PANIMALAR ENGINEERING COLLEGE

Department of Computer Science and Engineering

CS8811 PROJECT WORK

RETINAL VESSEL SEGMENTATION BY USING (CNN) ALGORITHM .

GUIDE ;

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INTRODUCTION ;

In medicine, the finding is all around as significant as treatment. Retinal veins are the most effectively noticeable vessels in the entire body, and in this manner, assume a critical part in the conclusion of various illnesses and eye issues. Deliberate and eye illnesses cause morphologic varieties, like the developing, restricting, or spreading of retinal veins. Imaging-based screening of retinal veins assumes a significant part in the recognizable proof and follow-up of eye illnesses.

LITERATURE SURVEY ;

S.NO	TITLE	AUTHOR	YEAR	DESCRIPTION
1.	Emerging insights into the relationship between hyperlipidemiaand the risk of diabetic retinopathy	Yuyu Chou1 , Jin Mal, Young Zhong , Xin Su2*.	2020	Hyperlipidemia is correlated is a with serious health problem.
2.	Neurovascular Impairment and Therapeutic Strategies in Diabetic Retinopathy	Toshiyuki Oshitari	2021	Diabetic retinopathy has recently beendefined as a highly specific .

S.NO	TITLE	AUTHOR	YEAR	DESCRIPTION
3.	Diabetic retinopathy: current understanding, mechanisms, and treatment strategies.	Elia J. Duh,1 Jennifer K. Sun,2 Alan W. Stitt3	2017	Diabetic retinopathy (DR) causes significant visual loss on a global scale.
4.	The Evolving Treatment of Diabetic Retinopathy	Sam E Mansour 1,2 David J Browning .	2020	. A review and synthesis of the ophthalmologic literature on treatment of diabetic retinal.

PROBLEM STATEMENT ;

The fundoscopic exam is a procedure that provides necessary information to diagnose different retinal degenerative diseases such as Diabetic Retinopathy, Macular Edema, Cytomegalovirus Retinitis. A highly accurate system is required to segment retinal vessels and find abnormalities in the retinal subspace to diagnose these vascular diseases. Many image processing and machine learning-based approaches for retinal vessel segmentation have so far been proposed.

TECHNOLOGY STACK ;

SOFTWARE REQUIREMENT ;

1. Operating System : Windows 10 or later.

2. Tool : Anaconda with Jupyter Notebook, Pycharm .

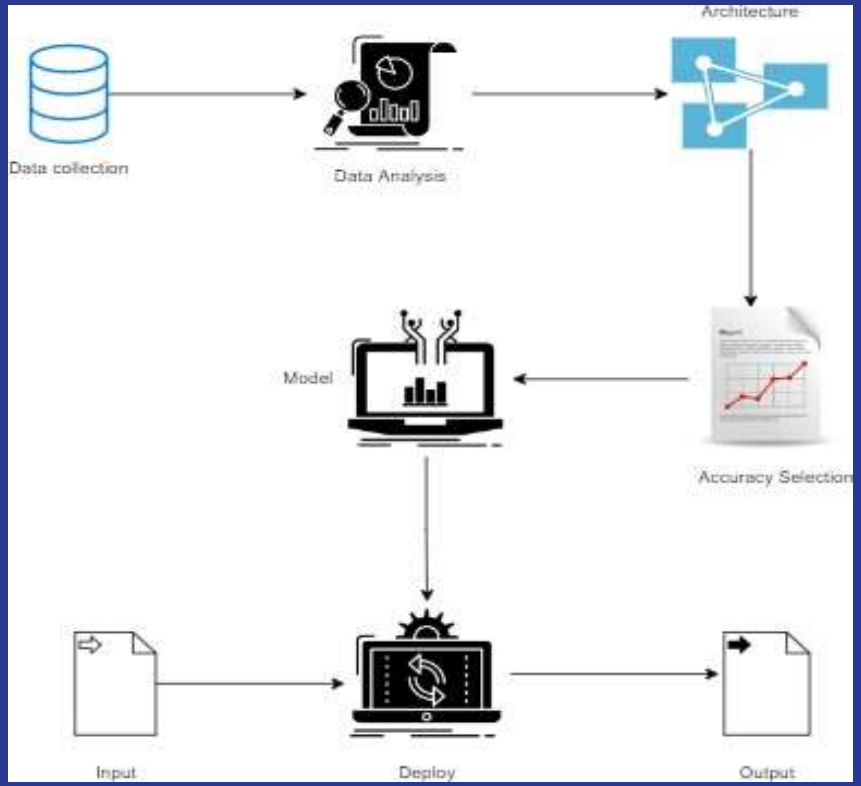
HARDWARE REQUIREMENT ;

1.Processor : Intel i3 or higher .

