# Survey on Unsupervised Domain Adaptation for Semantic Segmentation for Visual Perception

KI DELTA LEARNING
Scalable AI for Automated Driving


Manuel Schwonberg*, Joshua Niemeijer*, Jan-Aike Termöhlen*, Jörg Schäfer, Nico M. Schmidt, Hanno Gottschalk, Tim Fingscheidt

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Semi- and Unsupervised Learning

## Motivation

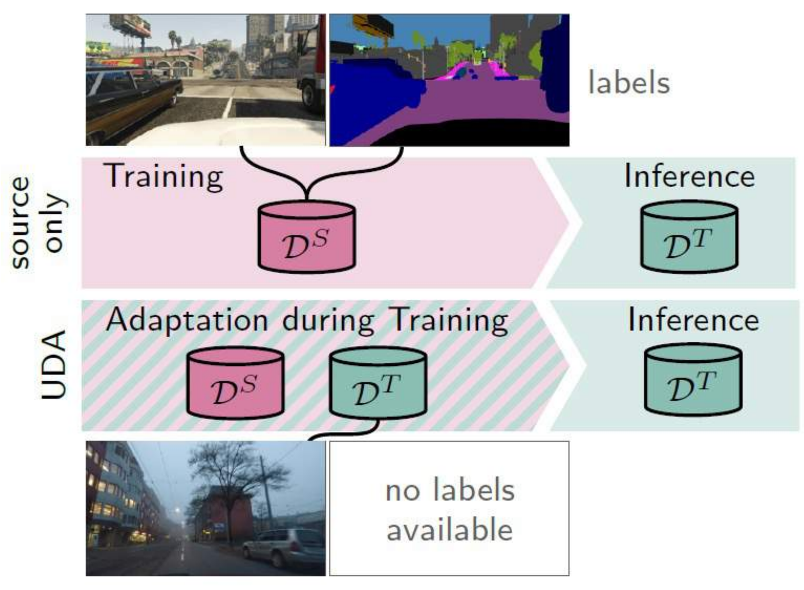

*Figure 1: UDA Principle*

- Unsupervised Domain Adaptation (UDA) without target labels
- Over 150 works on synthetic-to-real UDA since 2017

