Unsupervised Semantic Segmentation in Driving Scenario
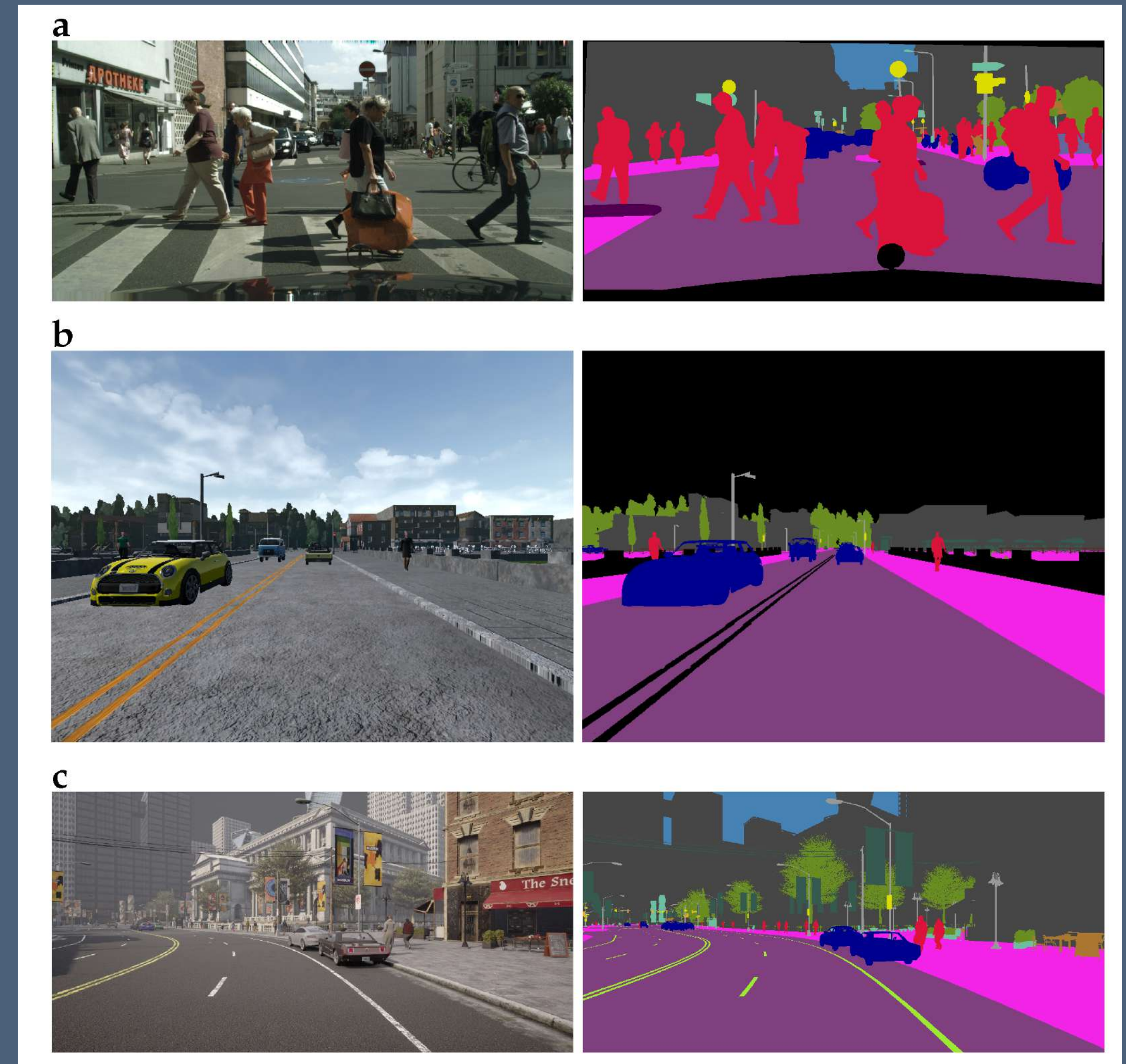