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CAS

Zero-Shot Object Detection with Attributes Based Category Similarity

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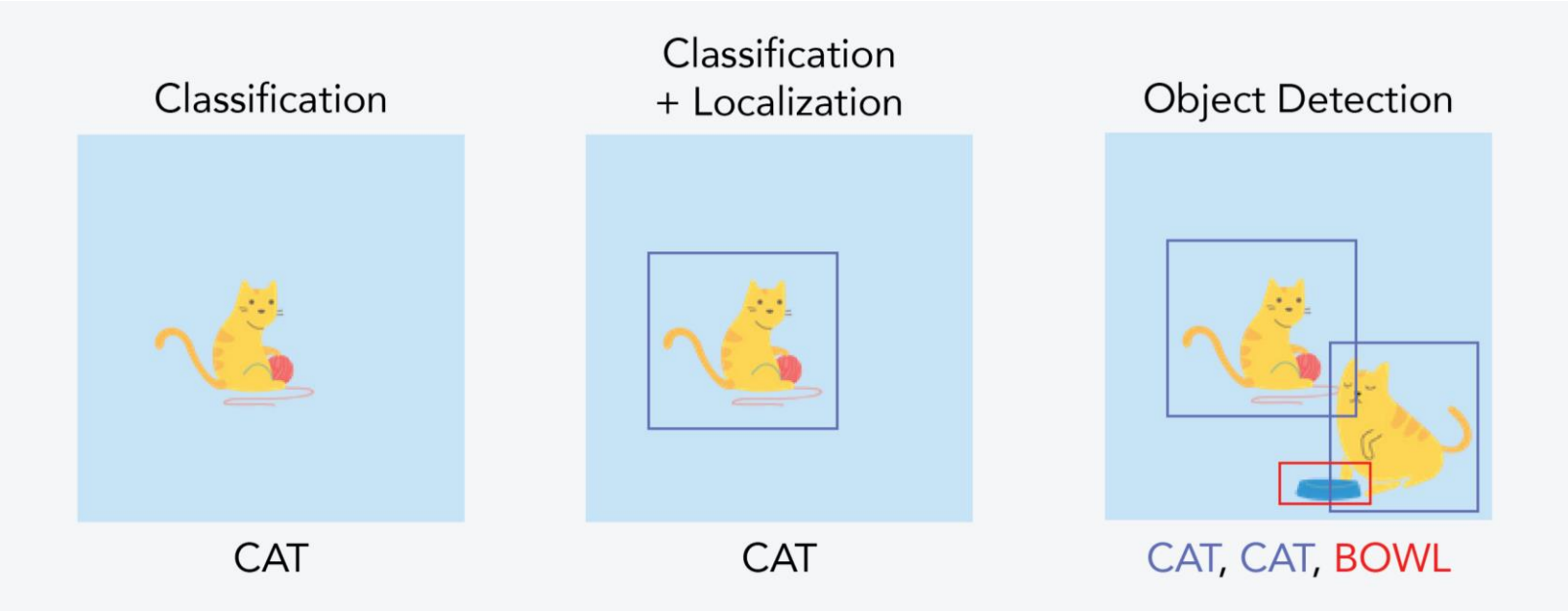
Object Detection

Is it possible to detect new classes without training samples?



