Panoptic Scene Graph Generation
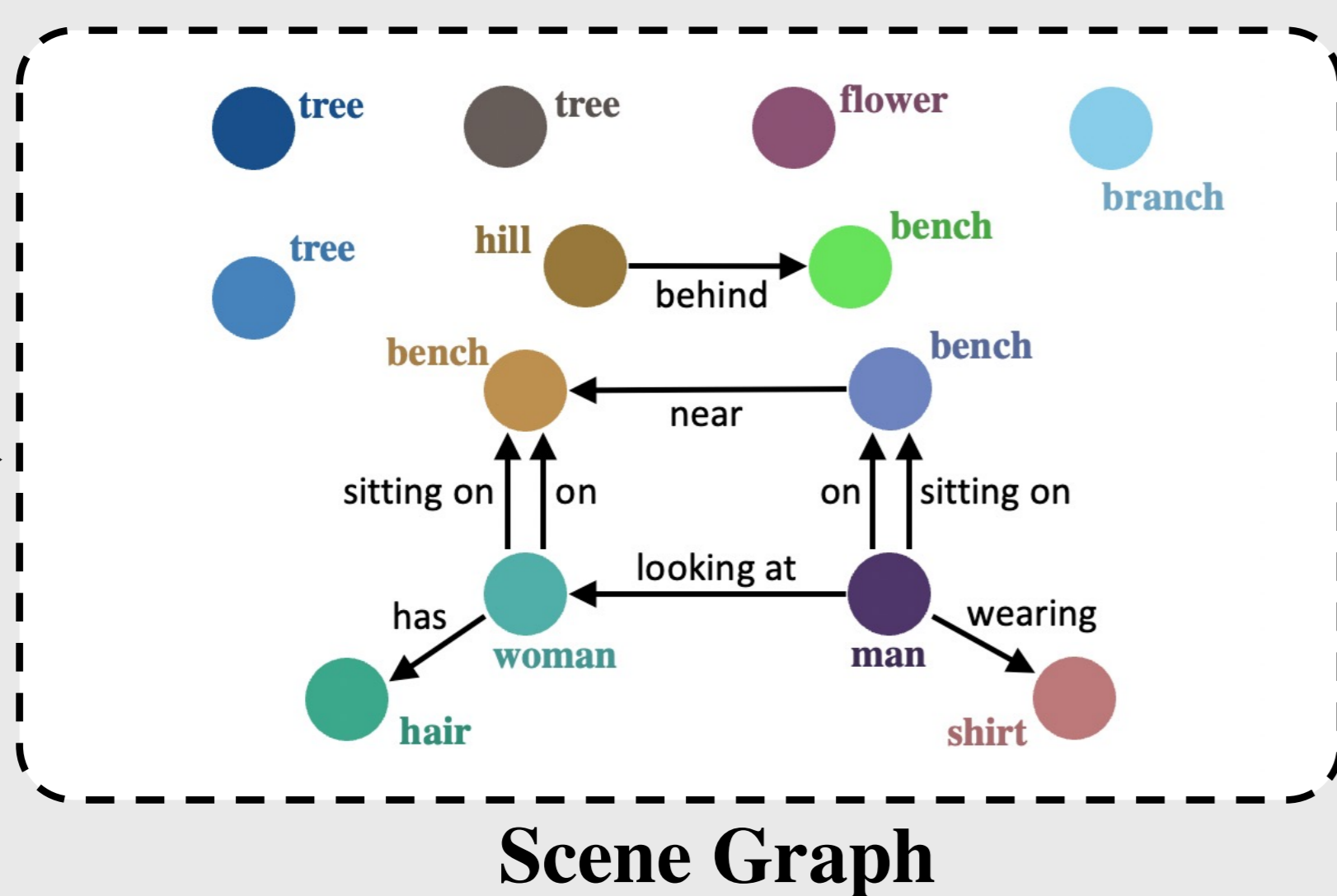
Jingkang Yang, Yi Zhe Ang, Zujin Guo, Kaiyang Zhou, Wayne Zhang, Ziwei Liu

