LEARNING BASED SINGLE IMAGE BLUR DETECTION AND SEGMENTATION

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1 Goal

- **Blur Detection and Segmentation:** Inferring pixel-level blur probability-map and segmentation-map from a single image affected by motion or defocus blur.
- Specially useful when blur is present for its aesthetic value in professional photography, as it is often used to highlight the salient regions in:
  - static scene (defocus blur) or
  - dynamic scene (motion blur).
- Applications include Foreground extraction, Image editing, Saliency detection, Deblurring etc.

2 Existing Works

- Almost all existing methods depend partially or fully on manually designed features for blur.
- These features are not robust and struggle with blur ambiguity in homogeneous regions.
- We propose a purely learning based approach to blur detection, which generalises to both blurs.

3 Our key idea: INTEGRATION OF GLOBAL AND LOCAL CNN-BASED ESTIMATES

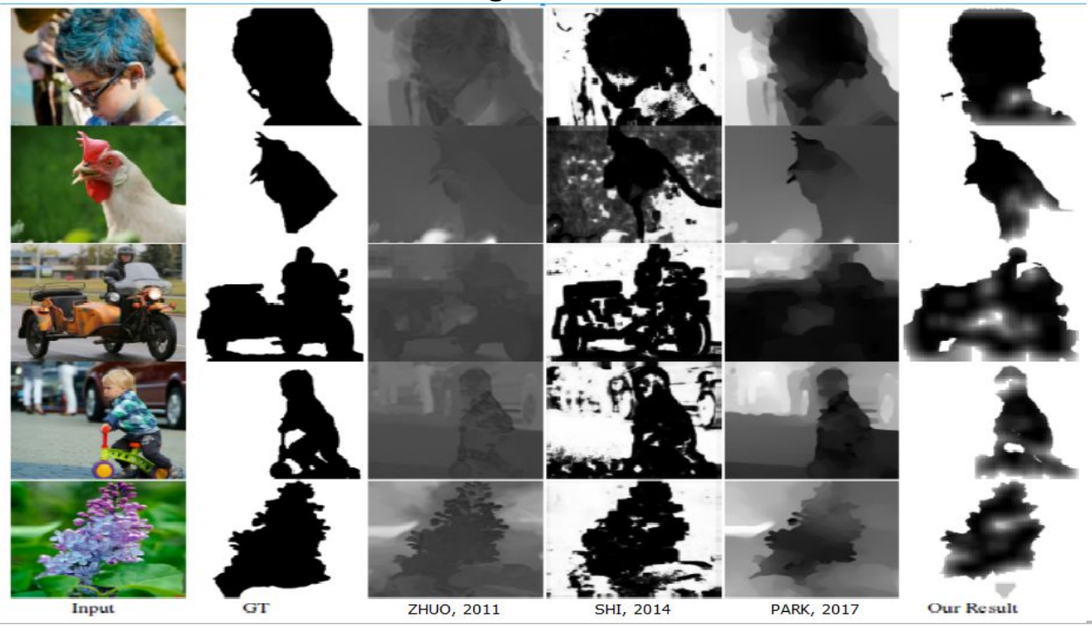
GLOBAL FULLY CONVOLUTIONAL NN FOR BLUR-SEGMENTATION MAP REGRESSION:

- Our FCN easily handle local blur ambiguities by incorporating global contextual information.
- Adversarial training leads to generation of realistic segmentation maps even with a small dataset.

