

Automatic Single-Image-Based Rain Streaks Removal via Image Decomposition

报告人：陈丽琴

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background

- I Significance

Computer vision system is easily influenced by the bad outdoor weather. Moreover, the bad weather is a challenge to our vision, such as driving on rainy days, film directors must remake some movie clips due to the bad weather.

II The physical property of rain

commonly used mathematical model of rainy

$$I_{in} = (1 - \alpha)I_b + \alpha I_r \quad (0 \leq \alpha \leq 1)$$

background

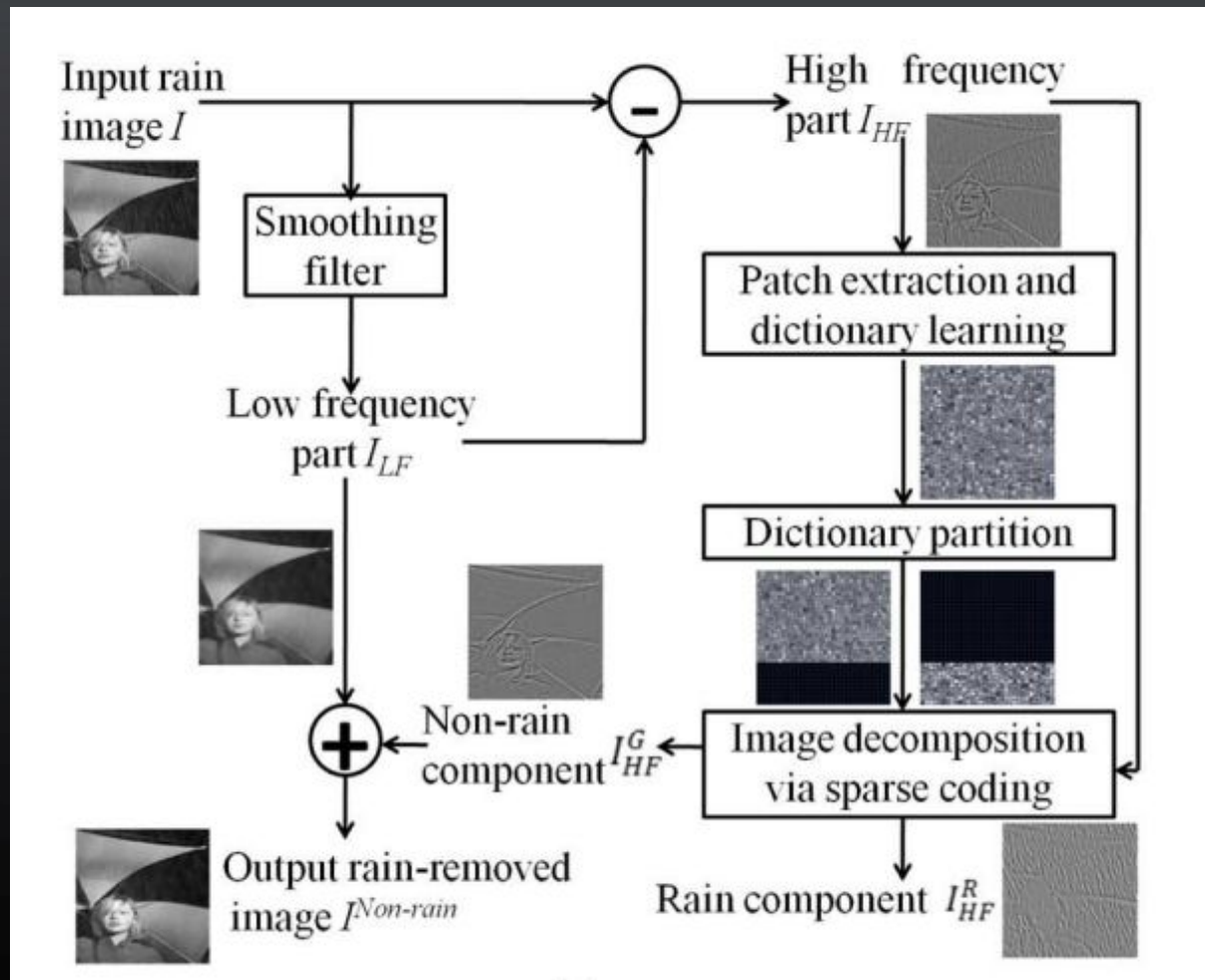


