Image specific class saliency map

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Problem Statement

Given an Image I, and the corresponding class model learnt by image-classification ConvNet.

Our goal is to find the set of pixels which are taking more human visual attention.

Saliency Map

- What is saliency map?
- Some real world applications
- Method in this paper
- Quadtree based approach to improve complexity

Saliency Map

- What is saliency map?
- Some real world applications
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  “Deep Inside Convolutional Networks: Visualising Image Classification Models and Saliency Maps”

- Quadtree based approach to improve complexity

Saliency Map

- What is saliency map?

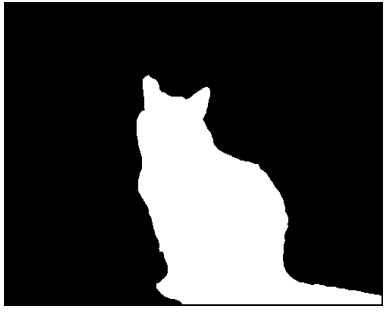
- The most important/salient set of pixels in an image.

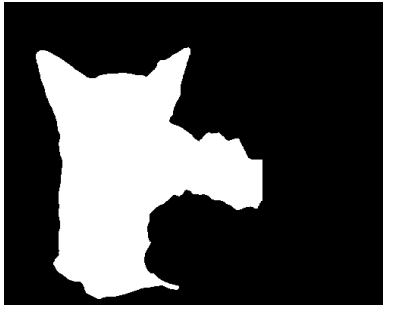
- Saliency map can be viewed as a Image segmentation problem, where each pixel has a unique influnce in the image.

Saliency Map







PASCAL-S dataset

Real world applications

- Medical Imaging
- Image cropping
- Image Captioning
- Robot active vision
- Region-of-interest extraction

Methodology

- We have score S_c of a class c for an image I. The goal is to find a Image where the score is maximized.

$$\arg\max_I S_c(I) - \lambda \|I\|_2^2$$

- Probability of each class score => $P_c = \frac{\exp S_c}{\sum_c \exp S_c}$

Maximum prob. can be achieved by minimizig the scores of other classes. So, by optimizing the class score S_c we can focus more on the image specific classes .

Methodology

- So the class score can be written as $S_c(I) = w_c^T I + b_c$

where w is the derivative of S_c with respect to the image I at the point (image) I_0

