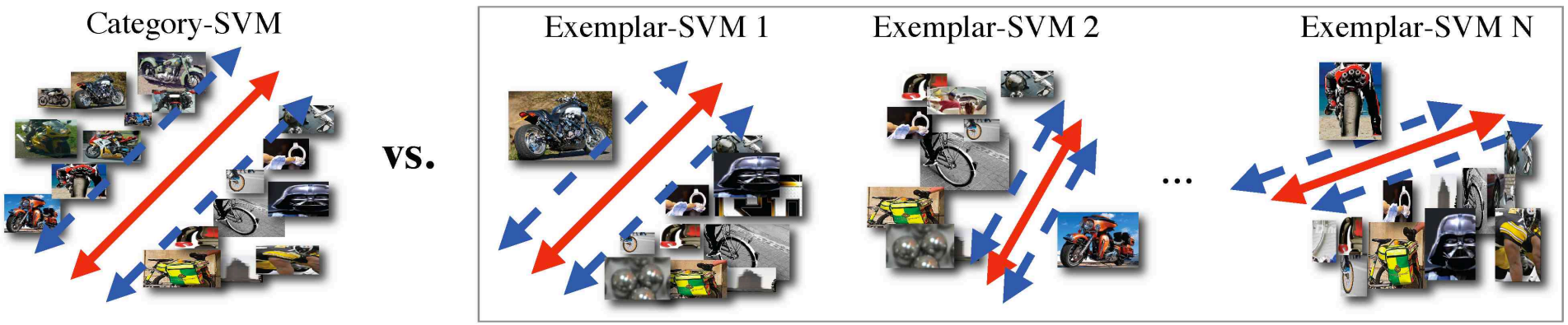
COS 429 PS5: Finding Nemo

Exemplar–SVM

- Still a rigid template, but train a separate SVM for each positive instance



For each category it can has exemplar with different size aspect ratio

Problem 1 Describe Steps

Training :

To train one exemplar SVM what we do

Testing :

For each image what we do ?

In this assignment we use 6 images as training and others as testing.

Problem 2 why use image pyramid ?

When we compute HoG for each image we compute the HoG for different scale of image.

- What problem we are trying to solve here?
- If there any alternative solution? Why not as good as this one ?

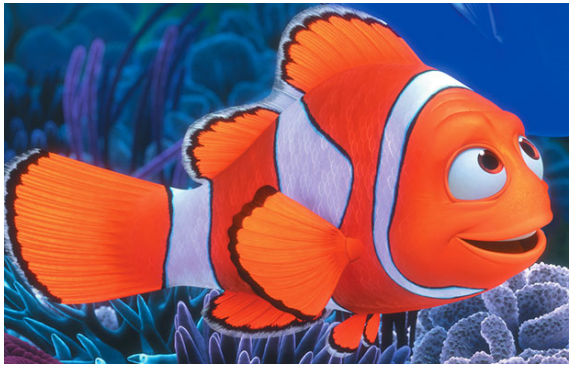
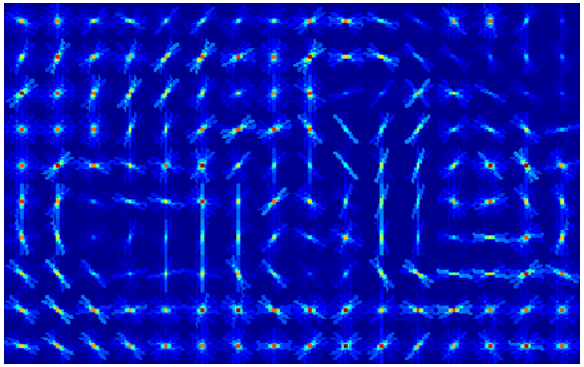
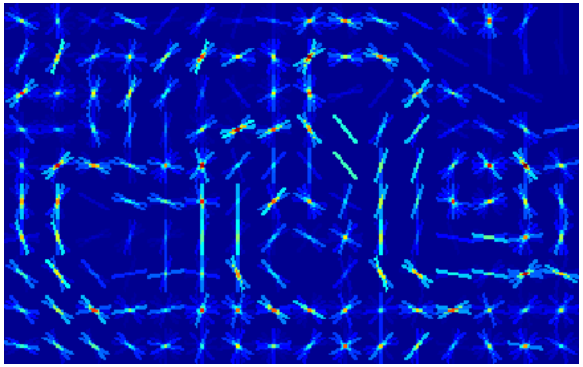
Problem 2 Why Non-Maximum Suppression?

