

Neural Networks and NVIDIA Jetson TX1: Image Segmentation on the Edge

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Instructor: Galvanize Data Science Immersive
Thanks to: Eric Harper and Max Cohen at NVIDIA

NVIDIA Drone flight footage



Sample image segmentation label

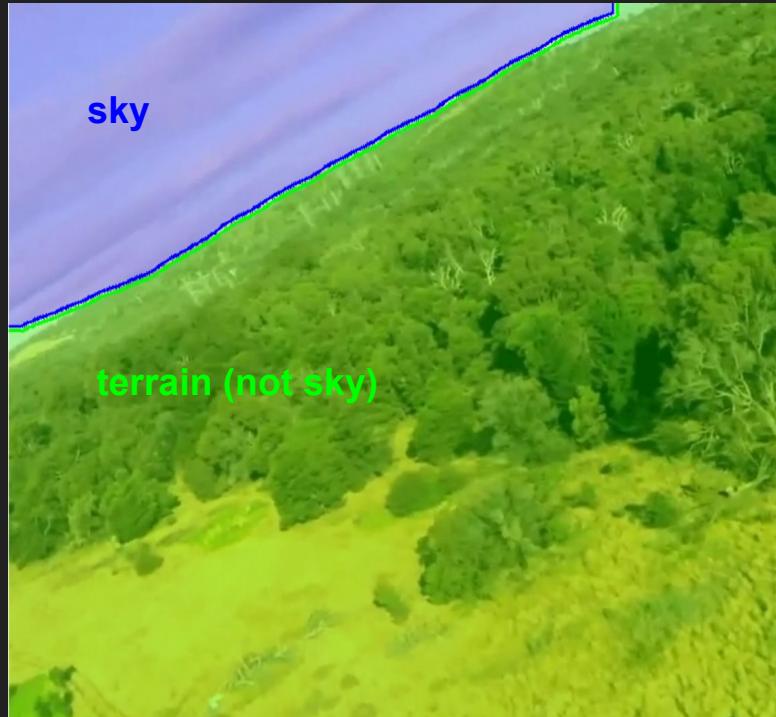


Image Segmentation

Testing on
unseen Denver
video after
training on
solely field
images.



Dataset

120 high resolution images from 12 cities* with 4000 individually labeled buildings.

* Chicago, Dallas, Frankfurt, Hong Kong, Miami, New York, Philadelphia, Seattle, Shanghai, Singapore, Tokyo, Toronto

