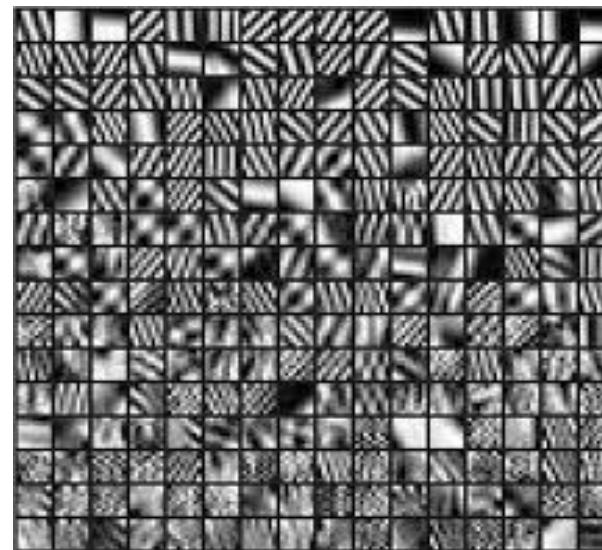
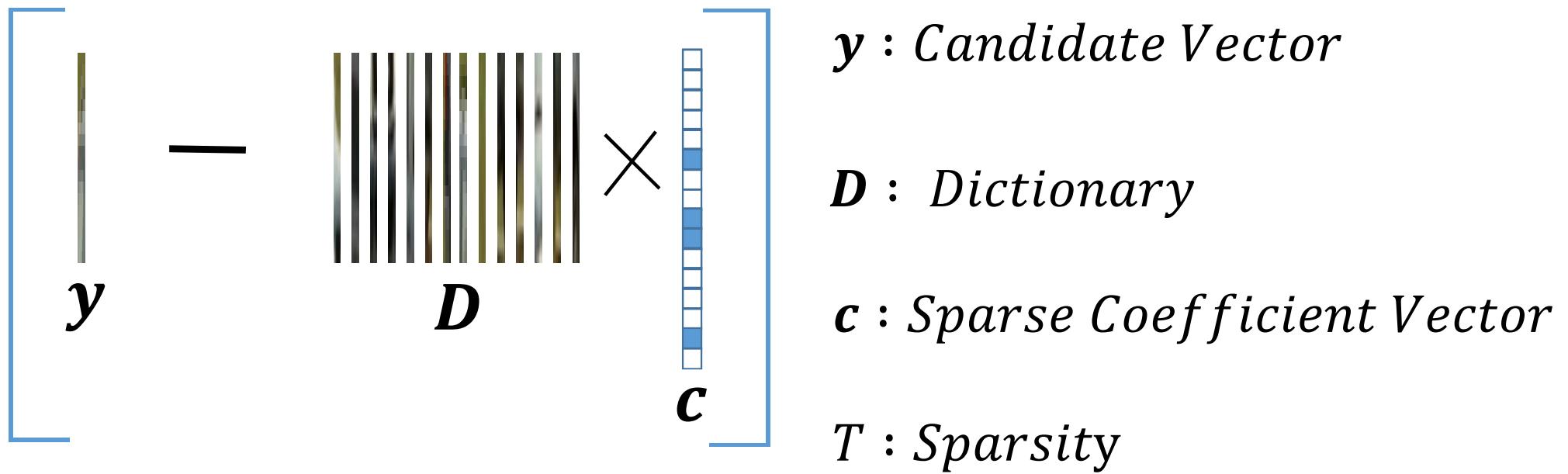


# Sparse Representation Applications



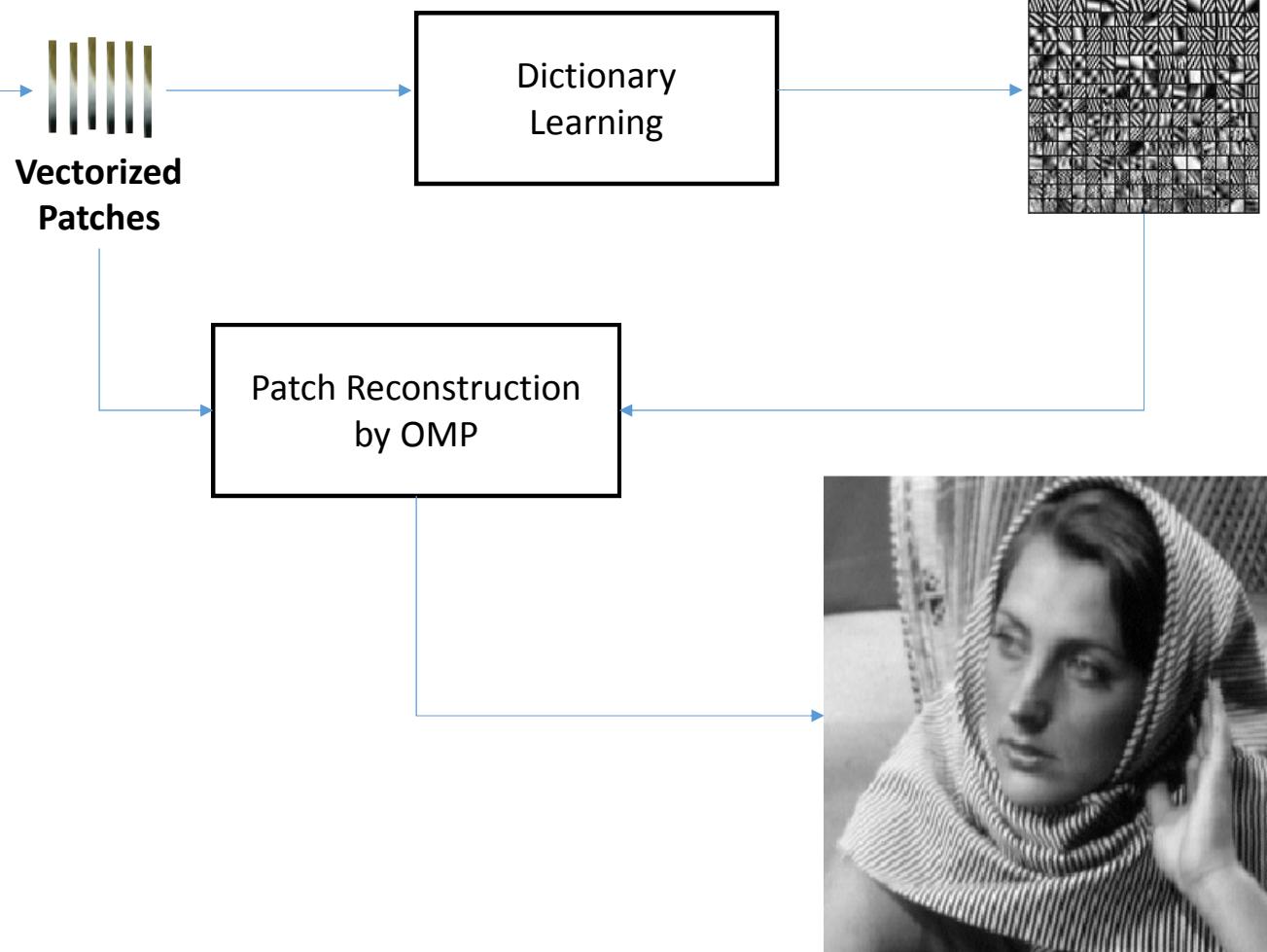
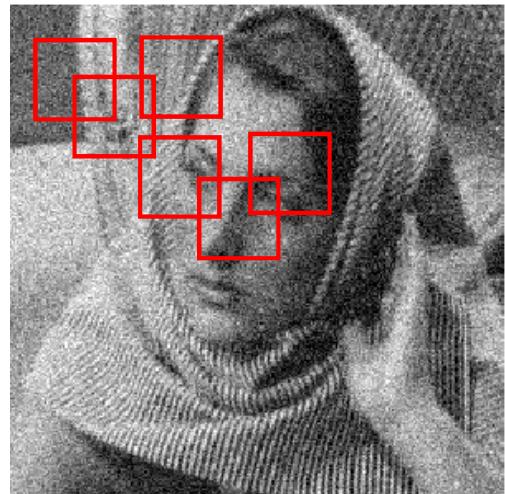
*Prithwijit Guha*  
*Dept. of EEE, IIT Guwahati*

