Joint Image Filtering Using Deep CNN

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Joint Image Filtering/Guided Image Filtering

- The guided image filtering performs edge-preserving smoothing on an image, using the content of a second image, called a *guidance image*, to influence the filtering.
- The guidance image can be the image itself, a different version of the image, or a completely different image.
- Guided image filtering is a neighborhood operation, like other filtering operations, but takes into account the statistics of a region in the corresponding spatial neighborhood in the guidance image when calculating the value of the output pixel.
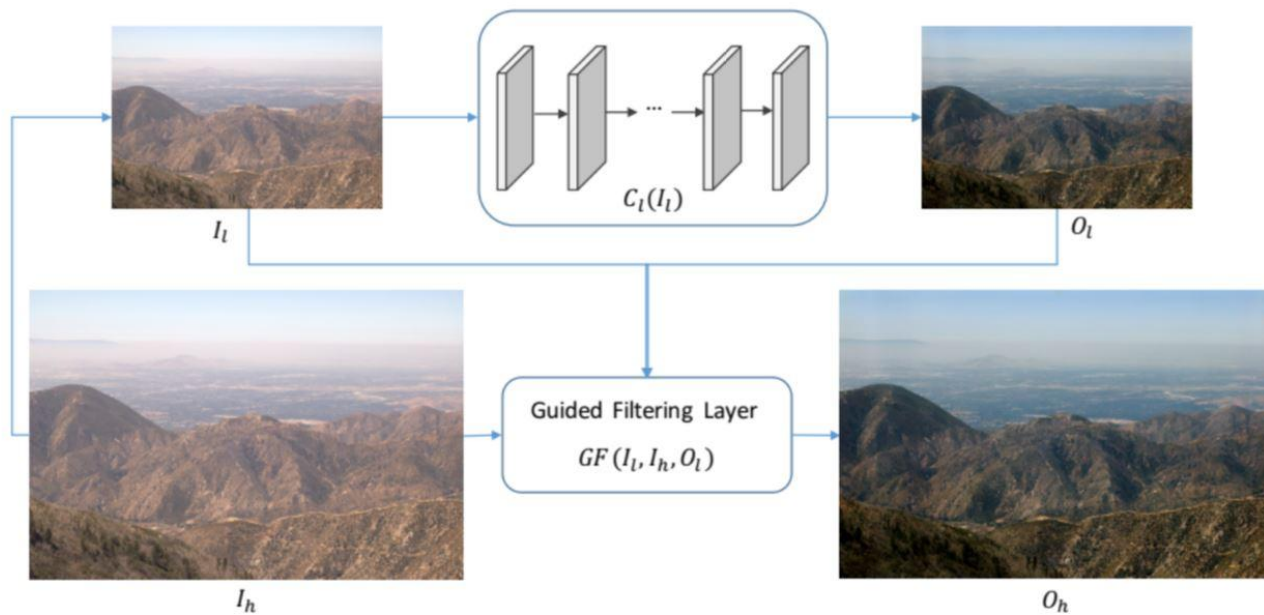
Input (Image to be filtered)
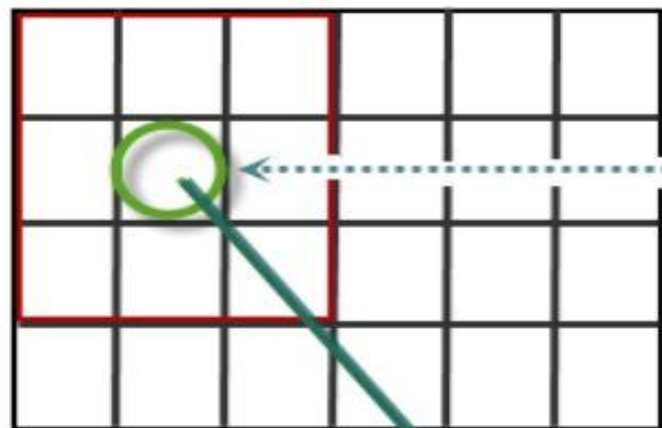
Guidance image
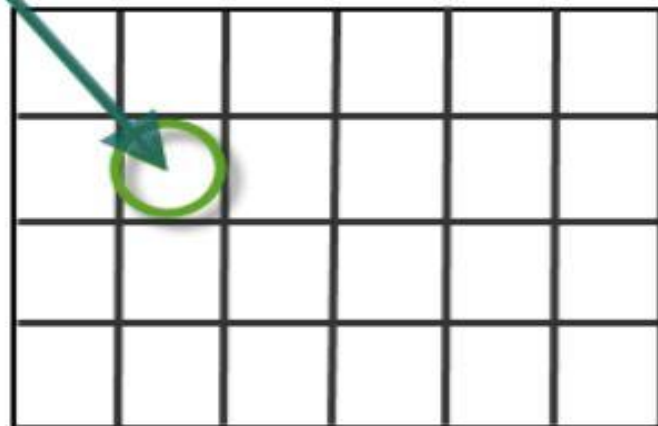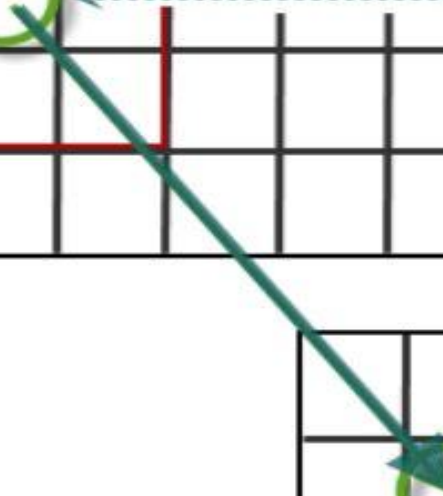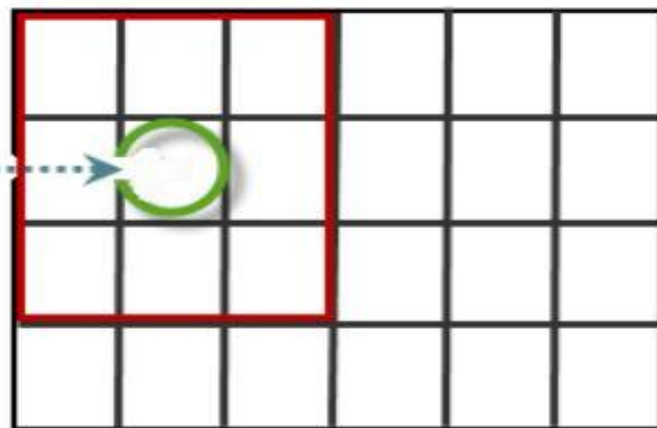
Output (Filtered Image)