Look at the code see where we do non-maximum suppression (call the function nmsMe).

- What does it do?
- Why we do this?

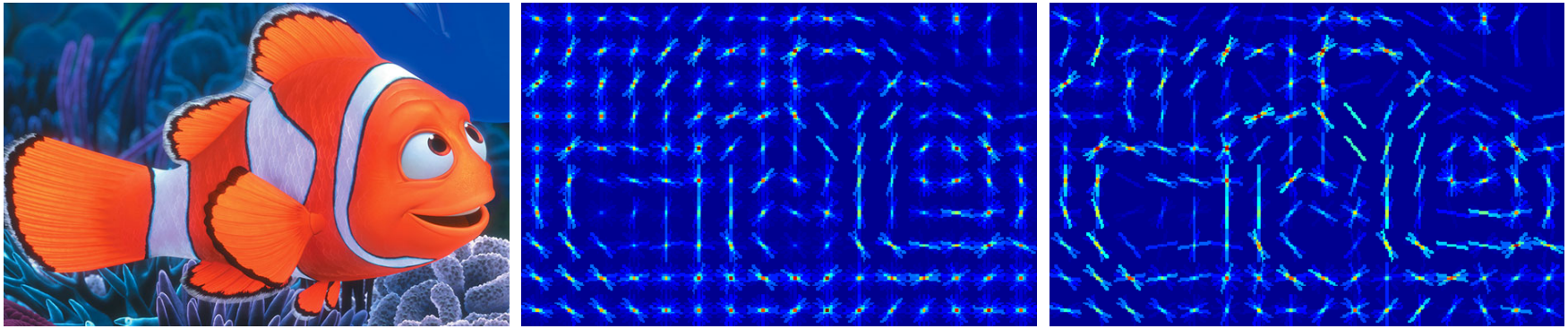
Problem 3 Visualizing Examplars

- Visualize the exemplar image : Model.posRgb
- Visualize the exemplar HoG feature : showHoG(Model.posfeature)
- Visualize the trained svm weight : showHoG(Model.svm.w)

Problem 3 Visualizing Examplars

- Try to understand the correspondences among the three visualization.
- Describe the patterns in the HOG and SVM weight visualization.



Problem4 Testing Procedure

- Goal : complete the function bbdet = testfeaturePym(imageRgb,Model)

- What it does : slide one exemplar detector over the image to find Nemo

- Past your code in the report.

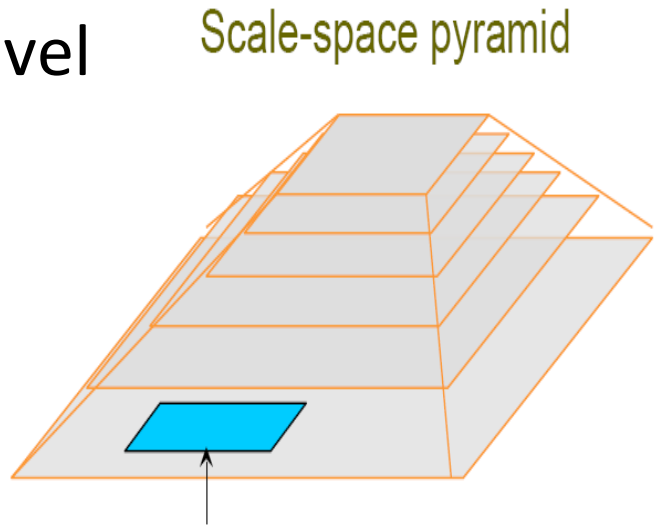
Problem4 Testing Procedure

Basic steps (Listed in the code comments)