# Sparse Representation



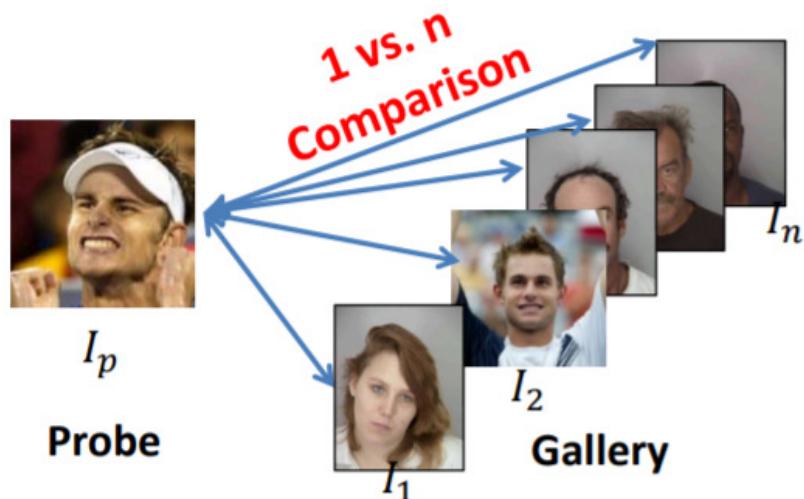
$$\min_c \|y - Dc\|_2^2 \text{ such that } \|c\|_0 \leq T$$

# Image Denoising



# Face Recognition with Sparse Codes

- Automatically identify or verify a person from still images, video sequences or even sketches



Who is this person?

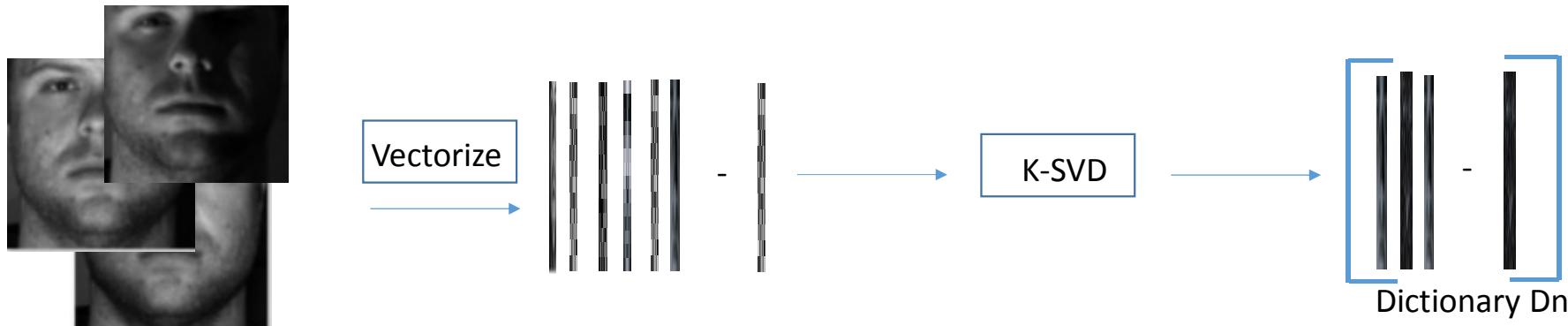
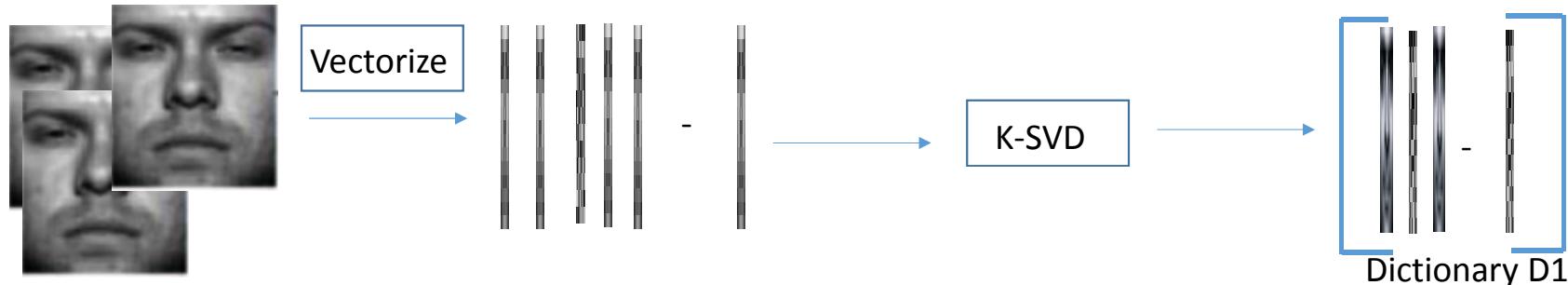
Identification



