

Perception

Object Segmentation

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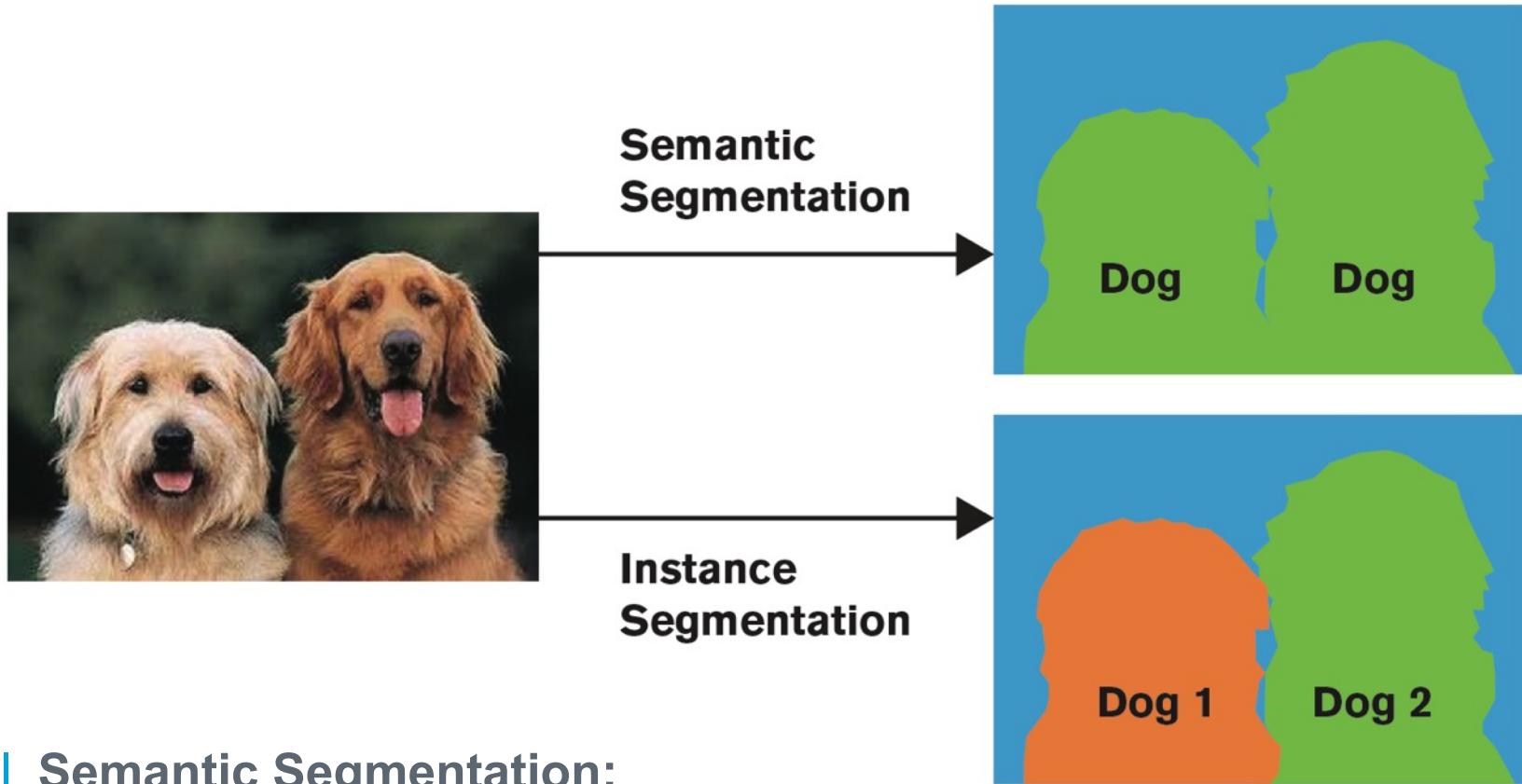
Problem Definition



| Object Segmentation:

