

Keyword-based image re-coloring

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At the start



Sunset



Sunset



But



Sky



Strawberry



Red



Can we do better with
deep learning?

Recoloring a strawberry



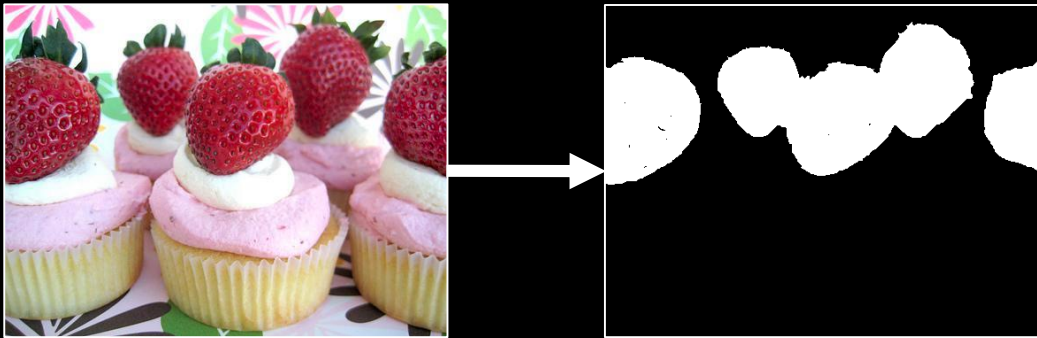
Recoloring a strawberry

- Where is it?



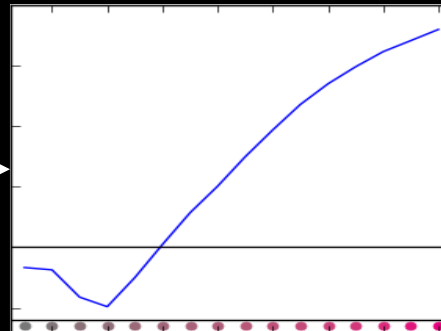
Recoloring a strawberry

- Where is it?



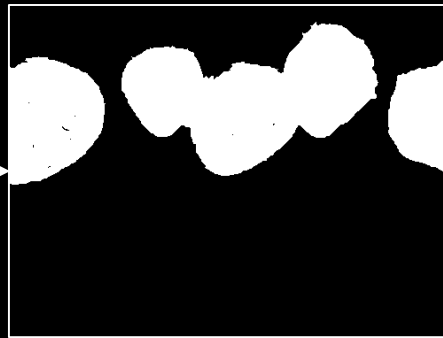
- What colors should it be?

Strawberry



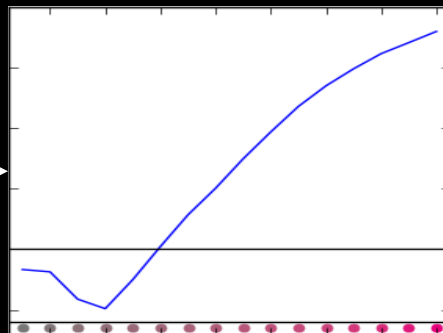
Recoloring a strawberry

- Where is it?

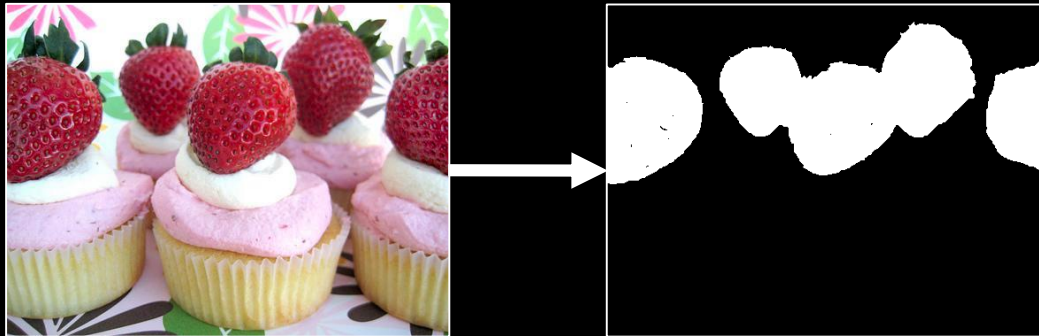


- What colors should it be?

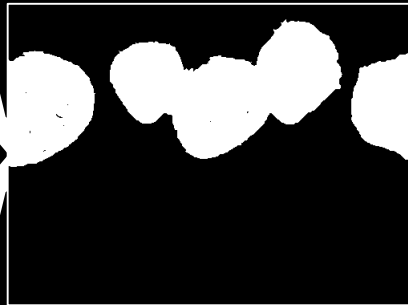
Strawberry



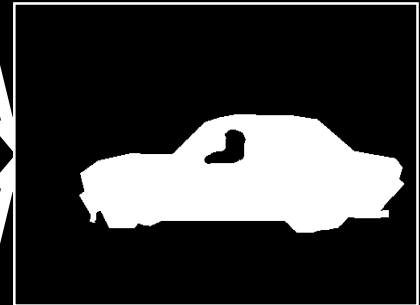
Where is the keyword?



Keyword-based segmentation



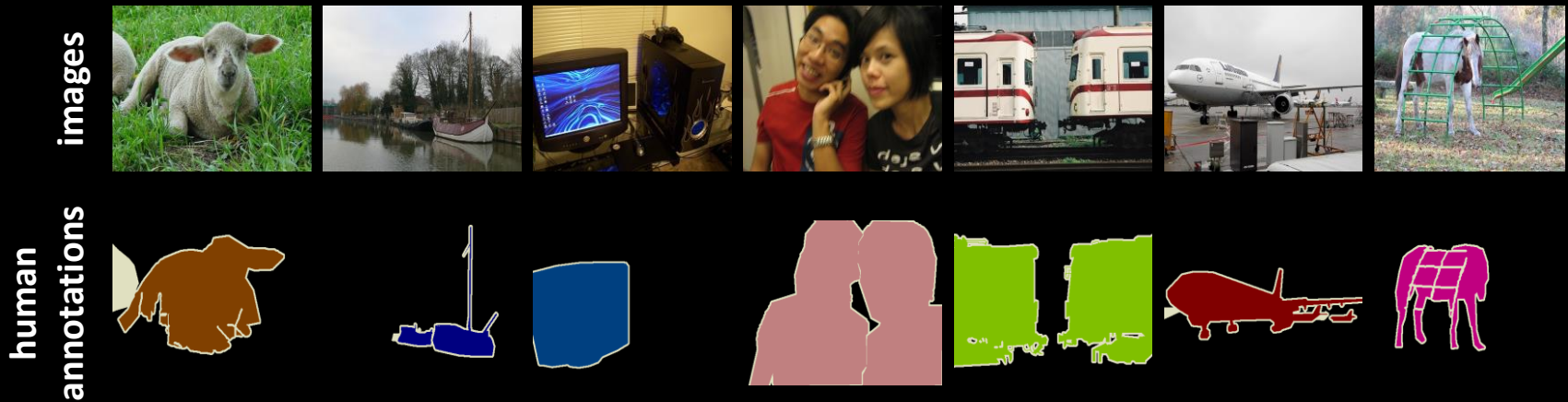
Strawberry



Car

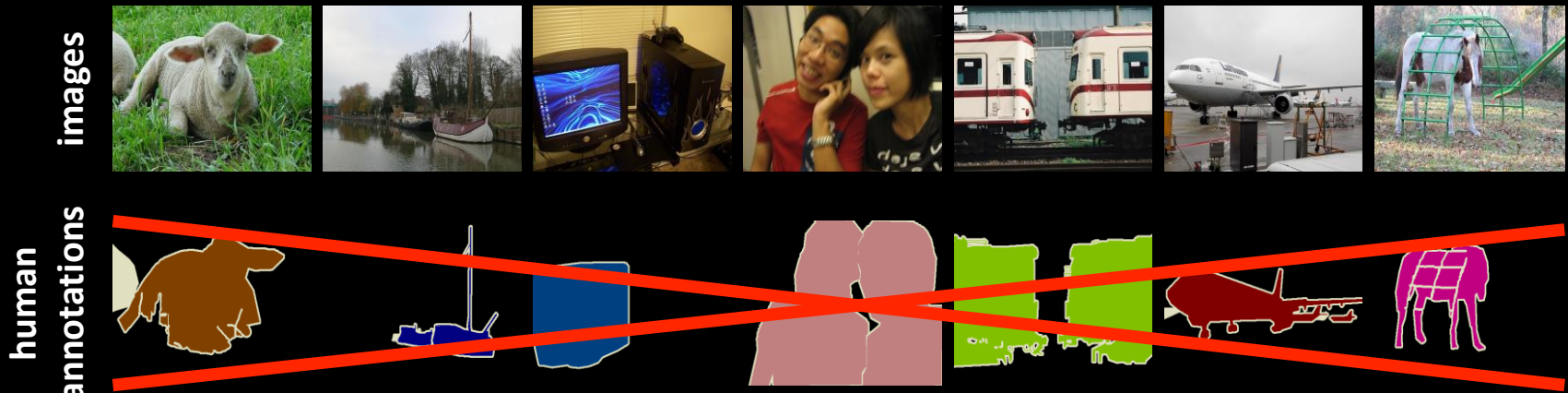
Semantic Segmentation

- Learning segmentation from annotations



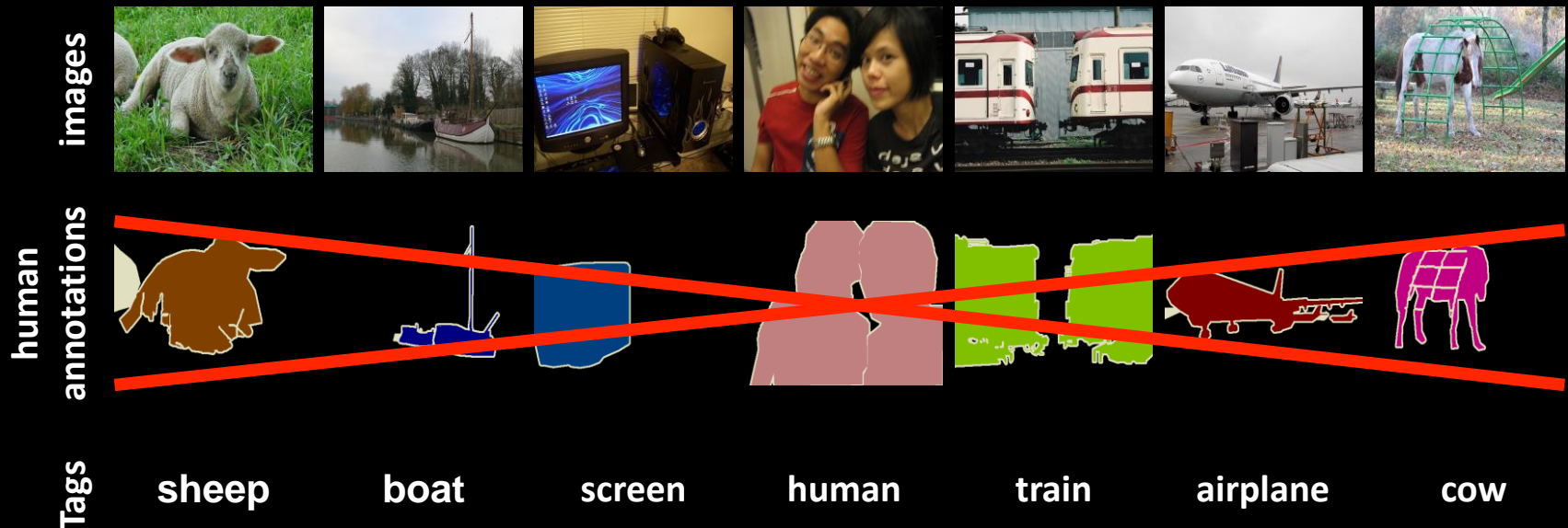
Semantic Segmentation

- Learning segmentation without human annotations



Goal

- Learning segmentation without human annotations



- Using image tags instead!