## Overview

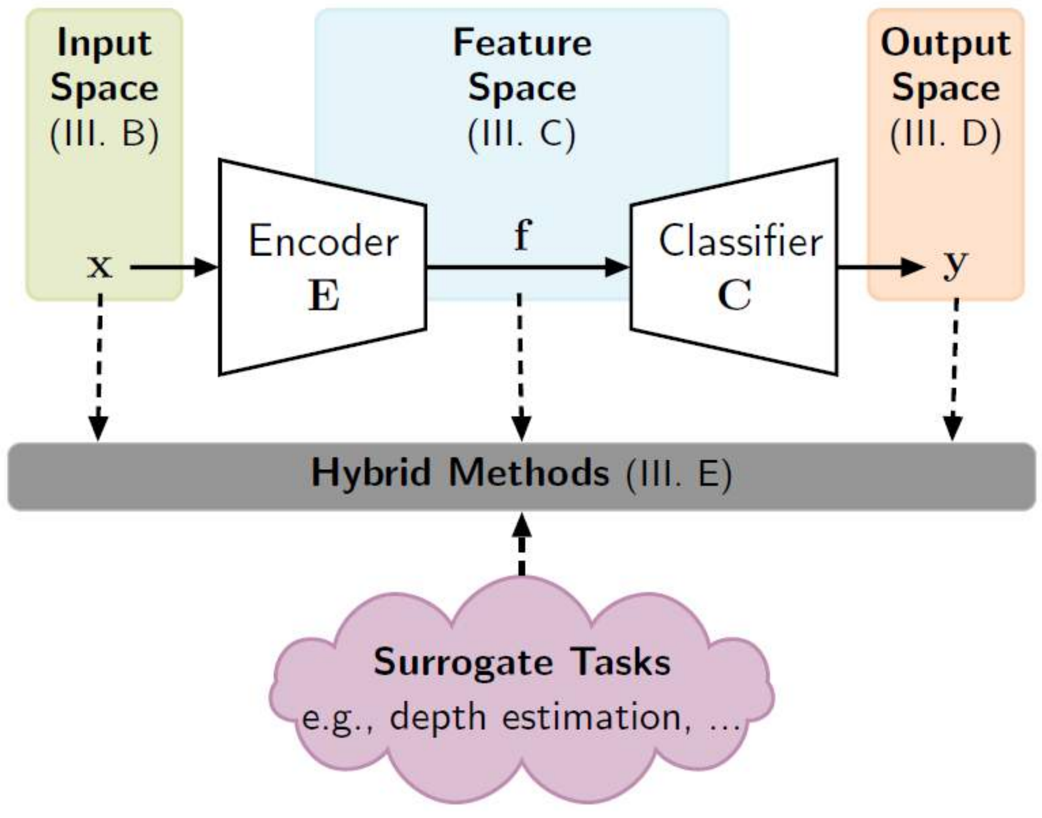

*Figure 3: Taxonomy of UDA approaches*

Categorization of approaches: Input, feature and output and if combined hybrid space

## (1) Input Space

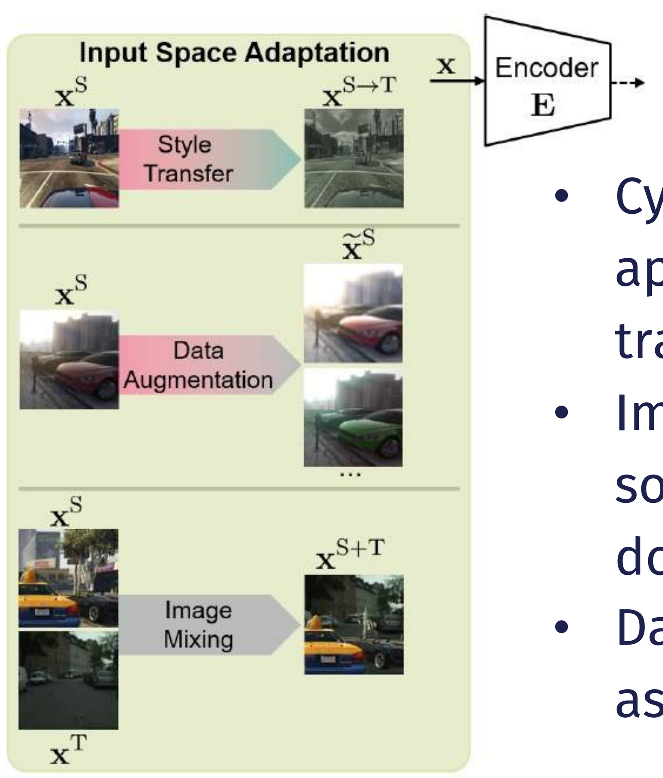

*Figure 4: Input Space UDA approaches*

- CycleGAN often applied for style transfer
- Image mixing to mix source and target domain
- Data augmentation as simple alternative