- Process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

Problem Definition

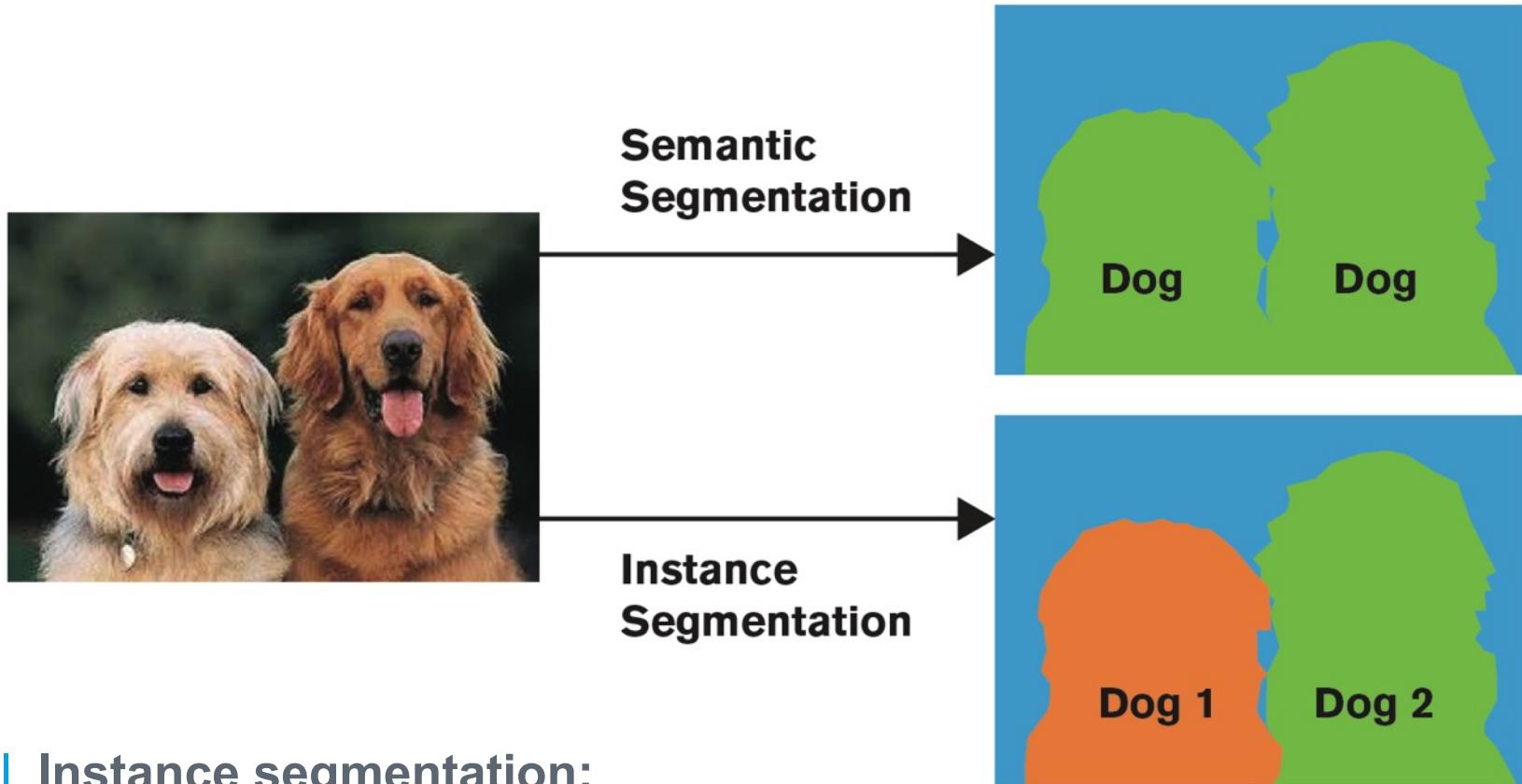


Semantic Segmentation:

- Describing the process of associating each pixel of an image with a categorical label.

Image modified from “Our Story,” Ari Had a Dream | Ensuring dogs will have a safe and warm place to stay, 19-May-2017. [Online]. Available: <https://arisplace.org/about-2/>. [Accessed: 11-May-2019].

Problem Definition



| Instance segmentation:

- Detecting each distinct object (Instance) of interest appearing in an image, and assigning each pixel with labels.

Image modified from “Our Story,” Ari Had a Dream | Ensuring dogs will have a safe and warm place to stay, 19-May-2017. [Online]. Available: <https://arisplace.org/about-2/>. [Accessed: 11-May-2019].