Multiple Object Classification

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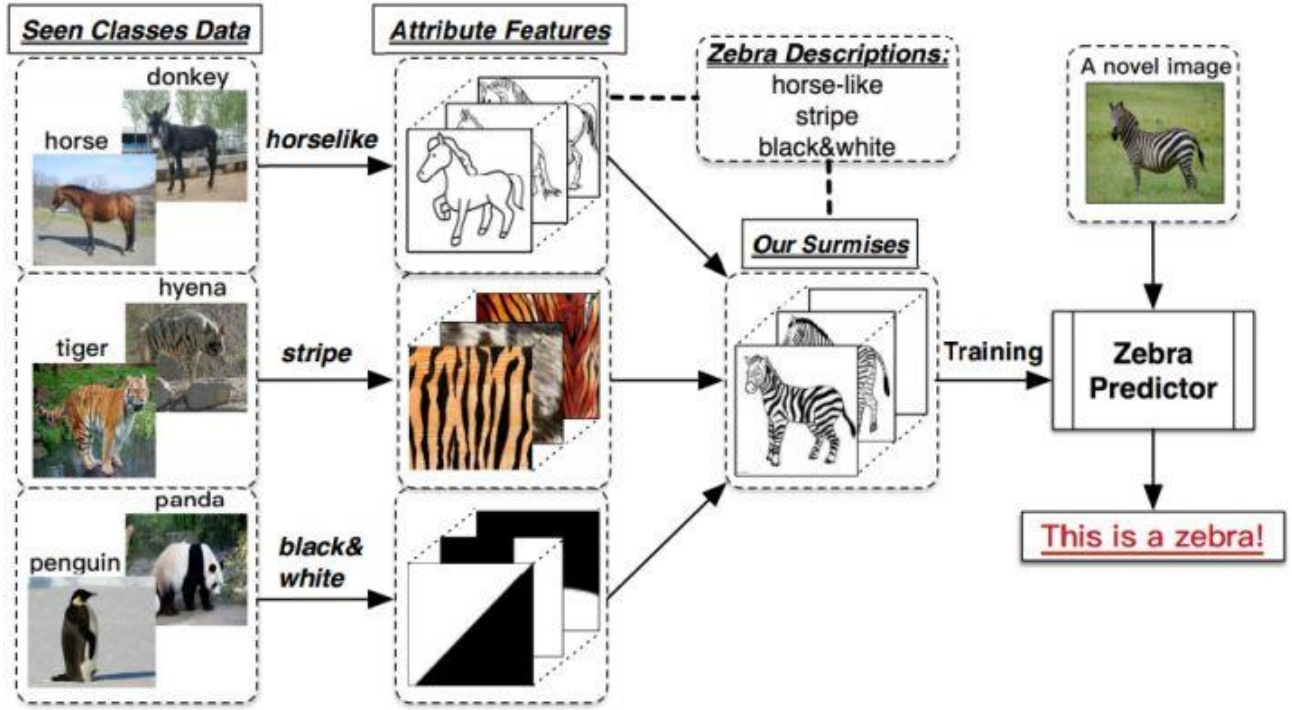
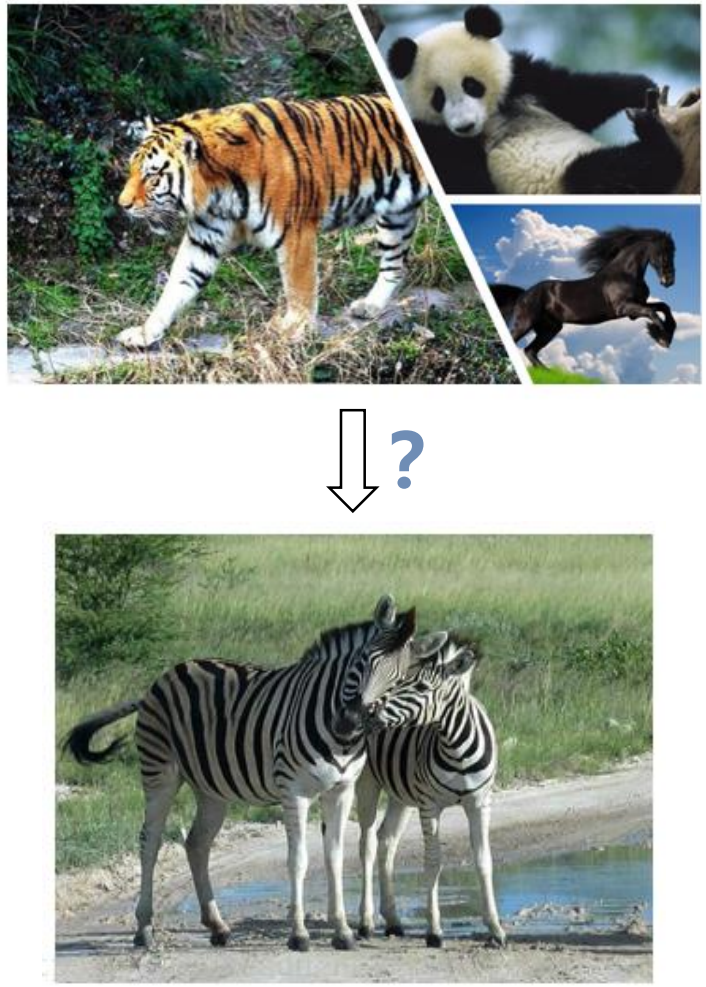
Localization