$$w = \left.\frac{\partial S_c}{\partial I}\right|_{I_0}$$

- We take the maximum magnitude of w across all colour channels

$$M_{ij} = \max_c |w_{h(i,j,c)}|$$

Methodology

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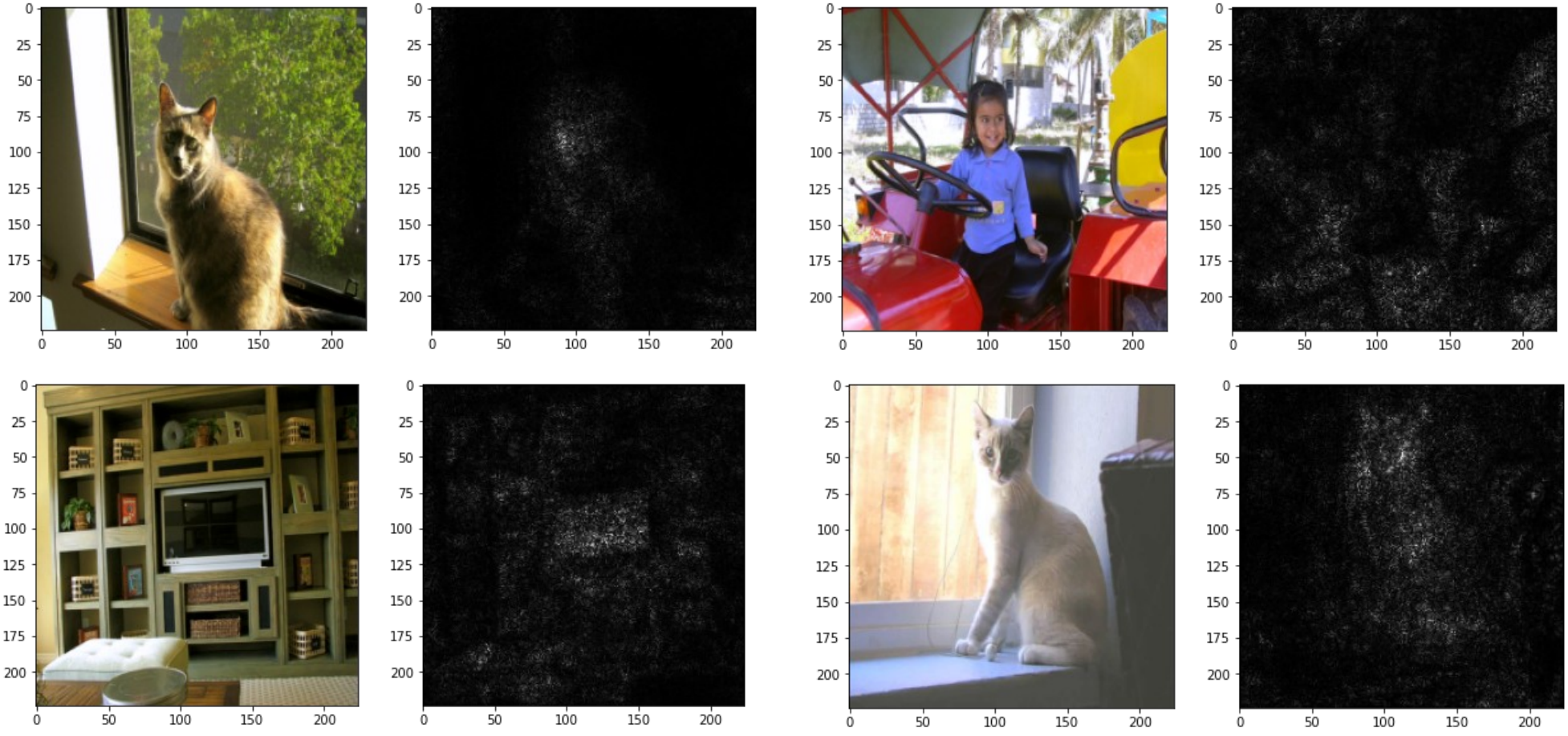
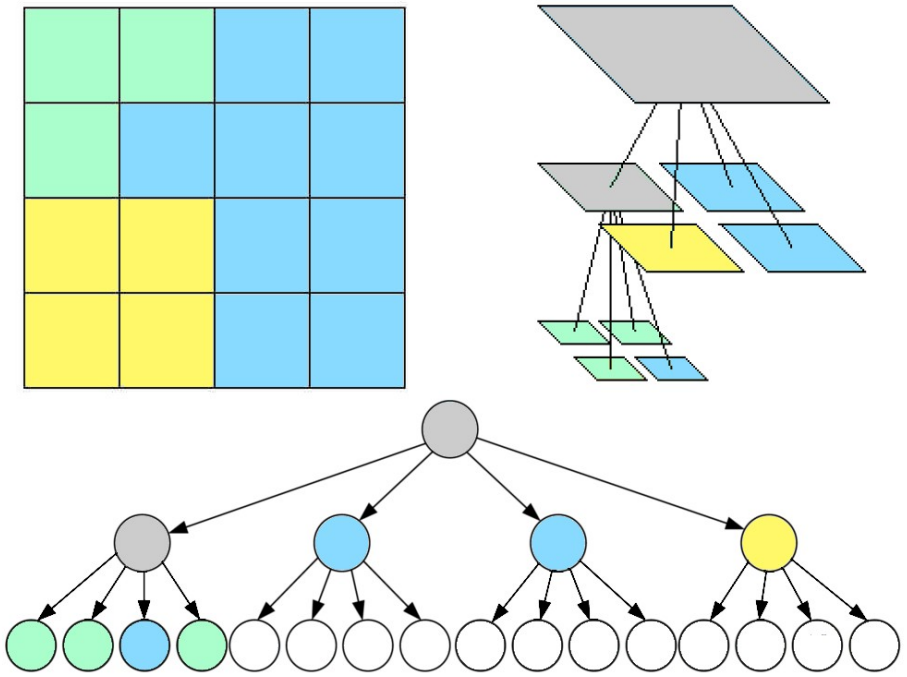
Results