Web image sets

*“keyword” on white
background*

W_{car}



$W_{airplane}$



Web image sets

*“keyword” on white
background*

W_{car}



$W_{airplane}$



Automatic masks



Saliency and
Conditional Random
Fields [1]

Web image sets

W_{car}



$W_{airplane}$



C



Web image sets

W_{car}



$W_{airplane}$



C



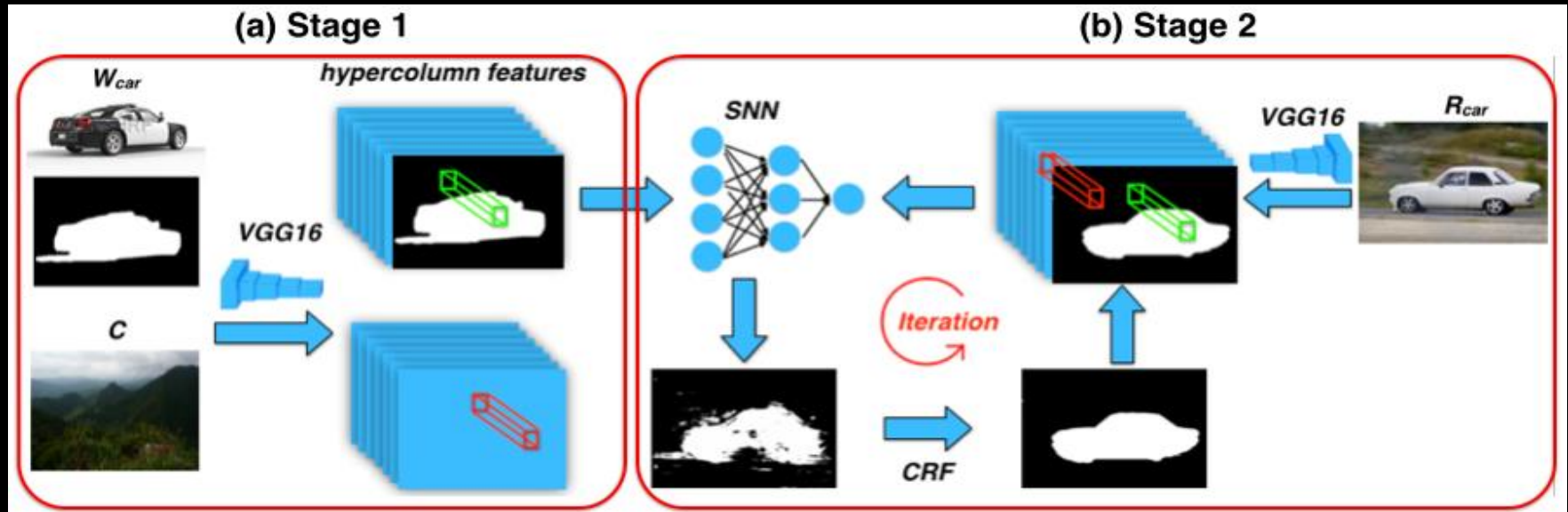
R_{car}



$R_{airplane}$



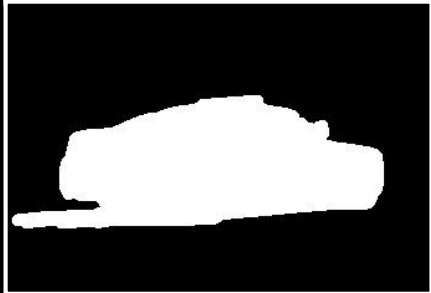
Method



- Stage 1: Learning to differentiate concept/background
- Stage 2: Refinement on natural images

Stage 1

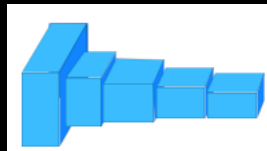
W_{car}



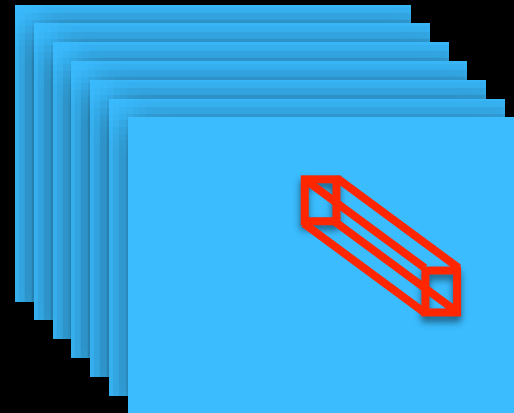
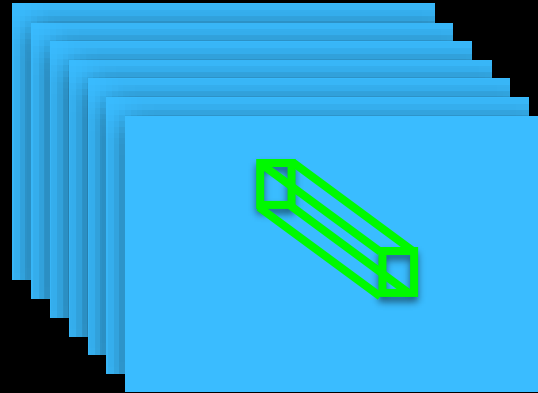
C



VGG16



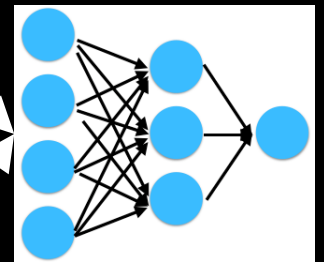
hypercolumn features

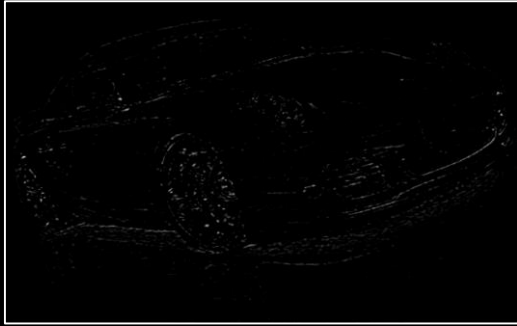


positive

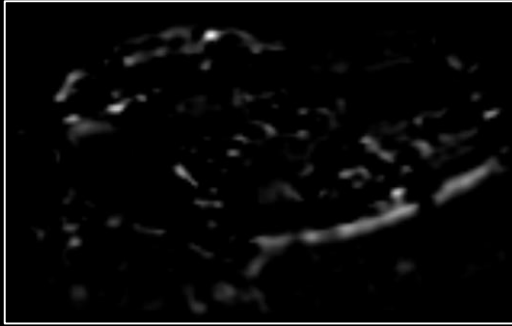
negative

SNN

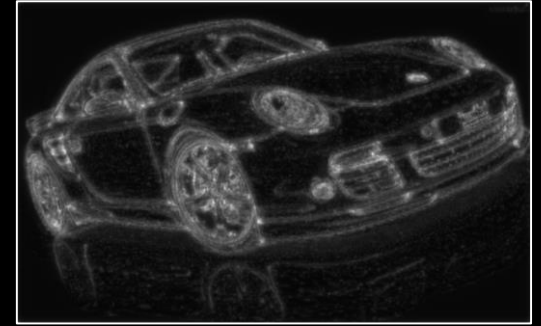




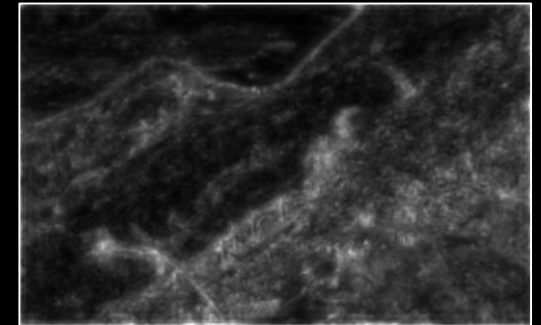
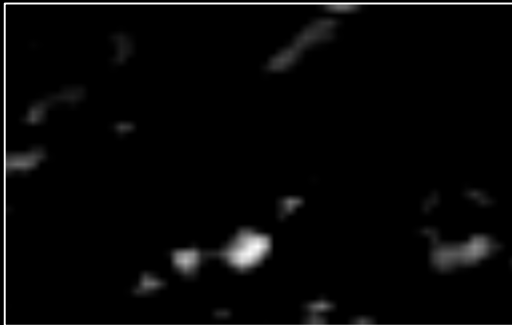
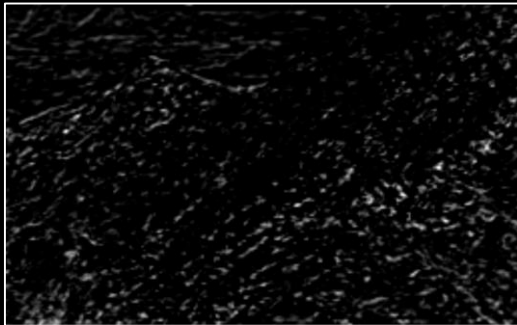
Early feature map