Zero-Shot Learning



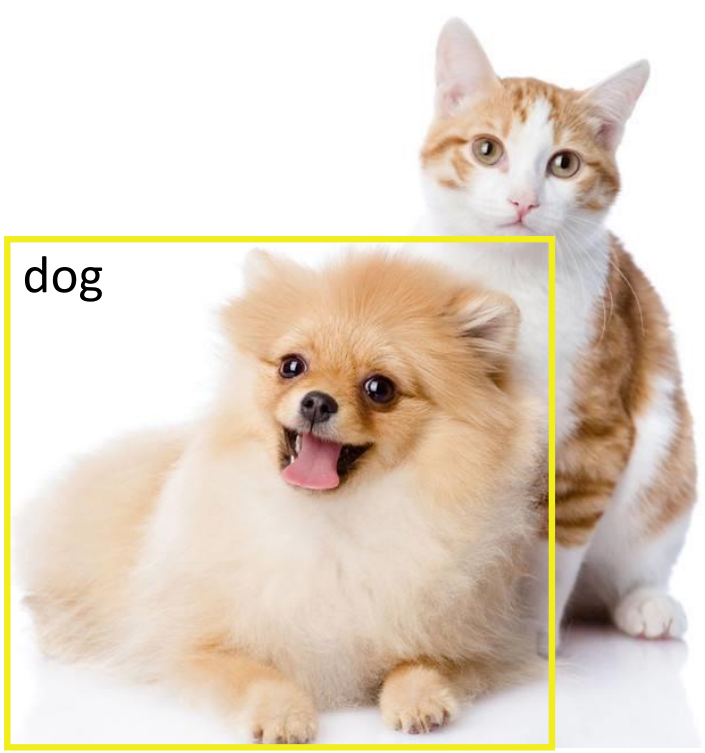


Without any training samples, learn some new categories that have never been seen before with the help of semantic concepts (e.g., attributes, word vectors, etc.).

