IMAGE QUALITY ASSESSMENT TO A DEEP LEARNING APPROACH

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Abstract –Today digital images and video has everywhere. Number of images and videos are captured displayed and transmitted are intended to be viewed by humans. A variety of models for Image Quality Assessment have been used and is generally classified as full reference and no reference image quality metrics depending on number of information from the reference image is available to the Image Quality algorithm[1].Quantitative evaluation of an image perceptual quality is important fundamental challenging problem in image processing. Image Quality assessment methods in two types.1) For humans Subjective Assessment, 2) Algorithm for Objective Assessment [2].

Index Terms: Image Quality Metric, No Reference, Full Reference, Image Quality Assessment.

I. INTRODUCTION

Image Quality assessment is an important role in various image processing application great effort has been done in recent years to develop image quality metrics that correlate with quality measurement are crucial for most image processing applications. The best way to assess the quality of an image is to look at it because human eyes are the ultimate receivers in most image processing environments[3].A deep neural network is a ANN with multiple hidden layers between the input and output layers similar to shallow Artificial Neural Network can model complex non-linear relationships.

Deep Neural Network architechers generate compositional model where the object is expressed as a layered composition of primitives. As with the Artificial Neural Network many issues can arise with naively trained DNN.To common issues are over fitting and computation time.DNN are prone to over fitting because of added layers of abstraction which allow them to model rare dependencies in the training data. Deep neural network, each layer of nodes trains on a distinct set of features based on the previous layer's output. The further advance into the neural net, the more complex the features nodes can recognize, since they aggregate and recombine features from the previous layer [14].

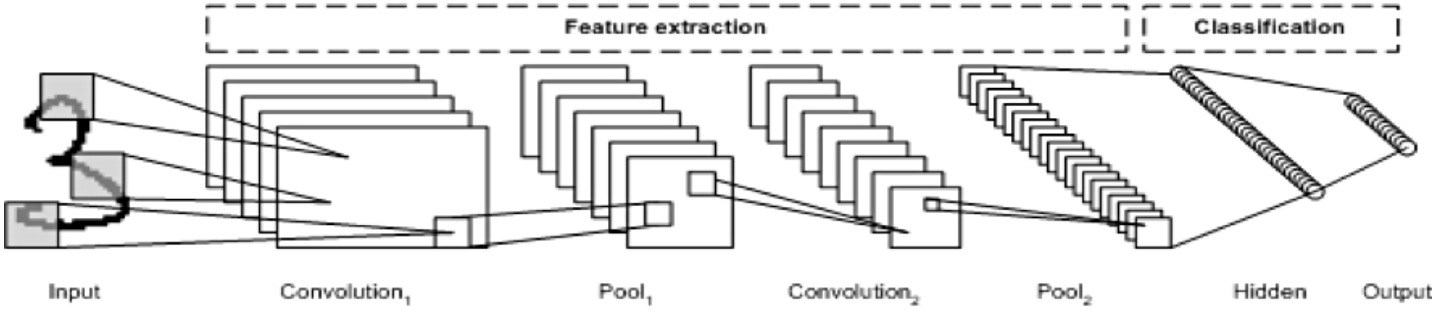

Fig.1: Deep learning Architecture

DNNs are typically feed forward networks in which data flows from the input layer to the output layer without looping back. At first, the DNN creates a map of virtual neurons and assigns random numerical values, or "weights", to connections between them. The weights and inputs are multiplied and return an output between 0 and 1. If the network didn't accurately recognize a particular pattern, an algorithm would adjust the weights. That way the algorithm can make certain parameters more influential, until it determines the correct mathematical manipulation to fully process the data.

II. RELATED WORK

Objective image quality metrics can be categorized to the availability of an original image with which the distorted images is to be compared .Most existing approaches are known as full reference meaning that a complete reference image is assumed to be known. In many practical situations, the reference image is not available and a no reference quality assessment approach is desirable. Recently machine learning is a third category of IQA exposed, comprising approaches the have purely data driven, do not rely on any open model and allow end-to-end effective characteristics extraction and regression [4].

2.1. No reference and Full reference Image Quality Assessment

Number of measurable factors to be trained in deep neural network is usually very large, the training has to hold enough data samples in order to keep away from overfitting.The image Quality Assessment models trained with the current methods are

calculated to state-of-art image quality measures on the popular LIVE,TID 2013 and CISQ image quality databases. The models covered for No Reference IQA are jointly evaluated on the recent LIVE In the Wild Image Quality Challenge database, while Full Reference approaches has been access to full reference image, no information about it is available to no reference approaches in the following Fig.2.

The objective image quality evaluation approaches are used in most application. They can be classified into three categories: One is Full Reference (FR) requiring a complete reference image. Second is known as Reduced Reference (RR). RR is useful when the reference image is only partially available. Both of FR and RR need the reference image. However the reference images are not always available in most cases. No Reference (NR) is the third metric to satisfy the cases when reference images are unavailable [15].