2. Hard disk : minimum 10 GB .

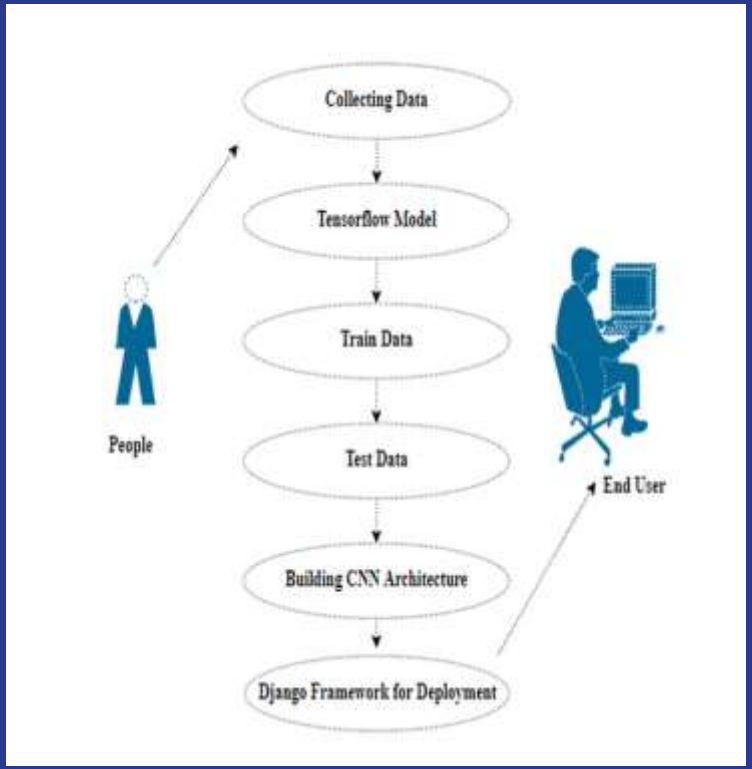
3.RAM : minimum 4 GB .

SYSTEM ARCHITECTURE ;



The data used is usually split into training data and test data. The training set contains a known output and the model learns on this data in order to be generalized to other data later on. It has the test dataset (or subset) in order to test our models and it will do this using the Tensorflow library in Python using the Keras method.

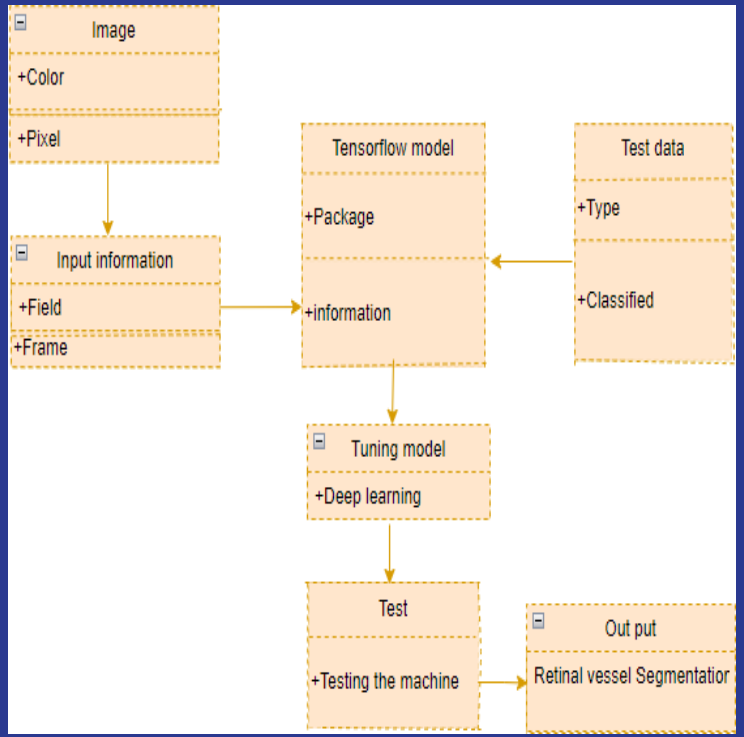
SYSTEM DESIGN ;



USECASE DIAGRAM :

Usecase diagrams are considered for high level requirement analysis of a system. So when the requirements of a system are analyzed the functionalities are captured in use cases. So, it can say that uses cases are nothing but the system functionalities written in an organized manner.

