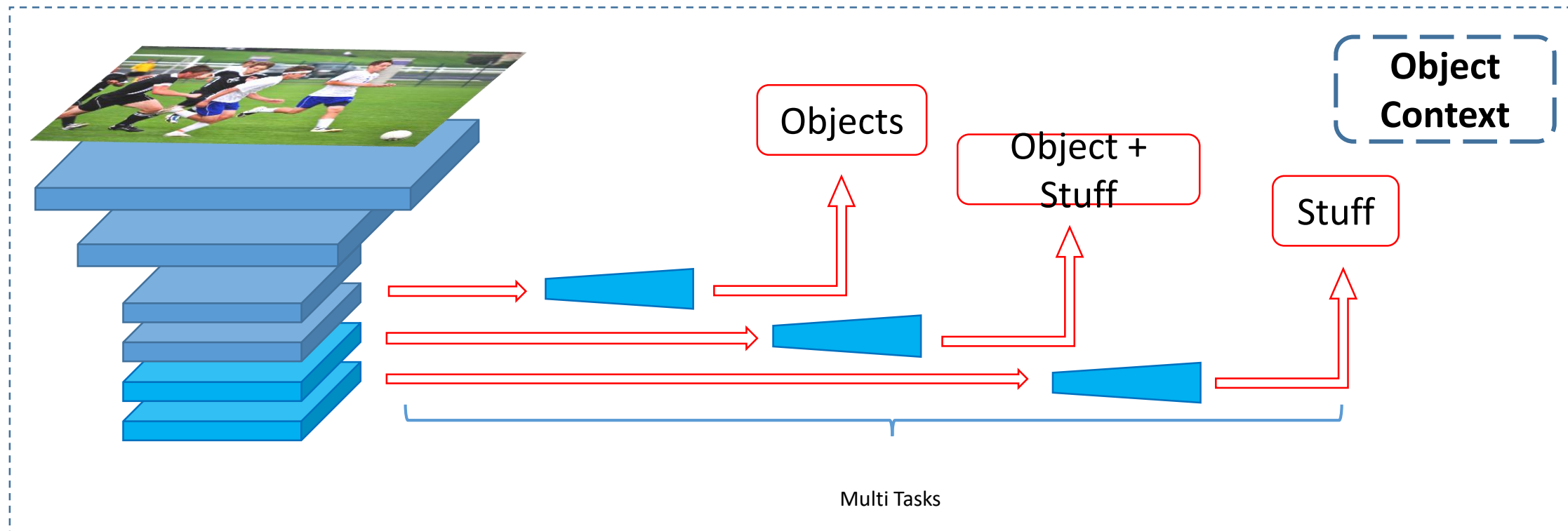
Object Context Network
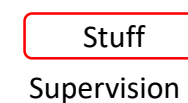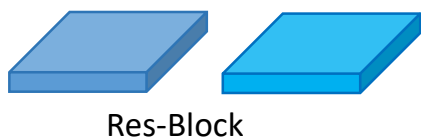