Zero-Shot Object Detection

seen class: dog

unseen class: cat



Object Detection

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Zero-Shot Learning

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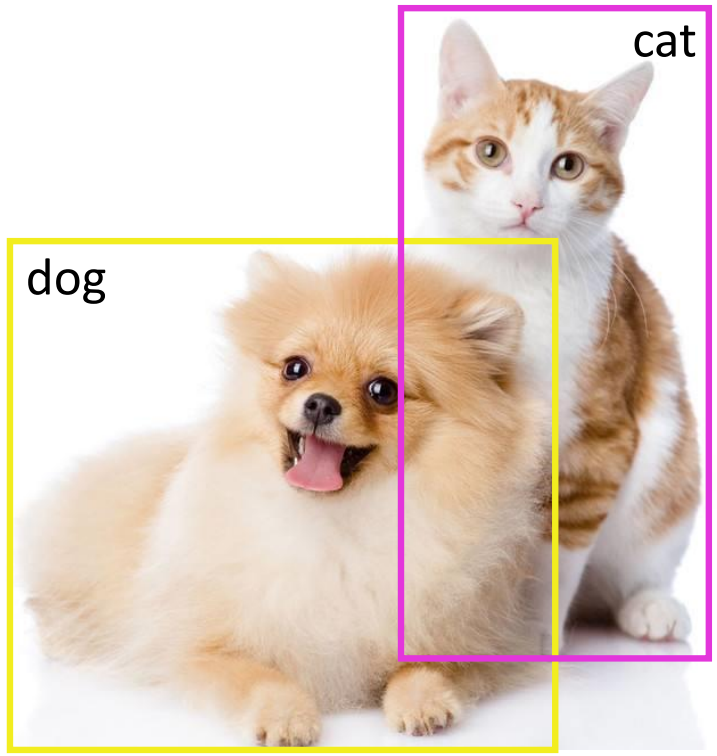
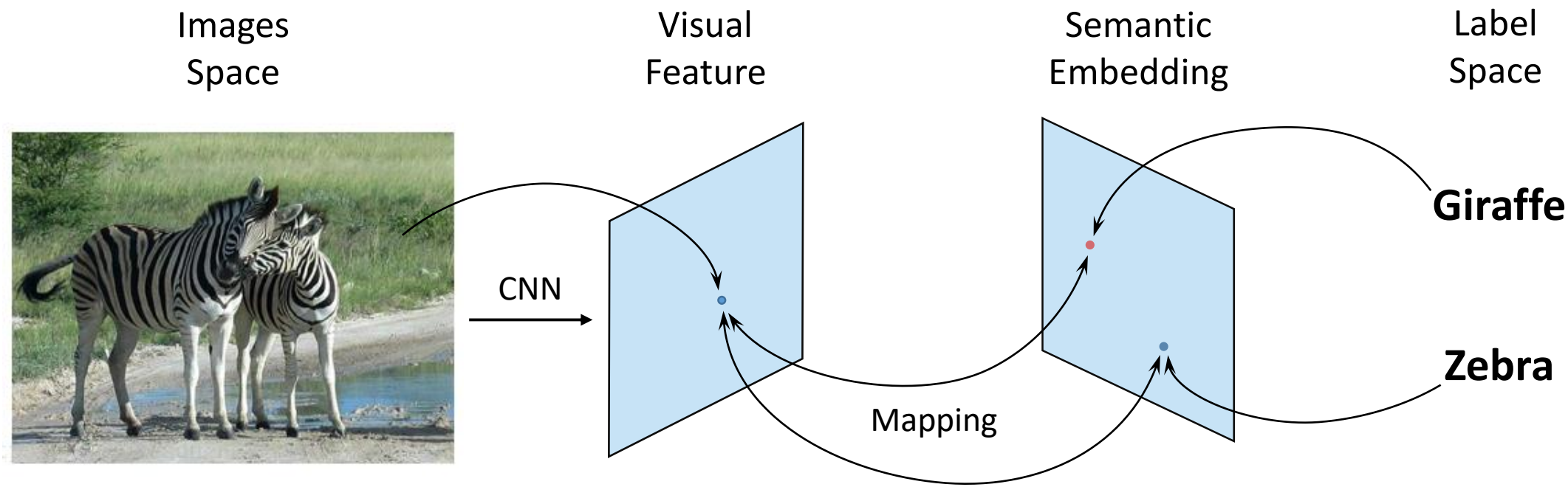


Zero-Shot Object Detection

Modifying the classic object detection network and introducing zero-shot learning classifier can achieve zero-shot object detection.

Challenge

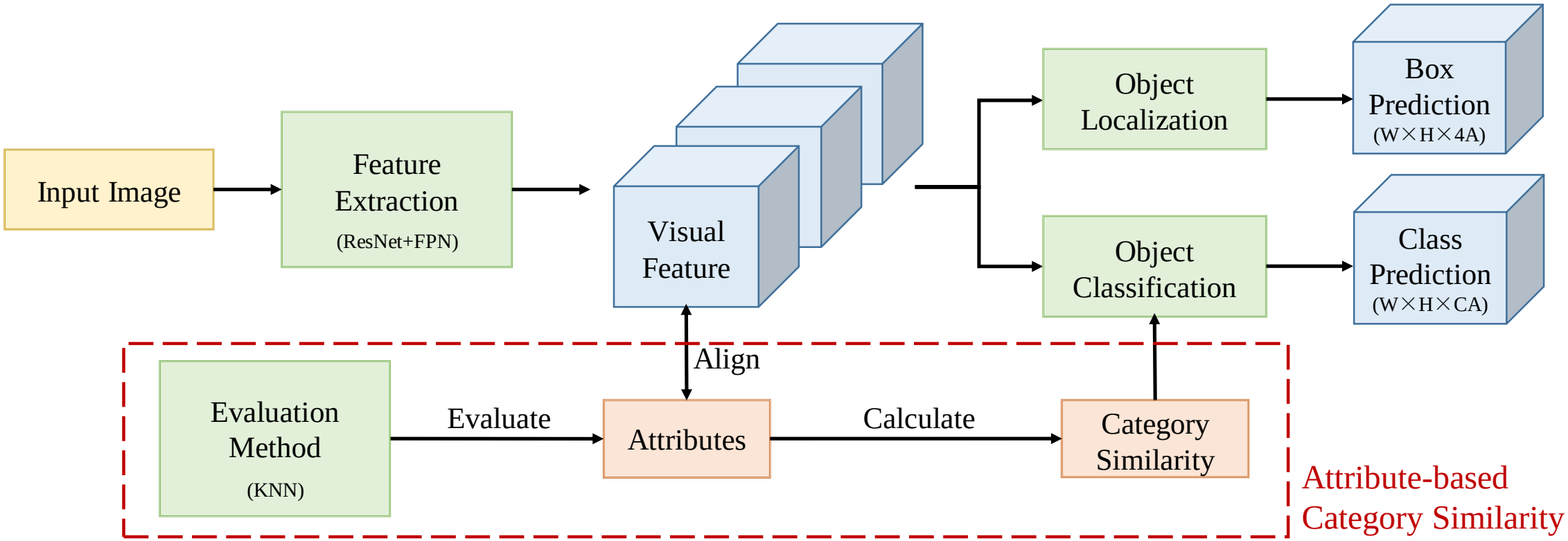
The accurate alignment between visual features and semantic concepts.



