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# Detection Of Postpartum Hemorrhaged Using Fuzzy Deep Learning Architecture

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***Abstract***

Maternal mortality is mainly caused because of the post-partum hemorrhage. The main goal of this research is to predict the postpartum hemorrhage based on Deep learning technique. This paper presents comparison of different deep learning approaches to achieve better performance. In this paper, Convolutional neural network concept of ZF net and VGG-16net are used for the advance observation of postpartum hemorrhage's risk in the PPH development is predicted by Fuzzy based rules in every parameter and the performance evaluation of the system proposed is done by decreasing the rate of morbidity and mortality. Low level PPH, Average level PPH, and High level PPH are the metrics used to perform the research in this experiment. It concluded that CNN concept of VGG-16net yield outstanding performance and gave better accuracy than other techniques.

Keywords**.** Deep learning, CNN, ZF net, VGG-16net, Fuzzy Neural Network.



## 1 INTRODUCTION

Blood loss during the labor and delivery is above the 500ml and for C- section less than 1000 ml is defined as Postpartum hemorrhage [1].To overcome this risk modern techniques and an antenatal practices are used for the identification of this disease[2].Oxytocin, Misoprostol are the suture methods, balloon tamponade and prostaglandins are some methods of intervention widely used[3].Postpartum hemorrhages minimized likely by this suture methods. Neural network can also be used for foresee explicit values based on the determined patterns from known results. CNNis special kind of NN which is utilized effectively for classification. They have demonstrated so productive that, they are go – to

method for any type of prediction issue [4].

## 2 RELATED WORK

Reviewed the research papers such as neonatal jaundice [5], heart disease, and Parkinson disease for predicting. By using naive bayes , the accuracy for the neonatal jaundice was 79% , for the heart disease [6] was 77.6% and for the Parkinson disease was 82.5%. By using Decision tree, the accuracy for the neonatal jaundice was 77.03%, for the heart disease was 100%, for the Parkinson disease [7] was 75.52%. The results presented a better accuracy by using data mining techniques. Boosted decision tree as well as 10-foldcross-validation are used in validation process of [8] and Boosted decision tree produced better results. 0.978 is the highest prediction rate obtained by Boosted decision tree on AUROC curve. [9, 10] are used in Hinslemann screening method. Boosted decisiontree provides best performance as compared to other classifiers.

## 3 SYSTEM MODEL

Blood loss during the labour and delivery is above the 500ml and for C- section less than 1000 ml is defined as Postpartum haemorrhage. PPH detection is difficult to diagnose early because of this PPH in deliveredwomen leads tosuffer or die. The suggested classification methods offer a quick training procedure and improved accuracy for predicting postpartum haemorrhage in women, making it simple to determine whether a patient will experience postpartum haemorrhage or not. When postpartum haemorrhage reaches a particular point, it is possible to stop the bleeding and rescue the woman by allowing more advanced medical care.

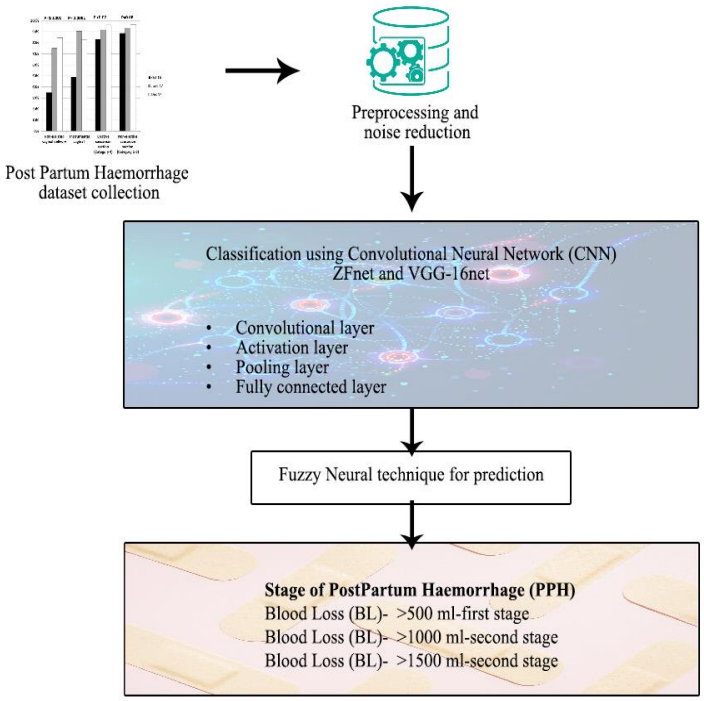


*Figure-1 Architecture for Post-Partum Hemorrhaged classification*

### *3.1 Construction of VGG-16net*

Andrew Zisserman and Karen Simonyan put forth VGG 16. VGG is an acronym for the Oxford-based Visual Geometry Group, a type of convolutional neural network. By merely preserving the convolutional modules, the model may be adjusted to accommodate arbitrary input sizes. The model contains a collection of weights that have already been trained on Imagenet. This function makes use of the Deep Learning Toolbox model for the VGG-16 network support package. Convolution layer