1. Compute feature pyramid
2. For each level of the feature pyramid
   - Do convolution get the detection score for each window
   - Convert the score to bounding box in image domain
3. Do non- maximum-suppression

Convolution get the detection score

- Dot product between trained svm weight and feature for each window
  - score = fconv(one level of feature, {weight}, 1, 1);
  - The score stores at the left top corner of the window in feature domain.
- If image at this level is too small, will not do convolution on this and smaller level

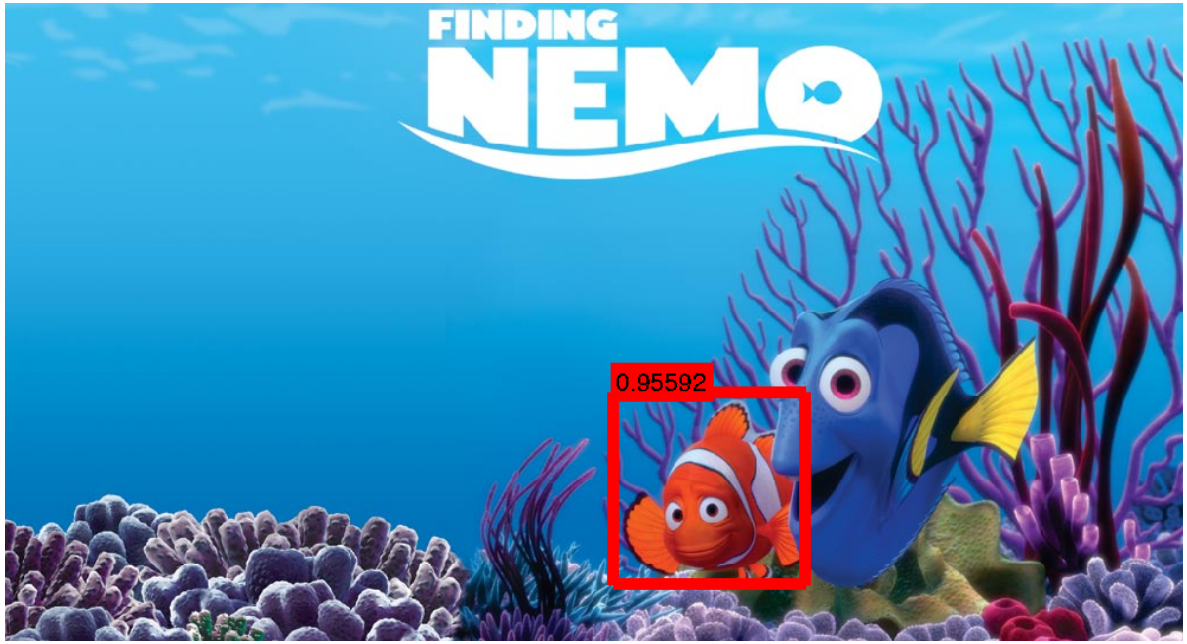


Convert the score to bounding box in image domain

- Use:
  - the scale of the this level
  - HOG bin size 8x8 pixels
  - size of this exemplar
- Example in white board

Problem6 draw box

- Paste result in report
- Can you find Nemo? When it fails ?



Problem 7 Training Procedure

- After you finish the function testfeaturePym Congratulations! You can train your own detectors.
- Run rumMe.m with step.train =1
- To train 6 exemplars and test on the images
- What's the difference of the results ?

