BINUS UNIVERSITY DOCTORATE PROGRAM | Doctor of Computer Science

DEEP LEARNING APPROACH FOR CLASSIFICATION OF HYPERTENSION RETINOPATHY

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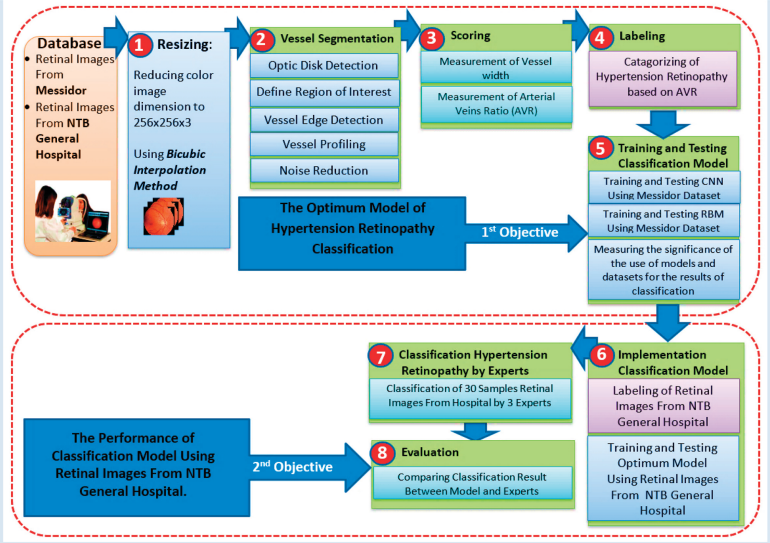
Background and Objectives:

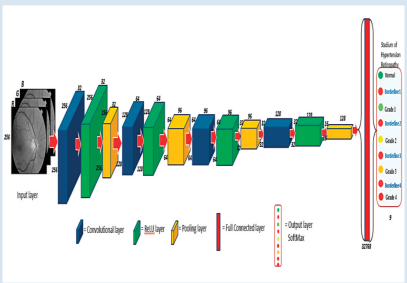
Ophthalmologists use fundus images or retinal images of the eye, to evaluate the presence of hypertensive retinopathy and to define the evolutionary phase, but these methods have limitations because, in the case of the border stage, early symptoms of hypertensive retinopathy will be difficult to identify manually, then The early diagnosis of hypertension retinopathy using deep learning is necessary for accurate prevention and treatment to help ophthalmologists to perform hypertension retinopathy screening, particularly in borderline stages to prevent high blood pressure and heart attack.

The Objectives of this research are to identify the optimum classification model of hypertension retinopathy through deep learning approach, and implement the classification model of hypertension retinopathy using retinal images dataset from the regional public hospital provincial of Nusa Tenggara Barat

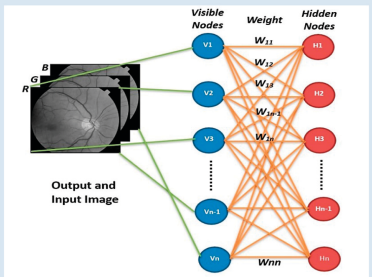
Research Framework



Model



The Architecture of CNN Model



The Architecture of RBM Model

No	9 Classes		
	Layer	Number of Neuron, (Number of the kernel)	
1	Input	256 x 256 x 3	
2	Convolutional	256 x 256, (32)	
3	ReLU	256 x 256, (32)	
4	MaxPool	128 x 128, (32)	
5	Convolutional	128 x 128, (64)	

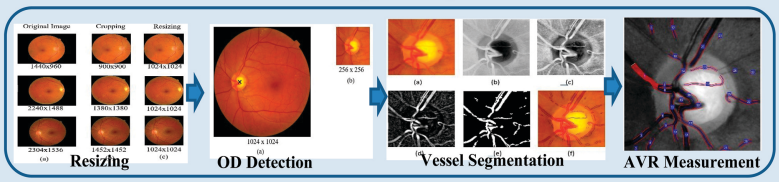
No	9 Classes		
	Layer	Number of Neuron, (Number of the kernel)	
6	ReLu	128 x 128, (64)	
7	MaxPool	64 x 64, (64)	
8	Convolutional	64 x 64, (96)	
9	ReLu	64 x 64, (96)	
10	MaxPool	32 x 32, (96)	