Motivation

It is inspired by the fundamental reason that how to learn unseen classes from seen ones just like the human cognitive system.

Overall Framework



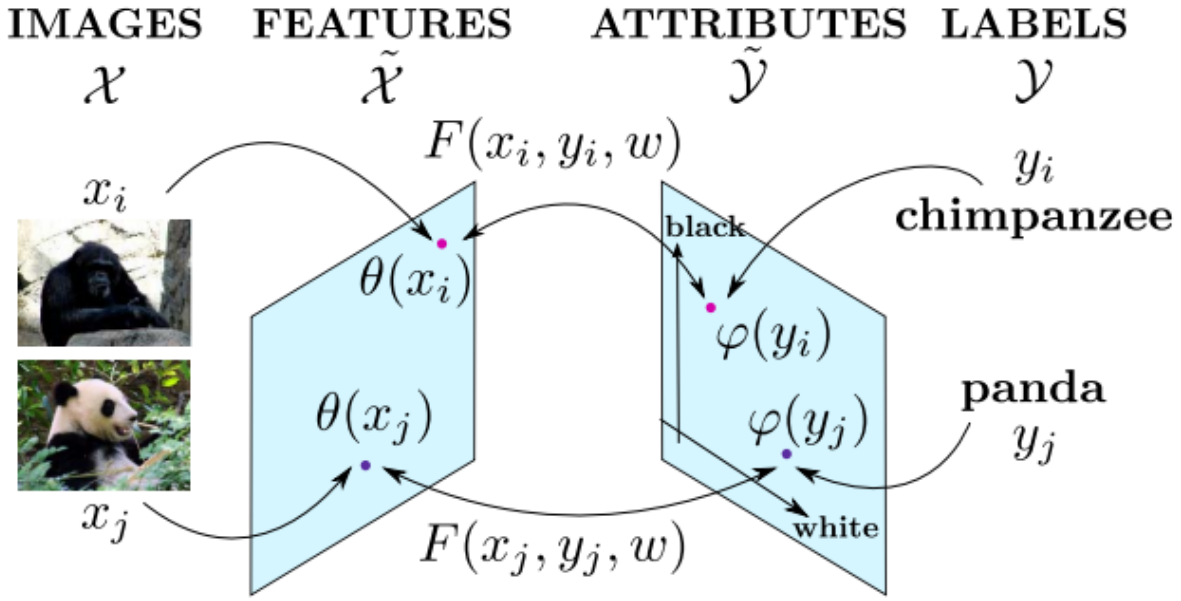
Alignment Between Two Space

Otter	
black	yes
white	no
brown	yes
stripes	no
water	yes
eat fish	yes

Polar Bear	
black	no
white	yes
brown	no
stripes	no
water	yes
eat fish	yes

Zebra	
black	yes
white	yes
brown	no
stripes	yes
water	no
eat fish	no

abstract diagram of the attribute table



$$X_{ij} = \begin{cases} 1, & if\ \ i\ category\ has\ \ j\ attribute \\ 0, & otherwise \end{cases}, \quad Y_i = [X_{i1}, X_{i2}, \cdots, X_{ij}]$$