Rainy image

$$I_r > I_b$$

**the proposed rain
streak removal method**

Proposed method

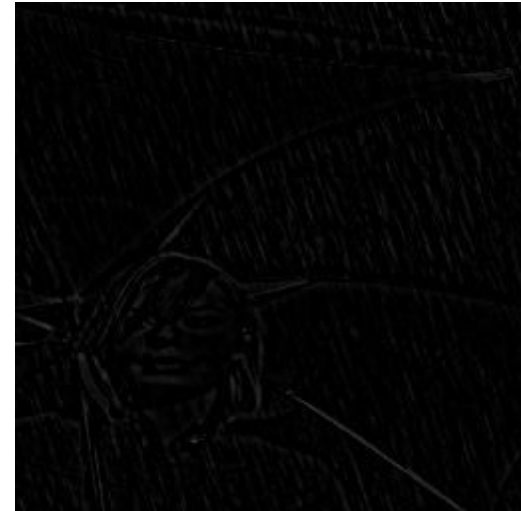


Block
diagram of
the proposed
rain streak
removal
method

Proposed method

- 1 apply the bilateral filter to obtain the LF part and HF part

$$I = I_{HF} + I_{LF}$$



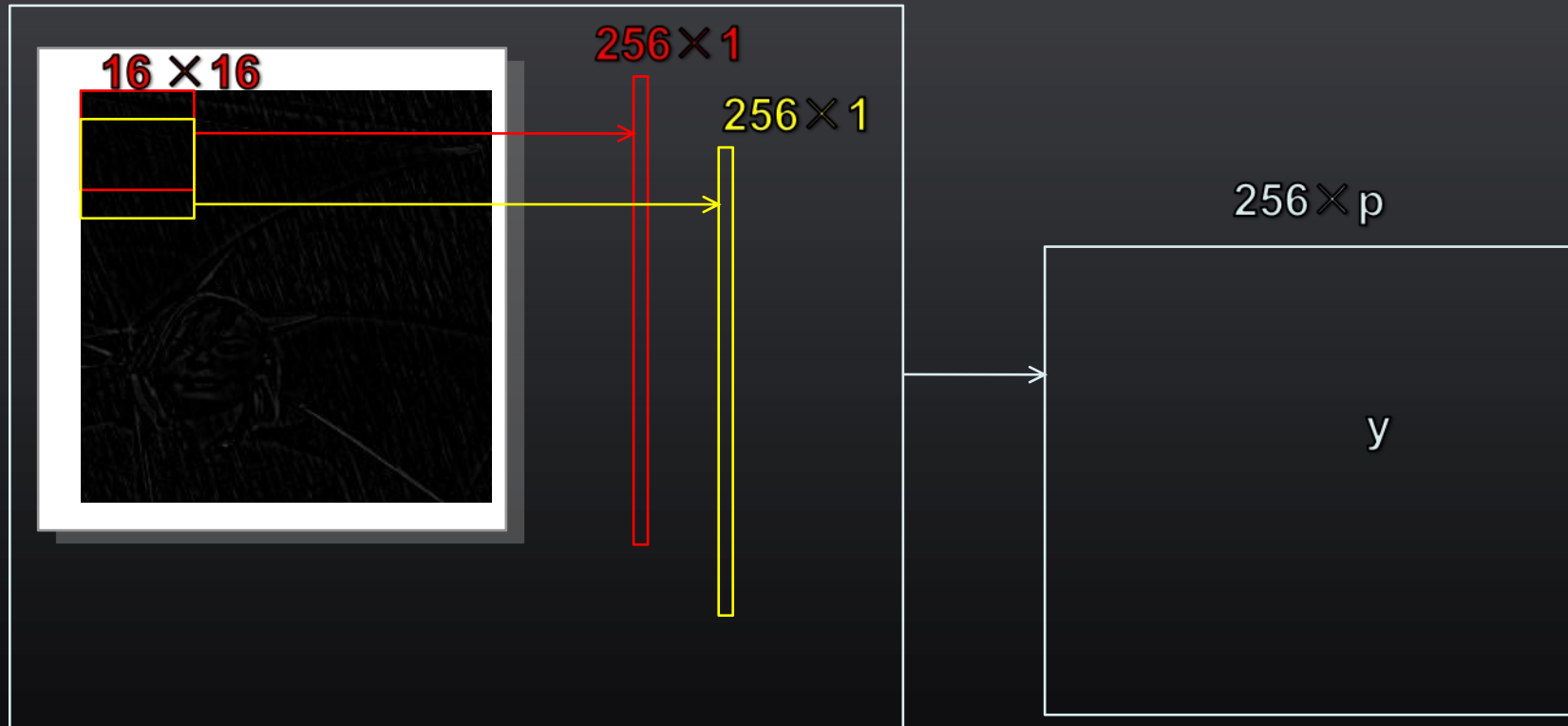
Proposed method



HF part

Proposed method

2 Extract a set of image patches from HF part



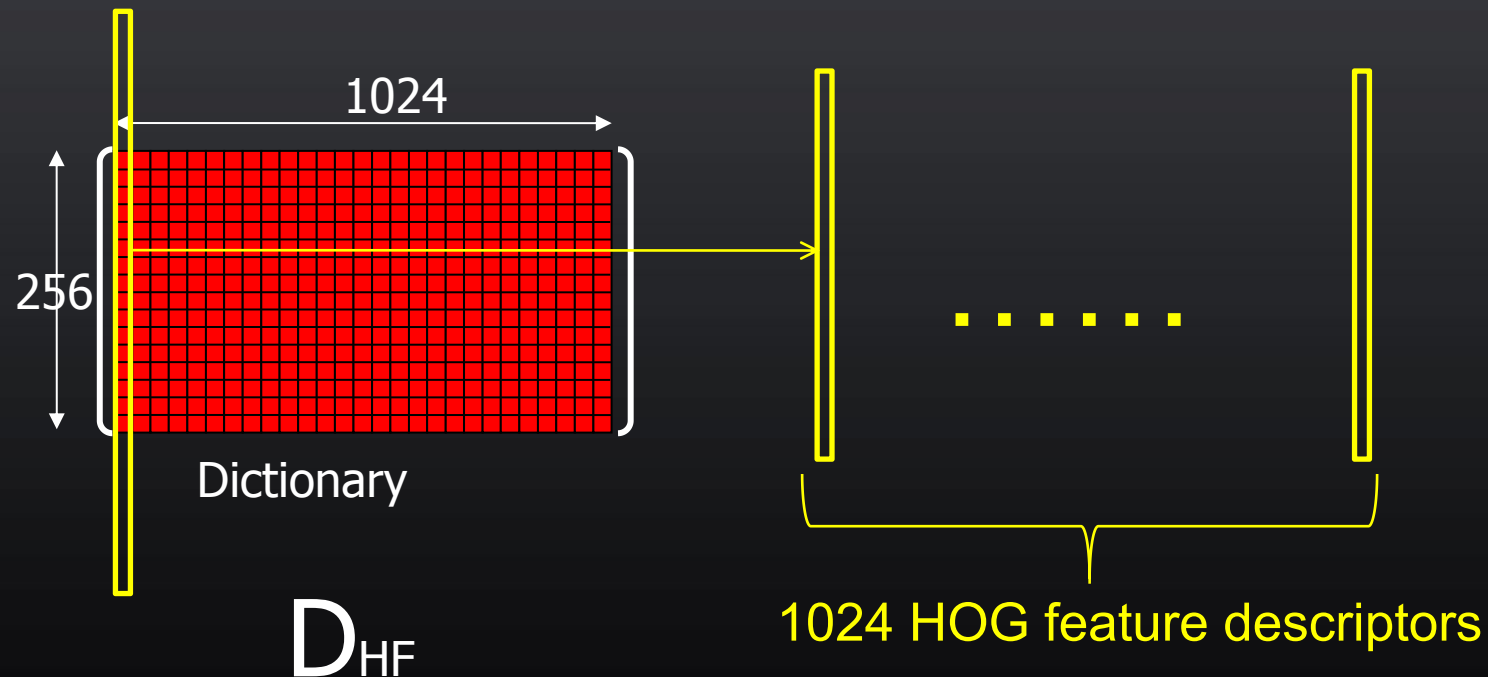
Proposed method

Online dictionary learning



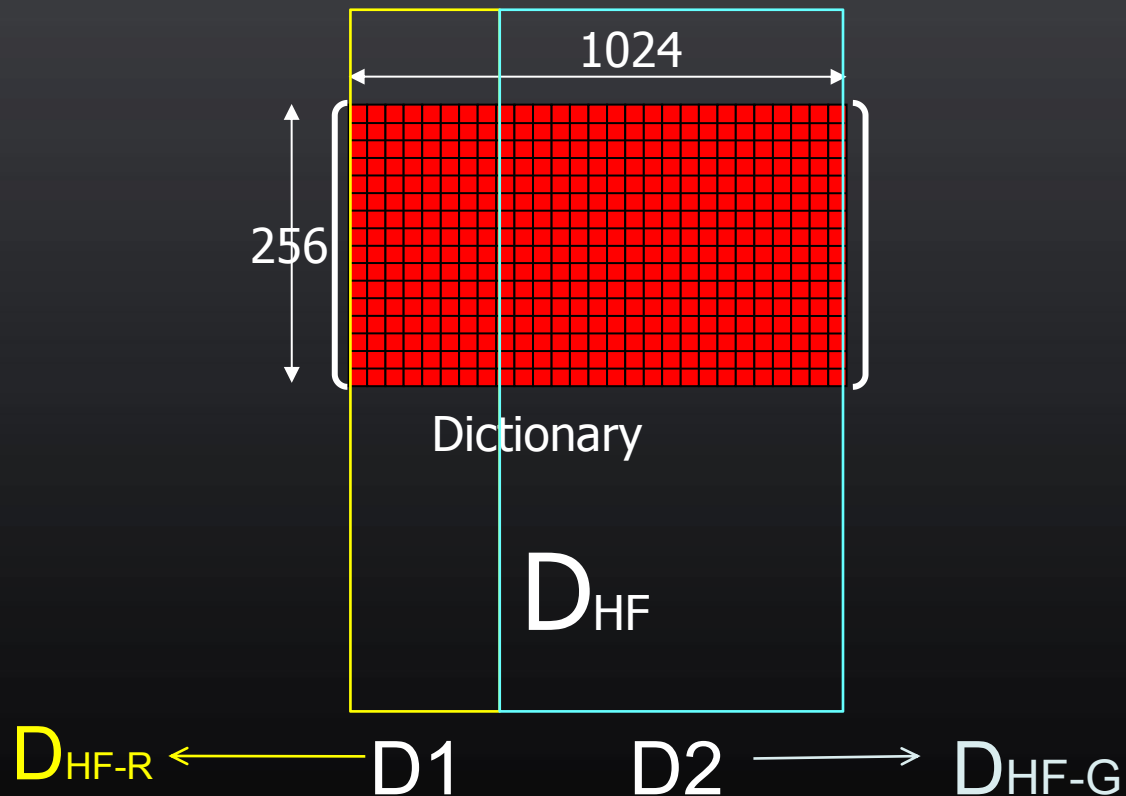
