

Week 3

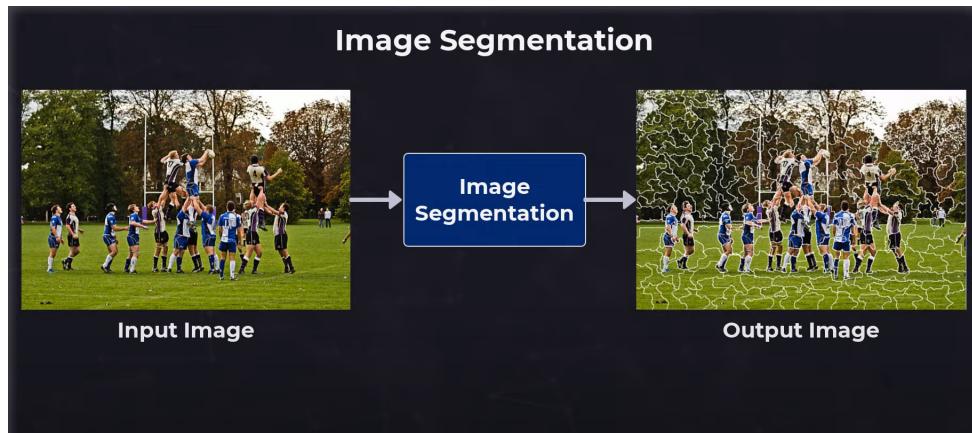
Image Segmentation, Semantic Segmentation, Instance Segmentation, and Panoptic Segmentation
Learn the differences between Image Segmentation v/s Semantic Segments v/s Instance Segmentation v/s Panoptic Segmentation. These are different types of Image Segmentation Techniques.

➡ <https://youtu.be/5QUmlXBb0MY?si=Eo-0daZm1DQSveKI>

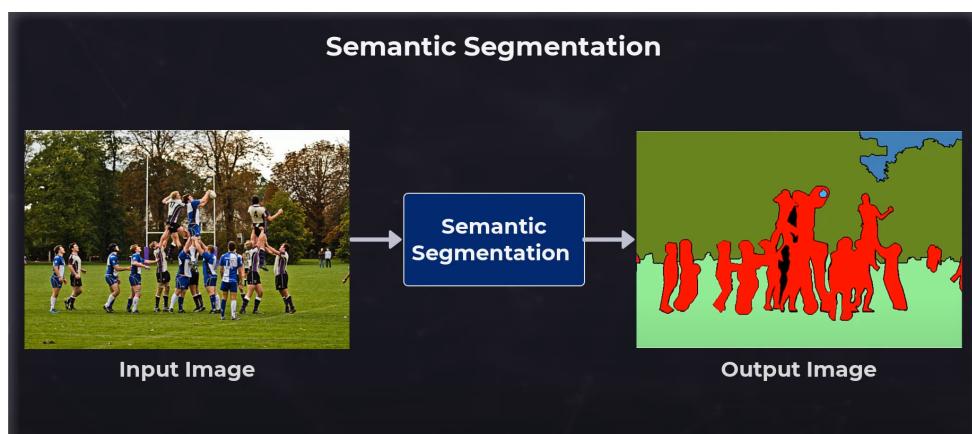


- Image Segmentation
- Semantic Segmentation
- Instance Segmentation
- Panoptic Segmentation

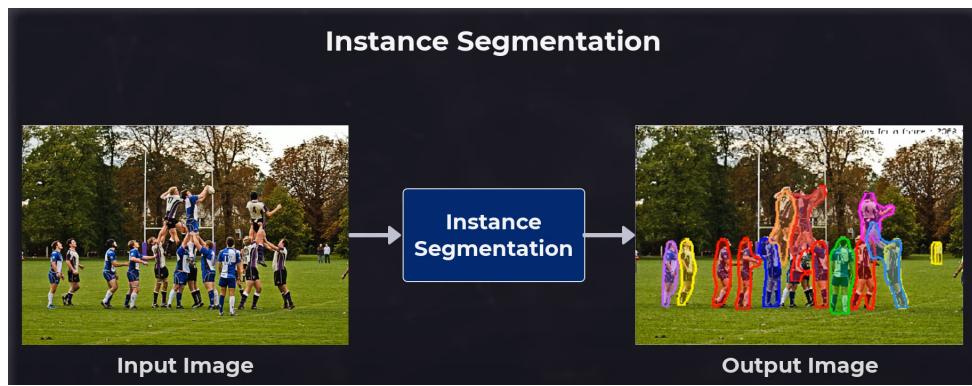
IMAGE SEGMENTATION - Dividing the image into groups of pixels based on some criteria.