[Extra Credit] Detecting Other Objects

- Find an interesting object to detect
- Get images
- Get ground truth box by label it by yourself

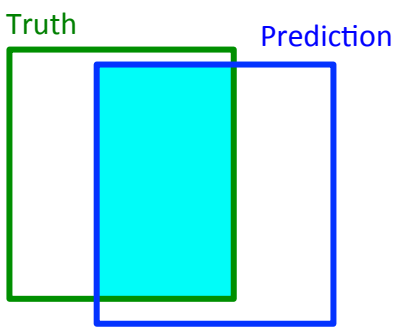
[Extra Credit] Evaluation

	Patient has the disease	Patient doesn't have disease
Test is positive	Correct result	False positive
Test is negative	False negative	Correct result

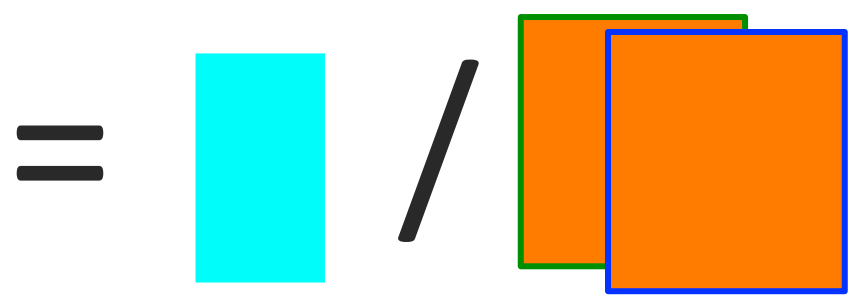
		Truth: Object	Truth: No Object
Algorithm Prediction	Object	True Positive	False Positive
	No Object	False Negative	True Negative

Precision = TP / (TP + FP)

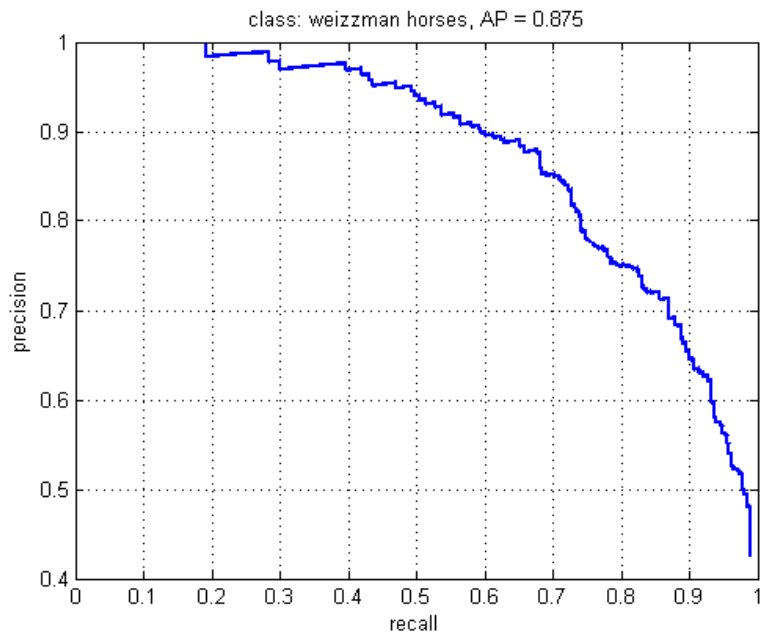
Recall = TP / (TP + FN)