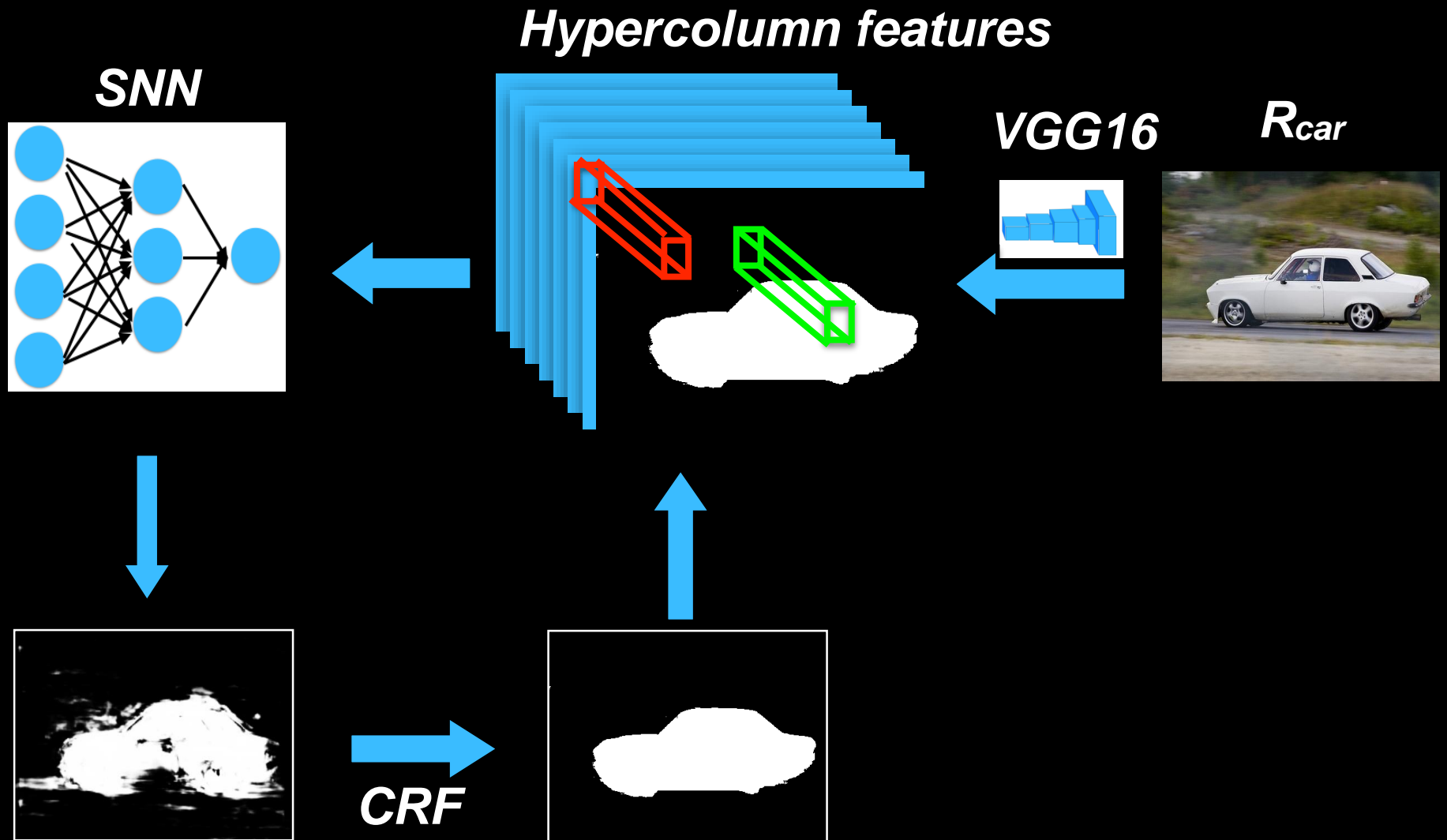
Deep feature map



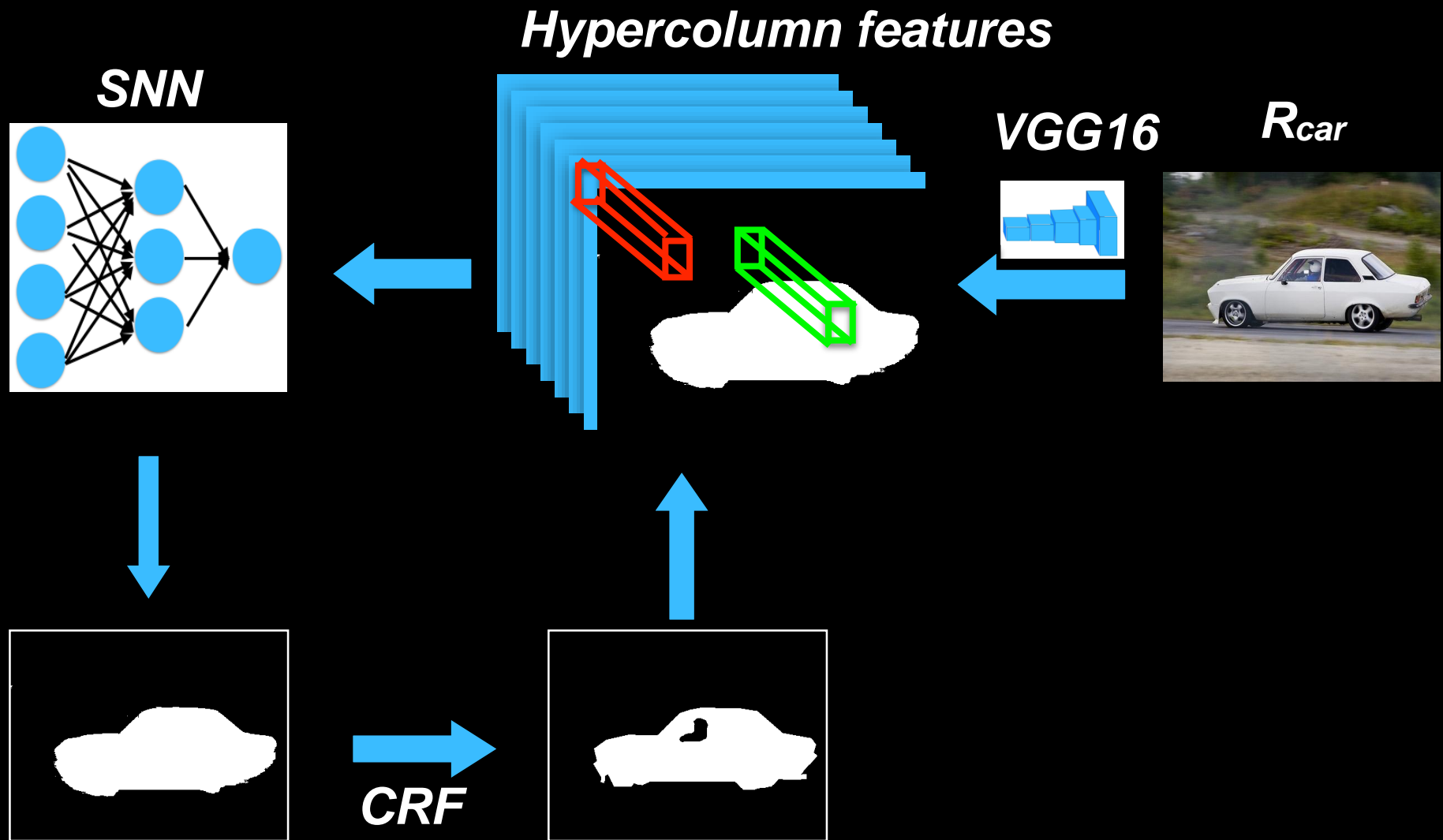
Hypercolumn mean



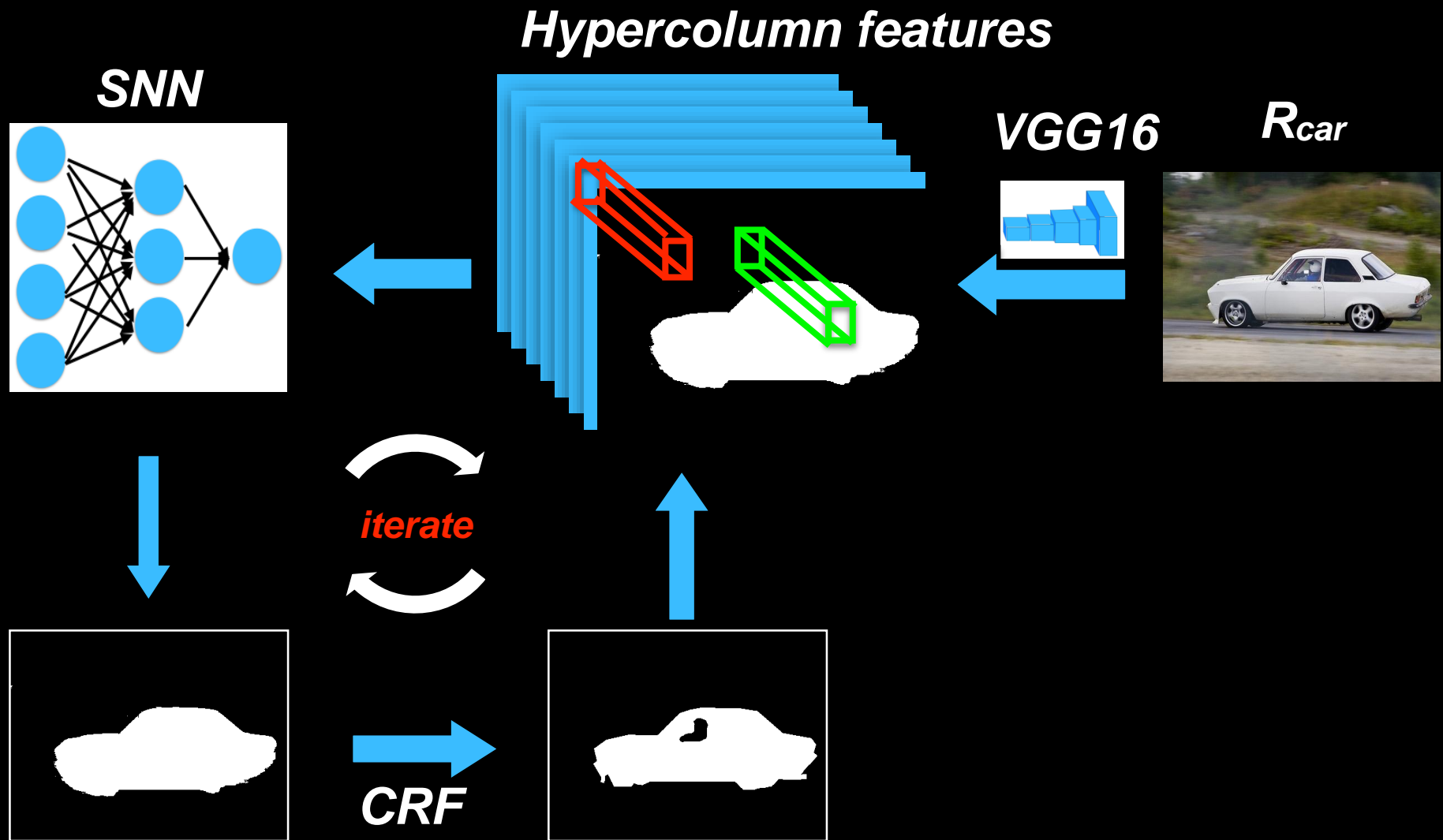
Stage 2



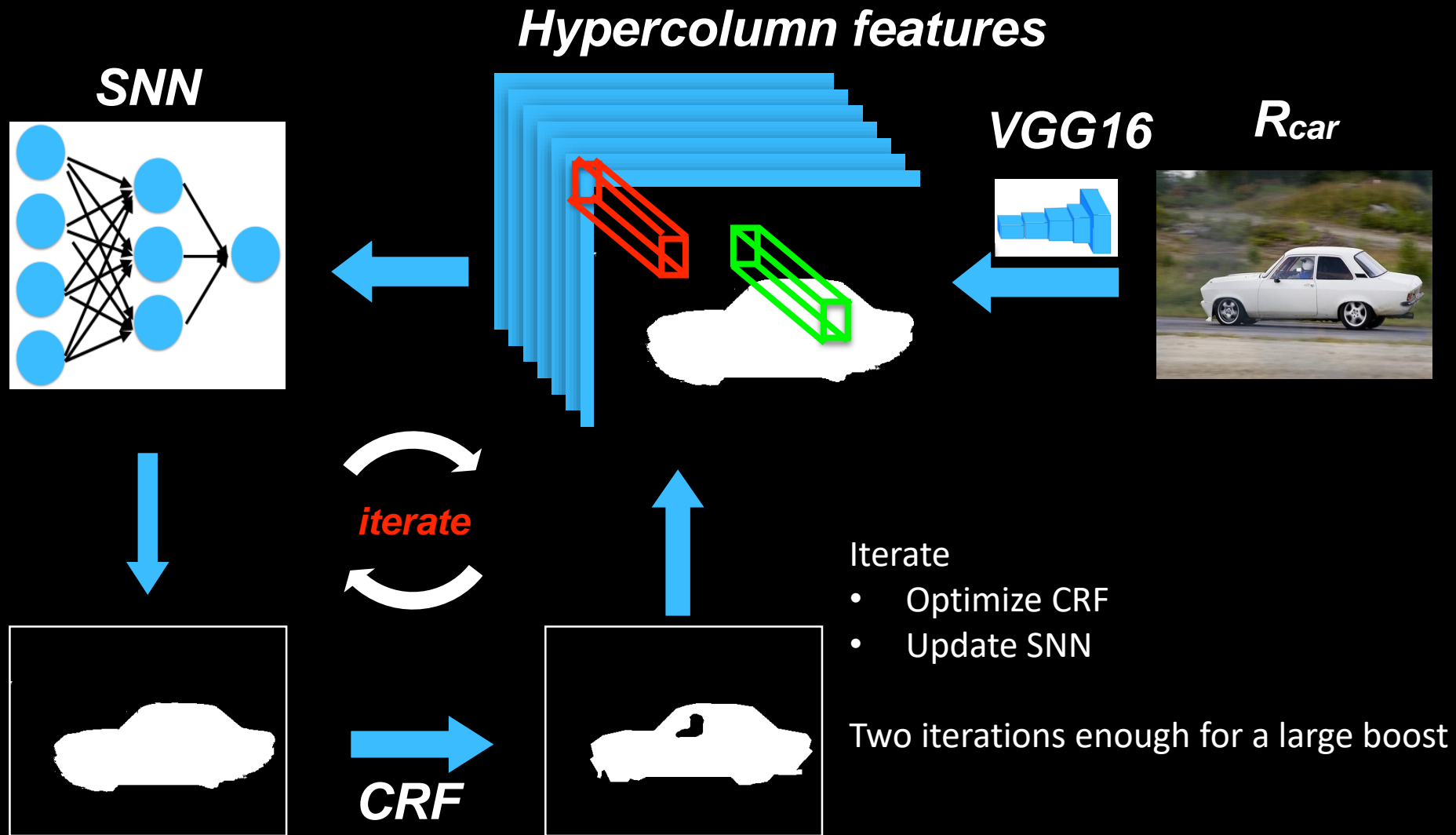
Stage 2



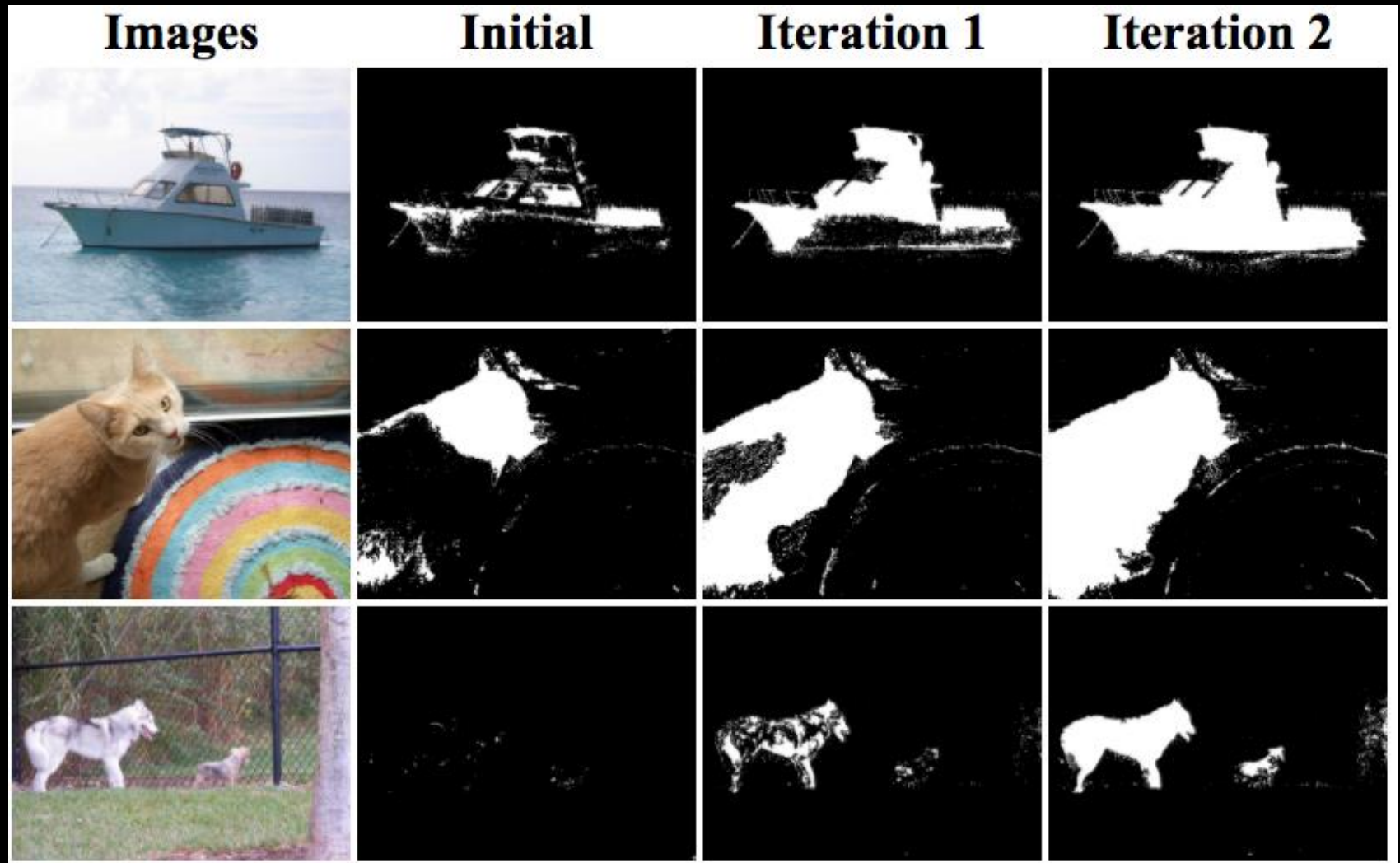
Stage 2



Stage 2



Labels evolution



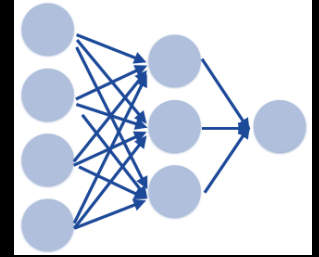