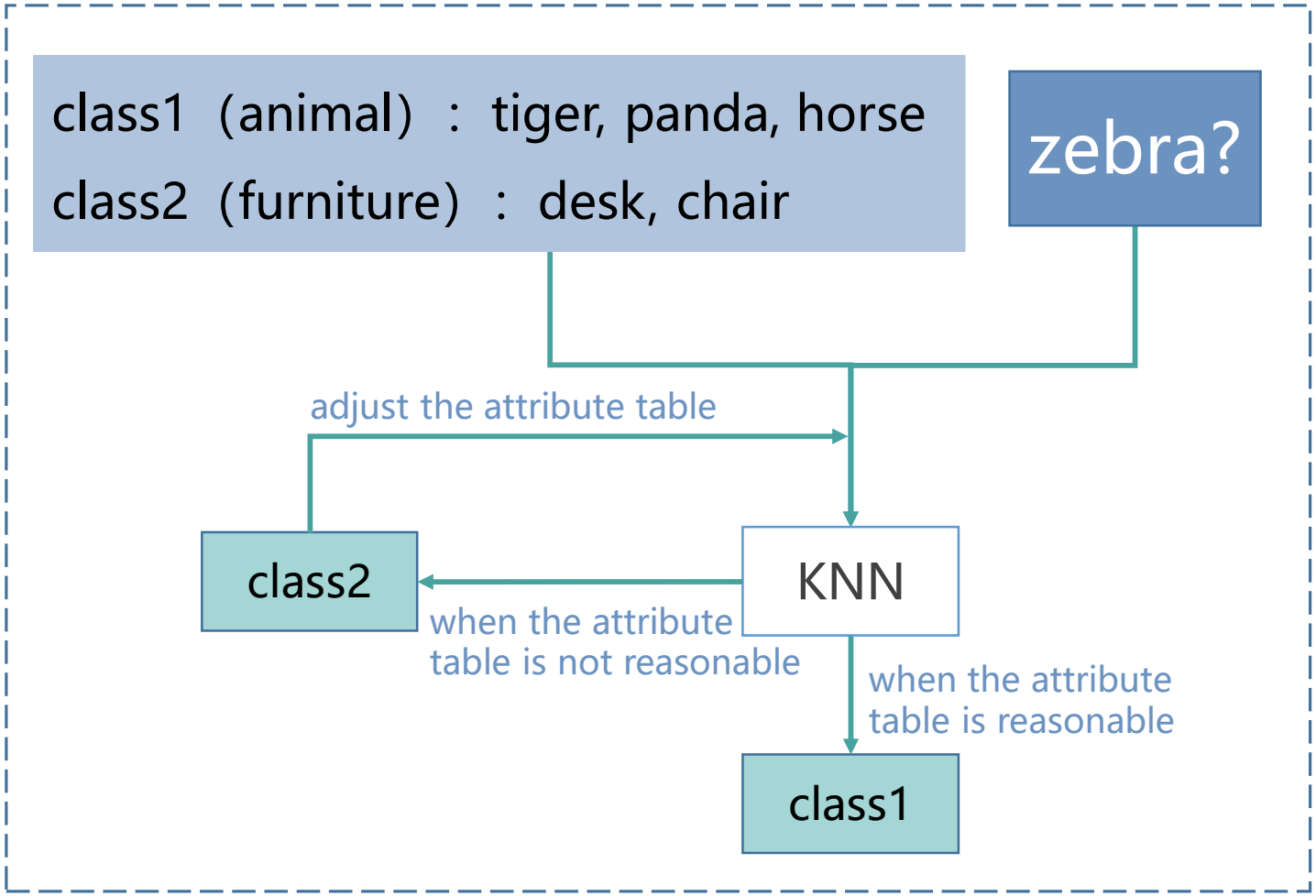
Evaluation Method

seen class: tiger, panda, horse, desk, chair

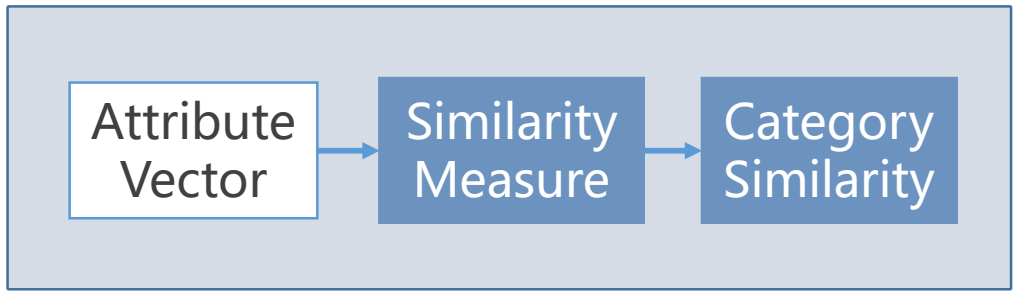
unseen class: zebra

$$Z'_u = arg\max_{c_j} \sum_{Y_i \in N_k(Y_u)} I(Z_i = c_j),$$