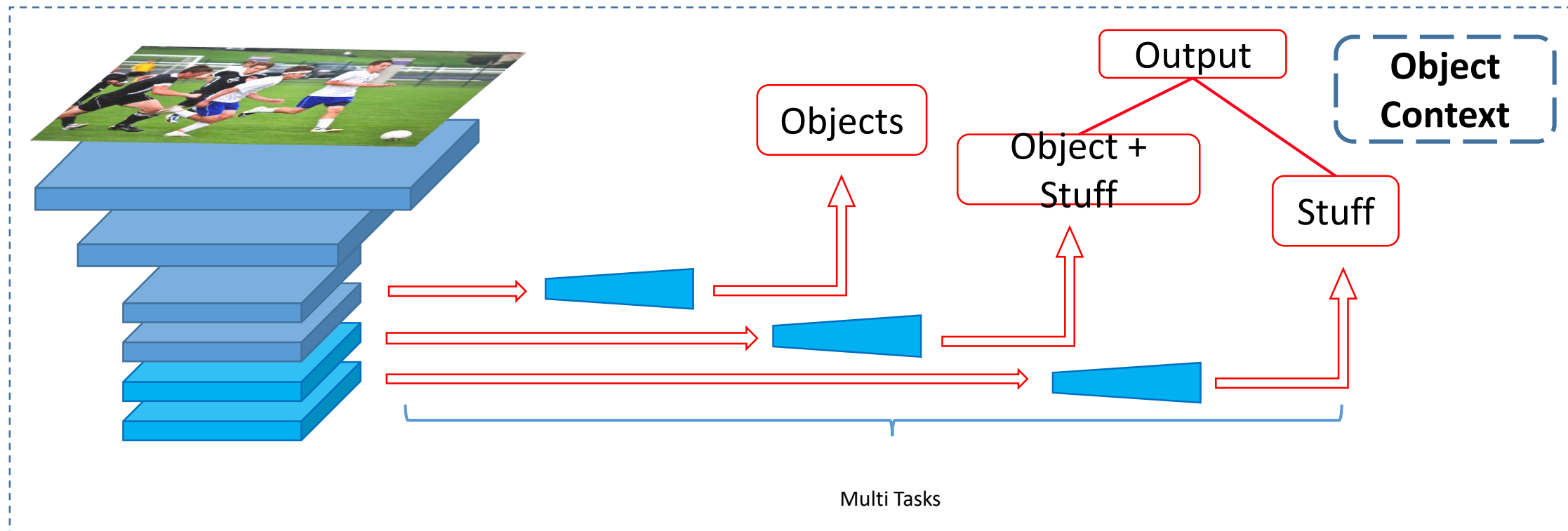
Object Context Visualization
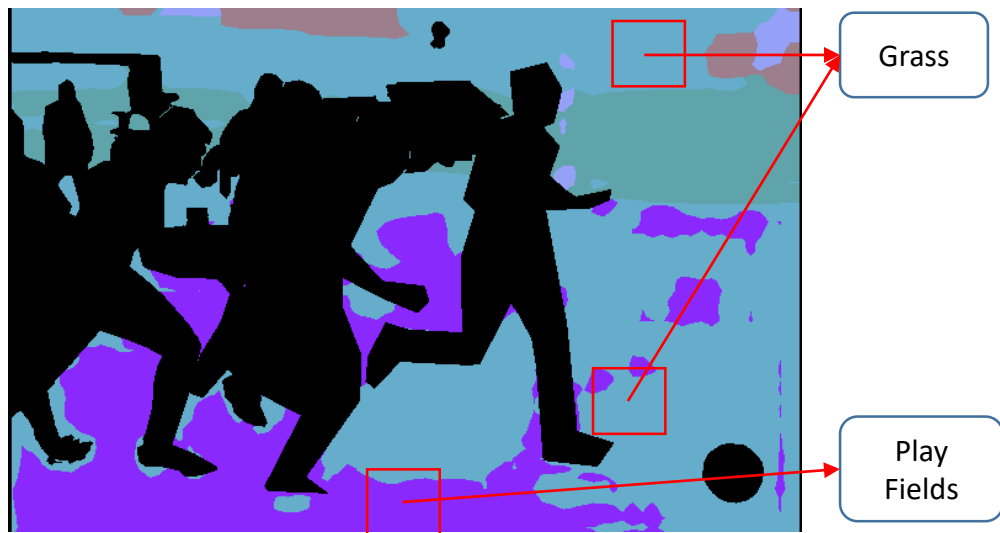
Single Task
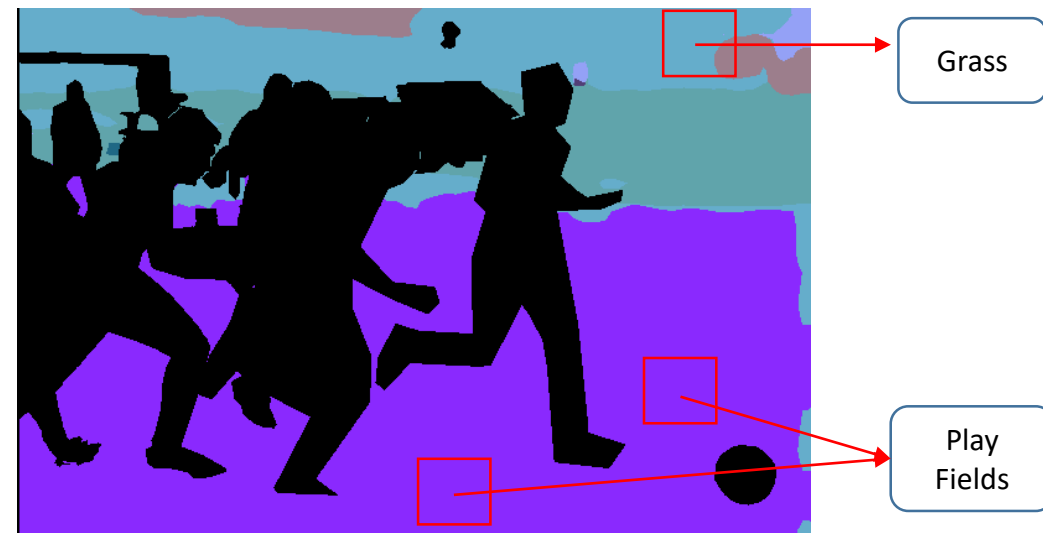
Multi Tasks