General Workflow

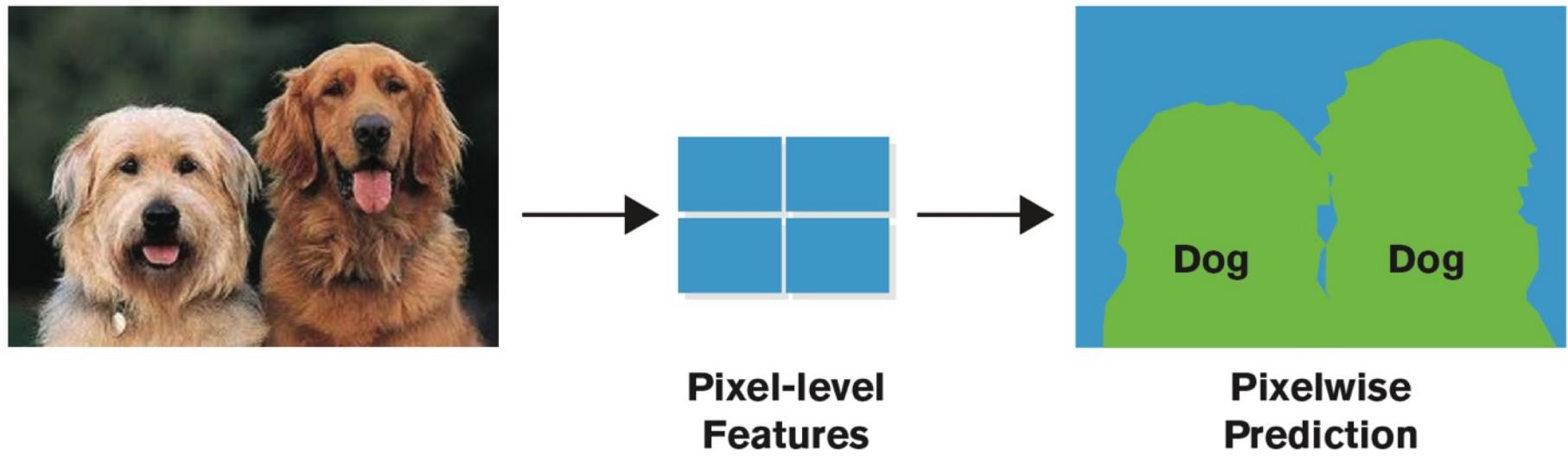
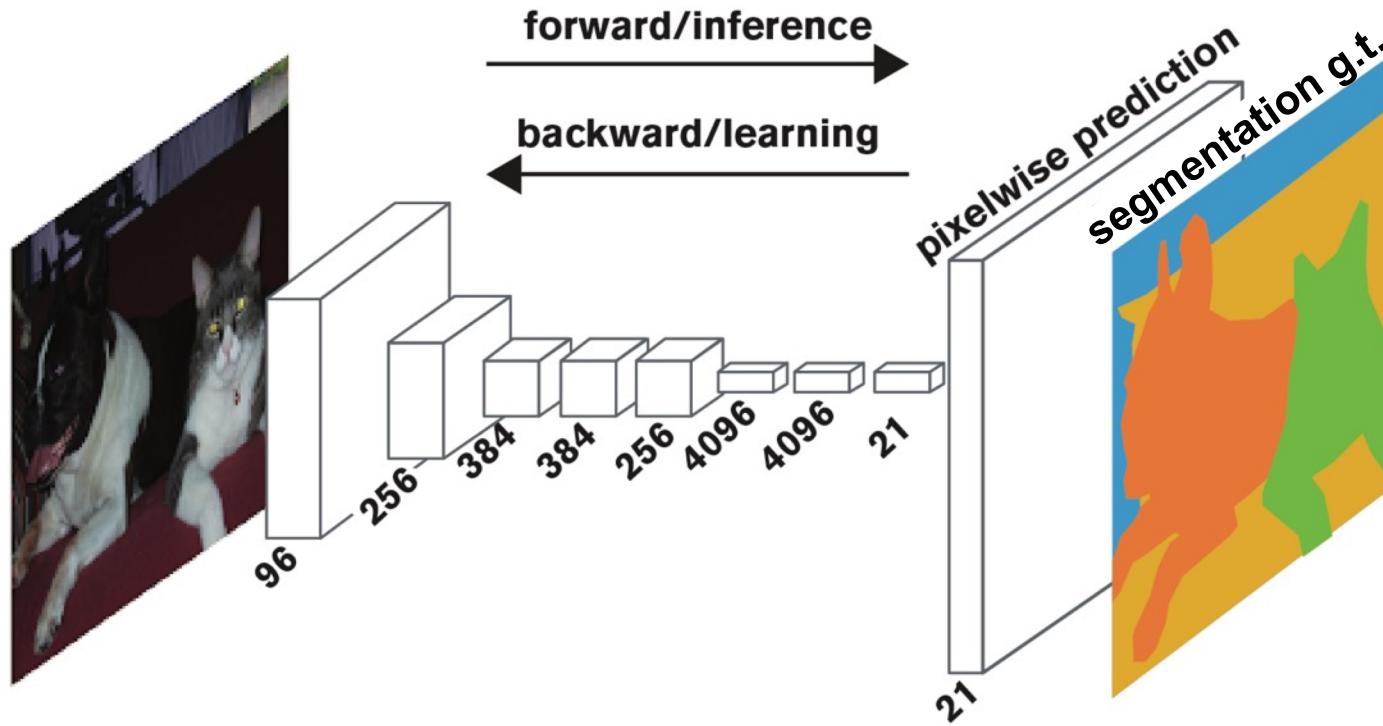