## (2) Feature Space

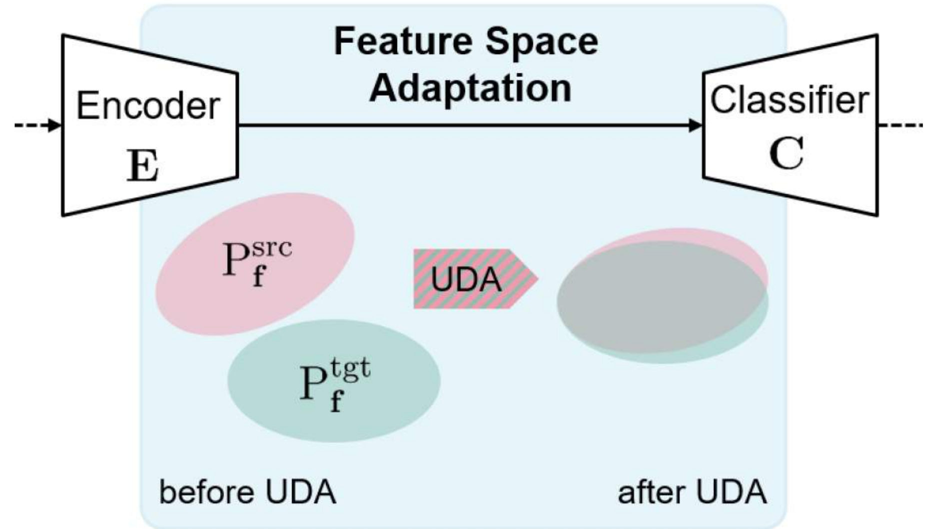

*Figure 5: Feature Space UDA scheme*

## (3) Output Space

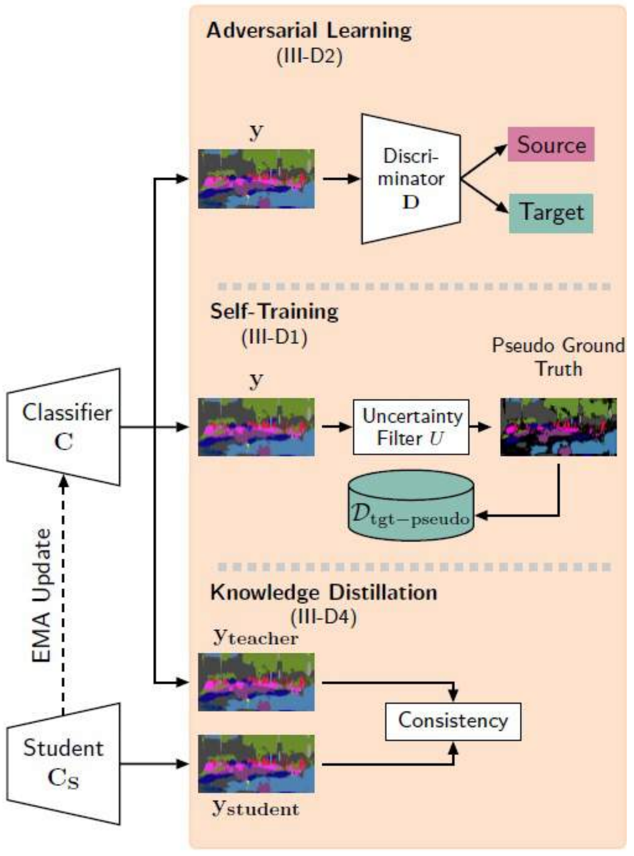

*Figure 6: Output Space UDA Approaches*

- Self-Training and adversarial learning most popular output space techniques
- knowledge distillation became more popular