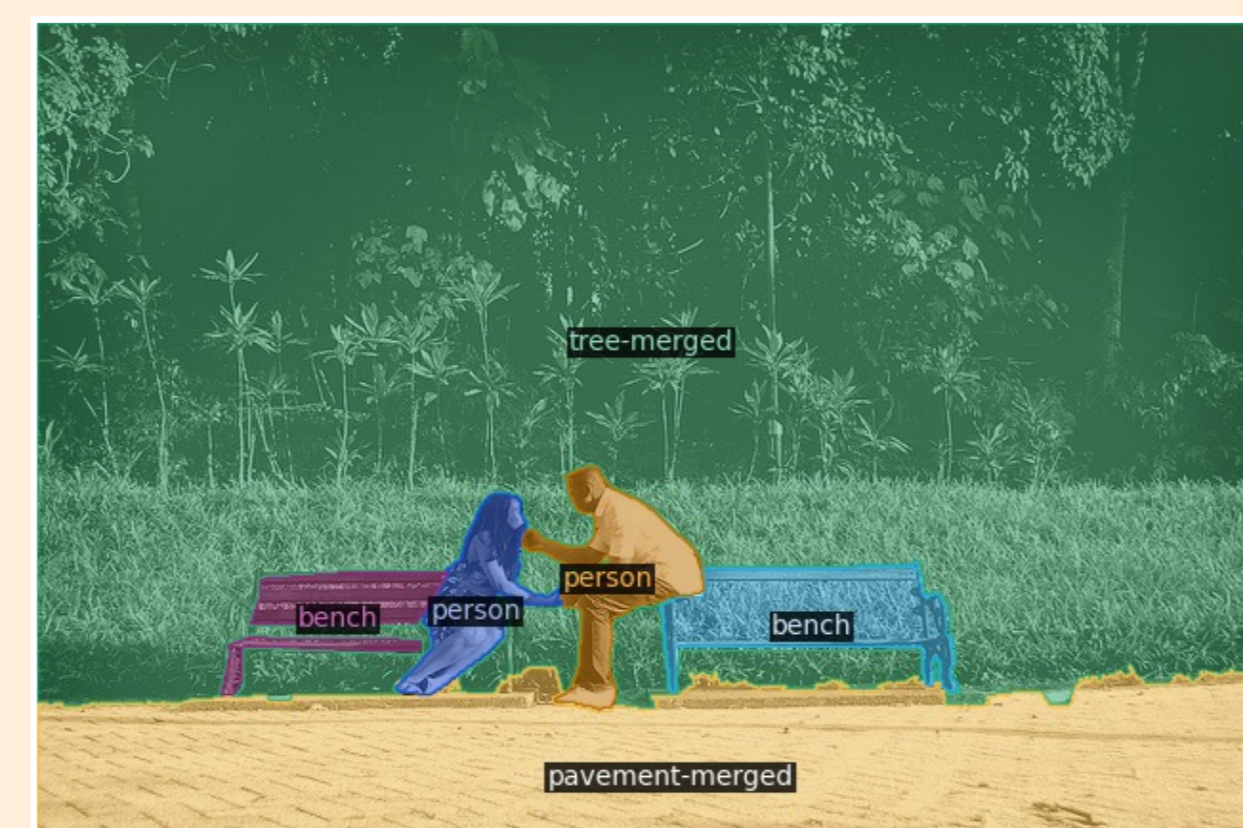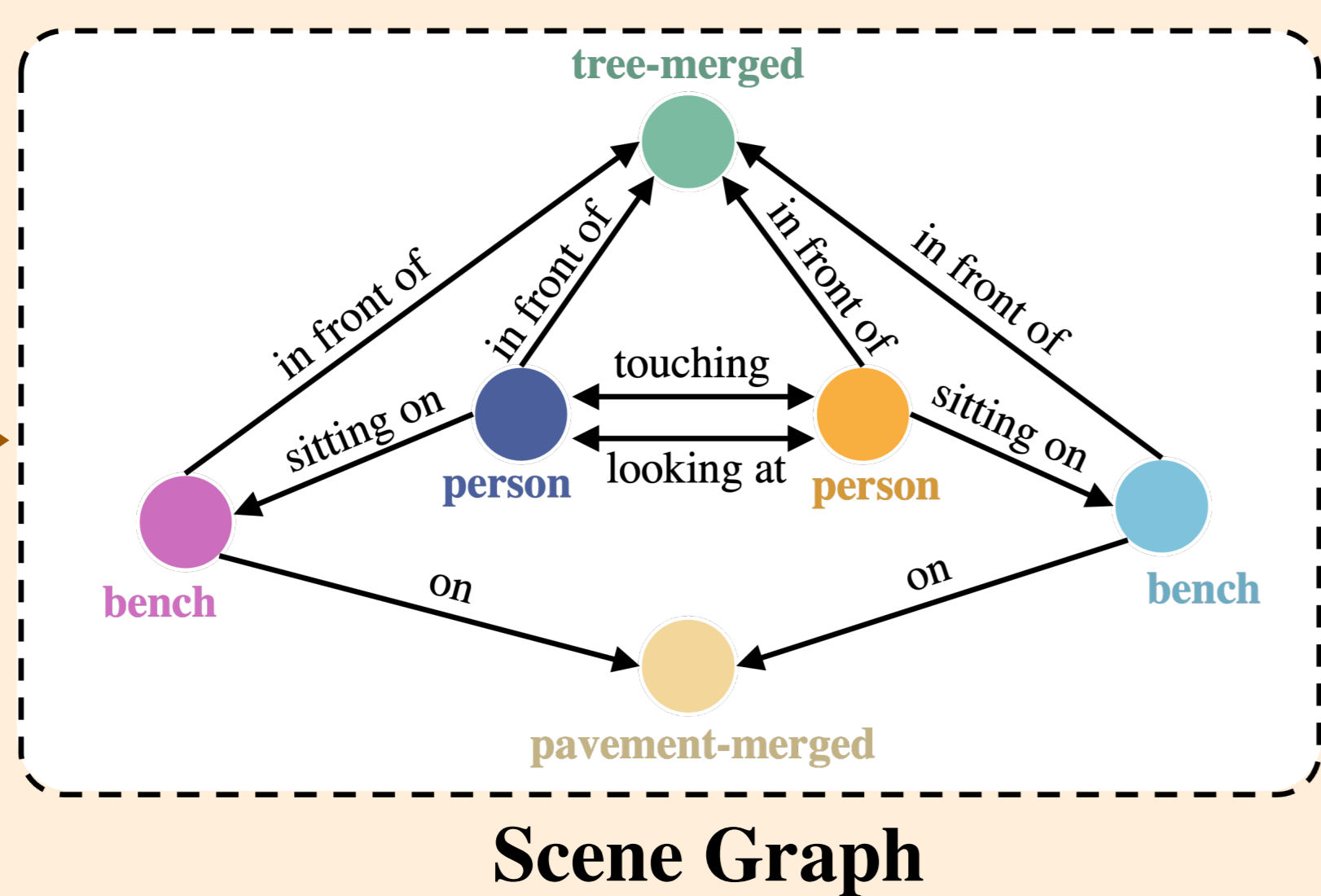NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | S-LAB FOR ADVANCED INTELLIGENCE | 商汤 sensetime