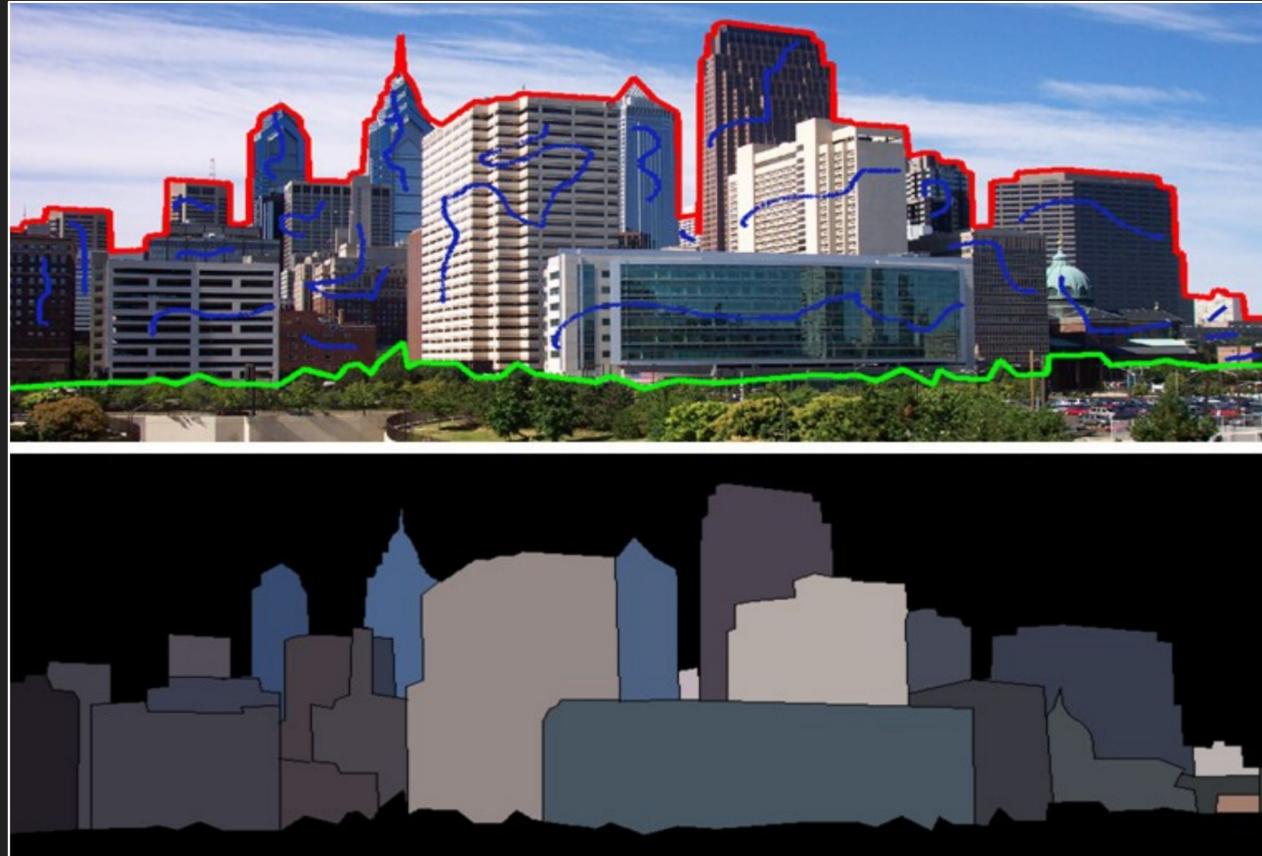
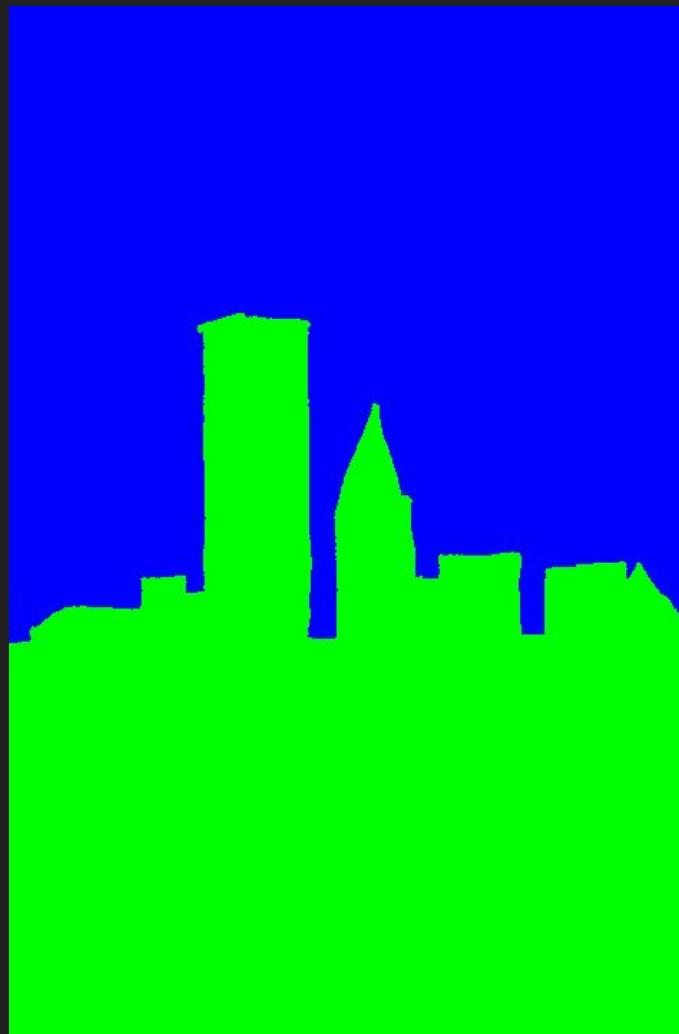


Figure from *Parsing World's Skylines using Shape Constrained MRFs*
by Rashmi Tonge, S. Maji, and C.V. Jawahar,
Toyota Technical Institute of Chicago, 2014