Proposed method

3 Extract HOG feature descriptor for each atom in D_{HF} (Histograms of oriented gradients)



Proposed method

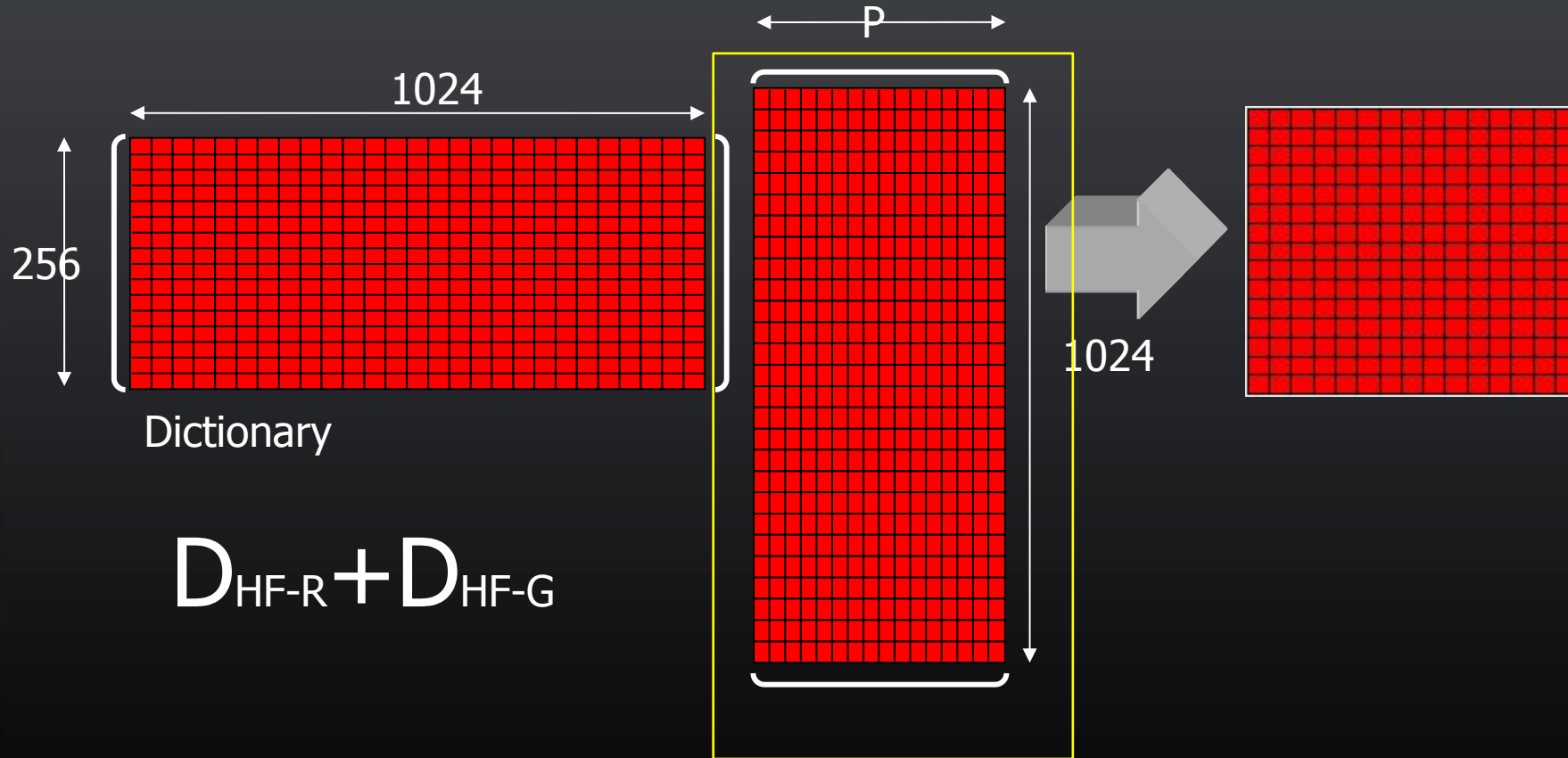
- 4 Apply K-means algorithm to classify all of the atoms into two cluster based on their HOG feature descriptors