What is the PSG task and Why?

Classic
Scene Graph Generation Output

Scene Graph
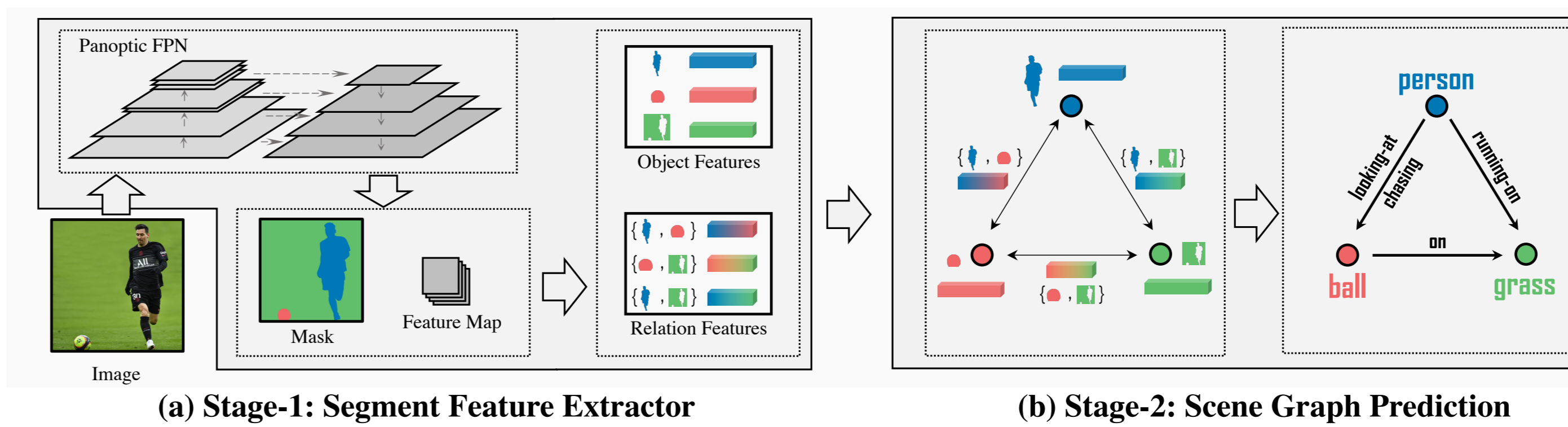
Bounding Box Groundings

**PSG**
Our Panoptic
Scene Graph Generation

Scene Graph

Panoptic Segments

+ Involve Background, toward Comprehensive Scene Understanding

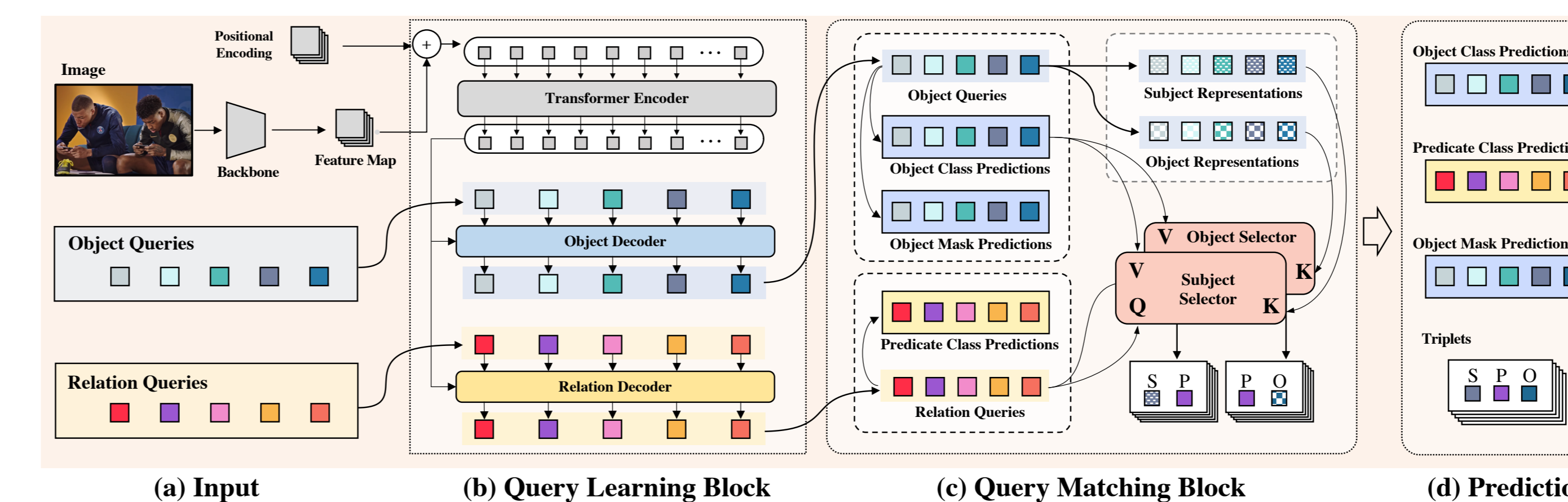+ Accurate & Unique Localization   + Proper Class Granularity

The PSG Dataset

- 49K images
- 133 object classes (80 objects and 53 stuff)
- 56 predicate classes.
- It annotates inter-segment relations based on COCO panoptic segmentation.
- Interact to explore PSG Dataset on https://psgdataset.org/explore.html

How to solve the PSG Task?