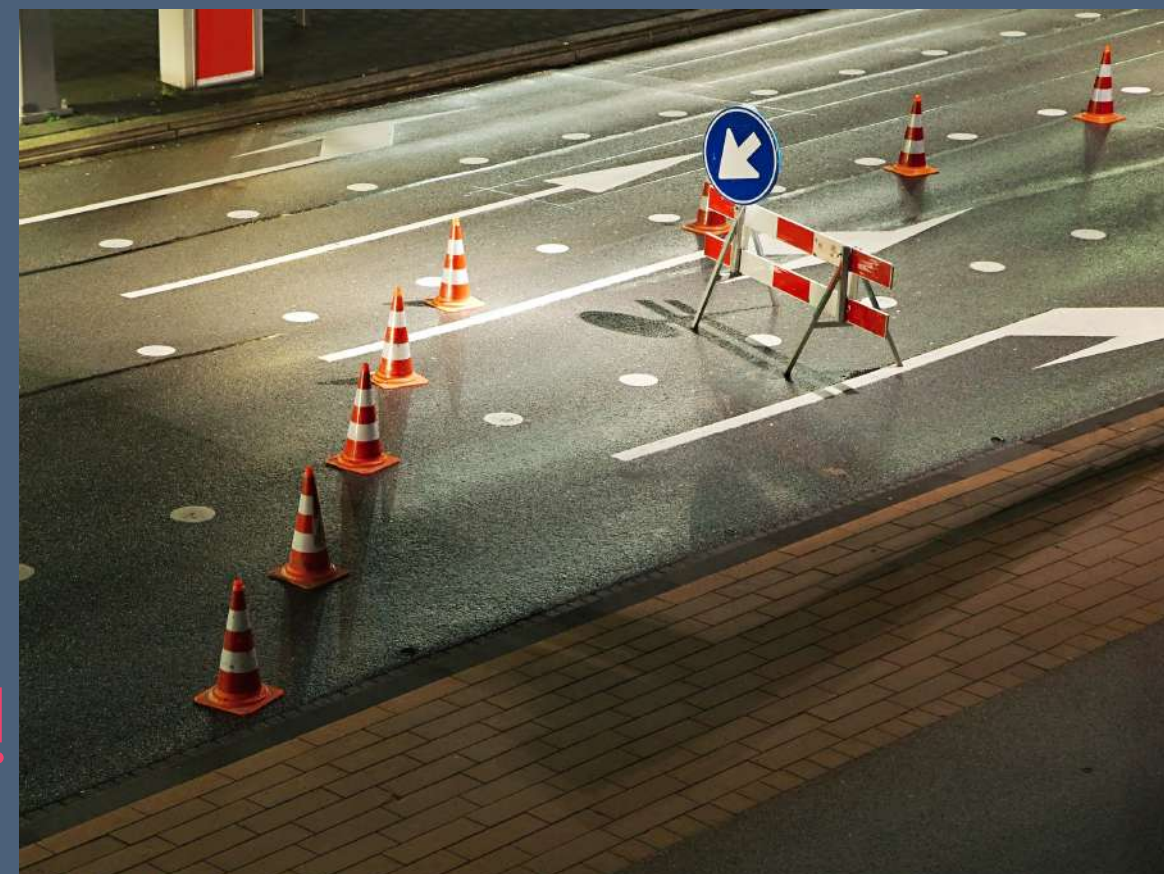
Enhancing Semantic Segmentation in Dynamic Environments Without Label
A122582 清華 陳佑祥