Image modified from “Our Story,” Ari Had a Dream | Ensuring dogs will have a safe and warm place to stay, 19-May-2017. [Online]. Available: <https://arisplace.org/about-2/>. [Accessed: 11-May-2019].

Relevant Methods

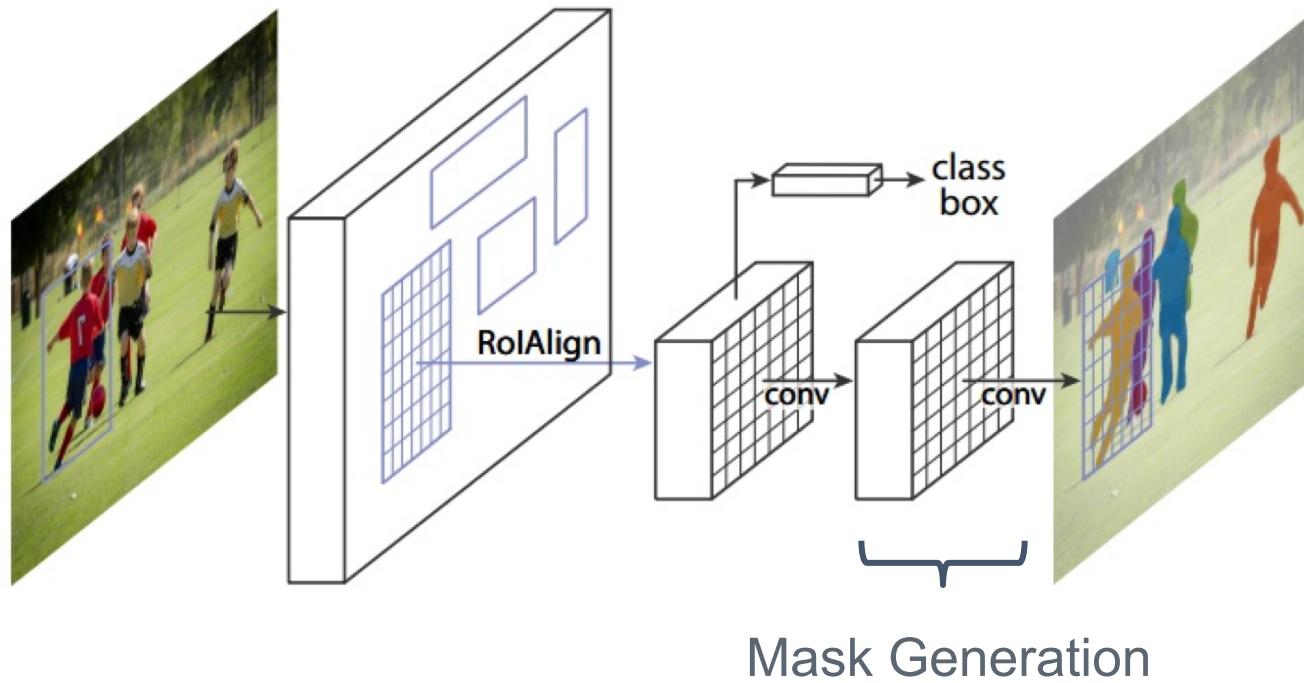


Long, Jonathan, Evan Shelhamer, and Trevor Darrell. "Fully convolutional networks for semantic segmentation." Proceedings of the IEEE conference on computer vision and pattern recognition. 2015.

| Fully Convolutional Neural Network (FCN):

- FCN consists of only convolutional layers and has been proved to be effective in semantic segmentation task.