(a) Stage-1: Segment Feature Extractor   **(b) Stage-2: Scene Graph Prediction**

Two Stage Methods
+ Fast, Simple, Easy to use
+ Support Classic Methods
- Heavily Rely on Detectors

(a) Input   **(b) Transformer Block**   **(c) SG Prediction Head**
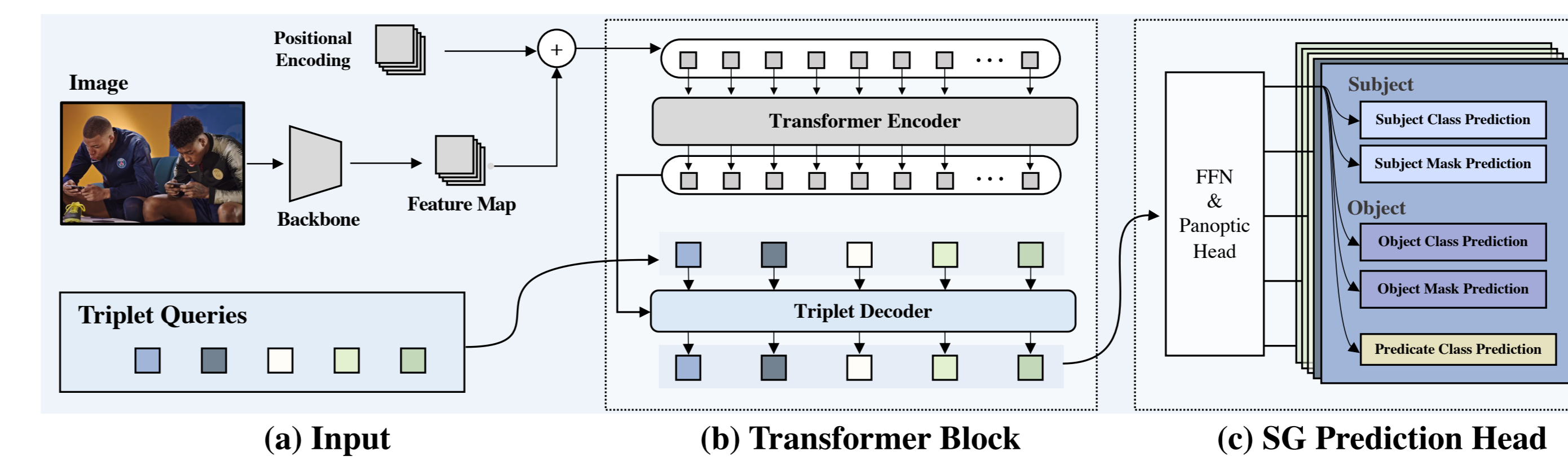
PSGTR
+ Focus on Vision
+ Direct Training
- Need Long Time to Learn
- Conflict with PanSeg

(a) Input   **(b) Query Learning Block**   **(c) Query Matching Block**   **(d) Prediction**

PSGFormer
+ Explicit Relation Model
+ Fun Query Matching
+ Quick Converge
- Larger model

Backbone	Method	Predicate Classification			Scene Graph Generation		
		R/mR@20	R/mR@50	R/mR@100	R/mR@20	R/mR@50	R/mR@100
ResNet-50	IMP	31.9 / 9.55	36.8 / 10.9	38.9 / 11.6	16.5 / 6.52	18.2 / 7.05	18.6 / 7.23
	MOTIFS	44.9 / 20.2	50.4 / 22.1	52.4 / 22.9	20.0 / 9.10	21.7 / 9.57	22.0 / 9.69
	VCTree	**45.3** / **20.5**	50.8 / **22.6**	52.7 / **23.3**	20.6 / **9.70**	22.1 / **10.2**	22.5 / **10.2**
	GPSNet	31.5 / 13.2	39.9 / 16.4	44.7 / 18.3	17.8 / 7.03	19.6 / 7.49	20.1 / 7.67
	PSGTR (12 epochs)	-	-	-	3.82 / 1.29	4.16 / 1.54	4.27 / 1.57
	PSGFormer	-	-	-	**16.8** / **14.5**	**19.2** / **17.4**	**20.2** / **18.7**
	PSGTR† (60 epochs)	-	-	-	**28.4** / **16.6**	**34.4** / **20.8**	**36.3** / **22.1**
	PSGFormer†	-	-	-	18.0 / 14.8	19.6 / 17.0	20.1 / 17.6