2024.5.17

# Importance of Semantic Segmentation in Autonomous Driving

- Backbone of driving safety

- "Essential for object and road recognition

- "Current challenges: High complexity and rapid changes in urban traffic."

- "Limitations of current methods: High costs and scalability issues due to the need for extensive labeled data."

Unseen Scenario !!

Unsupervised Semantic Segmentation (USS)

Advancing Towards Unsupervised Semantic Segmentation

- "USS: Bypassing the need for labels."

- "Common methods fall short in driving scenarios—lack customization for dynamic environments."

- "Introduction to CAUSE: Leveraging causal inference to enhance segmentation without supervision."
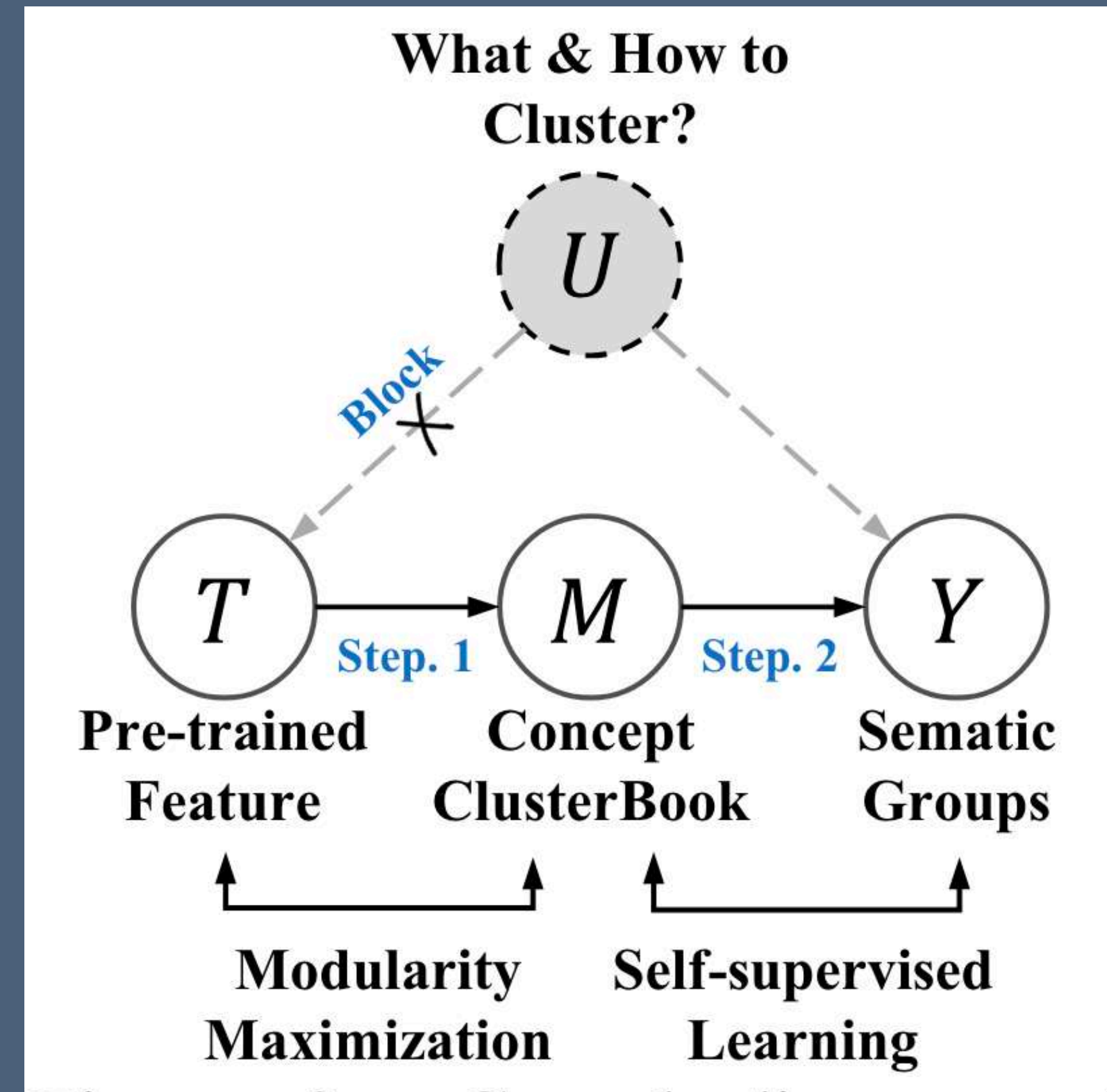
CAUSE Framework Adaptation and Methodology

- "CAUSE Framework: A two-step approach integrating causal inference with self-supervised learning."

- "Adaptations for the road: Incorporating CNNs and Transformers for comprehensive feature analysis."