Dataset

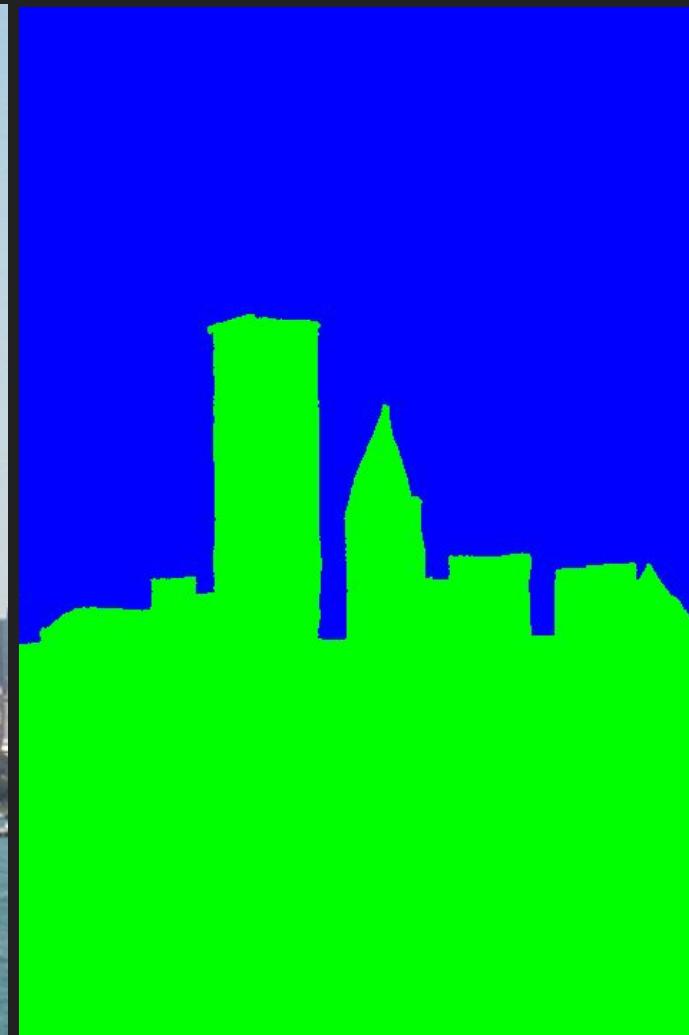
Sample
images and
(sky / not sky)
segmentations



Dataset

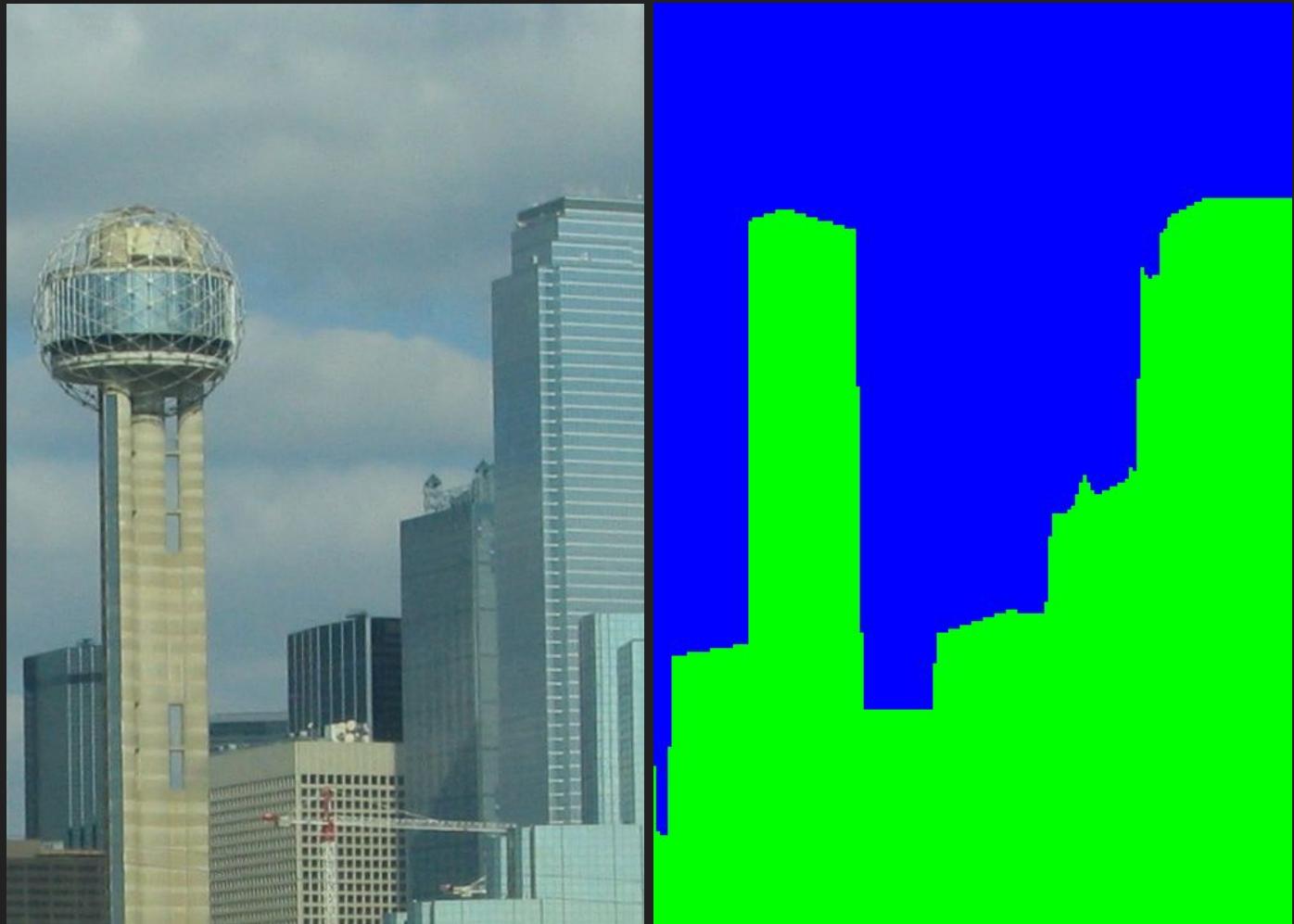
Sample
images and
(sky / not sky)
segmentations