Identify one of two clusters as “rain sub-dictionary,” the other one as “geometric sub-dictionary”

Proposed method

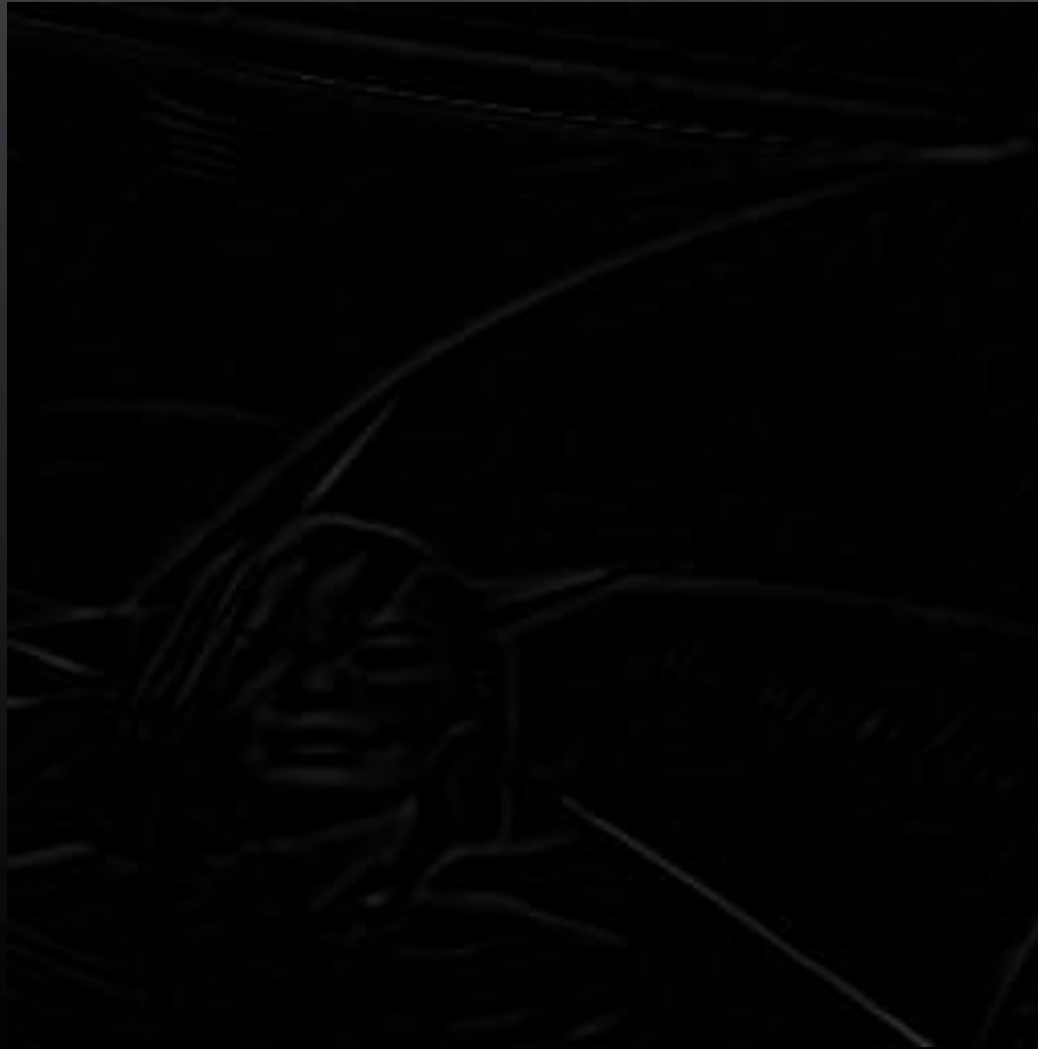
5 Image decomposition via sparse coding(OMP)



更新 Θ

Proposed method

5 Reconstruct each patch to recover geometric component of I_{HF}



Proposed method

$$I^{Non_Rain} = I_{LF} + I_{HF}^G.$$



I^{Non_Rain}



Original image