Intersection Over Union



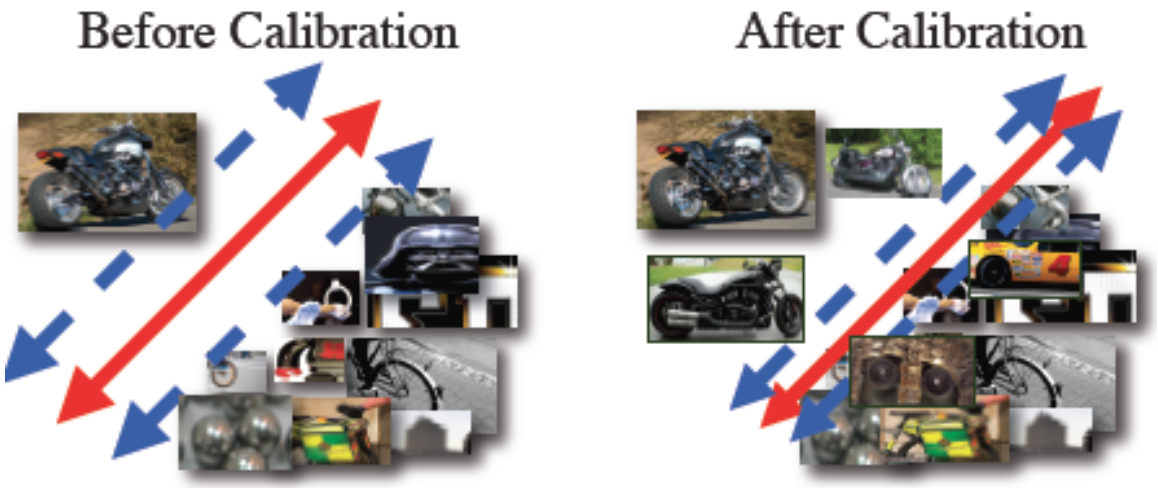
[Extra Credit] Evaluation



- X : recall = true positive / total ground truth
- Y : precision = true positive / total detection

Calibration

- Idea : make different exemplar detector's score compatible.

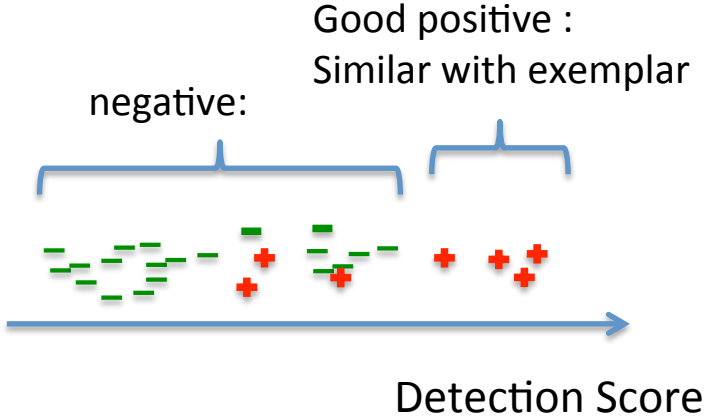


- Good exemplar vs Bad exemplar

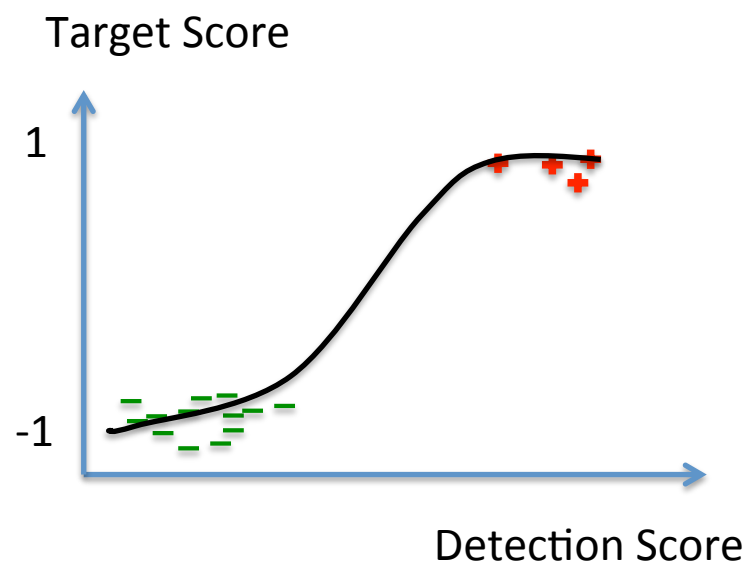
Calibration

- Idea : make different exemplar detector's score compatible.