Chicago
(Aon Center,
Two Prudential
Plaza)



Dataset

Sample
images and
(sky / not sky)
segmentations



Segmentation model performance on holdout images

Source image



Segmentation - field only



Segmentation - field & city



Segmentation model performance on holdout images

Source image



Segmentation - field only



Segmentation - field & city

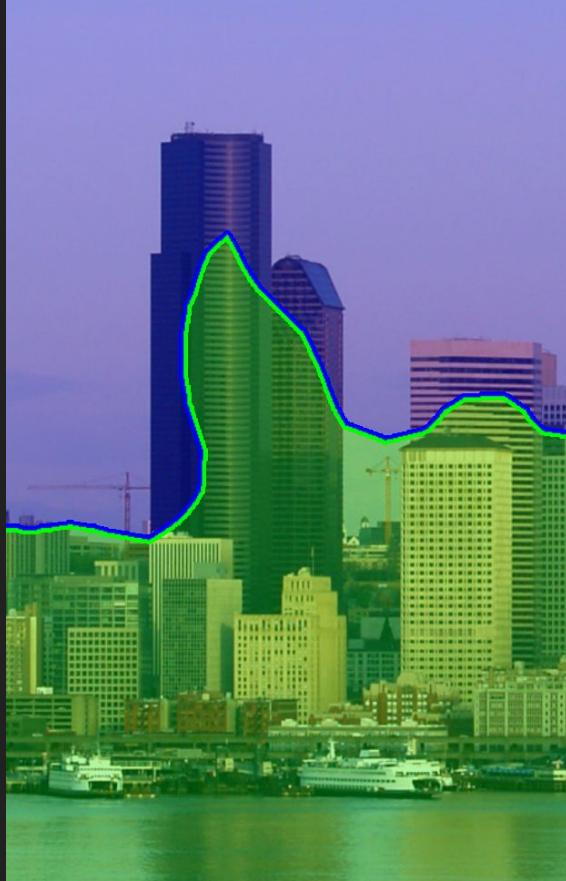


Segmentation model performance on holdout images

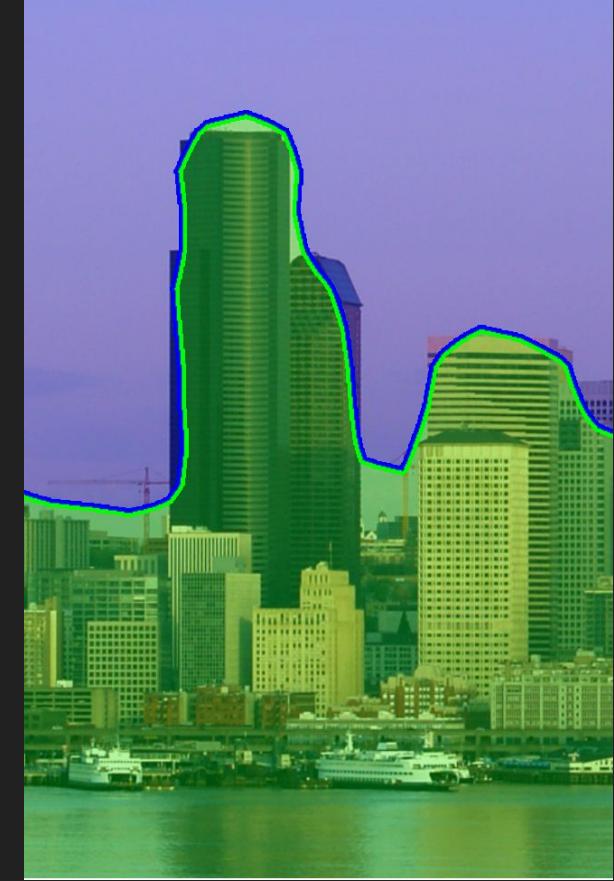
Source image

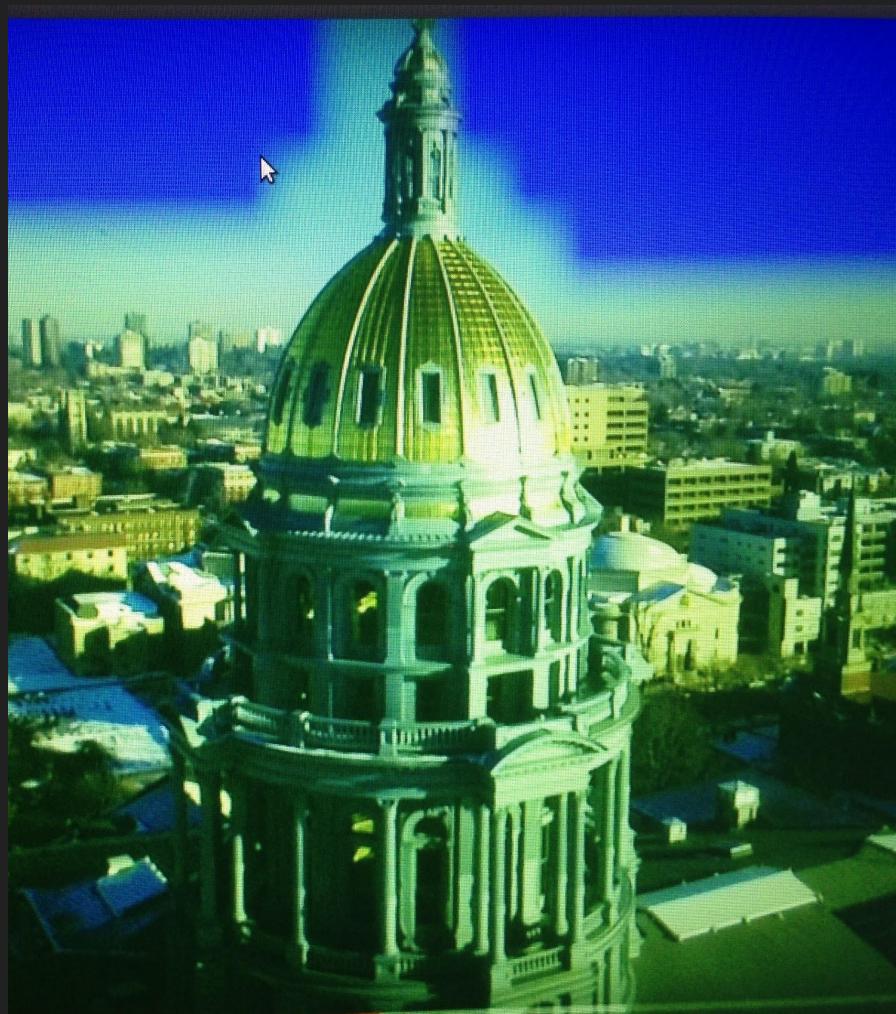


Segmentation - field only



Segmentation - field & city





References

- NVIDIA Two days to a Demo (<https://developer.nvidia.com/embedded/twodays toademo>)
- NVIDIA Jetson TX1 and TX2
(<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems-dev-kits-modules>)
- AlexNet
(<https://papers.nips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf>)
- FCN-AlexNet (https://computing.ece.vt.edu/~f15ece6504/slides/L13_FCN.pdf)
- GoogleNet (Inception) (<https://www.cs.unc.edu/~wliu/papers/GoogLeNet.pdf>)
- Drone footage of downtown Denver by Superfly Station
(<https://www.youtube.com/watch?v=D8YSWsmMeH8>)
- Pedestrians walk over car hood (<https://www.youtube.com/watch?v=vixFxqDODs>)
- NVIDIA Aerial Drone Dataset (<https://nvidia.box.com/shared/static/ft9cc5yjvrbhkh07wcivu5ji9zola6i1.gz>)
- Parsing the World's Skylines using Shape-Constrained MRFs, includes links to paper and data:
(<http://ttic.uchicago.edu/~smaji/projects/skylineParsing/>)