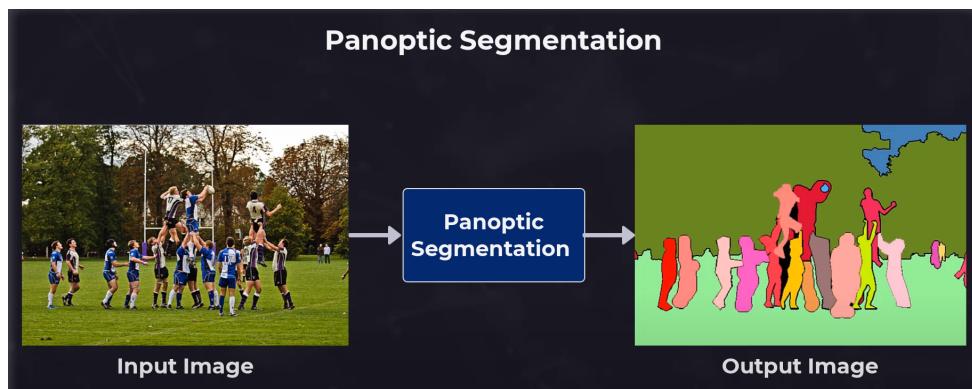
SEMANTIC SEGMENTATION - Assigning a label to every pixel in the image.



INSTANCE SEGMENTATION - Detection of each instance of an object and their boundaries.



PANOPTIC SEGMENTATION - combination of semantic and instance segmentations.



Additional Information.

[Panoptic Segmentation Article 1901.03784.pdf](#)

Panoptic Segmentation: Definition, Datasets & Tutorial [2023]

Panoptic segmentation is the task of simultaneously segmenting objects and classifying them into categories. Discover different approaches to the task.

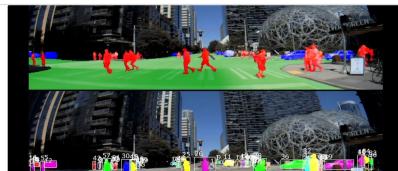
V7 <https://www.v7labs.com/blog/panoptic-segmentation-guide>



How AI Helps Autonomous Vehicles See Outside the Box - NVIDIA DRIVE Labs Ep. 14

For highly complex driving scenarios, it's helpful for the autonomous vehicle's perception system to provide a more detailed understanding of its surroundings. With our panoptic segmentation DNN approach, we can obtain such fine-grained results by segmenting image content with pixel-level

➡ <https://youtu.be/HS1wV9NMLr8?si=anpl3GyX5kBHocIM>



Tesla AI using PANOPTIC SEGMENTATION!! What the Heck does that mean--and why does it matter??

In a recent tweet, Andrej Karpathy, Tesla's AI and Full Self Driving (FSD) lead, posted some great pictures featuring panoptic segmentation. But what the heck is panoptic segmentation? What does it have to do with classification? And regression? And Bounding boxes? And Semantic Segmentation? And data labeling? And why does this all

➡ https://youtu.be/lRZ7Ans7trU?si=625VbWI6JdNgA_Uc



Trajectory Prediction

Predict trajectory of an Object with Kalman filter

Blog: <https://pysource.com/2021/11/02/kalman-filter-predict-the-trajectory-of-an-object/>

In this video, you will learn how you can predict the trajectory of an orange.

➡ <https://youtu.be/3iqRhbxBVRE?si=-6HE0xLHwut5lq5>



Inspiration: How Humans Drive or See

Humans can differentiate fake and real. What if a stranger wants to stop the Autonomous Car by holding a fake stop traffic light sign or a fake red traffic light.

Open Datasets:

COCO panoptic dataset

Mapillary Vistas Dataset

Cityscapes Dataset

ADE20K Dataset

BDD100K Panoptic Segmentation

Problem Statement:

1. Panoptic Segmentation is slow.

Panoptic segmentation | Solution and Advantages:

1. For slow and decision intensive applications such as parking or crowded places driving or off-road scenarios.
2. Integration with current state of the art methods.
3. Focus pulling method: only segments important part of the image.

Terms:

Context Information Loss - the loss of contextual information during the processing or analysis of data

Spatial Context: Information about the spatial relationships between objects or regions in an image can provide valuable context for understanding the scene. For example, knowing the proximity of a pedestrian to a crosswalk or the arrangement of objects on a road can aid in object detection and segmentation tasks

Temporal Context: In video analysis tasks, temporal context refers to information about how objects or scenes change over time. For instance, tracking the motion of a vehicle or predicting the trajectory of a pedestrian involves considering their previous movements.

Semantic Context: Semantic context involves understanding the semantic meaning or significance of objects, regions, or features in the scene. For example, recognizing that certain objects are typically found in specific contexts (e.g., cars on roads, trees in parks) can aid in scene understanding

Environmental Context: Information about the environmental conditions or context in which the scene is captured can also be crucial for accurate analysis. Factors such as lighting conditions, weather, time of day, or the presence of specific landmarks can influence the interpretation of the scene.

Feature fusion mechanisms are techniques used in machine learning and computer vision to combine information from multiple sources or modalities into a unified representation. Feature fusion is commonly employed to enhance the performance of models by leveraging complementary information from different sources. This can lead to improved accuracy, robustness, and generalization capabilities.

<https://youtu.be/4iRFGjNtzNo?si=VLMObRpka9uTqO9Q>