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NYU Center for Urban Science + Progress

Vehicle Detection for Cities

Machine Learning for Cities

By

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PROJECT GOAL

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› **Can we track the vehicle flows in real-time using traffic camera feeds?**

Source: NYC DOT

› **Possible Uses:**

  › **Detecting and Tracking Congestions in real-time**

  › **Efficient Traffic Planning and Management**

APPROACH

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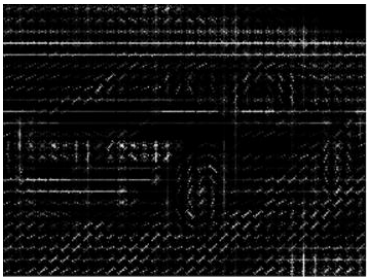
- **Shallow Learning Techniques:**
  1) **Using HOG Features and applying an SVM Classifier (In this presentation)**
  2) **Using HAAR Features and applying a Cascade Classifier**

- **Deep Learning Techniques:**
  - **Convolutional Neural Networks**
  - **R-CNN**

HOG - SVM

Histogram of Oriented Gradients (HOG)



Parameters

Cell Size = 10x10 Pixels

Stride = 10 Pixels

Block Size = 20x20 Pixels

Bins = 8

Filter masks in x-y direction

Output

Flattened vector of size:

No: of Blocks *
No: of cell per block *
No of Bins

HOG - SVM

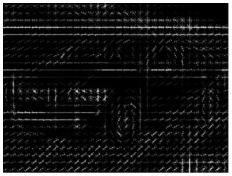
Process Flow

Step-1: Labelled Dataset

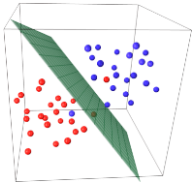
+ve Image

-ve Image

Step-2: HOG Extraction

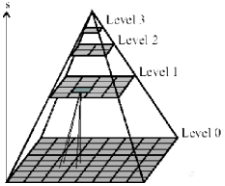


Step-3: Train SVM



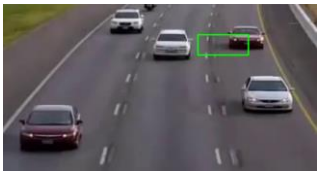
*Source: Google

Step-4: Image Pyramids

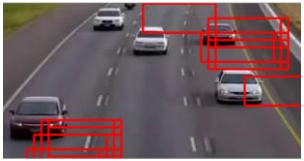


*Source: Google

Step-5: Sliding Window



Step-6: Non-Max Suppression



HOG - SVM

Results

Training Set

Positive: 500

Negative: 500

- Train-Test Split : 20%
- C=1 (inflection point is 0.1)

Confusion Matrix	Predictied: NO	Predictied: YES
Actual: NO	99	1
Actual: YES	1	99

HOG - SVM

Results

Training Set

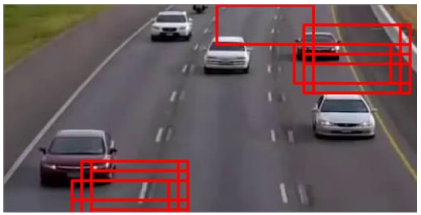
Positive: 500

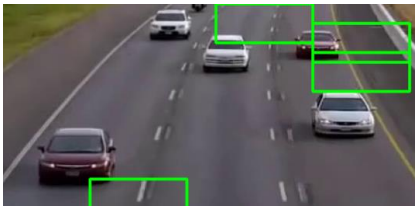
Negative: 500

- Train-Test Split : 20%
- C=1 (inflection point is 0.1)

Confusion Matrix	Predicted: NO	Predicted: YES
Actual: NO	97	2
Actual: YES	3	98

Test Image from Traffic Cam





Solution: Hard Negative Mining

REFERENCES/ACK

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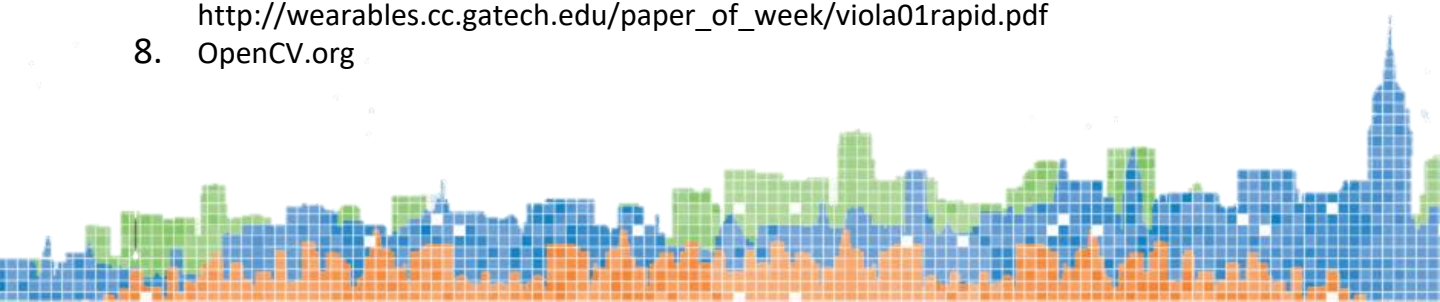

THANK YOU