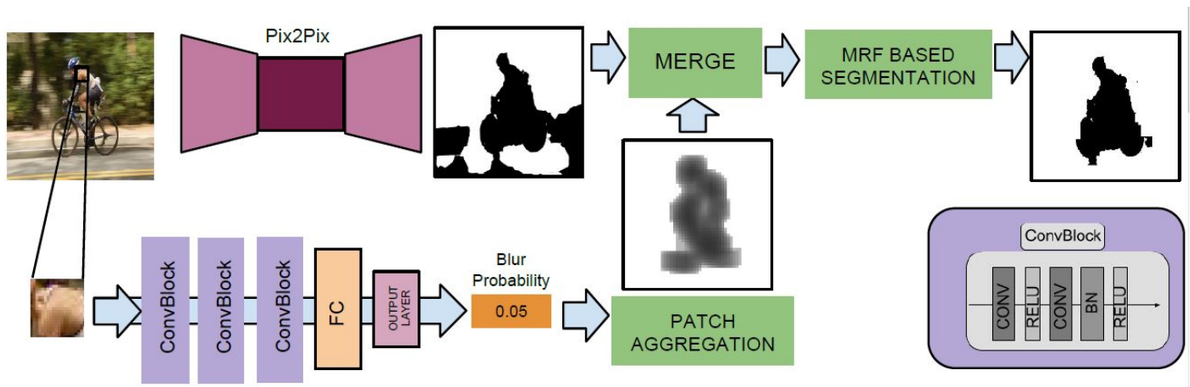
LOCAL CLASSIFIER CNN FOR BLUR CLASSIFICATION:

- Patch-level CNNs for blur classification are trained for better local accuracy using patches blurred with synthetic gaussian/motion blur kernels. The label for a patch is assigned to the central pixel.

5 Results on Defocus Blurred Images

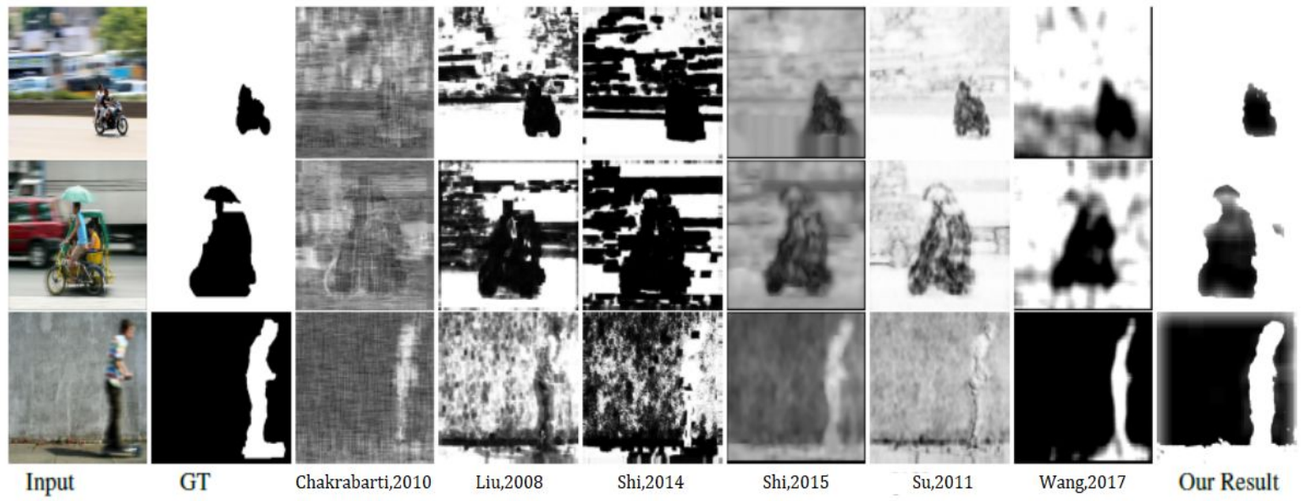


4 Framework

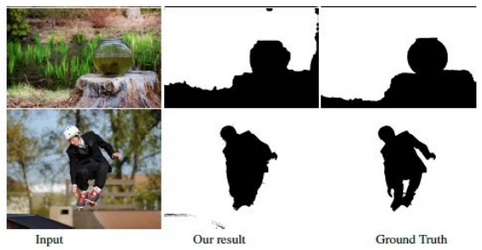


Merging the two estimates: We multiply the inverse of global-map with the patch-map. The product is then re-inverted.
Binary segmentation: The merged probability map is fed to an MRF formulation (solved using Graph-cut algorithm).

5 Results on Motion Blurred Images



Applications: Foreground segmentation, Foreground Transfer and Blur Magnification



Sharp region map is automatically estimated from (a) and (c). It is used for foreground transfer (as shown in image (b)) and for blur magnification application (as shown in (d)).