Politecnico di Torino
Dipartimento di Automatica e Informatica

PhD in Computer and Control Engineering
XXXV cycle

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Life long learning on multimodal data for safe human-robot interaction

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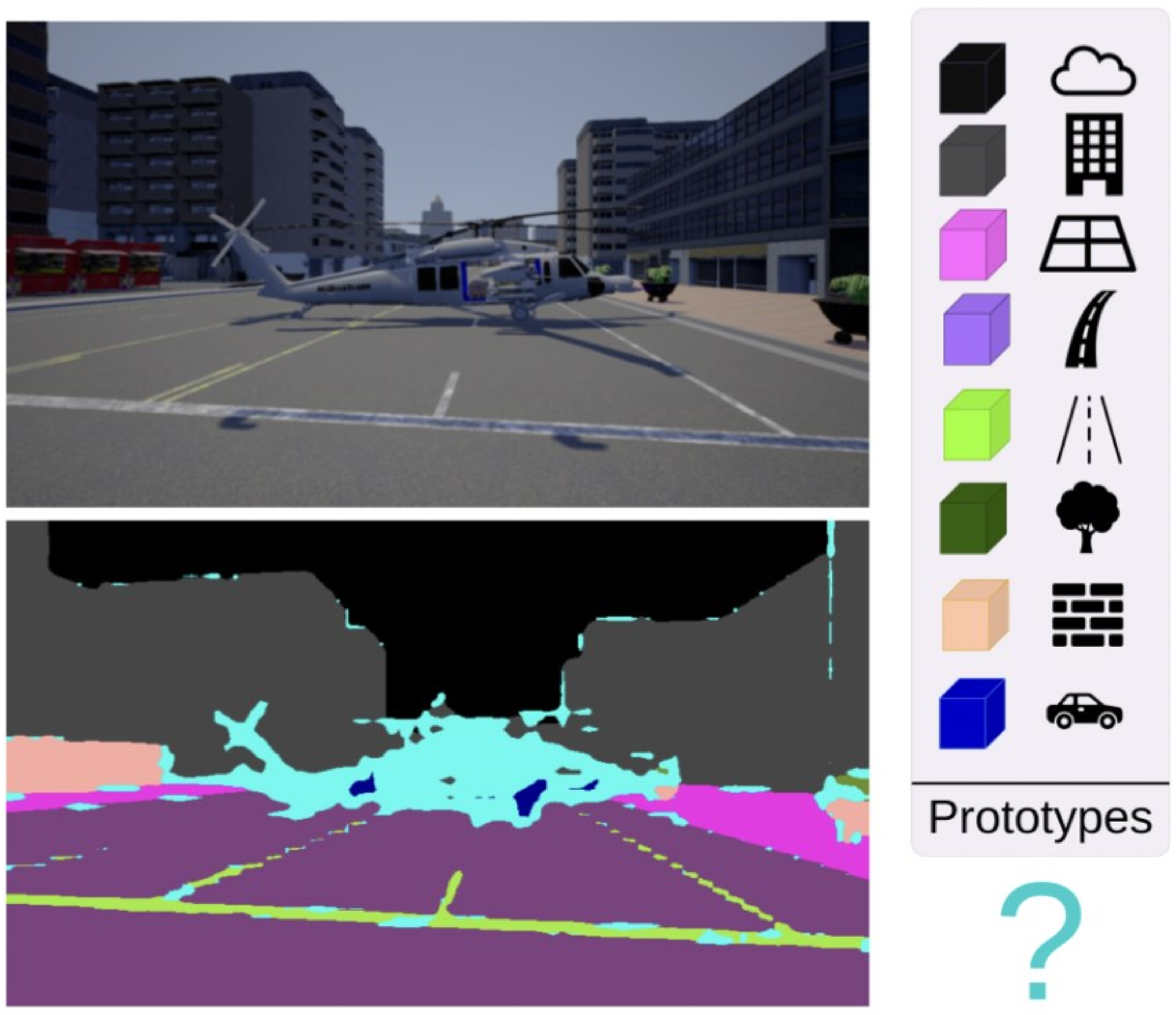