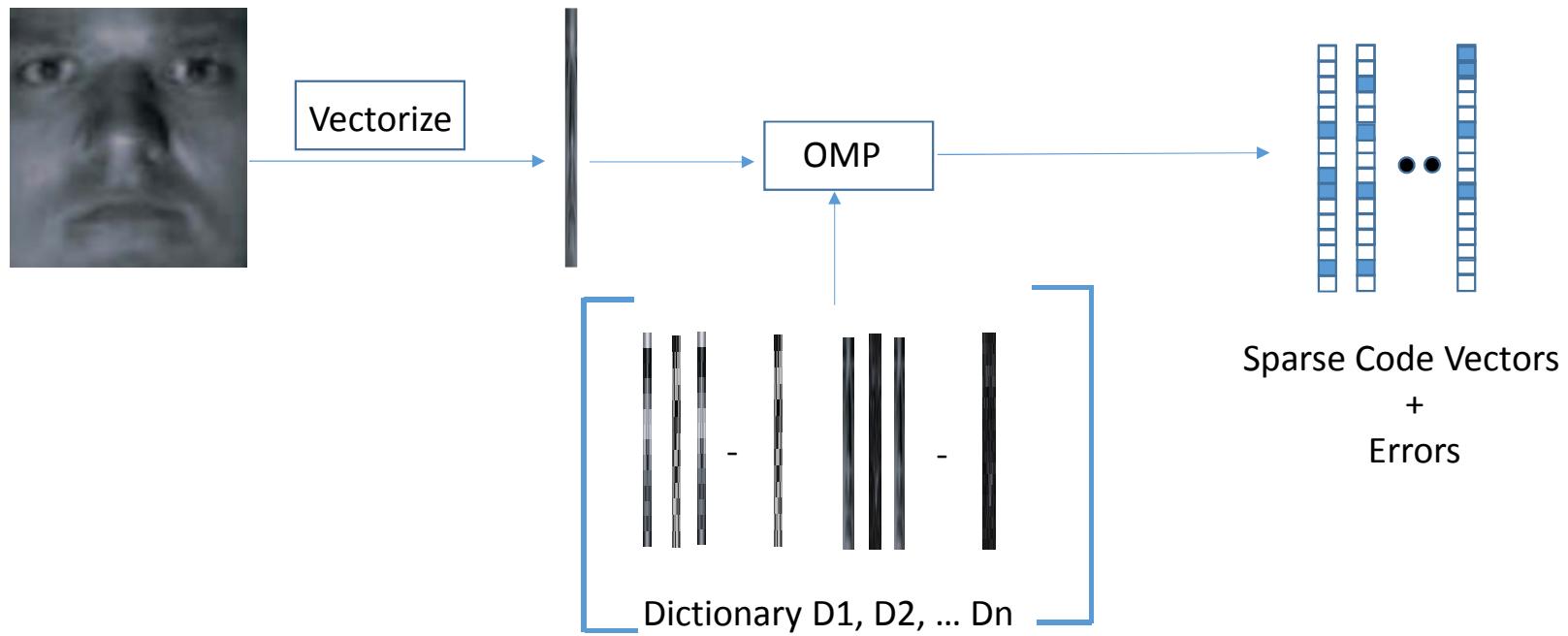
The same person or not?