WorkFlow

Terminology

- I_h --- Input Image
- I_l --- Down sampled Input Image
- $C_l(I_l)$ --- Convolutional Neural Networks
- O_l --- Output of down sampled image from CNN
- O_h --- Desired Output Image
- $GF(I_l, I_h, O_l)$ --- Guided Filtering Layer

Working

- We first downsample the original input image I_h, obtaining the low-resolution image I_l .
- Then, a convolutional neural network $C_l(I\_l)$ is applied, generating the corresponding low-resolution output O_l.
- The full-resolution output O_h is finally generated by the proposed guided filtering layer, taking I_l , I_h and O_l as inputs.
- We used CAN architecture as the Convolutional neural network for $C_l(I\_l)$.

Guided Filtering Layer

Guided Filtering Layer
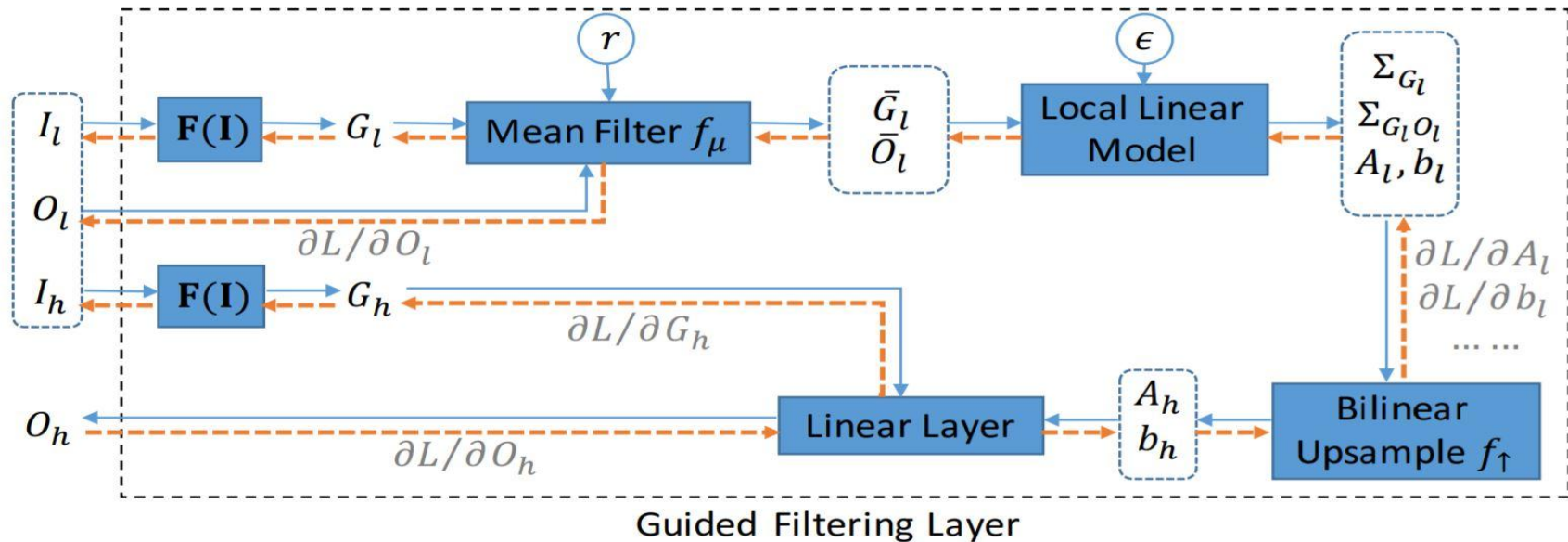
Contd..

- For different computer vision tasks, we use

   1)DSS for saliency detection

   2)Deeplab for segmentation

Implementation

- **Network Training**

    To train our network we took MIT-Adobe dataset and implemented on it.

    We train to kind of models for two different tasks

        1)Joint Image Upsampling and

        2)Noise Reduction

1)For upsampling task we obtain each low resolution target image from ground truth image using nearest neighbour downsampling.

2)For noise reduction we generate target image by adding gaussian noise to the ground truth image.

1.Input Image   2.Output of down sampled image from CNN

3.Output Image

Thank You!