Quadtree based approach



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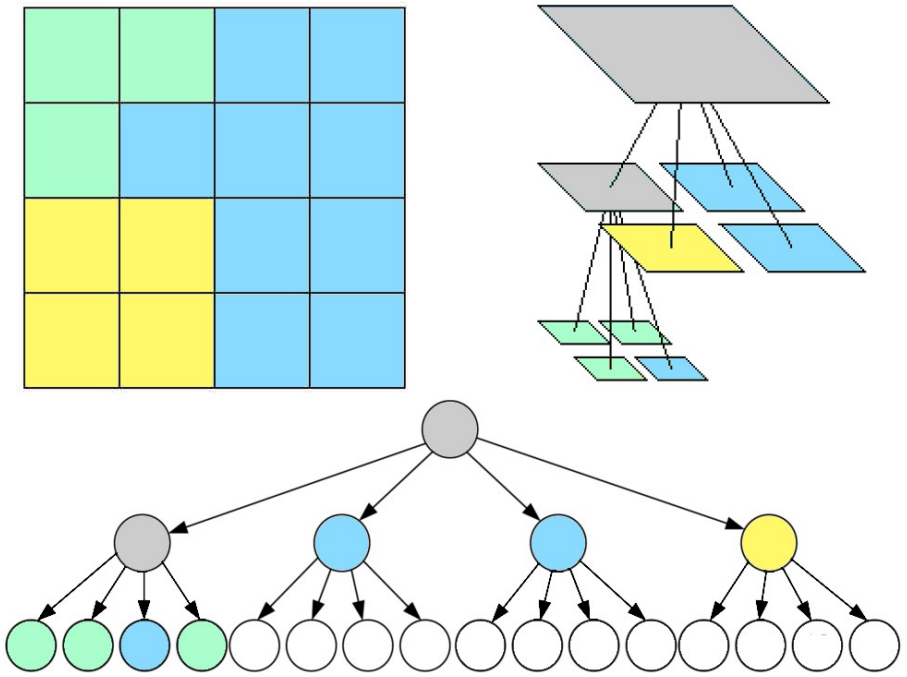