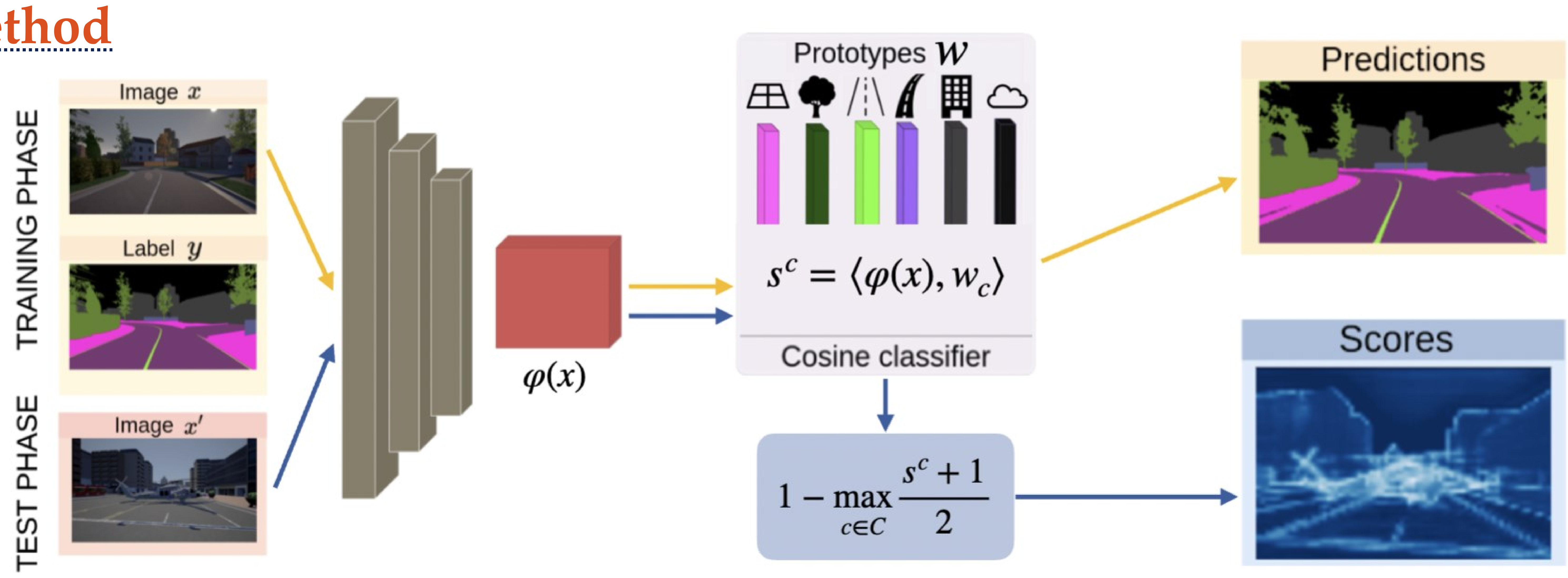
1. Task and Motivation

Image segmentation is the task of assigning a class label to every pixel inside an image.

One **key limitation** of traditional image segmentation models is that they limit their understanding of the world to the classes they have learned during the training phase. In real-world applications, such as self-driving automobiles, this is extremely restrictive and dangerous.

This work aims at **empowering segmentation methods to segment previously unseen** objects through prototype learning.

2. Method



The **cosine classifier** computes **class-independent confidence scores** by computing the similarity between the features of any pixel and the prototype itself. These similarity values enable the use of the scores as a **confidence measure** on the presence of a class.

3. Results and Conclusion

The table compares methods segmenting unknown objects in terms of **AUPR**, **AUROC** and **FPR95** on the **StreetHazard** benchmark.

Method	AUPR ↑	AUROC ↑	FPR95 ↓
AE [2]	2.2	66.1	91.7
Dropout [10]	7.5	69.9	79.4
MSP [16]	6.6	87.7	33.7
MSP + CRF [15]	6.5	88.1	29.9
SynthCP [37]	**9.3**	88.5	28.4
PAnS	8.8	**91.1**	**23.2**

4. References

1. Detecting Anomalies in Semantic Segmentation with Prototypes, D. Fontanel et al (CVPRW-21 Oral).
2. Learning in Semantic Segmentation from Image Labels, F. Cermelli et al (CVPR-22).
3. Boosting Deep Open World Recognition by Clustering, D. Fontanel (RAL-20, IROS-20).