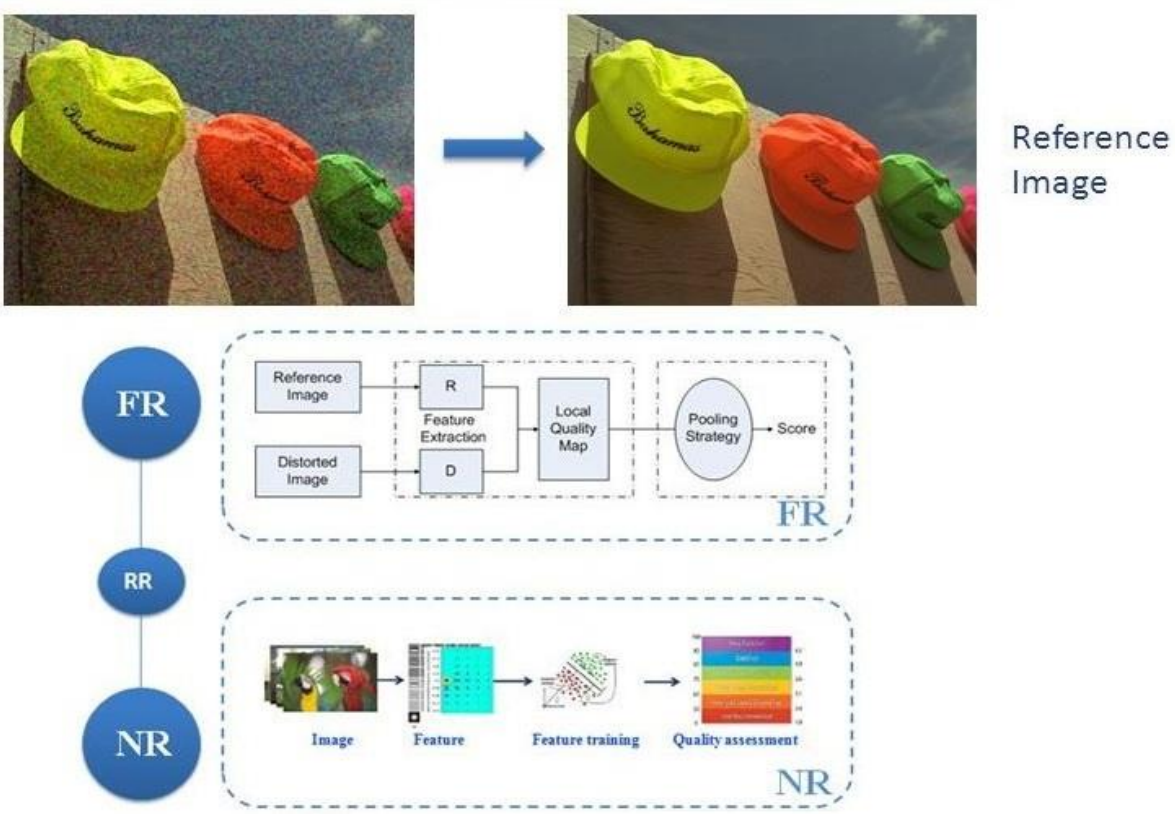

Fig.2.Image Quality Assessment

Our study is to develop a database of distorted images that will overcome the limitations of all the existing benchmark image quality assessment databases [5]. The LIVE In the Wild Image Quality Challenge Database includes 1162 distorted images collected from many different mobile devices. Every image was rated and viewed online on a continuous quality scale by an average of 175 unique subjects refer Table I. The IQA databases researchers to perform of IQA algorithms and participate towards reaching the goal of objective quality assessment research matching human perception [6].

Table I.Image Quality Assessment Databases

No	Database	Reference Images	Distorted Images	Distortion Types	Image type	Subjects
1	TID2013	25	3000	24	Color	971
2	LIVE	29	779	5	Color	161
3	CSIQ	30	866	6	Color	35

The LIVE in the Wild Image quality database has over 350,000 scores on1162 images performed by over 8100 human observers [7].

2.2. Massive online crowd sourcing

We discuss the critical factors that are involved in crowd sourcing human image quality assessment decisions, such as the overall system of the online study steps for subject validation and regression. Subjective study conditions on end users assessment of perceptual quality. The crowd sourcing image quality study allowed our diverse subjects to attend at their convenience no well defined distortion categories in real world pictures. The study highlights a characteristic of real world,

authentically distorted images collected by users of consumer devices that these pictures cannot be accurately explained as generally suffering from single distortion.

