



# Analysis of Directional Distortion on Stripe Regions in Deep Learning Image Coding Based on MS-SSIM

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## Abstract

- ❖ Compression is the most promising and influential research area, especially for images and videos. Many essential well-known traditional compression standards have been developed for many decades.
- ❖ However, recently it is a very crucial and challenging topic in the field of machine and deep learning.
- ❖ We investigate a directionality distortion that may occur in the striped area especially:
  - ✓ In the MS-SSIM optimized model.
  - ✓ At lower Bitrate (less than 0.5bpp)

## Methodology

- ❖ To address the critical problem of directionality, simulation of different AI-based image coding models (optimized by MS-SSIM) is done.
- ❖ Here we suppose to consider five different models for our analysis. Input image is encoded and then decode using the model.
- ❖ The methodology as shown below in Figure. 1.

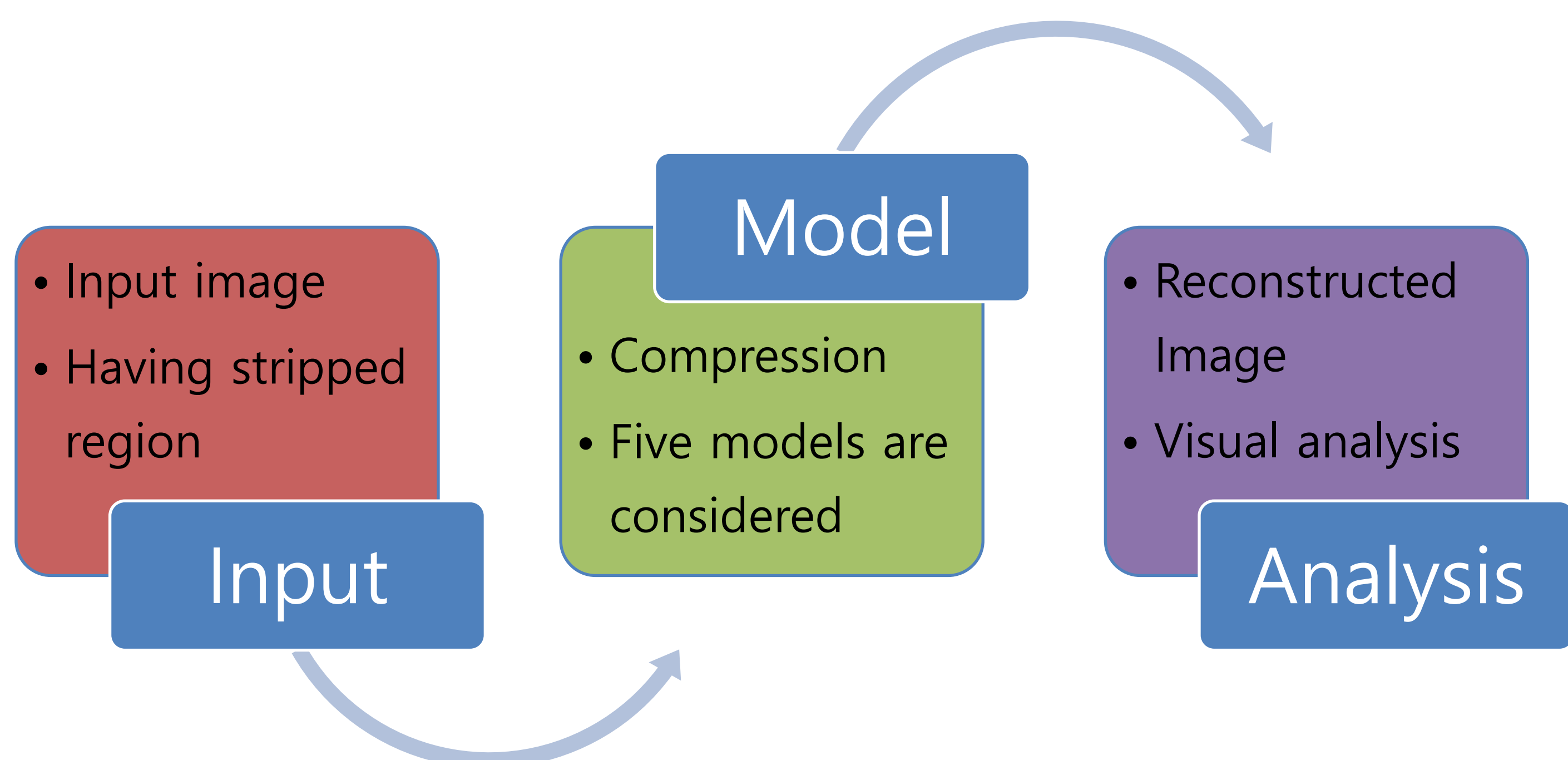


Figure. 1. Methodology and flow architecture

## Sample Images



(a)



(b)

Figure. 2. Sample Image of (a) Barbara and (b) House

## Experimental Analysis

- ❖ The Models which provide their source code are analyzed for directionality problem, which are the following:
  - I. End-to-end optimized image compression [1]
  - II. Variational image compression with a scale hyperprior [2]
  - III. Joint autoregressive and hierarchical priors for learned image compression [3]
  - IV. Context-adaptive entropy model for end-to-end optimized image compression [4]
- ❖ All the model are optimized and trained using loss function of MS-SSIM to investigate the problem.
- ❖ Model [2] have two sub model, factorized and hyperprior model.
- ❖ In case of model [2-4], we use their pre-trained model to generate the results.
- ❖ For model [1], the model is trained using default configuration and optimized for 1M iterations of the training step size.