Keyword-SNN pairs



Car



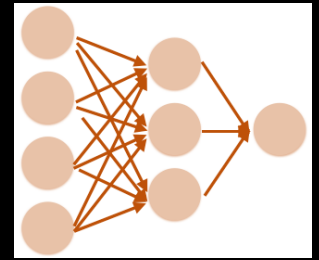
SNN_{car}



Airplane



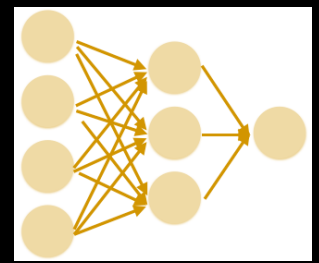
SNN_{airplane}



Horse



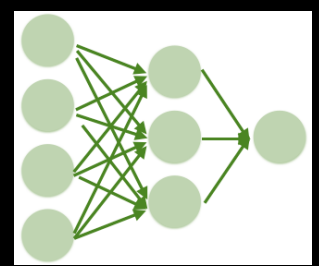
SNN_{horse}



Strawberry

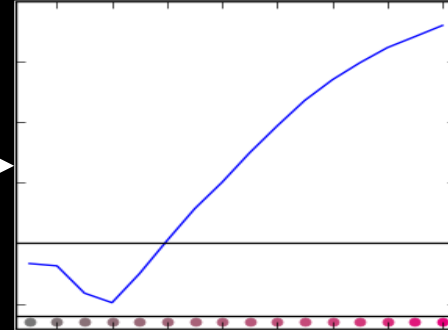


SNN_{strawberry}



What colors to assign/modify?