COCO Stuff Results
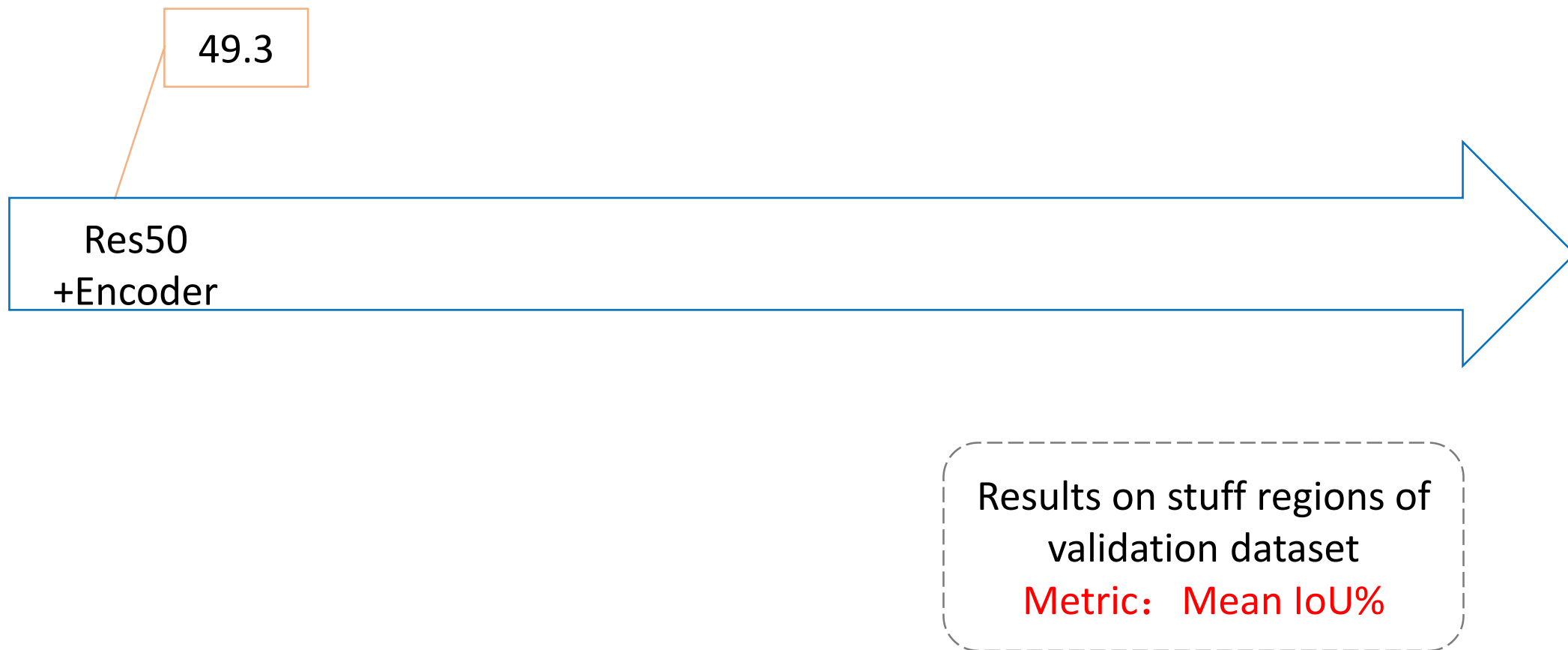