$$I(Z_i = c_j) = \begin{cases} 1, & if\ Z_i = c_j \\ 0, & otherwise \end{cases}$$



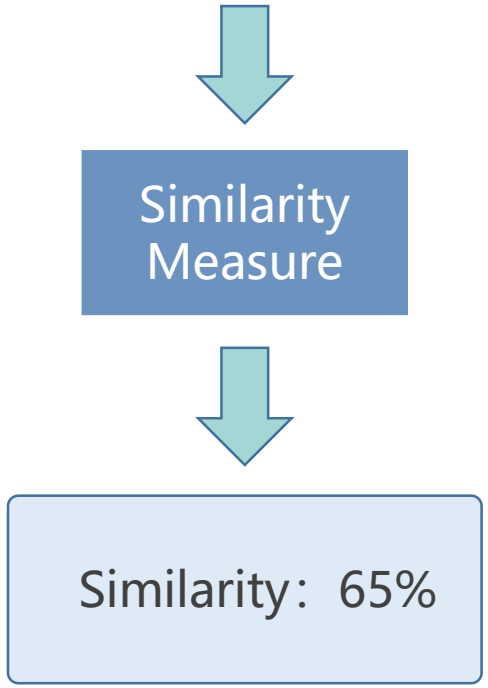
Similarity Measure



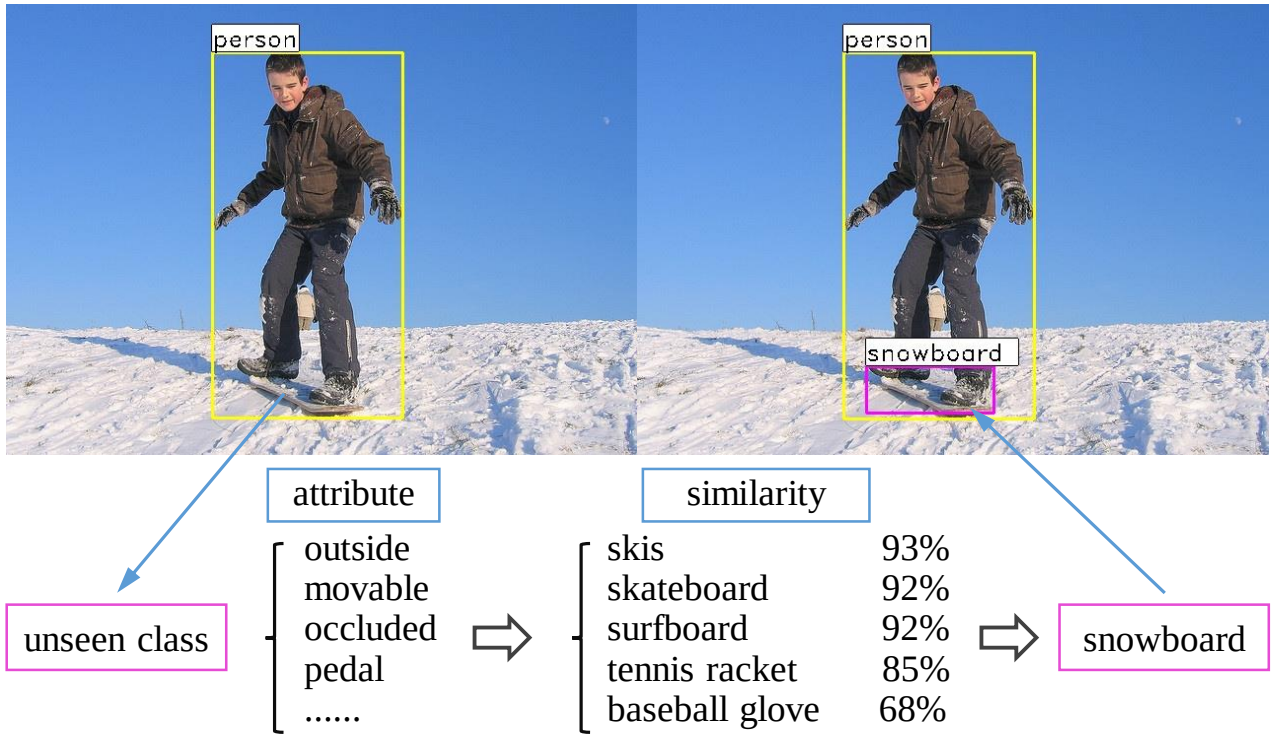
	Eye	Wing	Head	Long tail	…
Bird	1	1	1	0	…
Cat	1	0	1	1	…