## Experimental Results

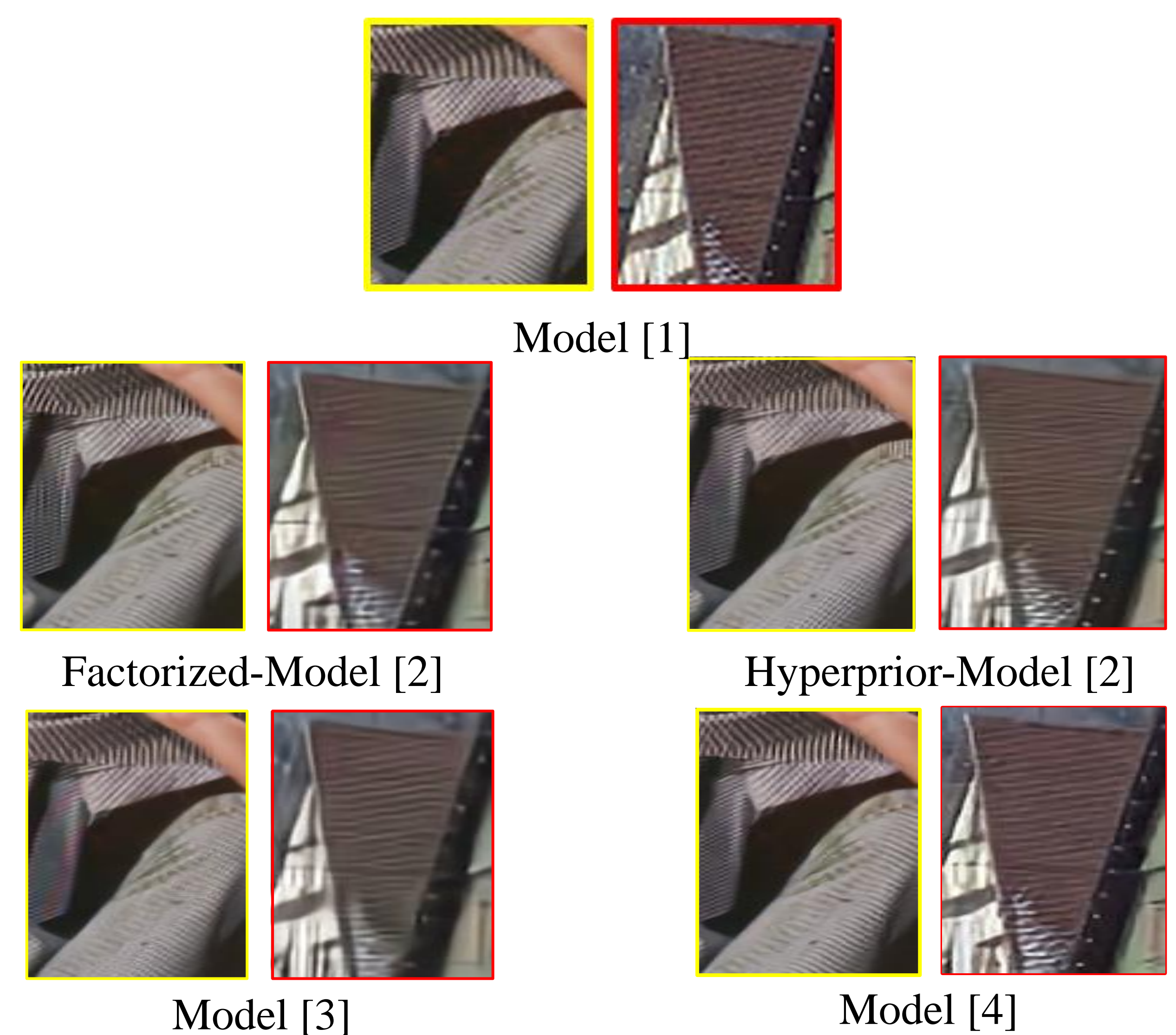


Figure. 3. Results of ROIs for their respective model

## Conclusion and Future Work

- ❖ This work shows to investigated different AI based image coding techniques for the purpose to address one of the critical directionality problems, which may occur in the stripped area of the image.
- ❖ This kind of distortion is found mostly in the model using MS-SSIM loss function for the optimization and, to be more specific, at lower bitrates (less than 0.5bpp).
- ❖ In the future, we need to find a novel solution for this kind of problem in AI based image coding by investigating MS-SSIM matric. As the problem may occur in stripped area in the MS-SSIM optimized models regardless of the training datasets, it is important to consider this distortion while evaluating the performance of AI-based image coding.