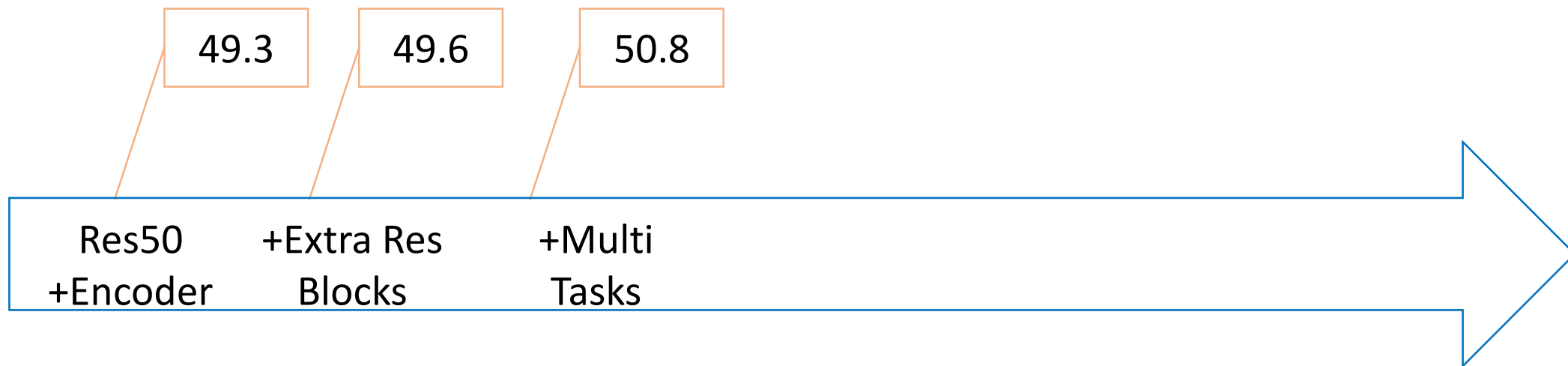
49.3