Strawberry



Keyword-based re-coloring



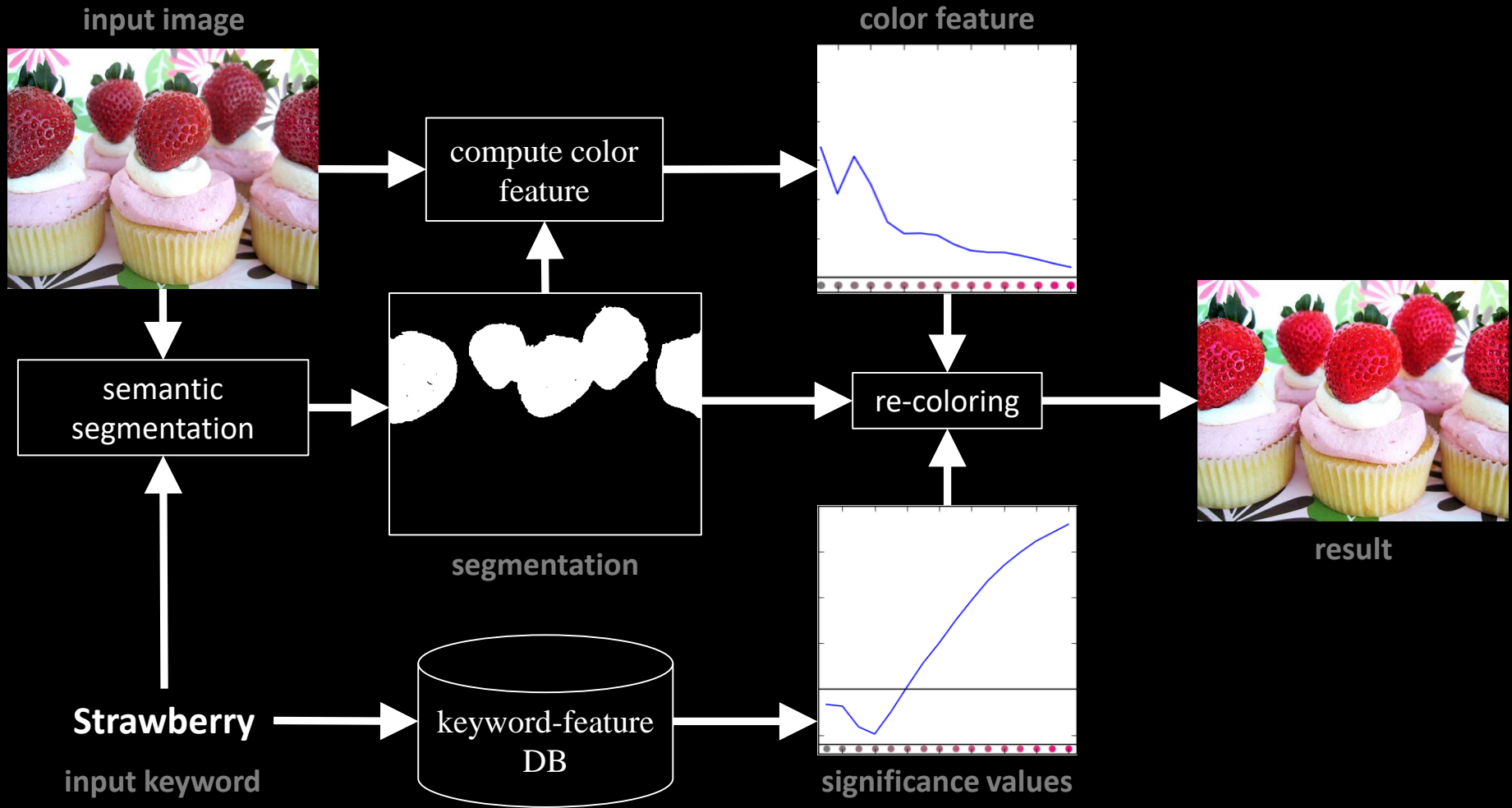
Strawberry



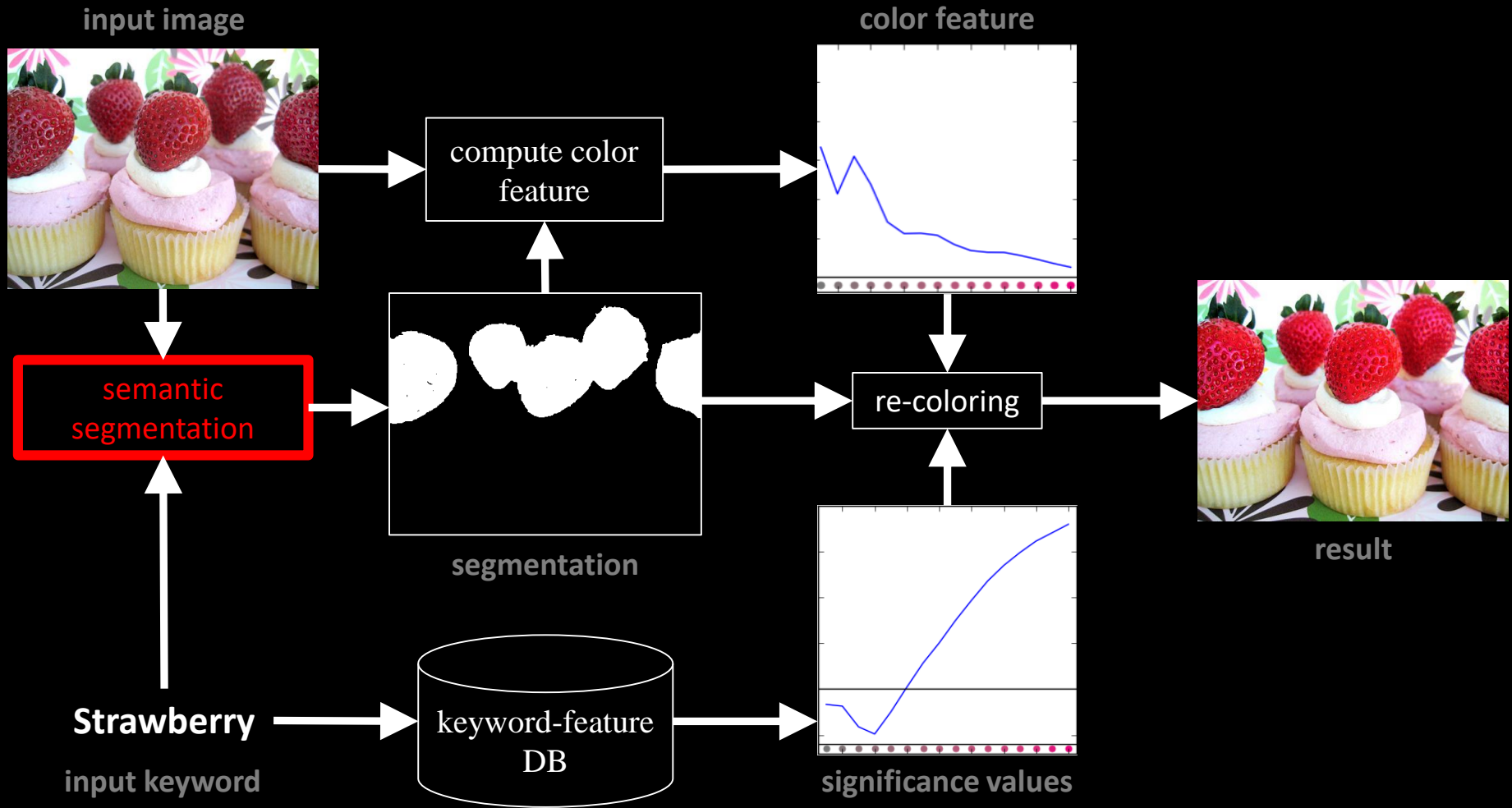
Banana



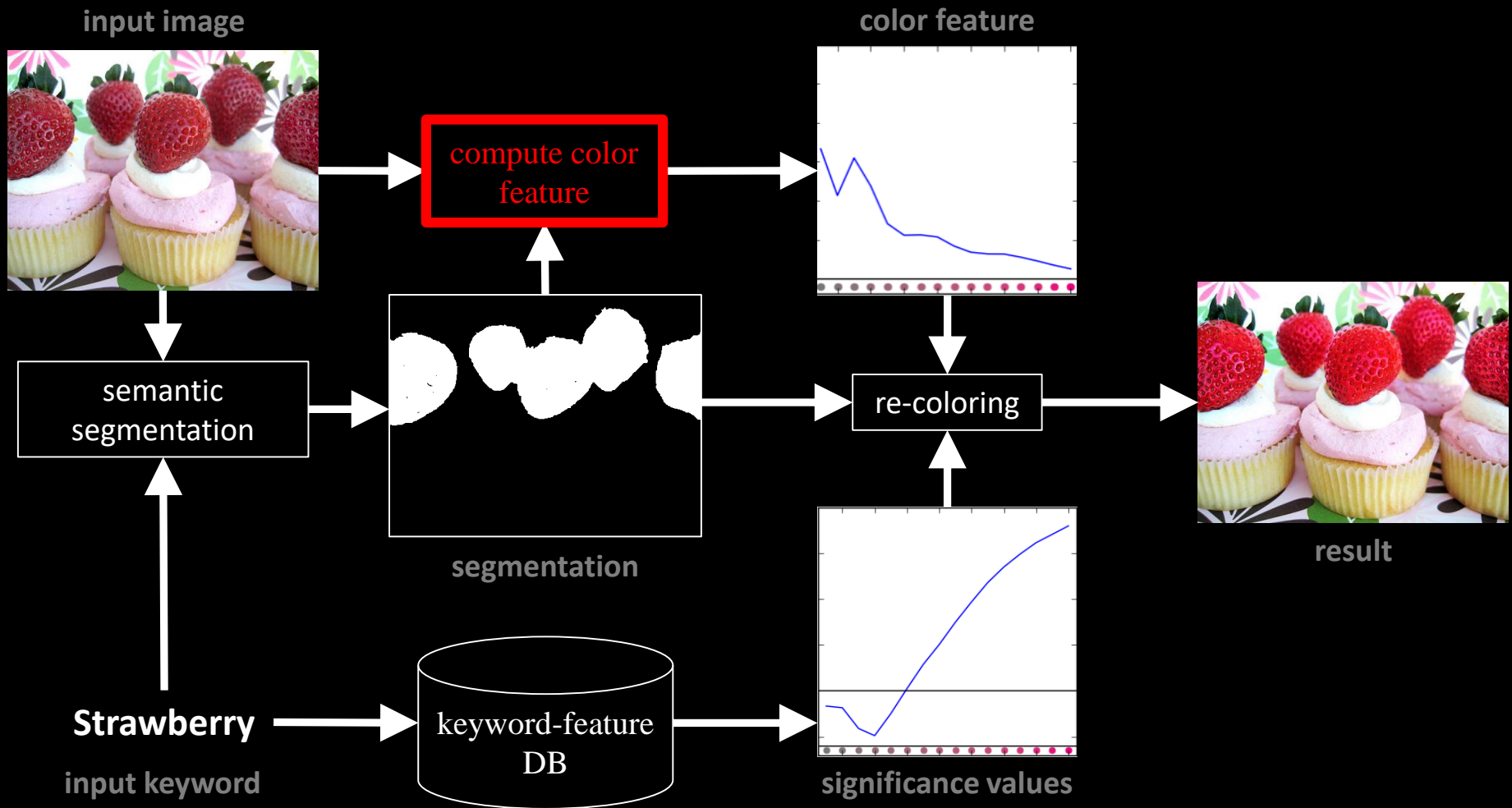
Method



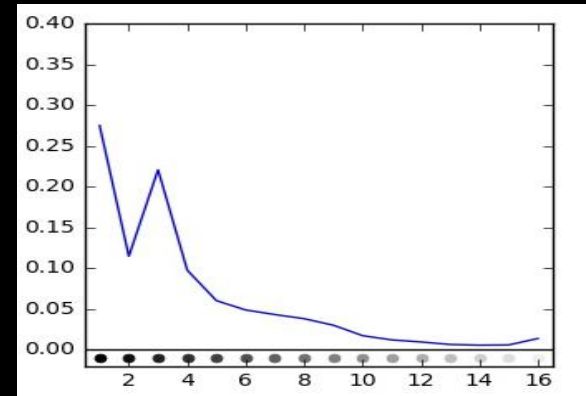
Method



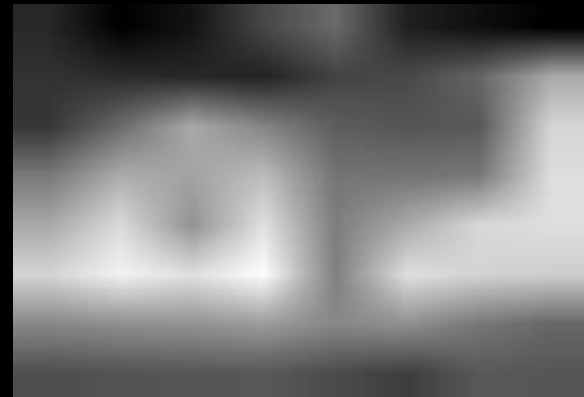
Method



Color Features



Graylevel Histogram

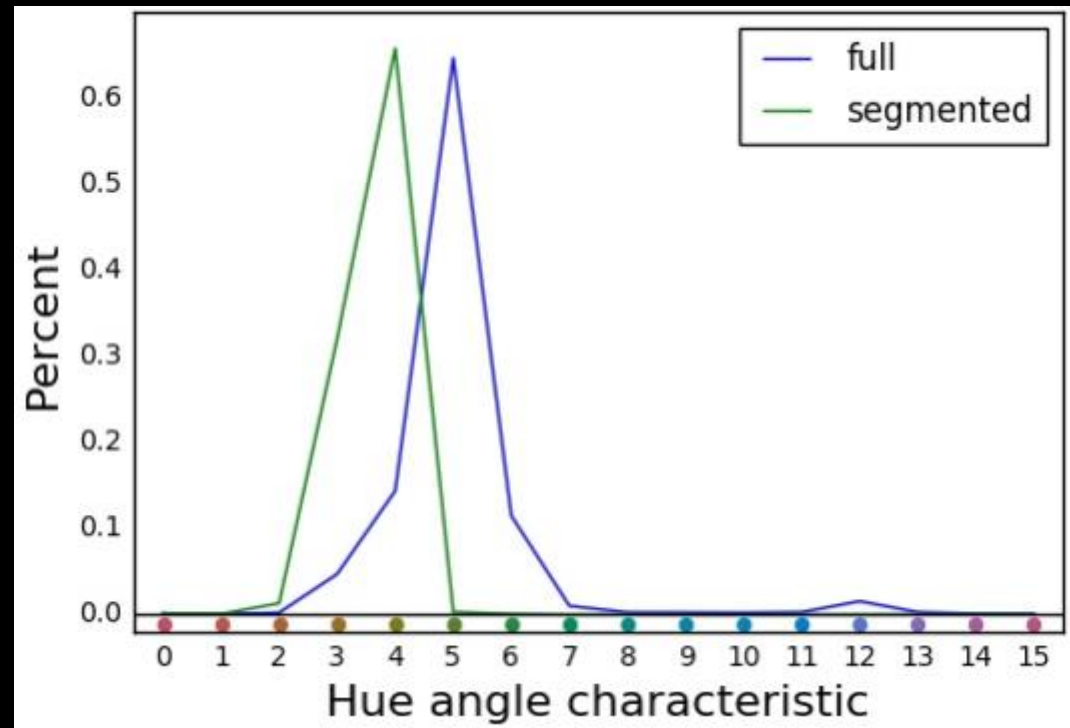


Lightness Layout