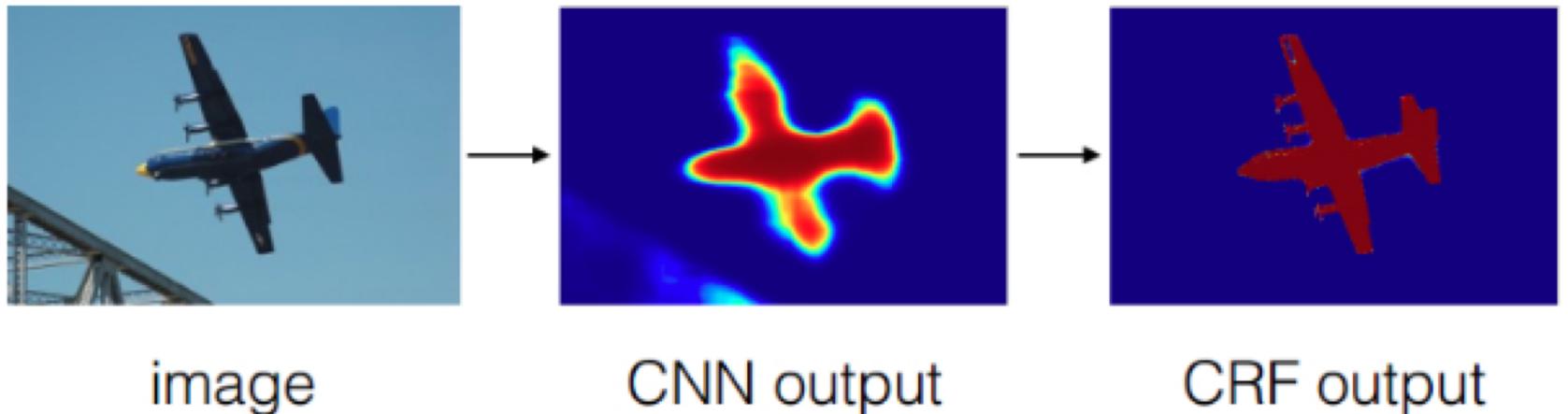
Relevant Methods



| Mask-RCNN:

- Mask RCNN is build upon Faster-RCNN architecture, and add one extra branch for object mask generation.
- Masks are generated from feature maps and bounding box of object.

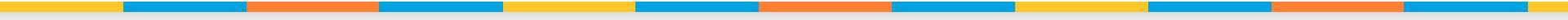
Relevant Methods



| Conditional Random Field (CRF):

- CRF is a type of undirected probabilistic graphical model. They are used to encode known relationships between observations and construct consistent interpretations.

Reading Materials



| Related Publications:

- Mask-RCNN
- Efficient multi-scale 3D CNN with fully connected CRF for accurate brain lesion segmentation
- Recurrent pixel embedding for instance grouping
- Recurrent instance segmentation
- Fully convolutional networks for semantic segmentation
- Learning deconvolution network for semantic segmentation

Wang, Xiaolong, Abhinav Shrivastava, and Abhinav Gupta. "A-fast-rcnn: Hard positive generation via adversary for object detection." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2017.

Kamnitsas, Konstantinos, et al. "Efficient multi-scale 3D CNN with fully connected CRF for accurate brain lesion segmentation." Medical image analysis 36 (2017): 61-78.

Kong, Shu, and Charless C. Fowlkes. "Recurrent pixel embedding for instance grouping." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2018.

Romera-Paredes, Bernardino, and Philip Hilaire Sean Torr. "Recurrent instance segmentation." European conference on computer vision. Springer, Cham, 2016.
Long, Jonathan, Evan Shelhamer, and Trevor Darrell. "Fully convolutional networks for semantic segmentation." Proceedings of the IEEE conference on computer vision and pattern recognition. 2015.

Noh, H., Hong, S., & Han, B. (2015). Learning deconvolution network for semantic segmentation. In Proceedings of the IEEE international conference on computer vision (pp. 1520-1528).