Res50
+Encoder

Results on stuff regions of
validation dataset
Metric：Mean IoU%

COCO Stuff Results

| 49.3 | 49.6 | 50.8 |

Res50 +Encoder   +Extra Res Blocks   +Multi Tasks

Results on stuff regions of validation dataset
Metric：Mean IoU%

COCO Stuff Results

49.3	49.6	50.8	54.1	54.5

Res50 +Encoder → +Extra Res Blocks → +Multi Tasks → + Large Backbone → +Multi-Scale Flip Test
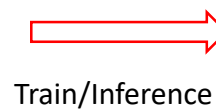
Results on stuff regions of validation dataset
Metric：Mean IoU%

COCO Stuff Results

Res50 +Encoder: 49.3
+Extra Res Blocks: 49.6
+Multi Tasks: 50.8
+ Large Backbone: 54.1
+Multi-Scale Flip Test: 54.5
+Ensemble: 55.9
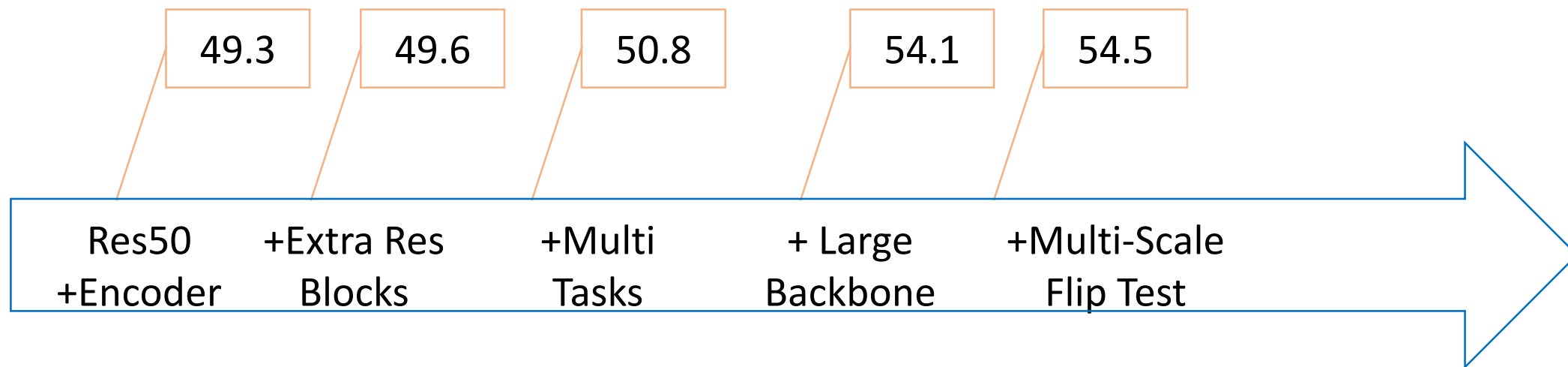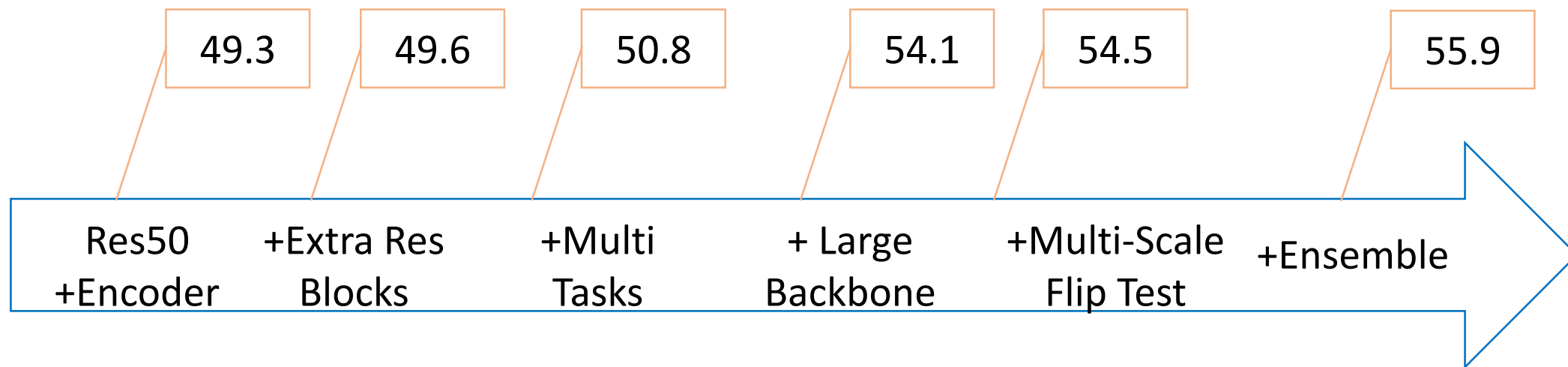
Results on stuff regions of validation dataset
Metric：Mean IoU%