## Quantitative Analysis

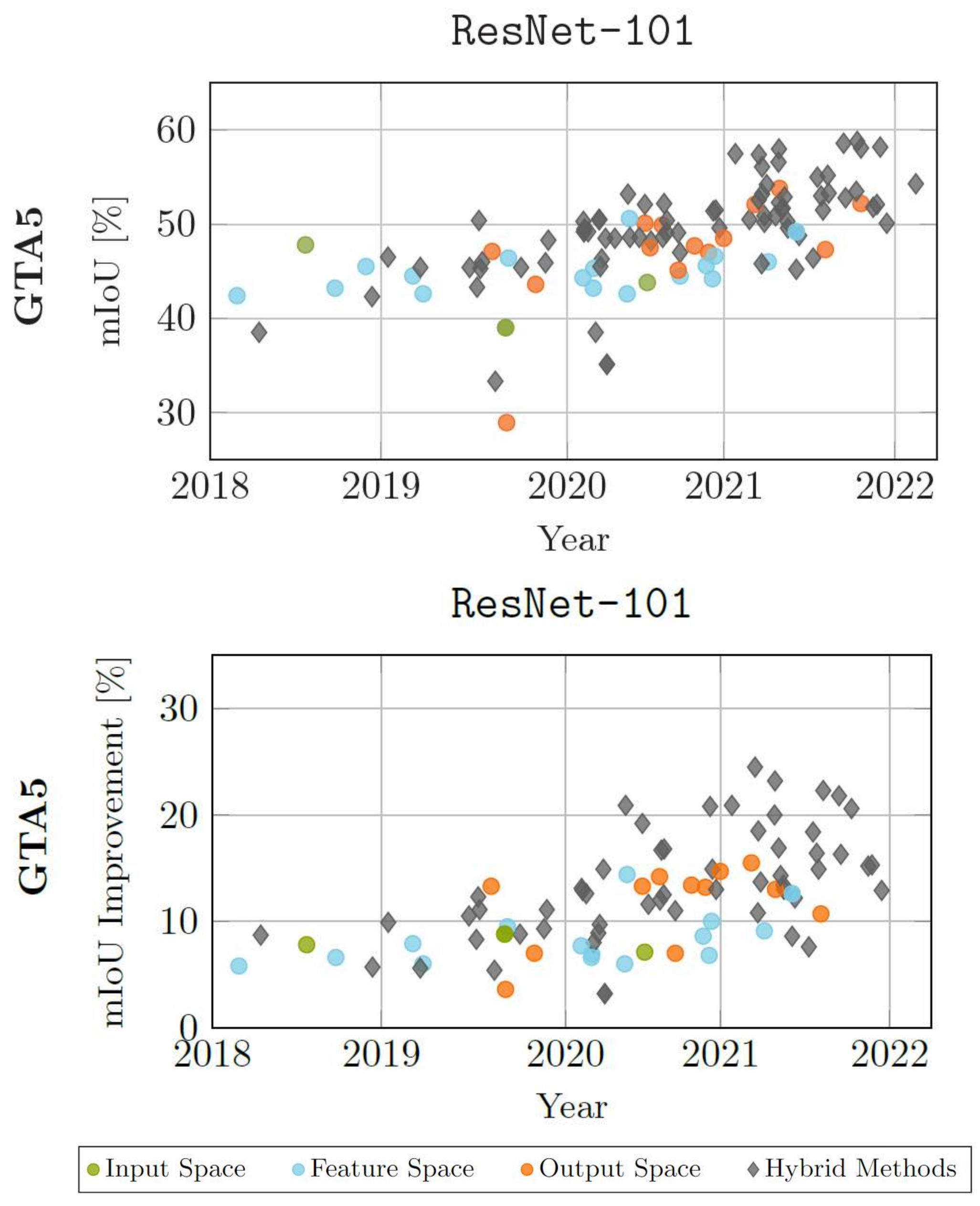

*Figure 7: Meta Analysis over time of UDA approaches*

→ Hybrid approaches cause signficant performance boost but more complex
→ Vision transformer set new SOTA performance

## Analysis

Several aspects impede UDA research and comparability:

- Dataset split, checkpoint selection
- Hyperparameters
- Complex hybrid frameworks

## Conclusions & Future Work

UDA made significant progress over the past years, vision transformer raised the performance to a new-level.

Future Research Directions:

- New architectures
- Large-scale, industrial UDA
- Domain generalization

## Partners

## External partners


## For more information contact:

manuel.schwonberg@cariad.technology
joshua.Niemeijer@dlr.de
j.termoehlen@tu-bs.de
joerg.schaefer@DLR.de
nico.schmidt@cariad.technology
Hanno.gottschalk@uni-wuppertal.de
t.fingscheidt@tu-bs.de



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