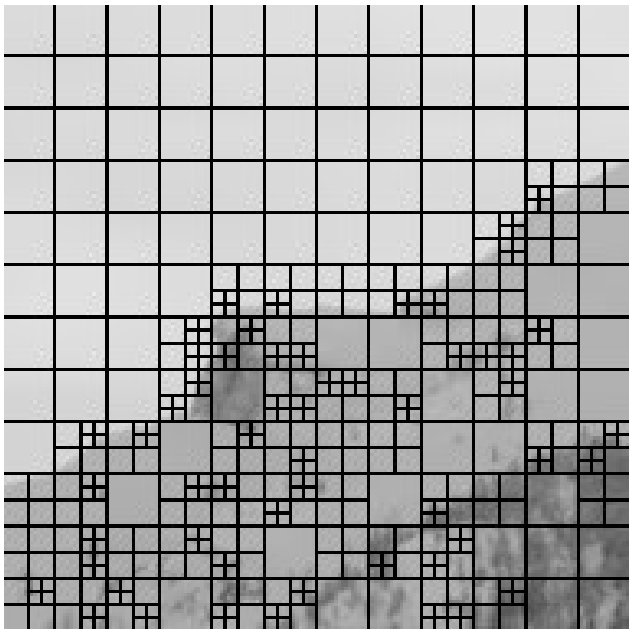

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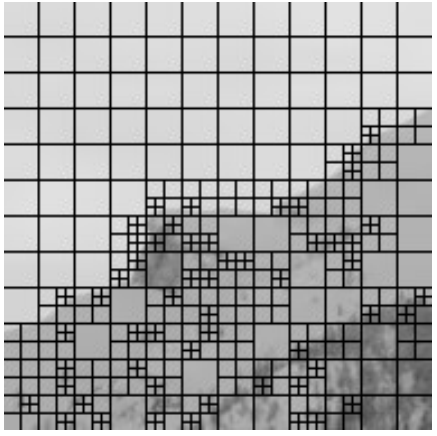

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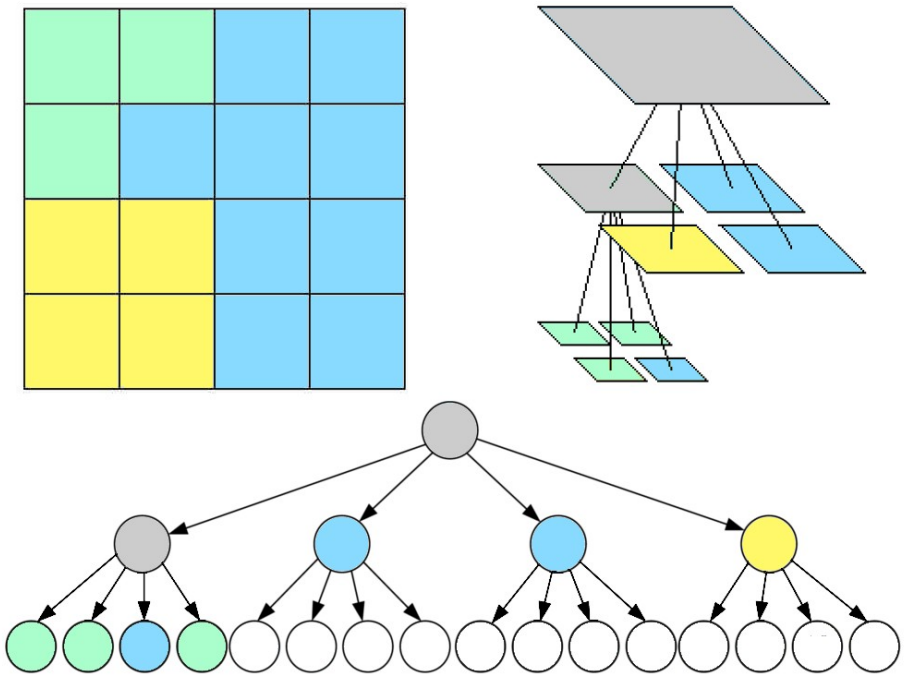


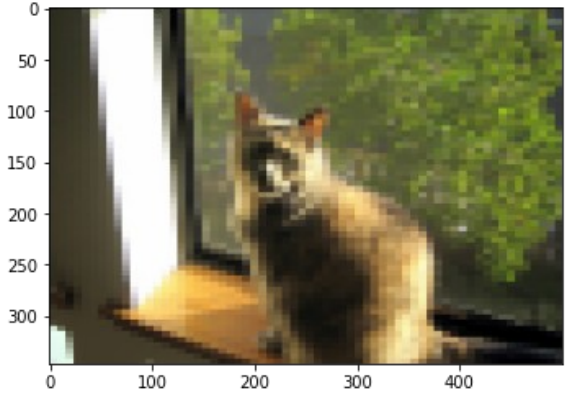
In case of CNN:

Complexity: $M^2 N^2 C$
for NxN image
convolving with MxM kernel

For Quadtree:

Complexity: $M^2 N' C$

Quadtree based approach



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References:

I. Deep Inside Convolutional Networks: Visualising Image Classification Models and Saliency Maps: Karen Simonyan Andrea Vedaldi Andrew Zisserman Visual Geometry Group, University of Oxford

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