Verification

# Dictionary from Faces



# Identification by Representation



Choose the Identity with Minimum Error

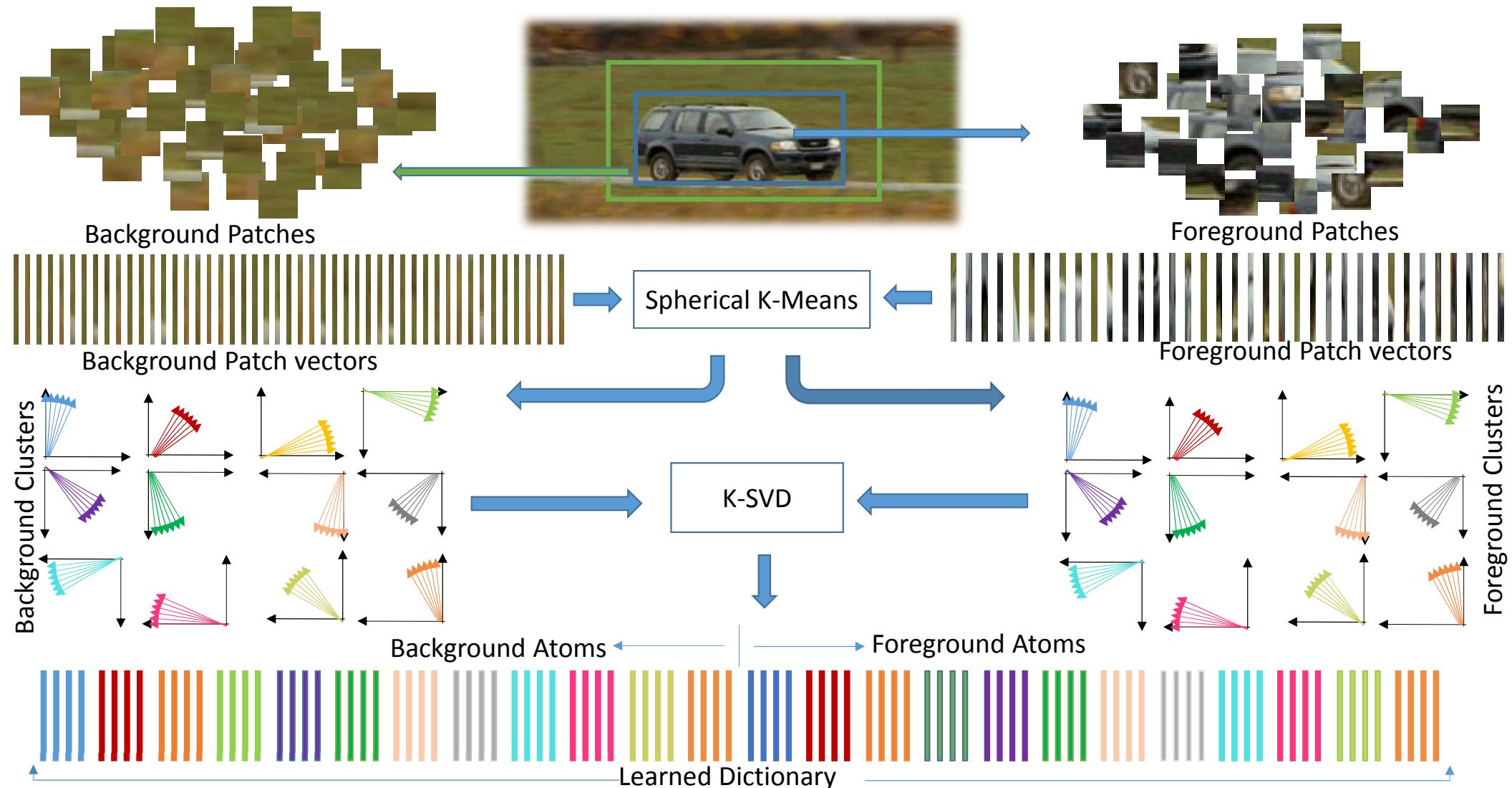


# **Single Object Tracking In Dynamic Scenes**

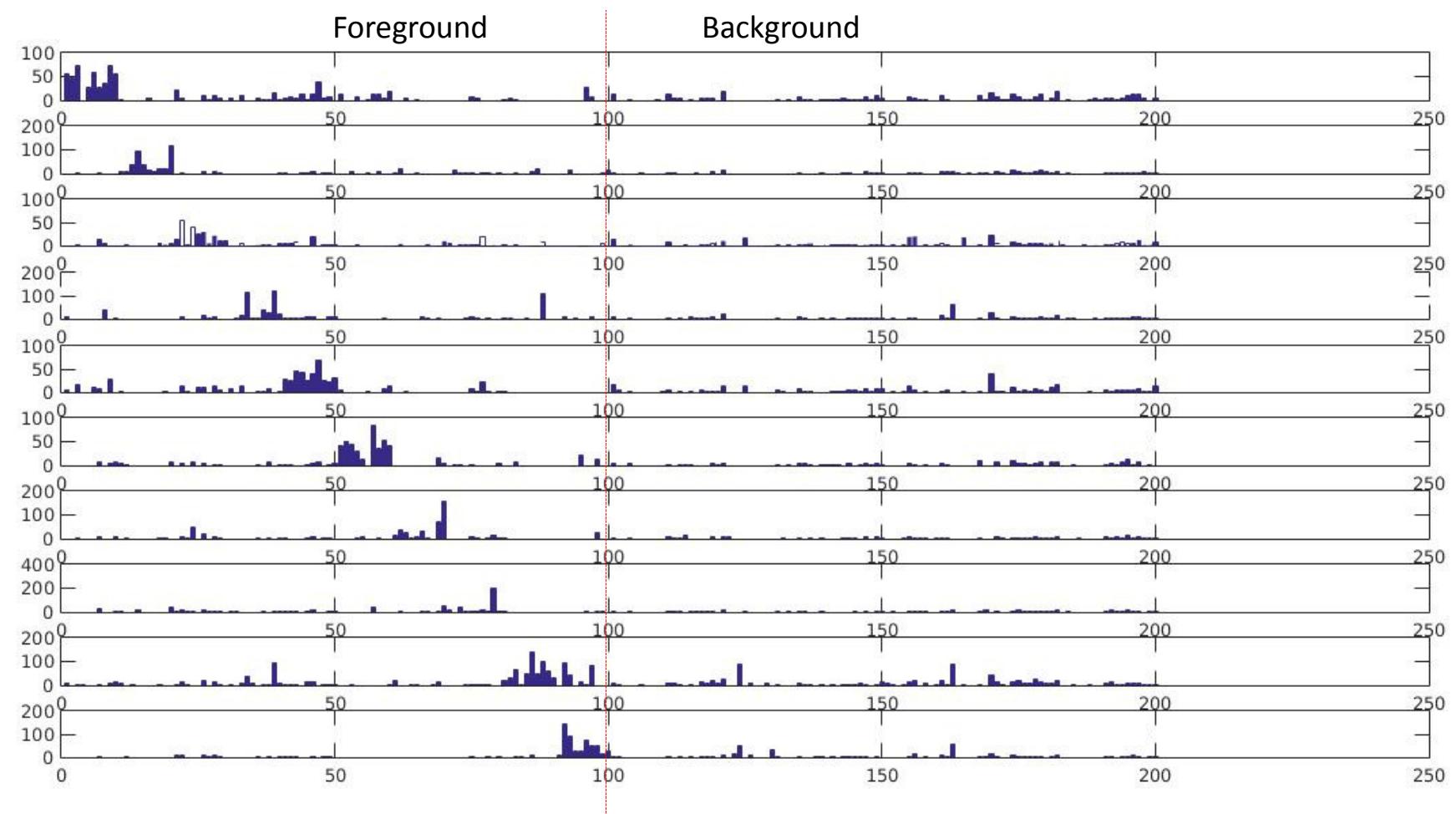
# Classification Score Weighted Histogram of Sparse Codes

- Cluster based Dictionary Learning
  - Hybrid Model
    - Sparse Code
    - Classification score
  - Localization based on Particle Filter