No	9 Classes		
	Layer	Number of Neuron, (Number of the kernel)	
11	Convolutional	32 x 32, (128)	
12	ReLU	32 x 32, (128)	
13	MaxPool	16 x 16, (128)	
14	Full-Connected	256	
15	Output Softmax	9	

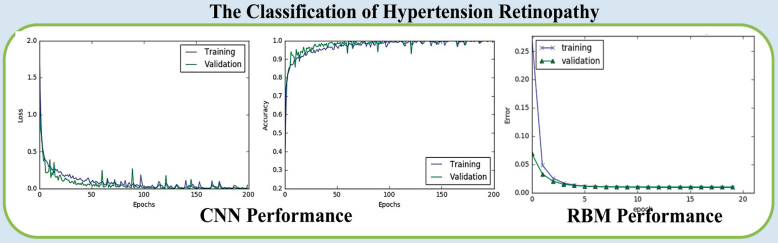
The Size of Input Image	Number of Visible Nodes	Number of Hidden Nodes	Learning rate	Number of epoch
256x256x3	196608	1500	0.05	20

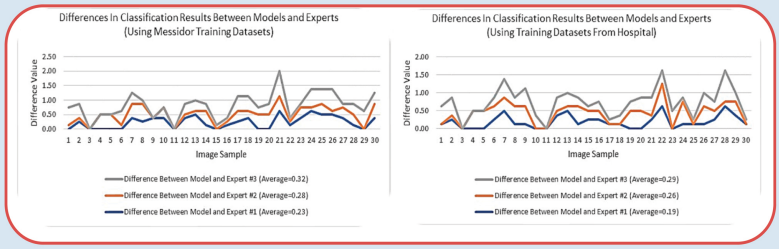
Result

Image Labeling

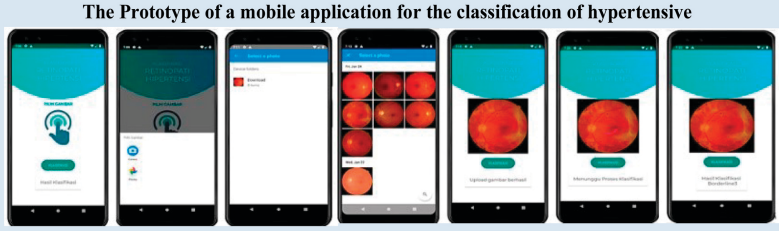


The Classification of Hypertension Retinopathy





The Prototype of a mobile application for the classification of hypertensive



Conclusion and Recommendation

CONCLUSION:

- The optimal hypertensive retinopathy classification model into 9 classes can be obtained. First, by applying the AVR calculation algorithm to build a new dataset with 9 class categories. Second, determining the architectural specifications for the CNN and RBM models by setting the input size, depth, and the number of nodes for each layer, transfer function, learning rate, and the number of epochs.
- Based on The results of the analysis of the implementation of the model using a dataset from general hospitals in NTB showed, first, the addition of the hypertensive retinopathy class category from 5 to 9 had an impact on the more sensitive classification results and could detect symptoms of hypertensive retinopathy earlier for preventive action. Second, the professional experience of an ophthalmologist is a key factor for the classification results. Third, the computational model for the classification of hypertensive retinopathy can be used as a reference to assist ophthalmologists who have professional experience or prospective ophthalmologists in classifying hypertensive retinopathy.
- The addition of hypertension retinopathy class categories from 4 to 9 has an impact on the classification results more sensitive and can detect symptoms of hypertension retinopathy earlier for preventative measures.

RECOMMENDATION:

- Modify the hypertension retinopathy classification model by adding or combining it with other machine learning algorithms and using another retinal image database that has a larger number of datasets

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