input should have a fixed size. Max-pooling is demonstrated over a 22 with stride 2. The dataset includes data that ought to have a set size. Differentiation probability for classification class is represented by the vector. Each model should be able to forecast the probability-related data. When using the softmax function to verify that the probabilities add up to 1, it is shown as eq. (1)

$$P(y=j|\theta^{(i)}=\frac{e\theta(i)}{\sum_{j=0}^{k} e\theta(i)k} \quad (1)$$

where,

$\theta = w_0x_0+w_1x_1+\ldots..w_kx_k$

$=\sum_{i=0}^{k} wixi$

$=w^TX$

Ground value for this vector should next be defined as well as given the name G. Then, add candidates with the highest likelihood to the vector and give it the letter C. It is necessary to determine the error function for this vector, which is defined as follows.

*3.2 Algorithm: Innovative method for predicting Postpartum Haemorrhage using VGG-16net*

BEGIN

Initialize (net)

m = (no_attributes / batch_size) for epoch 1 to n

{ do

{

forbatch_size 1 to m

{ do

im = uniformly random sample of batch_size attributes selected [ i,j ] = preprocess(im)

k = feed_forward(net,i) loss = loss_func(k,j)

adagrad = feed_backward(loss) update(net,adagrad)

}

end for

}

end for END.

It is claimed that the activation function utilised here for all hidden layers is more computationally productive since it speeds up learning and lessens possibility of a rinsing gradient issue. With a localization error of 25.32%, it also won the task. The best result obtained by VGG-16 with single net production is 7.0% test error.

*3.3 Prediction of stages in post-partum hemorrhage*

PPH development risk is predicted by fuzzy neural method-based rules which are utilized for every parameter and the performance evaluation of system proposedfor decreasing the arte of morbidity and mortality. Low level Postpartum Hemorrhaged, average level Postpartum hemorrhage, and High-level Postpartum Hemorrhage the metrics are used to perform the experiments. Depends upon the predicted sensitive values, make medical practitioner to scrutinize and perceive the lead better. The level of PPH using Neuro Fuzzy Technique will turnto be a small contribution in the field of Gynecology and for predicting the post-partum hemorrhage.

## 4 RESULTS AND DISCUSSION

The analysis of the health data was done using convolutional neural networks. The ZFnet, VGG-16, and fuzzy neural network networks are some examples of optimization strategies that are dealt with by the convolutional neural network. Performance sketches for accuracy, specificity, and sensitivity are used for comparison. To evaluate the three measures, a classified confusion matrix is obtained. Table 1 lists the operational parameters.

*Table 1: Operational parameters*

| Operational Parameters | Values |
|---|---|
| Epochs | 150 |
| Batch Size | 16 |
| Loss Function | Deice |
| Learning Rate Drop | 1e-1 |
| Learn Rate Drop Period | 50 |
| Initial Learn Rate | 1e-2 |

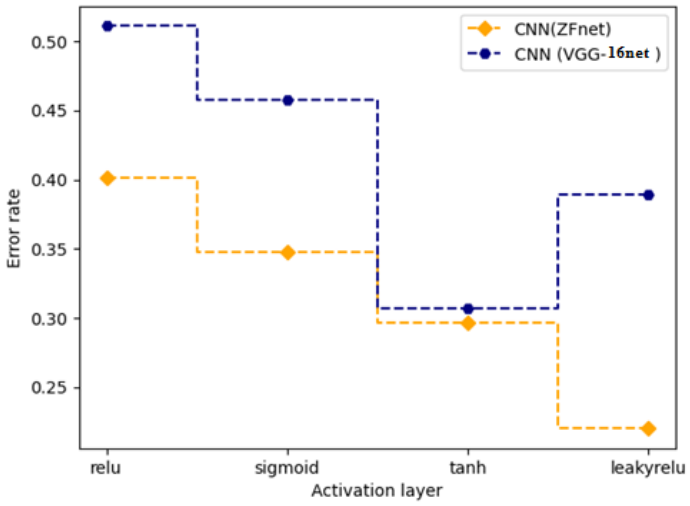


*Figure-2 Analysis of error rate*

Figure 2 shows the analysis of error rate where x axis indicates the activation layer such as relu,sigmoid,tanh,leakyrelu and y axis indicates the error rate for both CNN(ZFnet) and CNN(VGG-16net). It is find that the error rate is less for both networks. The four techniques used here are referred to as activation layer, which are predicted in form of confusion matrices. Table 3 displays prediction