1. On Validation set :
Sort detection by score,
classify true/false detection

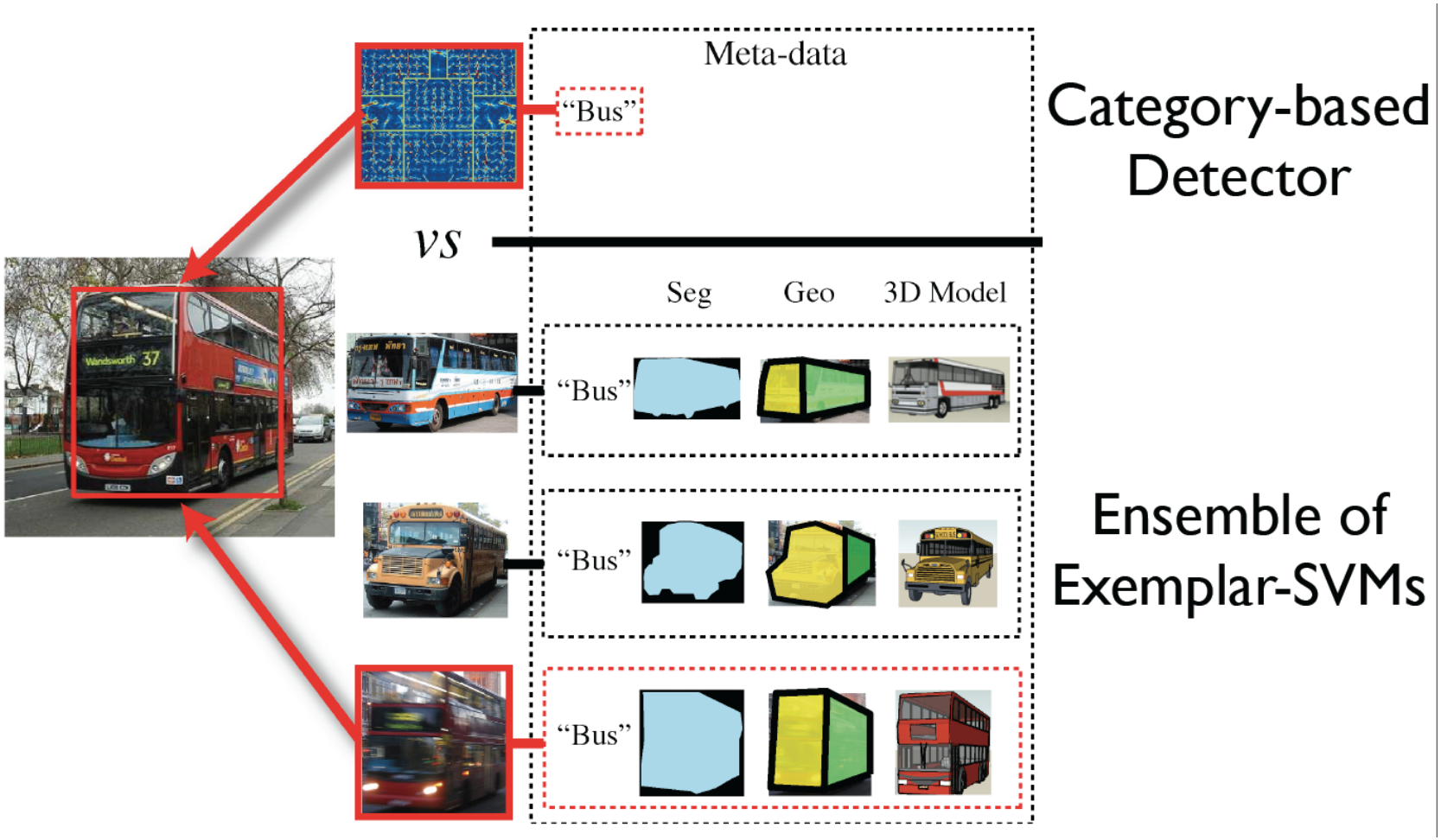


2. sigmoid function



- All detector's scores are from 0 to 1.
- The calibrated score reflects each detector's presicion

Extra Credit Label Transfer



Hints: http://www.cs.cmu.edu/~tmalisie/projects/iccv11/ paper and code

iHoG

- Webpage :http://web.mit.edu/vondrick/ihog/
- They have online demo and code for download

```
>> feat = features(im, 8);
>> ihog = invertHOG(feat);
>> imagesc(ihog);
```