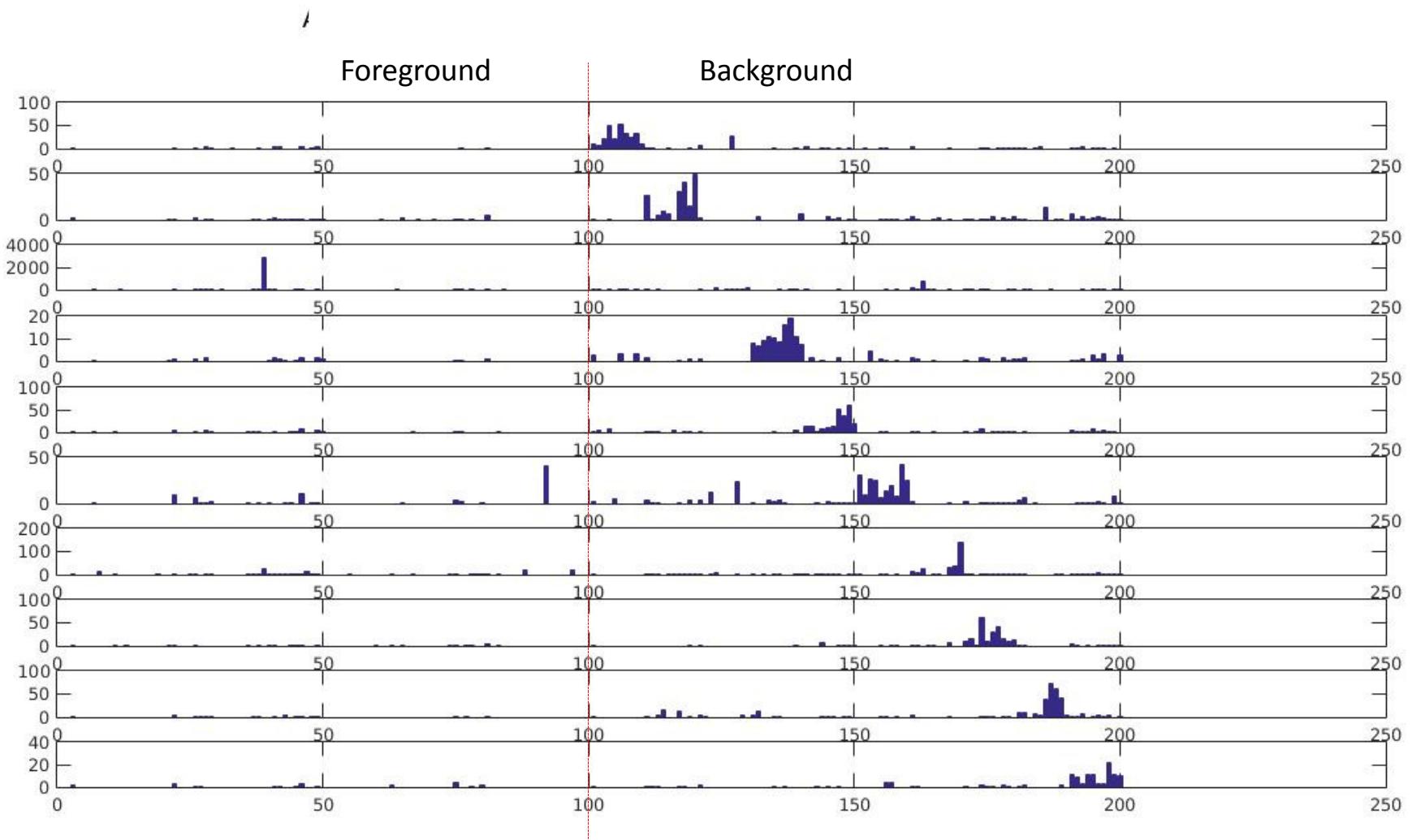
# DICTIONARY LEARNING



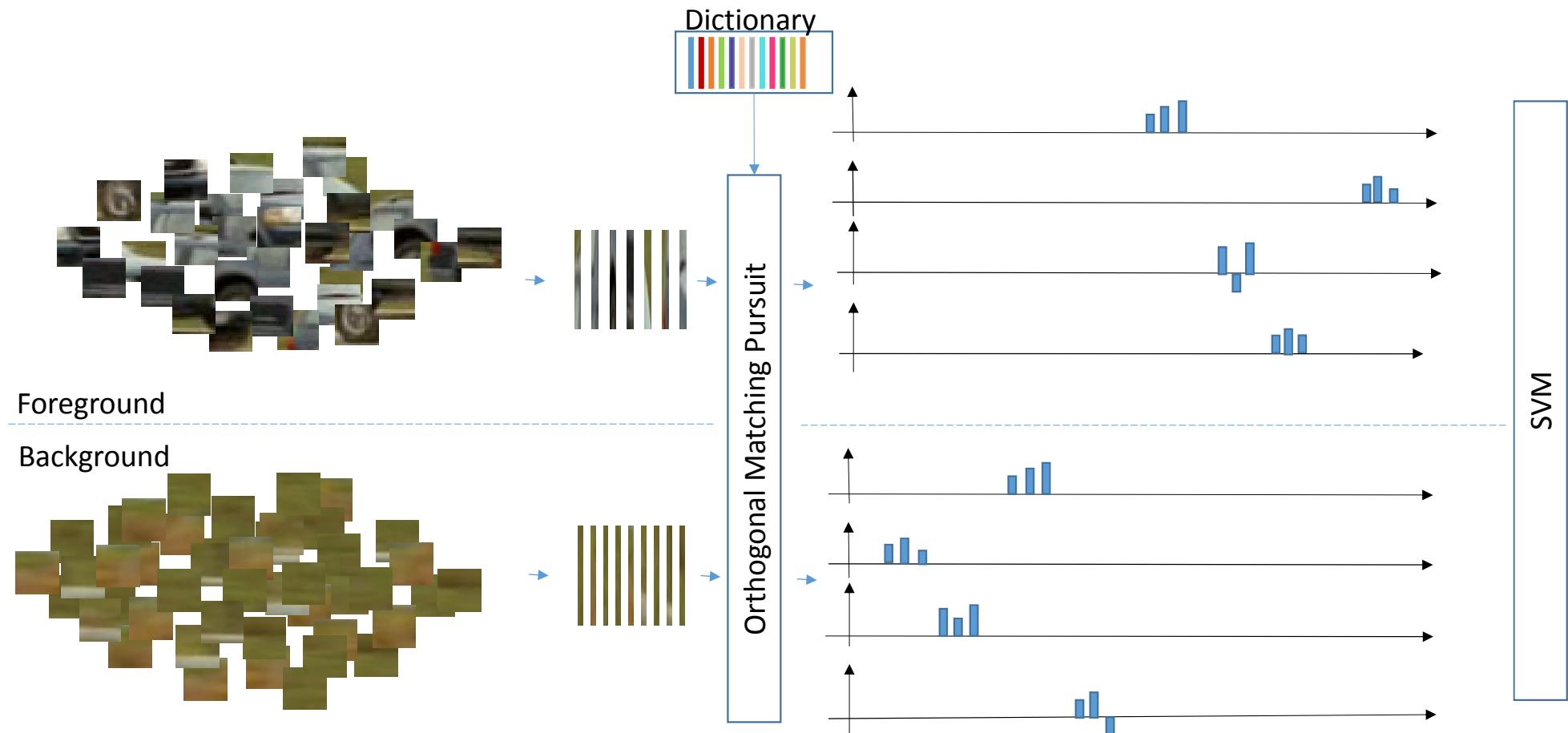
# ABSOLUTE SUM OF SPARSE CODES FOR FOREGROUND PATCHES



# ABSOLUTE SUM OF SPARSE CODES FOR BACKGROUND PATCHES