Similarity Measure

1. Euclidean ✔
2. Manhattan
3. Cosine



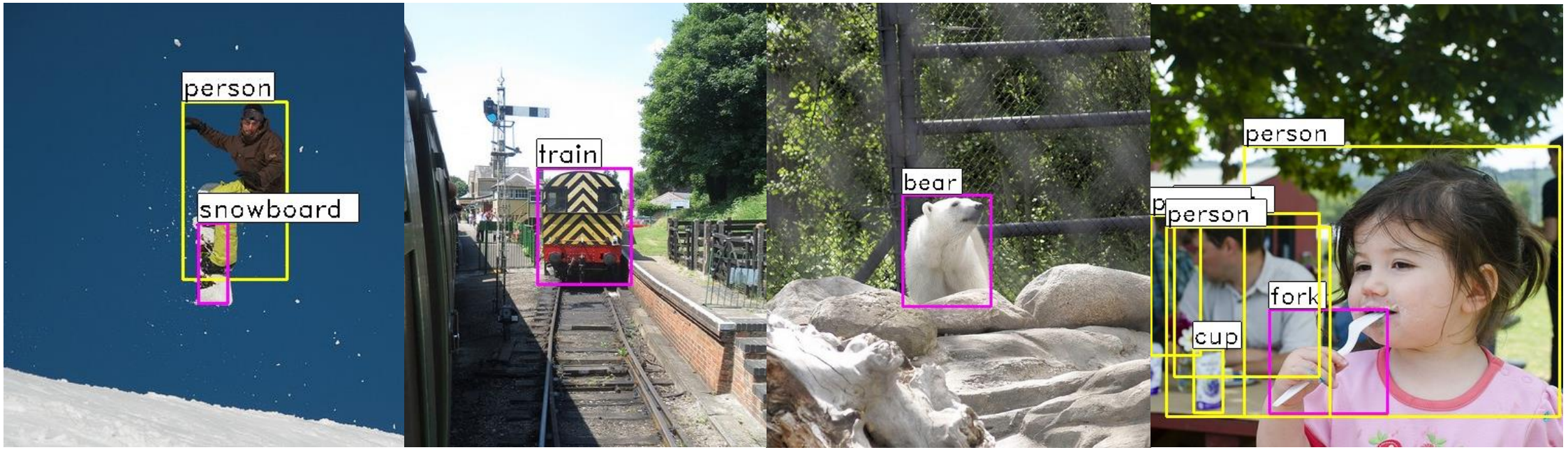
Category Similarity



Qualitative Results on COCO

Method	Seen/Unseen	mAP (%)	Recall (%)
SB(2018ECCV)	48/17	0.70	24.39
DSES(2018ECCV)	48/17	0.54	27.19
PL-ZSD(2020AAAI)	48/17	10.01	43.56
PL-ZSD(2020AAAI)	65/15	12.4	37.72
PL-ZSD + CS	65/15	13.6	44.33
TL-ZSD(2019ICCV)	65/15	14.57	**48.15**
Ours	65/15	**15.34**	47.83

Selected Experimental Results



The seen and unseen classed are marked in yellow and purple, respectively.

Thank you!

Paper path: https://ieeexplore.ieee.org/document/9043901

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