Crowd sourcing is a new tool with considerable to help in the production of valuable and generalized subjective databases representative of human decisions of perceptual quality with more than 350,000 subjective judgments in fig.3.We believe that the study explained here is the biggest and most comprehensive study of perceptual image quality. The digital video and moving picture are also captured with increasing frequently by both technical and causal users. Increasingly mobile environment the spatial temporal signals will be subject to a larger variety of distortion from a multiplicity of natural and artificial processes [8].

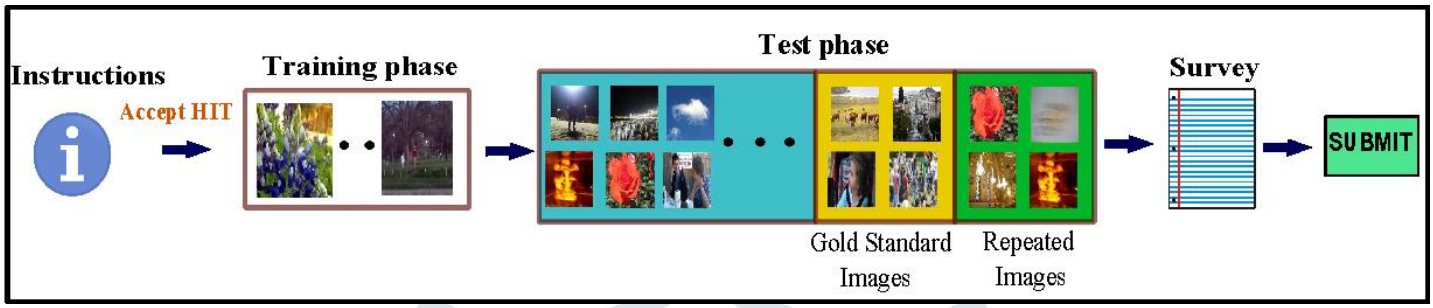

Fig.3.Massive online crowd sourcing

Measurement of visual quality is of fundamental importance for numerous image and video processing application, where the aim of Quality assessment algorithm is to assess the quality of images or videos with human quality judgments. We present result of an extensive subjective quality assessment study in which a total of 779 distorted images were evaluated by about two dozen human subjects. The ground truth image quality data obtained from 25,000 individual human quality judgment is used to evaluate the performance of several FR IQA algorithms [9].

2.3. Image quality metrics

Image quality metrics the 12 widely accepted IQMS namely PSNR , UQI, SSIM , MSSIM, FSIM, IWPSNR, IWSSIM, GBIM,NBAM,NPBM & JNBM are applied in evaluvation.These IQMs include 8 FR and 4 NR metrics and range from the purely pixel based IQMs without the characteristics of the HVS to Image Quality Assessment that contain complex HVS modeling[12].

a) Full-reference methods – Full reference metrics try to assess the quality of a test image by comparing it with a reference image that is assumed to have perfect quality, e.g. the original of an image versus a JPEG-compressed version of the image.
b) Reduced-reference methods – Reduced reference metrics assess the quality of a test and reference image based on a comparison of features extracted from both images.
c) No-reference methods – No reference metrics try to assess the quality of a test image without any reference to the original one.

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III. RESULTS AND DISCUSSIONS

LIVE database images distorted with lossy compression has been included into database. We have included into our database the images compressed by JPEG or JPEG 2000 and decoded with errors in data transmission channels. We have added into database images for which mean shift and contract change distortion image has been designed[10].The LIVE database contains 5 different distortion categories including JPEG 2000,JPEG,additive white Gaussian noise, Gaussian blur and bit errors due to transmission of JPEG 2000 images over a fast fading channel in Table 2. There are a total of 779 distorted images across all distorted categories. The reduced reference algorithm operates without knowledge of distortion type [11].

Table II.Databases that contain jpeg-distortion images

Database	Reference Images	Images Consider	Distortion Consider	Observer
TID2013	25	500	JPEG compression JPEG2000 compression JPEG transmission errors JPEG2000 transmission errors	971

TID2008	25	400	JPEG compression JPEG2000 compression JPEG transmission errors JPEG2000 transmission errors	838
LIVE	29	344	JPEG2000 compression JPEG	20
CSIQ	30	300	JPEG2000 compression Motion JPEG compression	35

IV .CONCLUSION

Many Full Reference databases that take into specific features of human visual system has been already proposed. To adequateness and performance of these metrics database of color images with certain types and levels of distortions have been used including the databases LIVE,TID 2013 etc.We had to sufficiently modify and to add types of distortion which are important from technical and practical viewpoints. All these consideration we have decided to introduce 7 new types of distortions to get the total number of distortions types equal to 24 with five levels distortions, there are 120 distorted versions of each reference color image.

Motivations for making these changes are presented. The introduced type's distortions and the generation of corresponding images are fully explained. Methodology of carrying out experiments is also revisited [13].

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