# DISCRIMINATIVE COMPONENT



# PATCH CLASSIFIER



#2



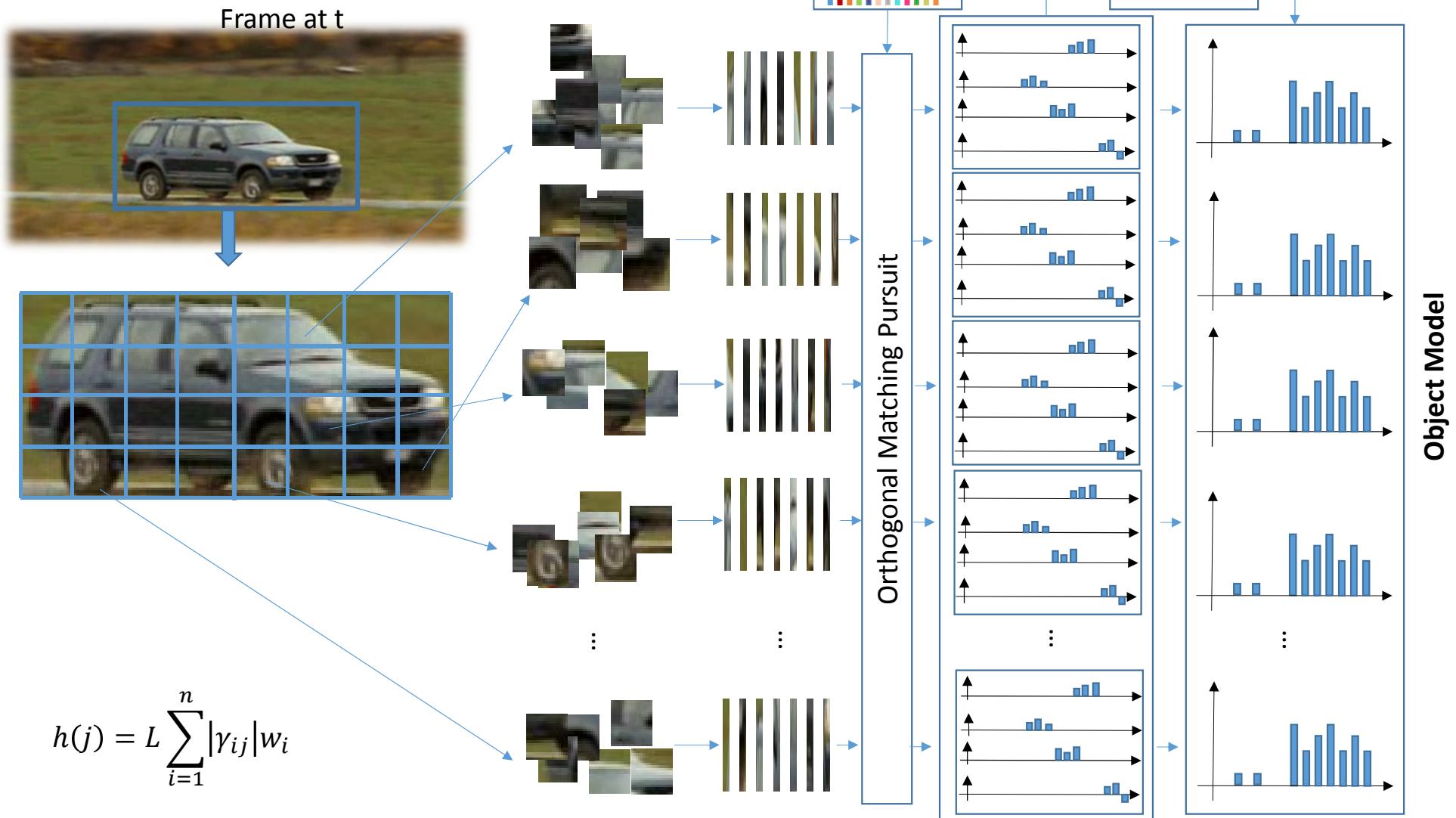
#6



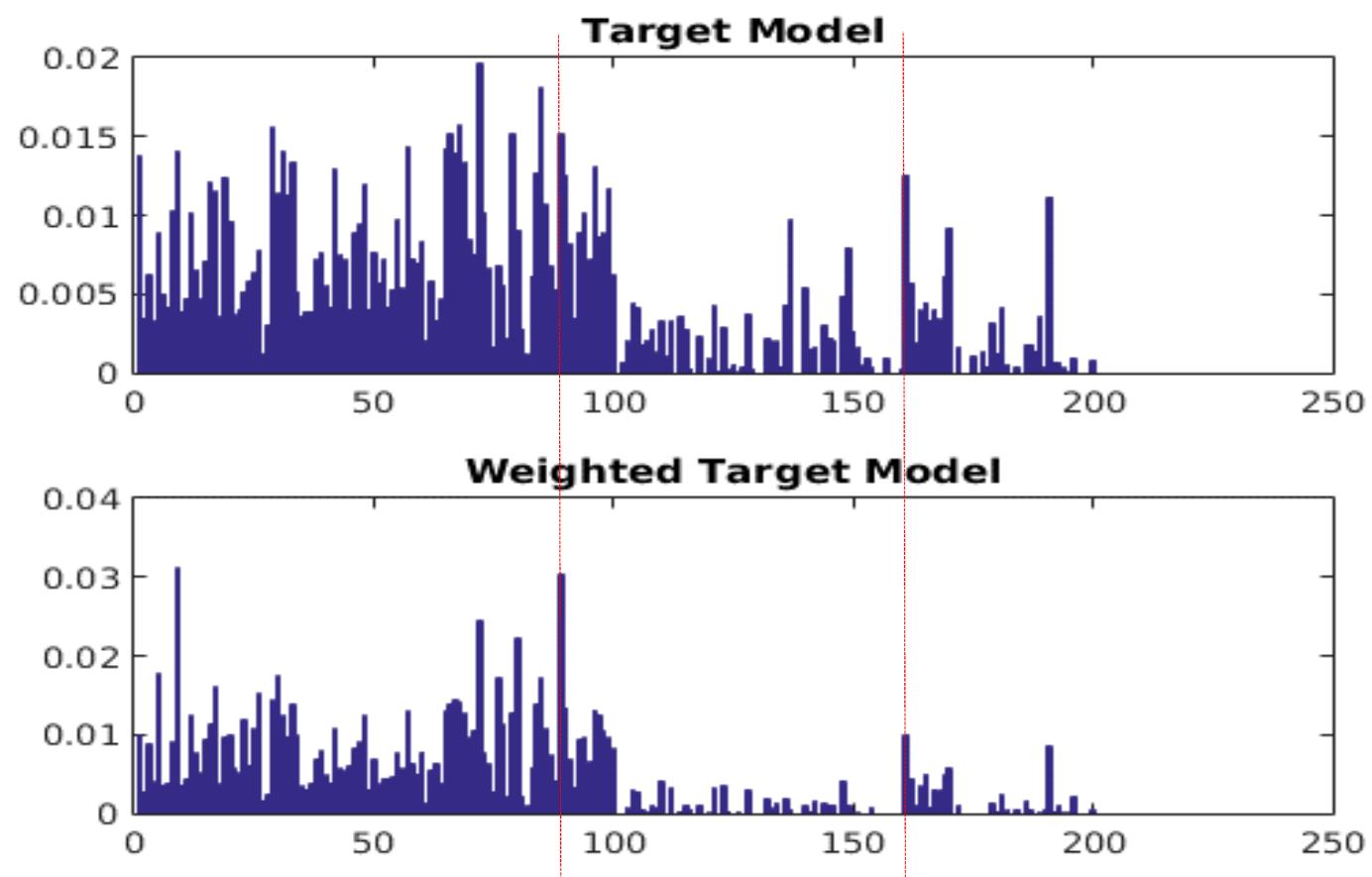
#24



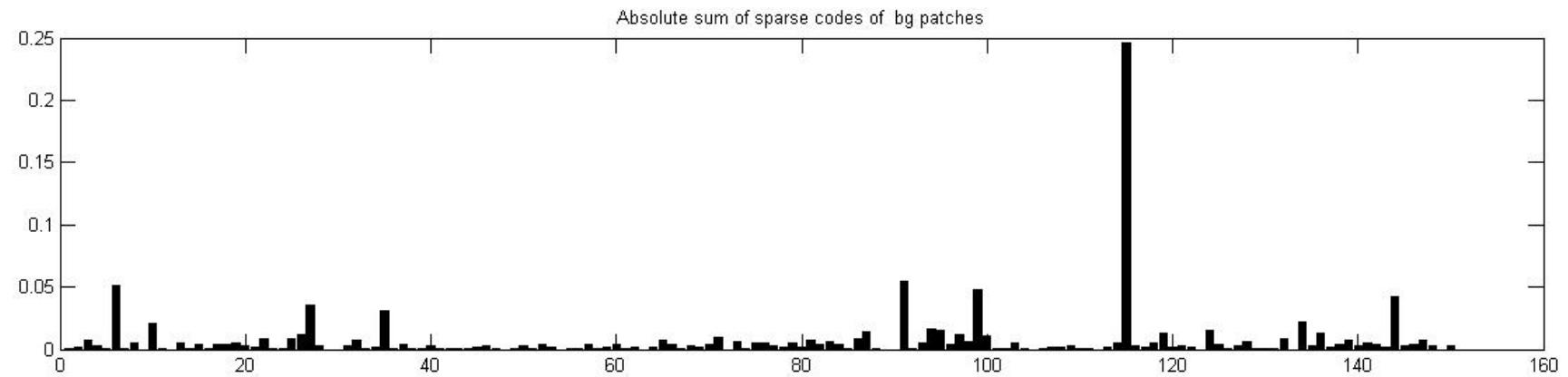
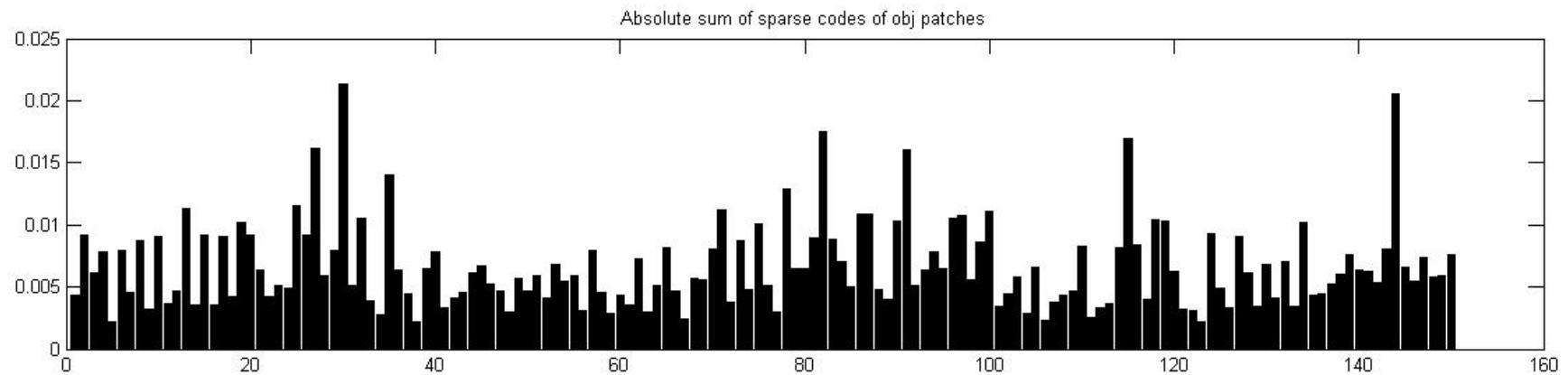