Instance Segmentation
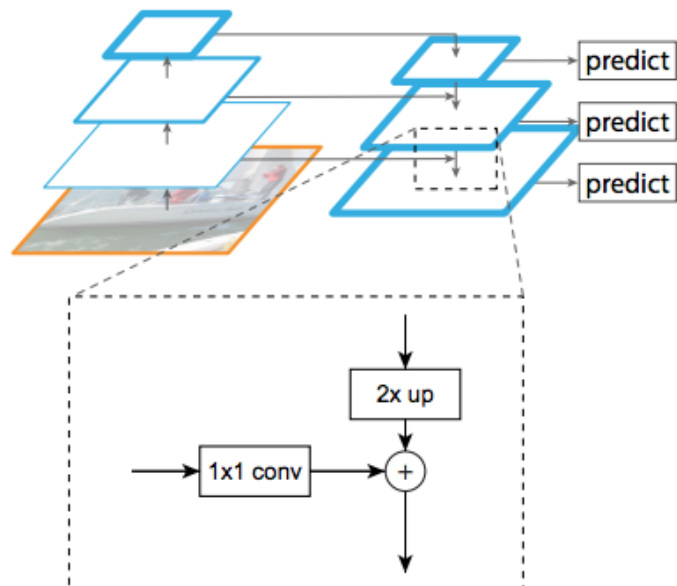
FPN
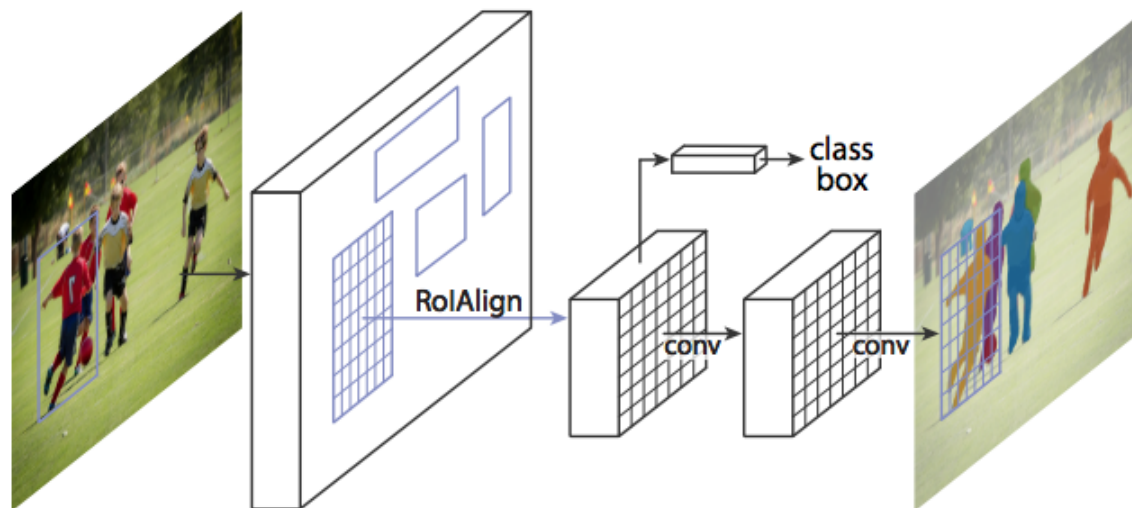
Mask RCNN

Detailed results from our Instance Segmentation Task.

Post Processing

1. Spatial Hierarchical Relation (SHR)

B

A
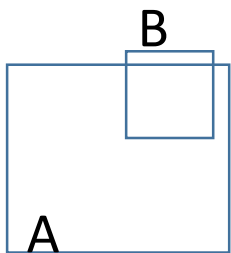
$$r_A \_\text{covered} = \frac{A \cap B}{A}$$

$$r_B \_\text{covered} = \frac{A \cap B}{B}$$

If r_B > threshold, we put B object on top

2. Grid-search *min_thing_area* and other paramet

**PQ on
Validation Dataset**

Method	PQ
Base	49.7
With SHR	51.5
Final	52.7

Post Processing Examples

- The effect of our SHR module between **'people'** and **'tie'**.

Without SHR   With SHR   Without SHR   With SHR

Panoptic Results on COCO

- COCO Validation:

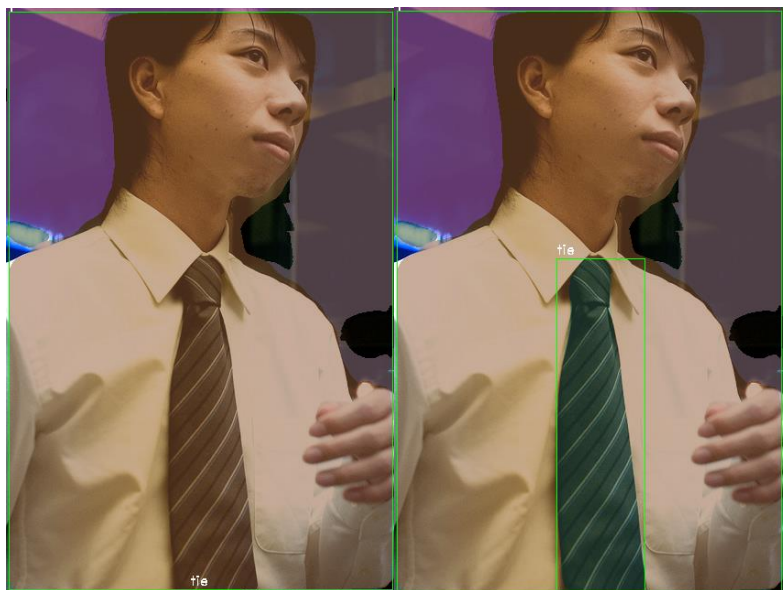| COCO Val	PQ	SQ	RQ
ALL	**52.7**	82.5	62.8
Thing	61.5	84.6	72.2
Stuff	39.5	79.3	48.6

- COCO Test-dev:

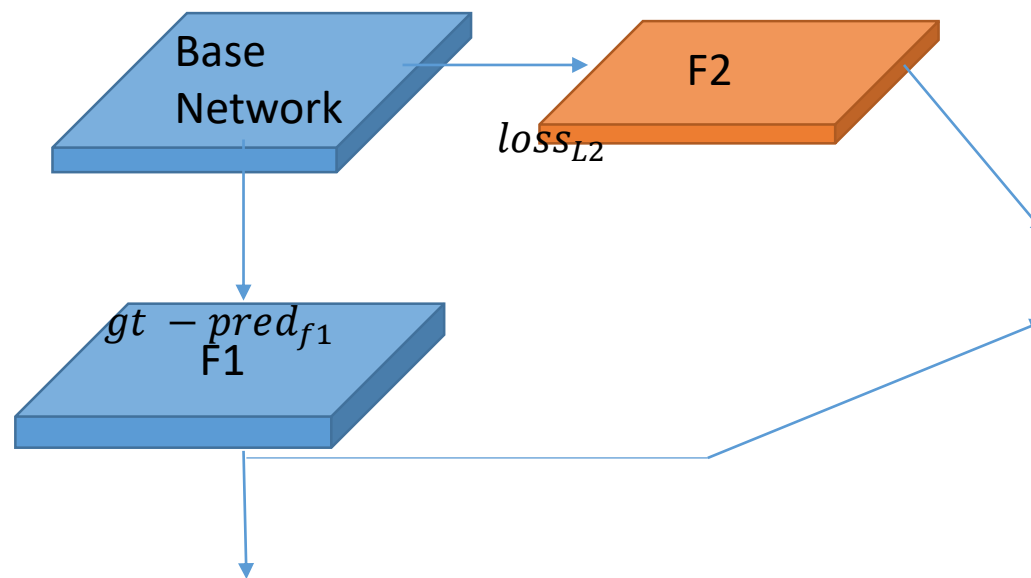| COCO Test-dev	PQ	SQ	RQ
ALL	**53.2**	83.2	62.9
Thing	62.2	85.5	72.5
Stuff	39.5	79.7	48.5