results of the validation datasets, and error rate is calculated for each and every activation layer of CNN concept of ZFnet and VGG-16net.

*Table 2 Performance metrices of CNN (ZFnet)andCNN (VGG-16net)*

| | Time | Kappa Statistics | MAE | RAE (%) | RRSE(%) | Accuracy (%) | Sensitivity (%) | Specificity (%) |
|---|---|---|---|---|---|---|---|---|
| **CNN(ZFnet)** | 1.03 | 0.850 | 0.1175 | 39.369 | 68.99 | 90.763 | 42.117 | 61.974 |
| | 3.01 | 0.798 | 0.0568 | 42.976 | 98.98 | 42.098 | 85.4 | 95.0367 |
| | 0.02 | 0.794 | 0.049 | 31.475 | 95.99 | 86.512 | 59.303 | 92.51 |
| | 4.1 | 0.779 | 0.021 | 55.613 | 126.21 | 33.373 | 42.204 | 87.76 |
| **CNN(VGG-16net)** | 2.01 | 0.900 | 0.2286 | 40.57 | 48.99 | 95.48 | 72.84 | 74.29 |
| | 1.09 | 0.887 | 0.0699 | 45.07 | 99.94 | 89.23 | 89.47 | 96.39 |
| | 0.05 | 0.789 | 0.0500 | 33.84 | 95.38 | 85.63 | 79.38 | 93.25 |
| | 18.6 | 0.583 | 0.0324 | 58.46 | 147.23 | 73.29 | 63.93 | 85.283 |

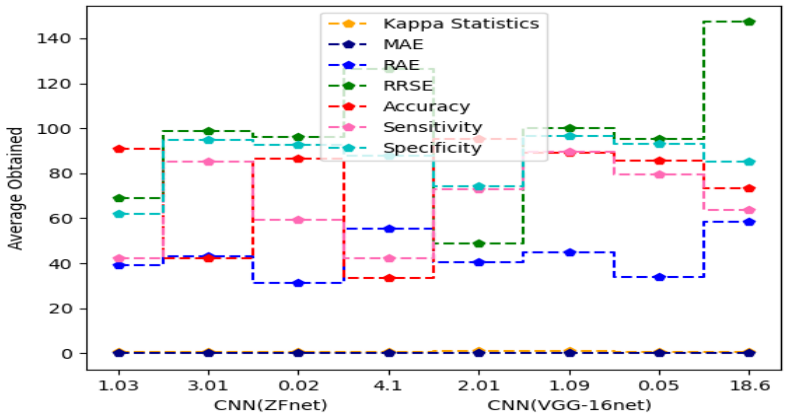


*Figure 3. Performance of CNN and FNN*

Figure 3 shows that the CNN concept of ZFnet achieved classification accuracy of 90.7639%, 42.0895%, 80.5120%, and 33.3738% for each of the activation layers with sensitivity of 42.1179%, 85.4175%, 59.3038%, and 42.2041% and specificity of 61.9743%, 95.0367%, 92.5180%, and 87.7611% while the CNN concept of VGG-16net achieved classification.

## 5 CONCLUSIONS

The techniques of classification in this proposal are utilized for considering postpartum haemorrhage in women is CNN concept of ZFnet and VGG-16net. PPH development risk is predicted by fuzzy neural method based rules which are utilized for every parameter and the performance evaluation of system proposed for decreasing the arte of morbidity and mortality. Low level Postpartum Haemorrhage, average level Postpartum Haemorrhage, and High level Postpartum Haemorrhage are the metrics are used to perform the experiments. Comparing VGG-16 net to ZFnet, the performance is better. It was said to be more complicated and provided superior precision. It was determined that using a genetic approach to reduce the actual size of the data and choose the best attribute subgroup

improved the ZFnet's accuracy. The VGG-16 net's notion of a convolutional neural network plays a key role in identifying related features.

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