# OBJECT MODEL CREATION



# TARGET MODEL



# ATOM DISTRIBUTION USING ONLY FOREGROUND DICTIONARY



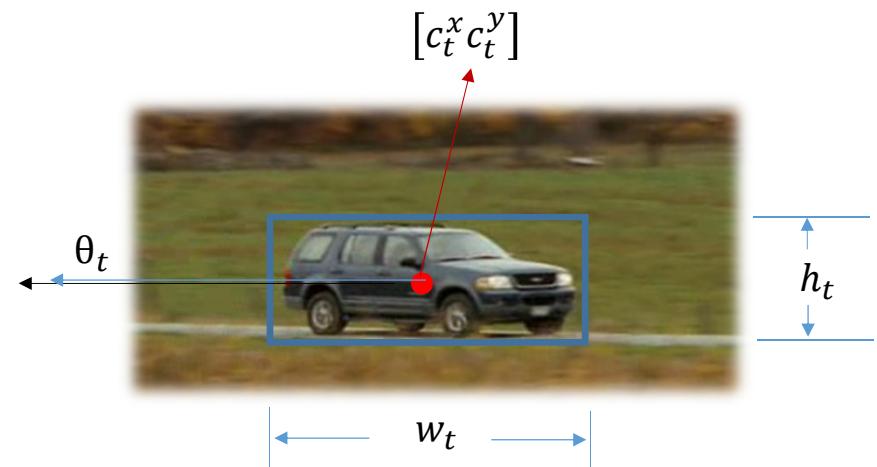
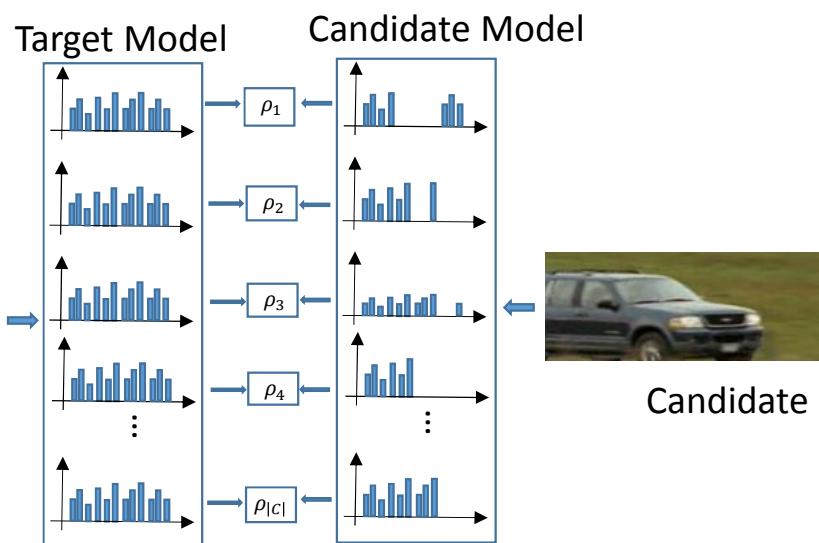
# TARGET LOCALIZATION