COCO Visualization

Mapillary Panoptic Segmentation

Residual L2 Loss

Design

1. Extract two feature maps from Base Network: F1 and F2

2. F1 predicts the probability map of all classes with cross entropy loss loss$_{cls}$

3. F2 predicts the residual value between F1 and GT, with L2 loss loss$_{L2}$

Mapillary Stuff

- Evaluation of semantic segmentation on the Val dataset

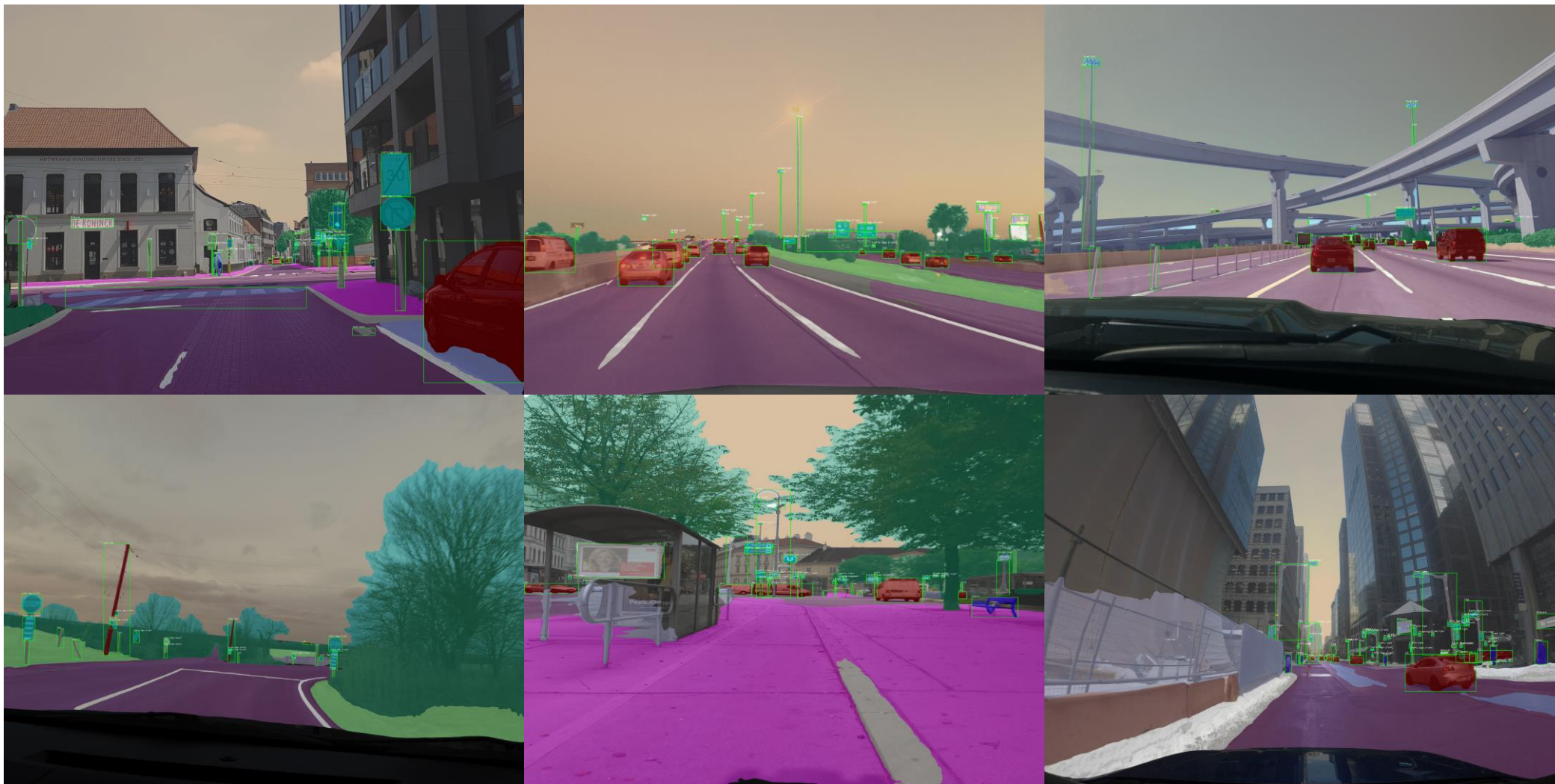| Method	Stuff mIoU(%)
Baseline(Res50)	56.3
+Residual L2 Loss	58.0
+Multiscale Testing	58.7
+Large Model	62.4
+3 Model Ensemble	62.8

Mapillary Panoptic

- Our Result on Val dataset

	PQ	SQ	RQ
All	40.8	77.1	50.5
Things	36.6	77.8	45.9
Stuff	46.2	76.3	56.7

Mapillary Visualization

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