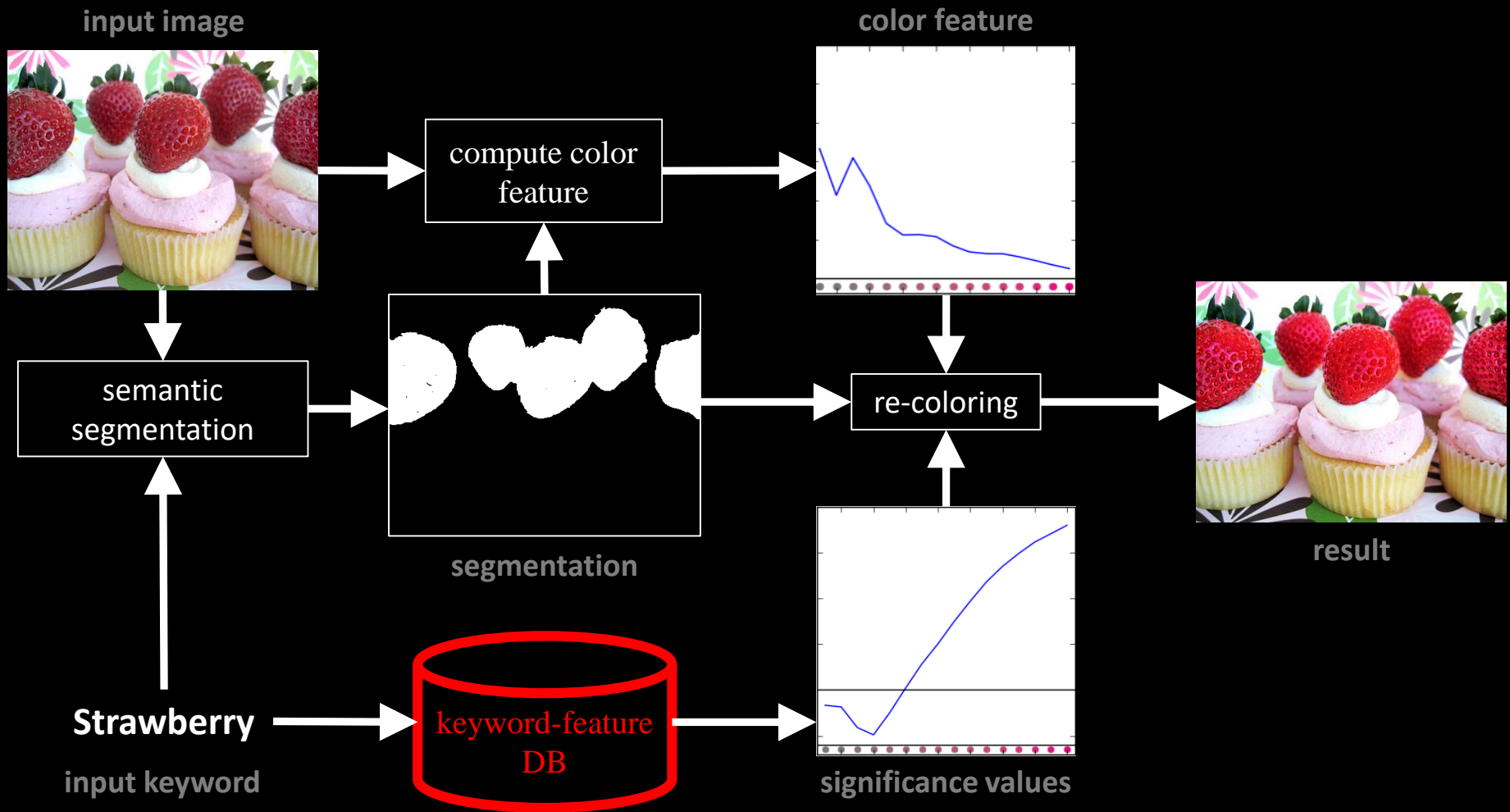
Local Color Features



Sunflower



Method



Significance values

Positive

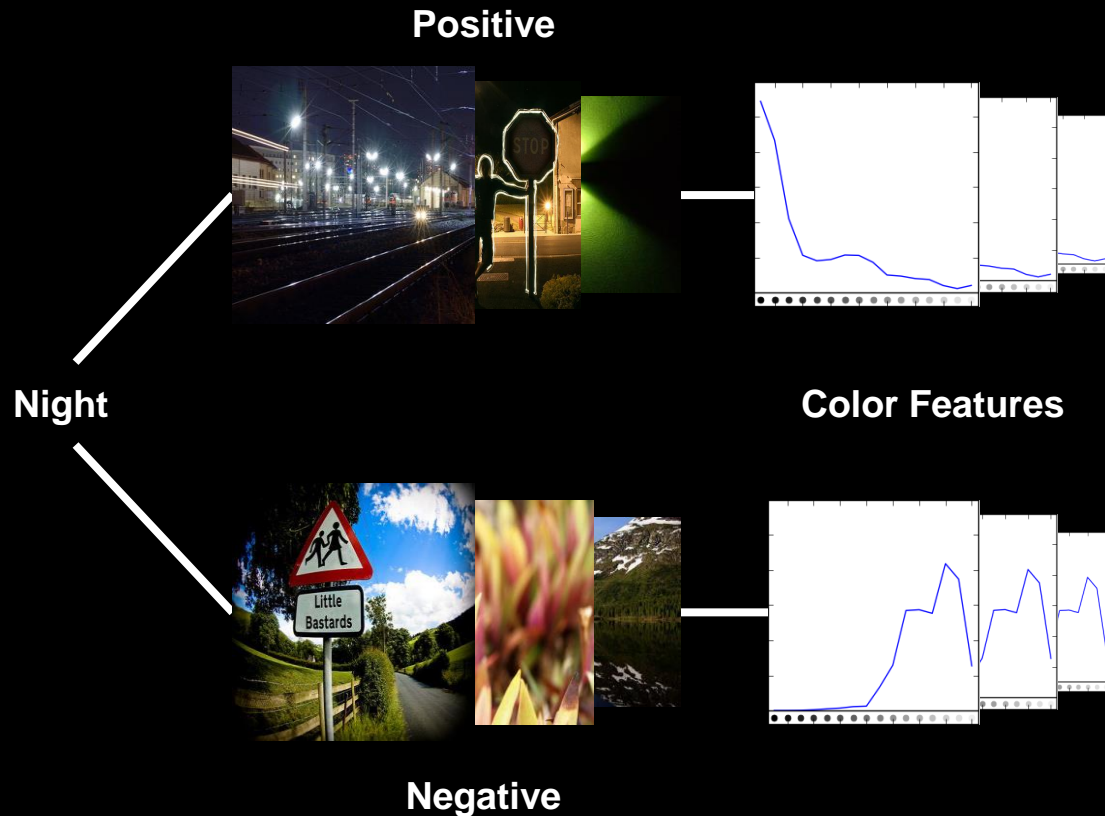


Night

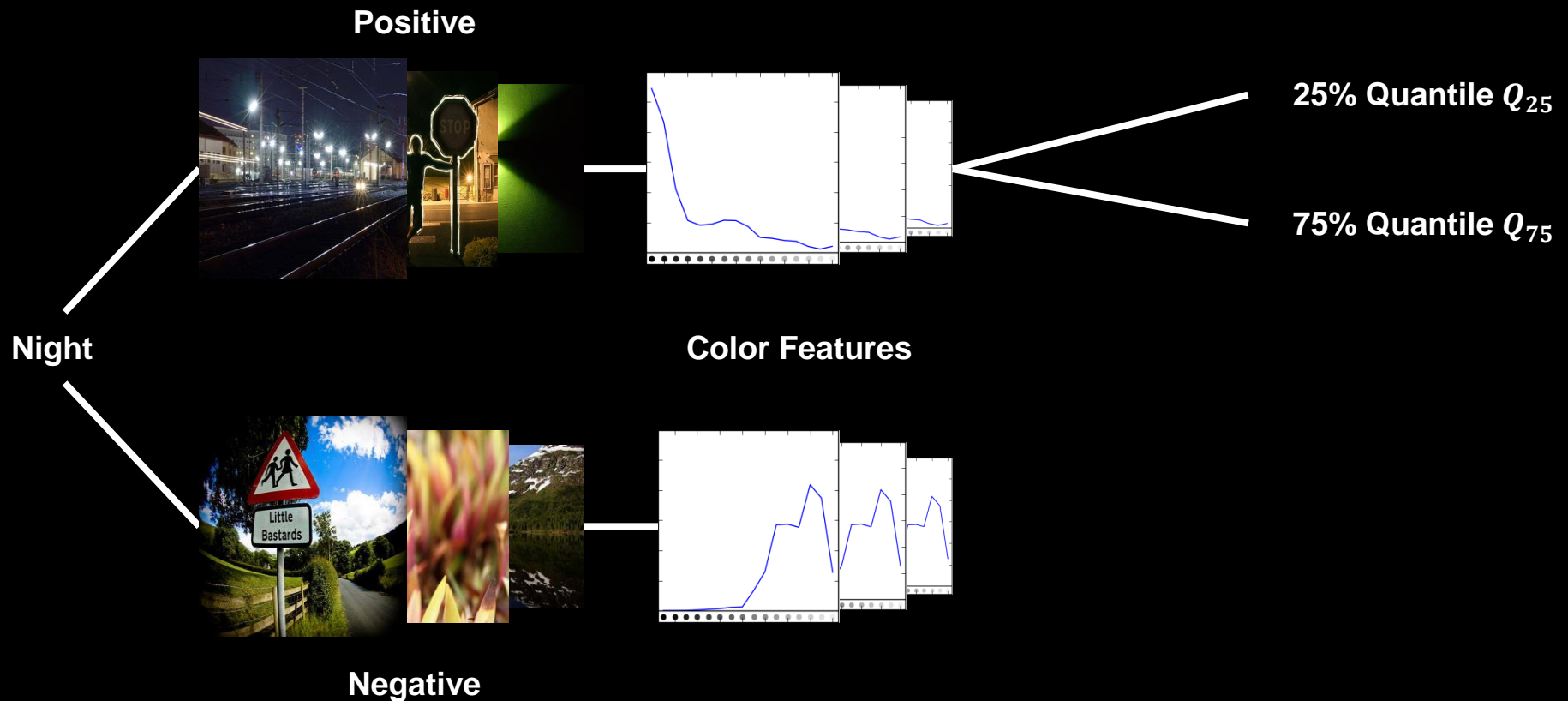


Negative

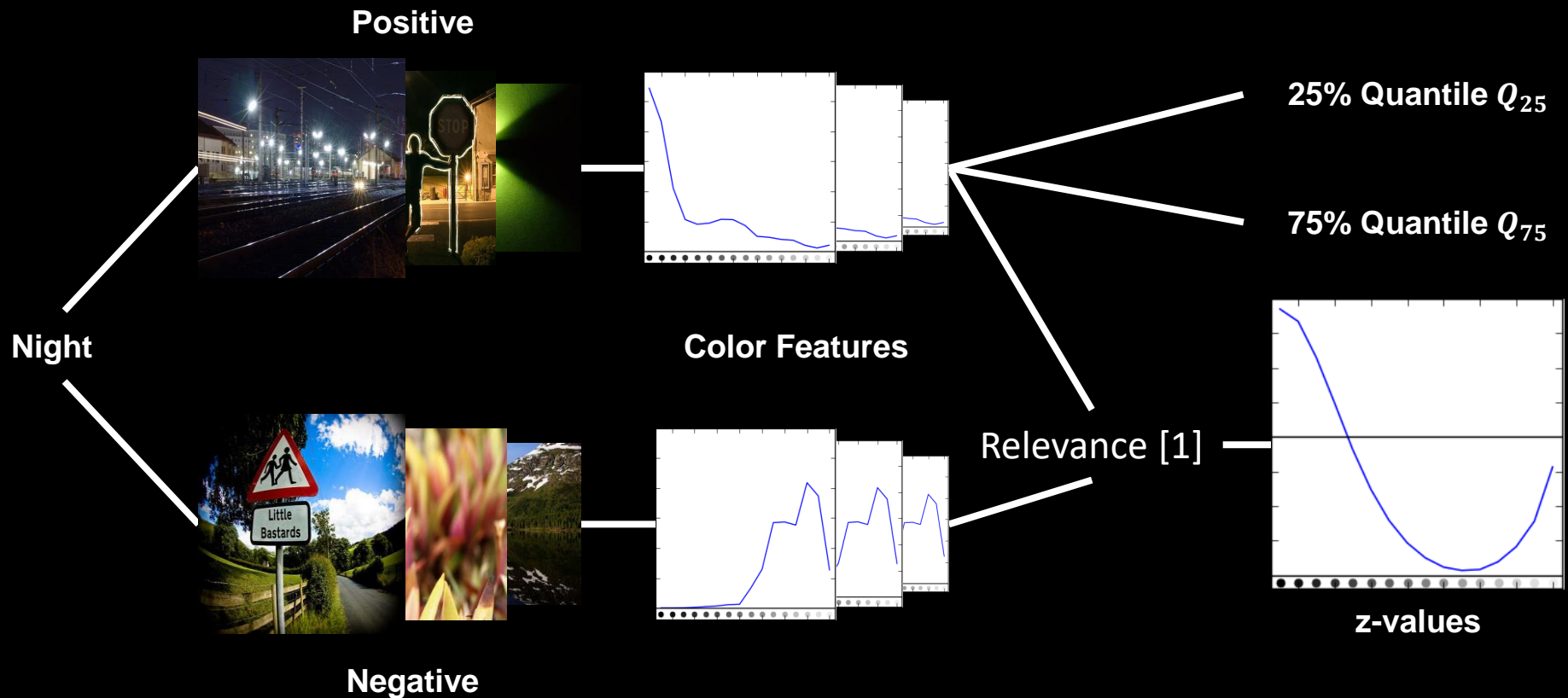
Significance values



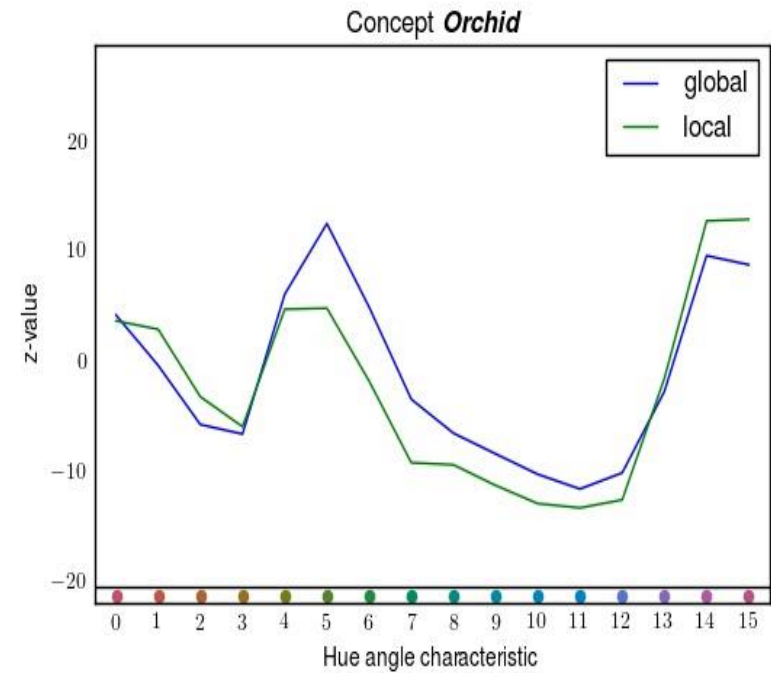
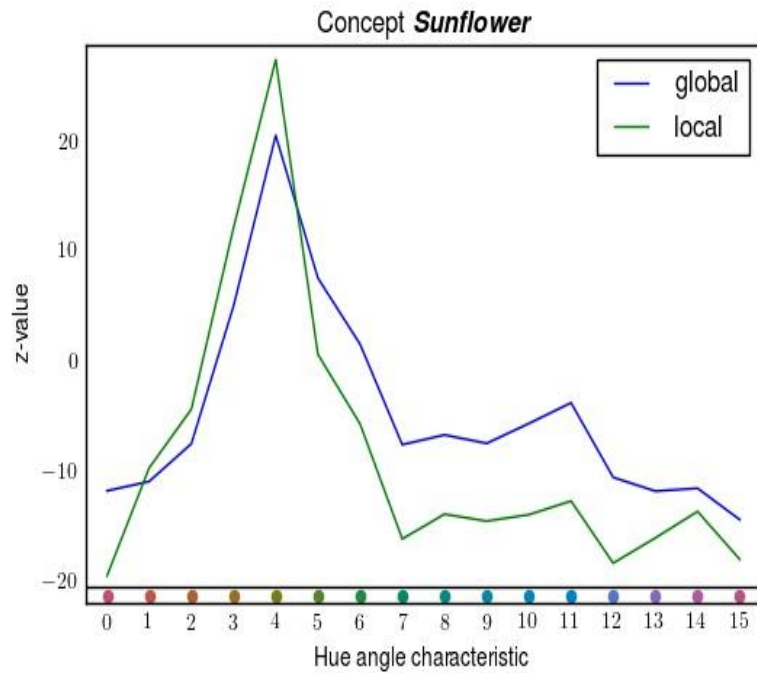
Significance values