- Particle Filter Framework

- State vector  $s_t = [c_t^x \ c_t^y \ w_t \ h_t \ \theta_t]$

- Likelihood : Average Bhattacharyya Similarity

- $p(y|s_t) = \frac{1}{|C|} \sum_{i=1}^{|C|} \rho_i$



$c_t^x$  : x co-ordinate of the bounding box centroid

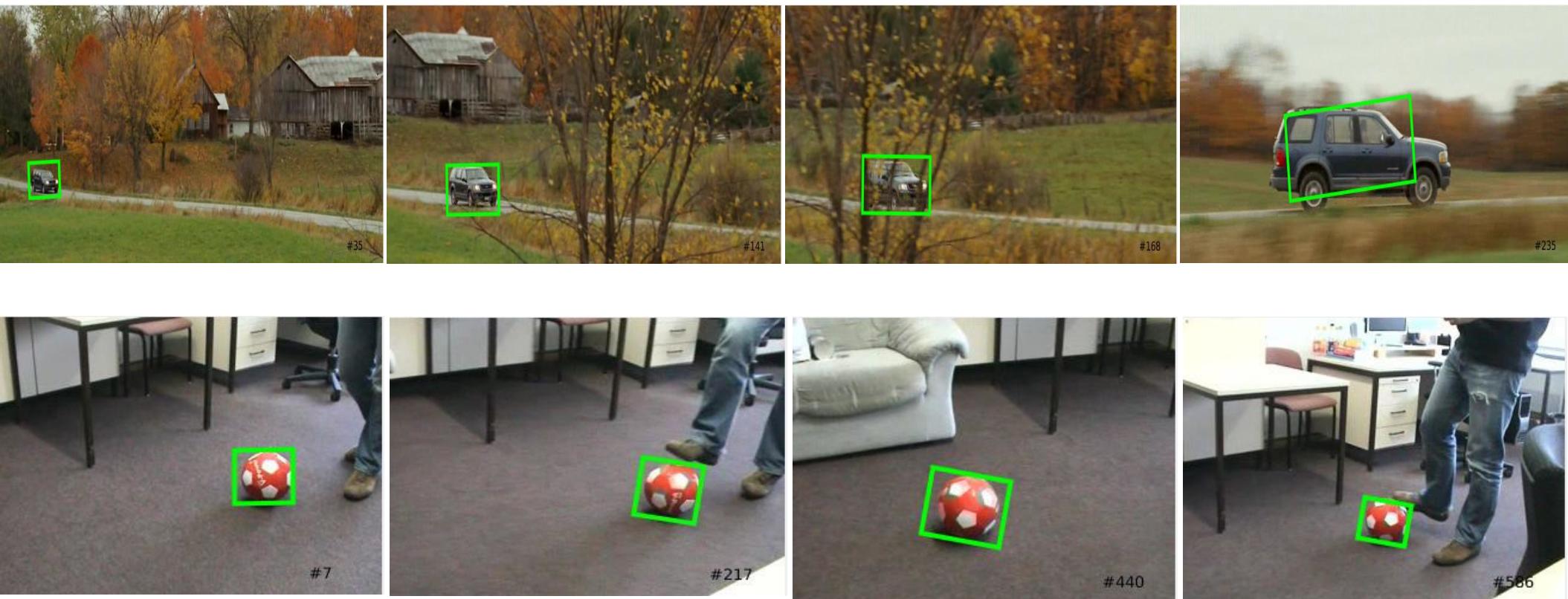
$c_t^y$  : y co-ordinate of the bounding box centroid

$w_t$  : width of the bounding box

$h_t$  : height of the bounding box

$\theta_t$  : orientation of the bounding box

# EXPERIMENTAL RESULTS



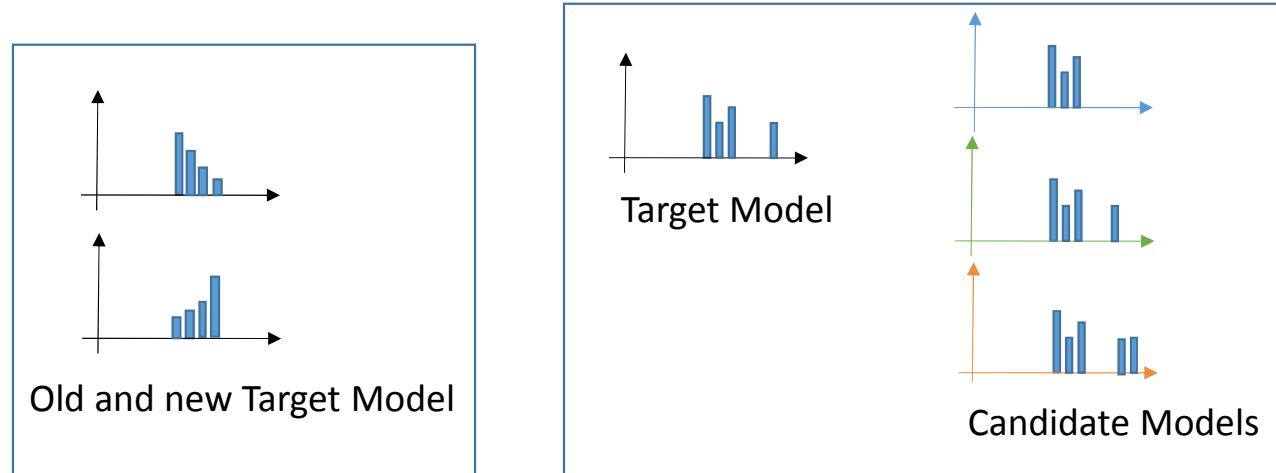
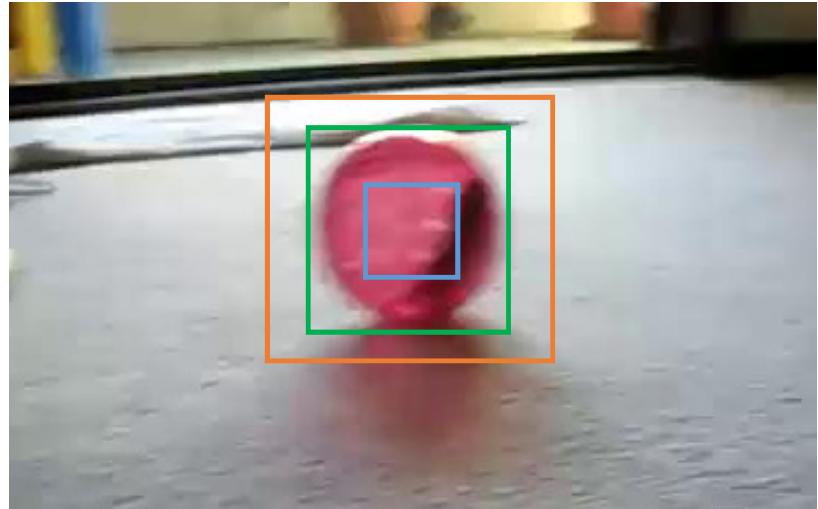
# EXPERIMENTAL RESULTS



# DISCUSSION

- Model
  - Target and Candidate Model
- Update
  - Dictionary
  - Target Model
  - Classifier
- Problem with scaling
- Ordering of atoms important
  - Makes update difficult

$$\rho = \sum_{j=1}^m \sqrt{h^t(j)} \sqrt{h^c(j)}$$



# Thank You

