UDACITY Self Driving Car Engineering Nanodegree

Project #5: Vehicle Detection and Tracking

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The Pipeline:

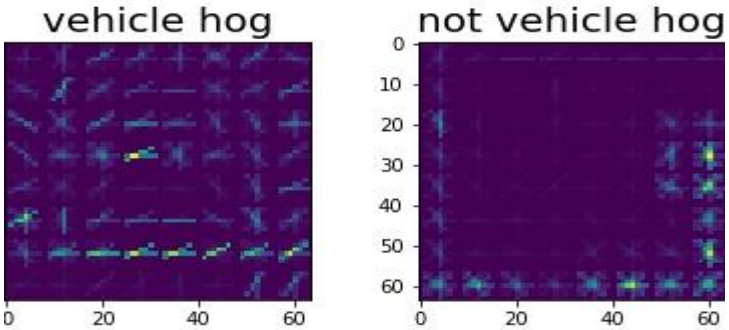
- **Import the data**

```
# of vehicle images: 8792
# of NOT vehicle images: 8968
```

As the number of “vehicle” and “not vehicle” examples are so close, we do not need to augment the data to balance the classes.

- **Features used for training**

As discussed in the lesson, all 3 of the histogram of the oriented gradients, color histogram, and binned spatial features are used.



- **Parameters used**

  LUV colorspace is used for its efficiency.
  All 3 colors are used for color histogram,
  Only first channel is used for HOG feature.
  Most of the parameters were found by trial and error.

Pixel per cell: 8,	Cell per block: 2	Spatial size: (16,16)
Histogram range: (0,256)	Histogram bins: 32	Orient: 8

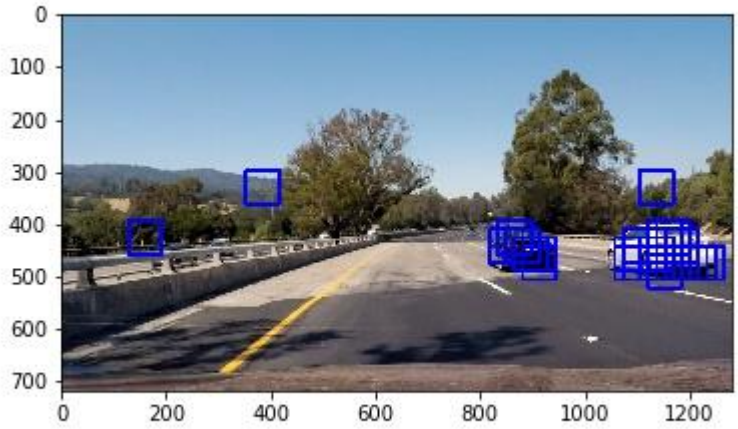
- **Training**

  Trainer: Linear SVC
  20% of the data is used for testing.
  The data is normalized before the training