- "Experimental approach: Testing on Cityscapes and Berkeley DeepDrive with advanced self-supervised models like DINOv2 and MAE.
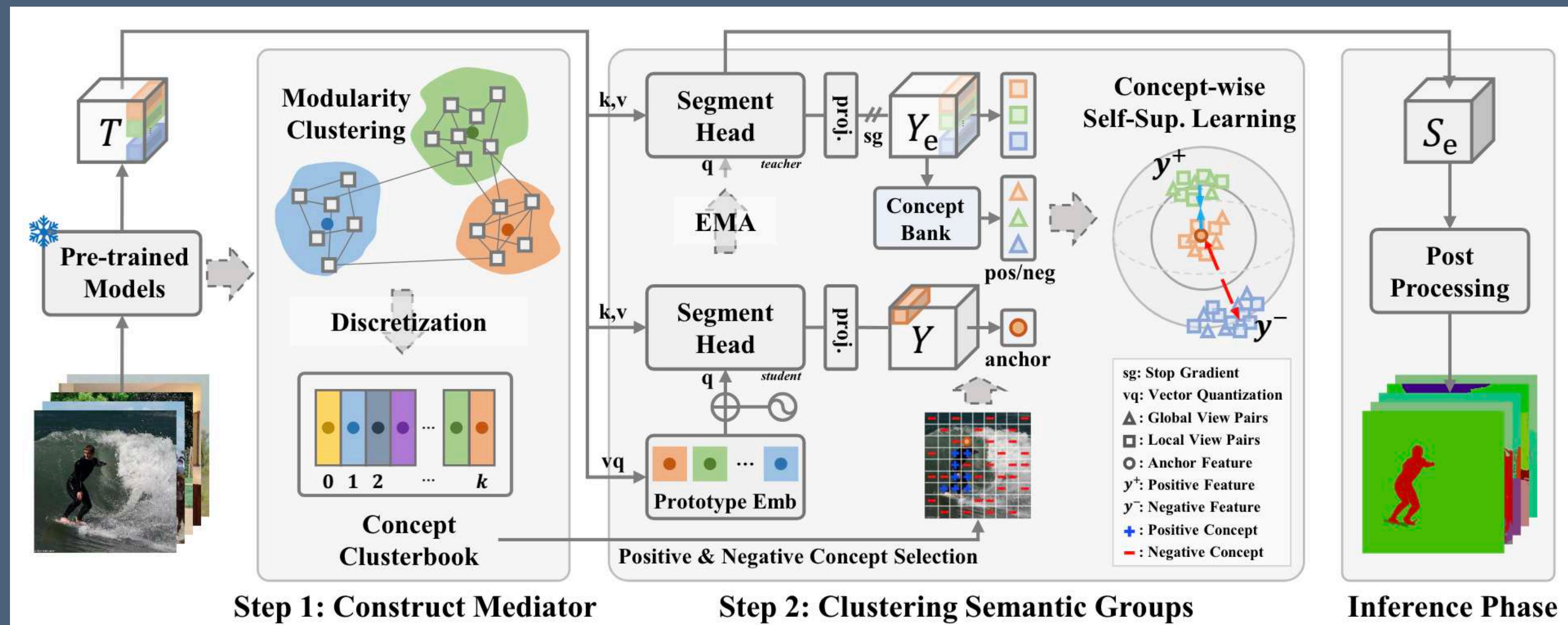
Expected Impact and Conclusion

Impact and Future of Unsupervised Learning in Driving

- "Reducing reliance on labeled data – significant cost and time savings."

- "Enhance accuracy and detail in real-time traffic conditions."

Rank	Model	mIoU↑	Accuracy	Paper	Code	Result	Year	Tags ✎
1	**CAUSE** (DINOv2, ViT-B/14)	29.9	89.8	Causal Unsupervised Semantic Segmentation	○	⇥	2023	
2	**CAUSE** (ViT-B/8)	28.0	90.8	Causal Unsupervised Semantic Segmentation	○	⇥	2023	

Improve segmentation quality without any pixel annotations !!