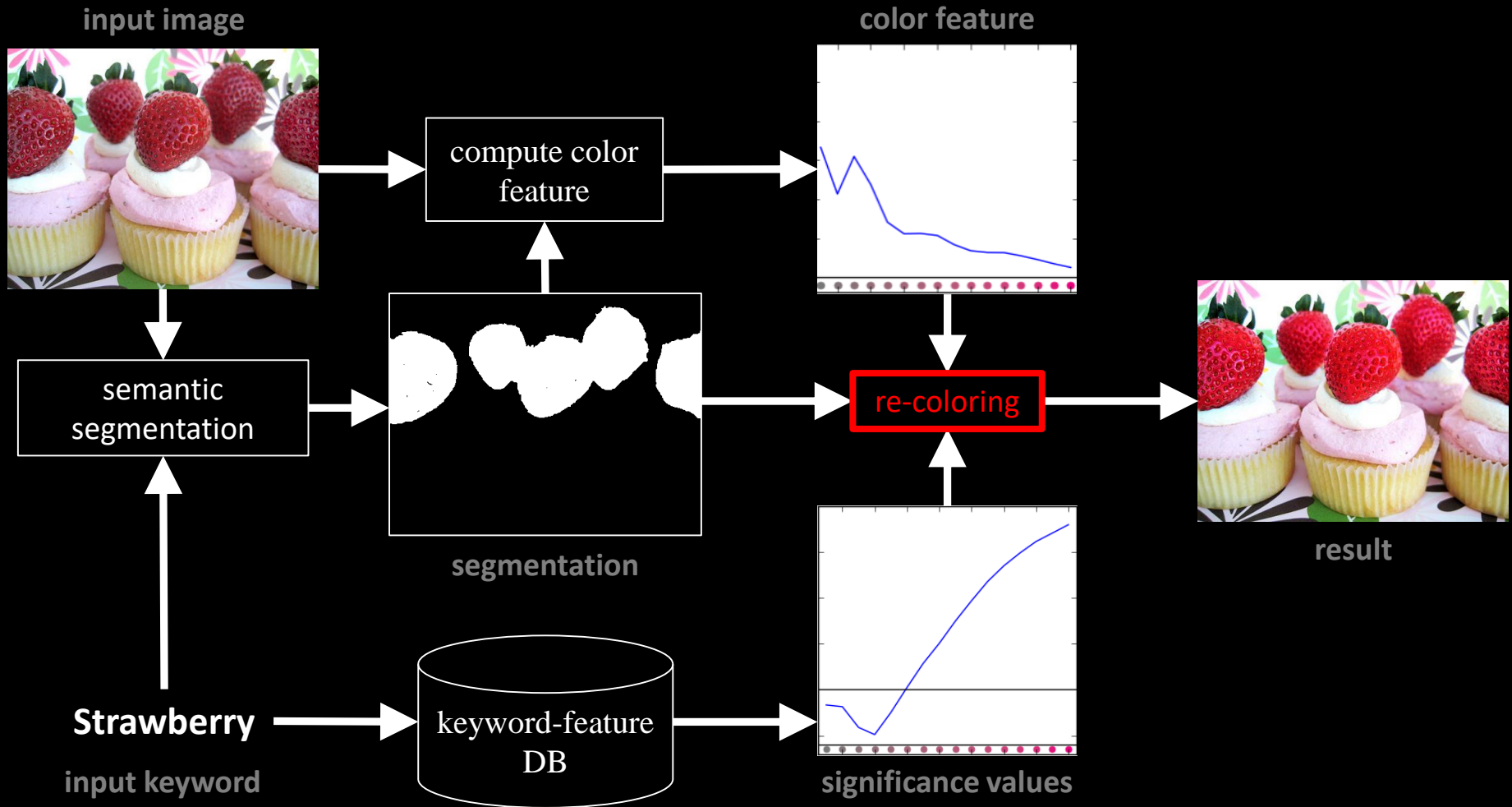
Significance values



Significance values



Method



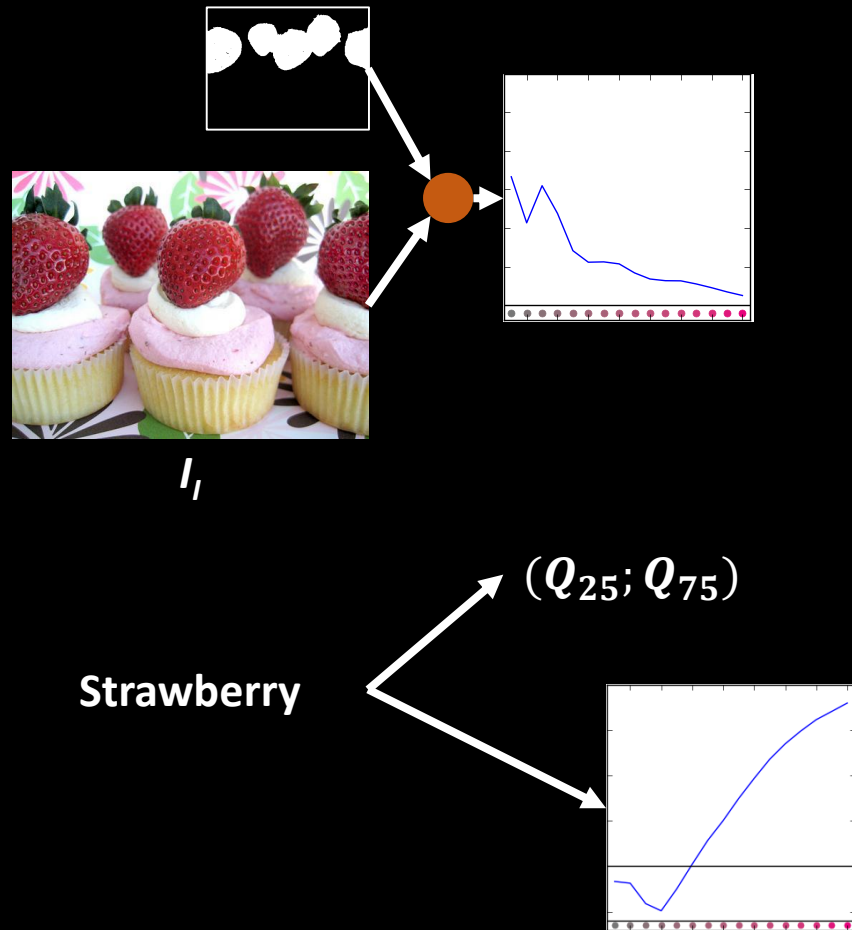
Local color enhancement



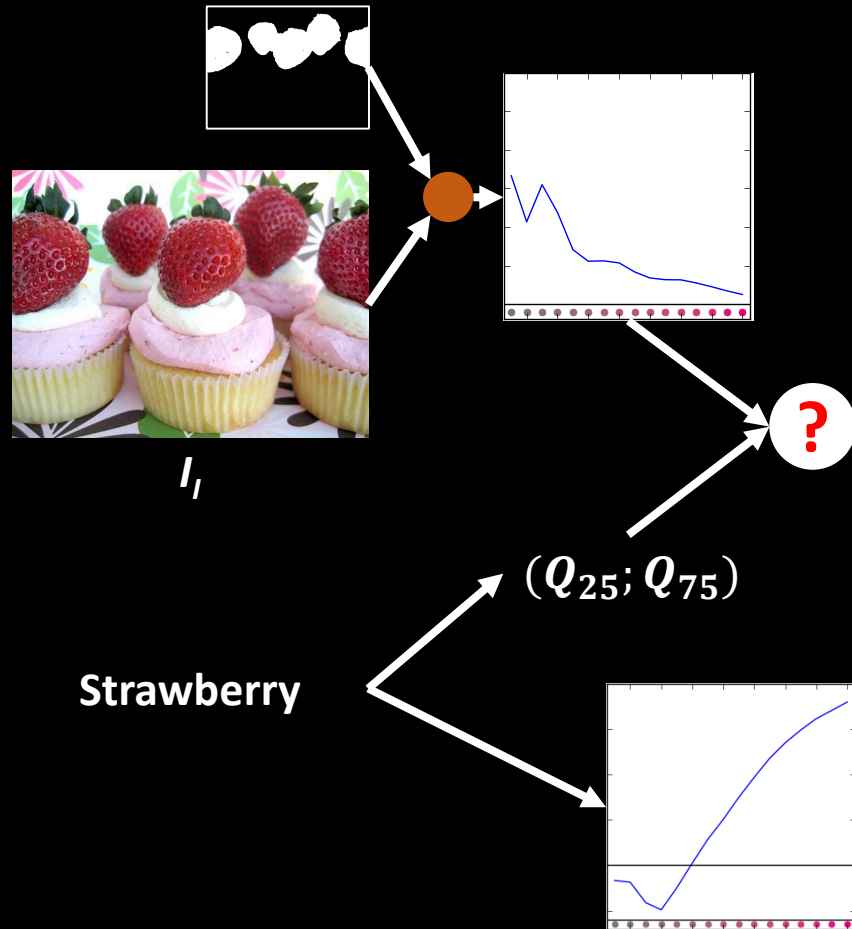
I_i

Strawberry

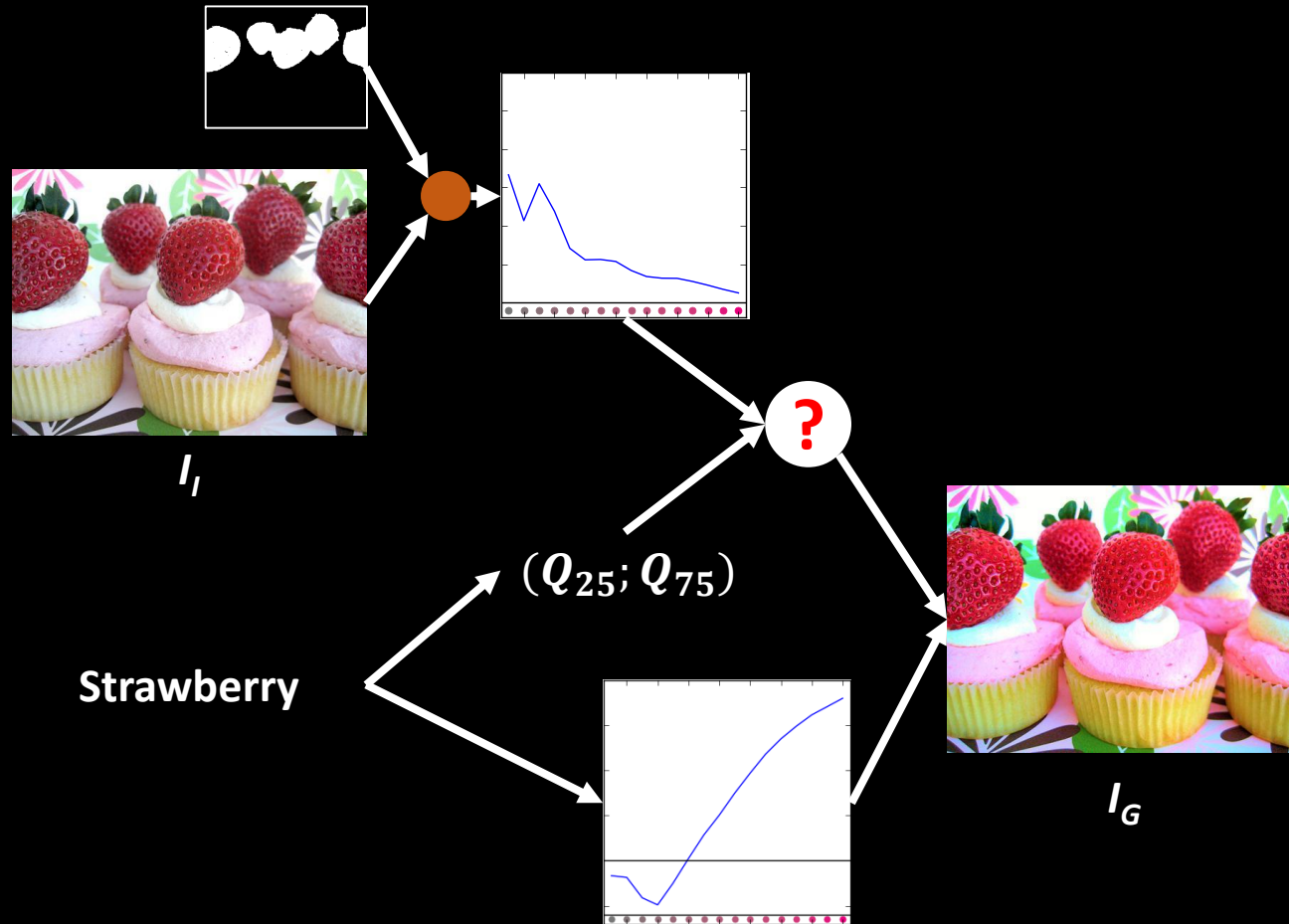
Local color enhancement



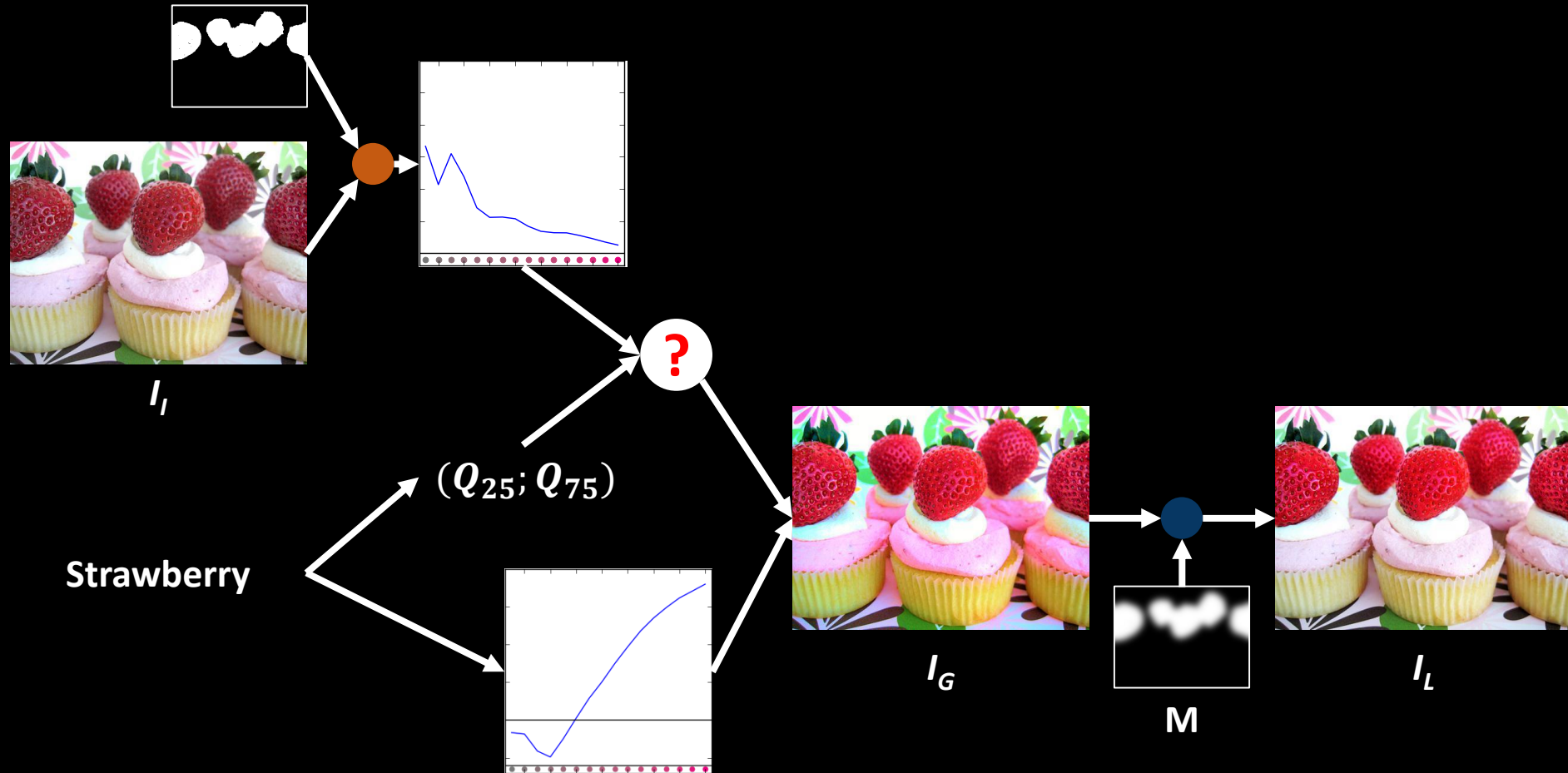
Local color enhancement



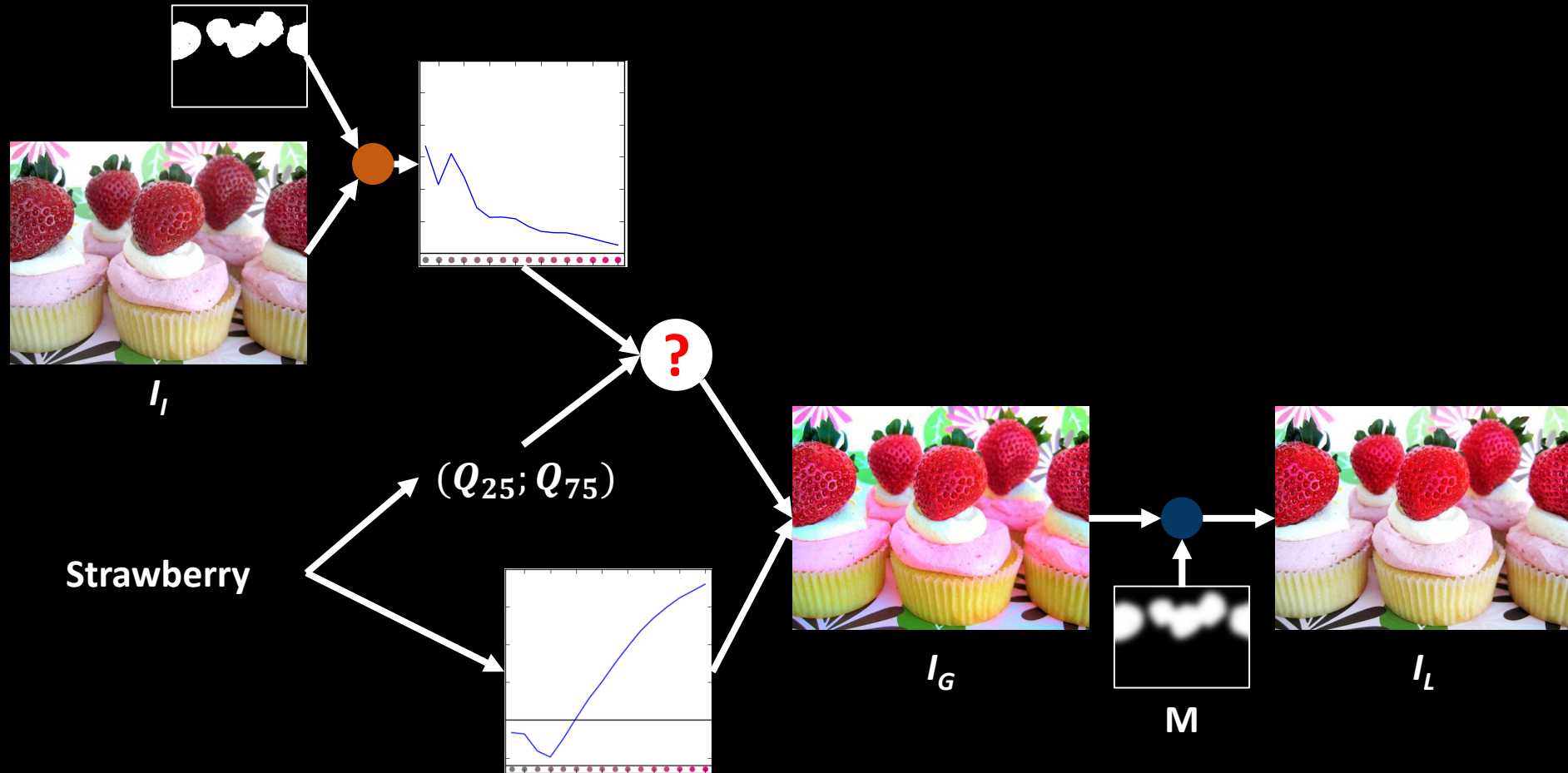
Local color enhancement



Local color enhancement



Local color enhancement



$$I_L = M \times I_G + (1 - M) \times I_I$$

Local color enhancement



Tulip



Banana



Ferrari



Strawberry



Lily



Orchid

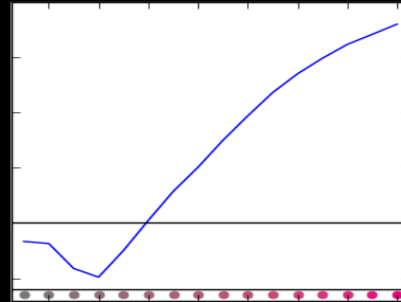


Strawberry



Conclusion

- Deep Learning
 - Keyword \leftrightarrow Concept
- Color
 - Keyword \leftrightarrow Properties



Strawberry