  After the training, **accuracy is 98%**

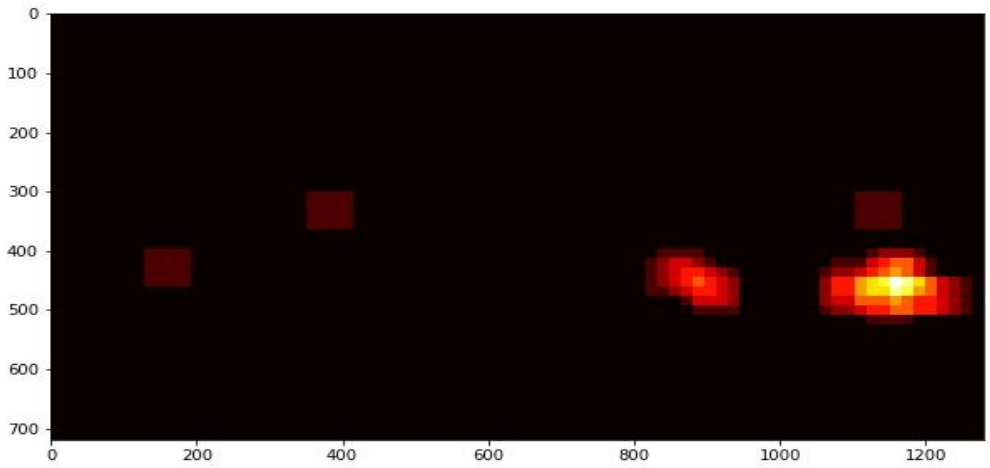
- **Vehicle Detection**

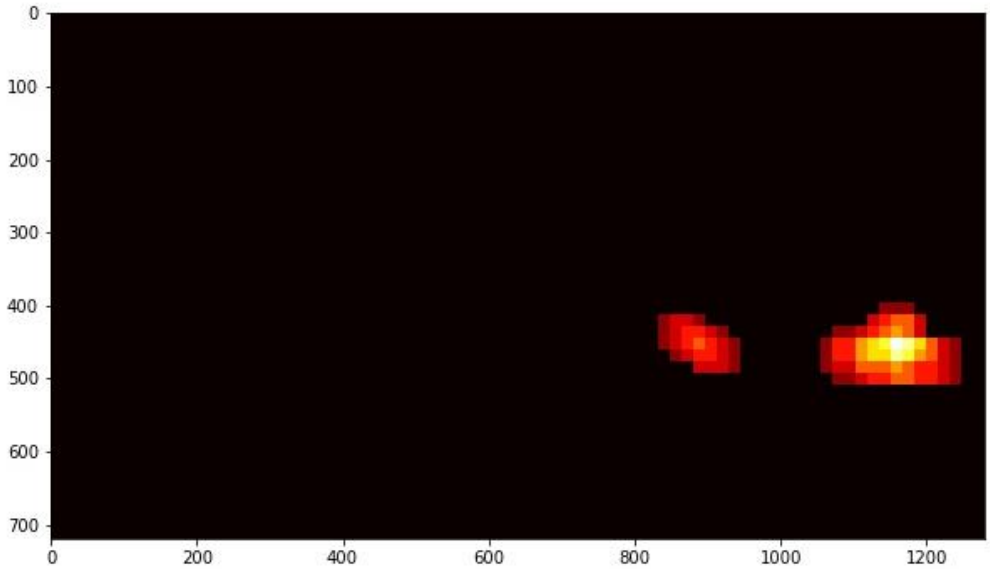
  Sliding windows are used to search for the vehicles in the frame.
  Positive samples are collected (including false positives) for further processing.

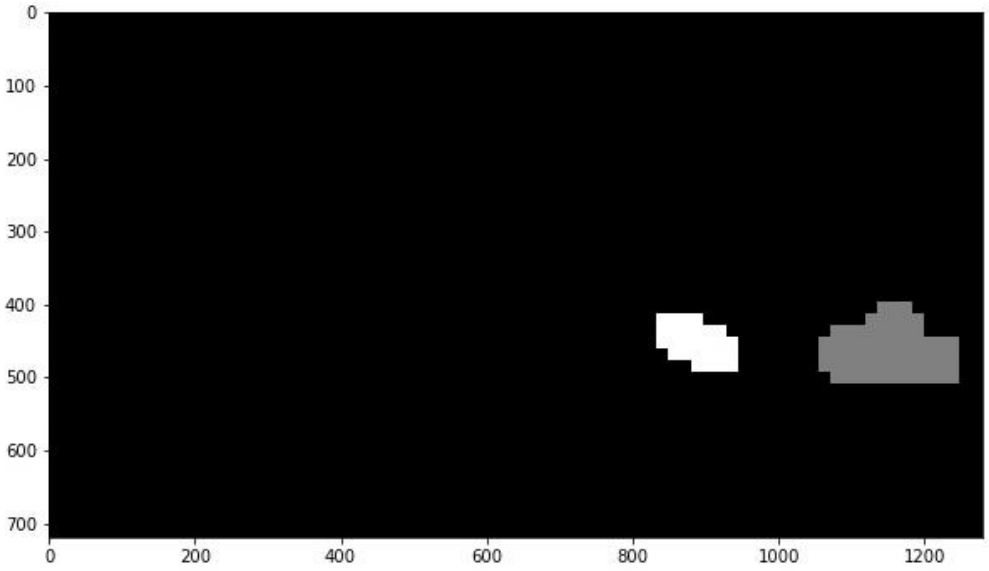


- **Filtering**

  Heat map is used to eliminate false positives and to increase robustness of the algorithm. Threshold of 1 is used. Then treshloded heatmap is labeled using the function shown in the lecture. Then, final rectangles are drawn.



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- **Discussion and future improvements**
  The algorithm successfully detected and tracked the vehicles.
  To develop it further, moving average filters might be used. Currently it handles each frame independently however as we know consecutive frames carry information about whereabouts of the vehicles found on previous frames.