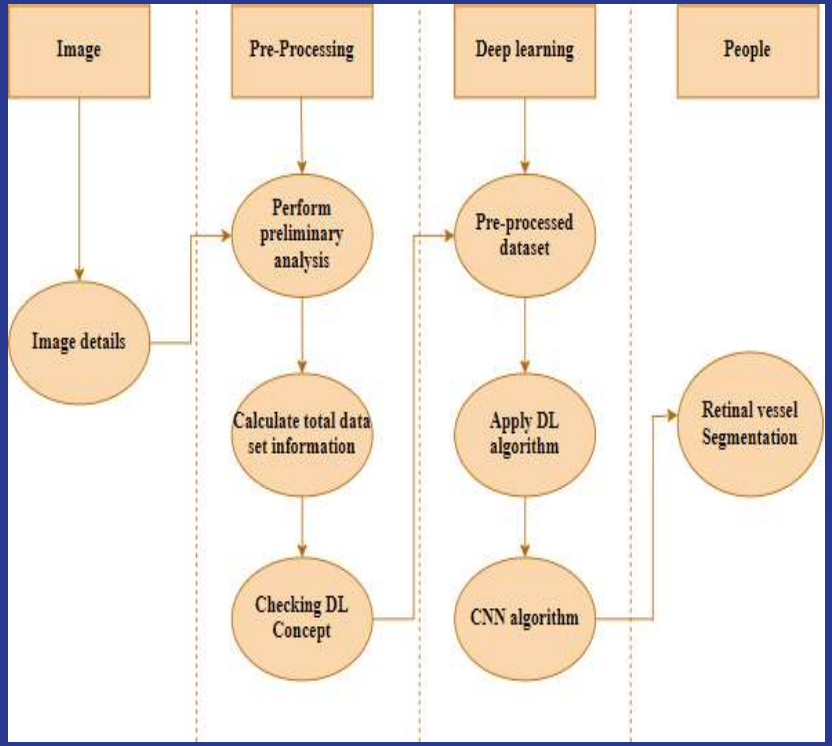
SYSTEM DESIGN ;



CLASS DIAGRAM :

Class diagram is basically a graphical representation of the static view of the system and represents different aspects of the application. So a collection of class diagrams represent the whole system. The name of the class diagram should be meaningful to describe the aspect of the system.

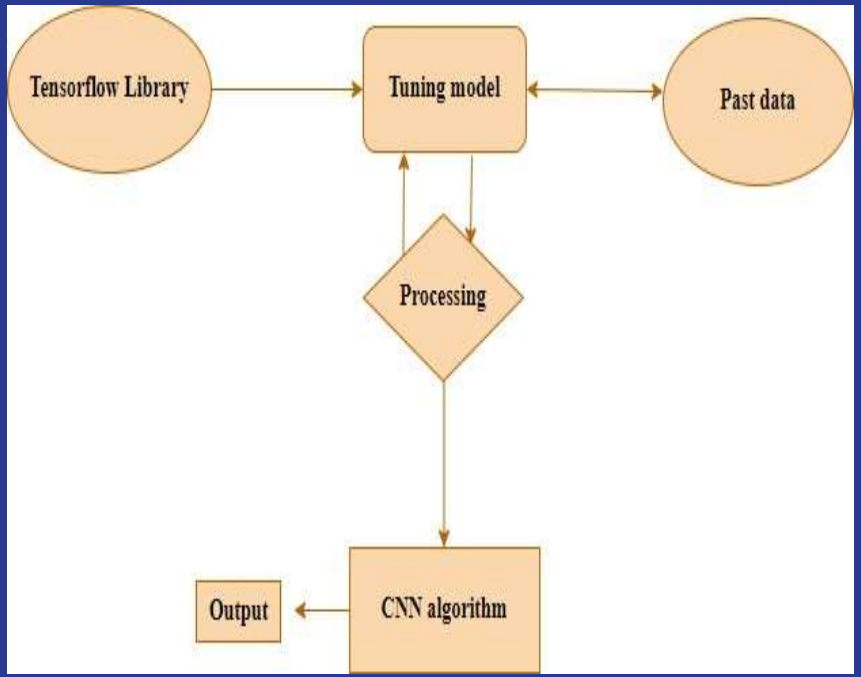
SYSTEM DESIGN ;



ACTIVITY DIAGRAM :

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing dynamic nature of a system but they are also used to construct the executable system by using forward and reverse engineering techniques.

SYSTEM DESIGN ;



ER DIAGRAM :

An entity relationship diagram (ERD), also known as an entity relationship model, is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within that system.

MODULE DESCRIPTION ;

1. DATA ANALYSIS ;

Data analysis is the process of cleaning, changing, and processing raw data, and extracting actionable, relevant information that helps businesses make informed decisions. The procedure helps reduce the risks inherent in decision-making by providing useful insights. The data analysis process, or alternately, data analysis steps, involves gathering all the information, processing it, exploring the data, and using it to find patterns and other insights.

2. MANUAL ARCHITECTURE ;

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms.

3 . U-NET ARCHITECHTURE ;

The U-Net architecture, first published in the year 2015, has been a revolution in the field of deep learning. The architecture won the International Symposium on Biomedical Imaging (ISBI) cell tracking challenge of 2015 in numerous categories by a large margin. Some of their works include the segmentation of neuronal structures in electron microscopic stacks and transmitted light microscopy images.

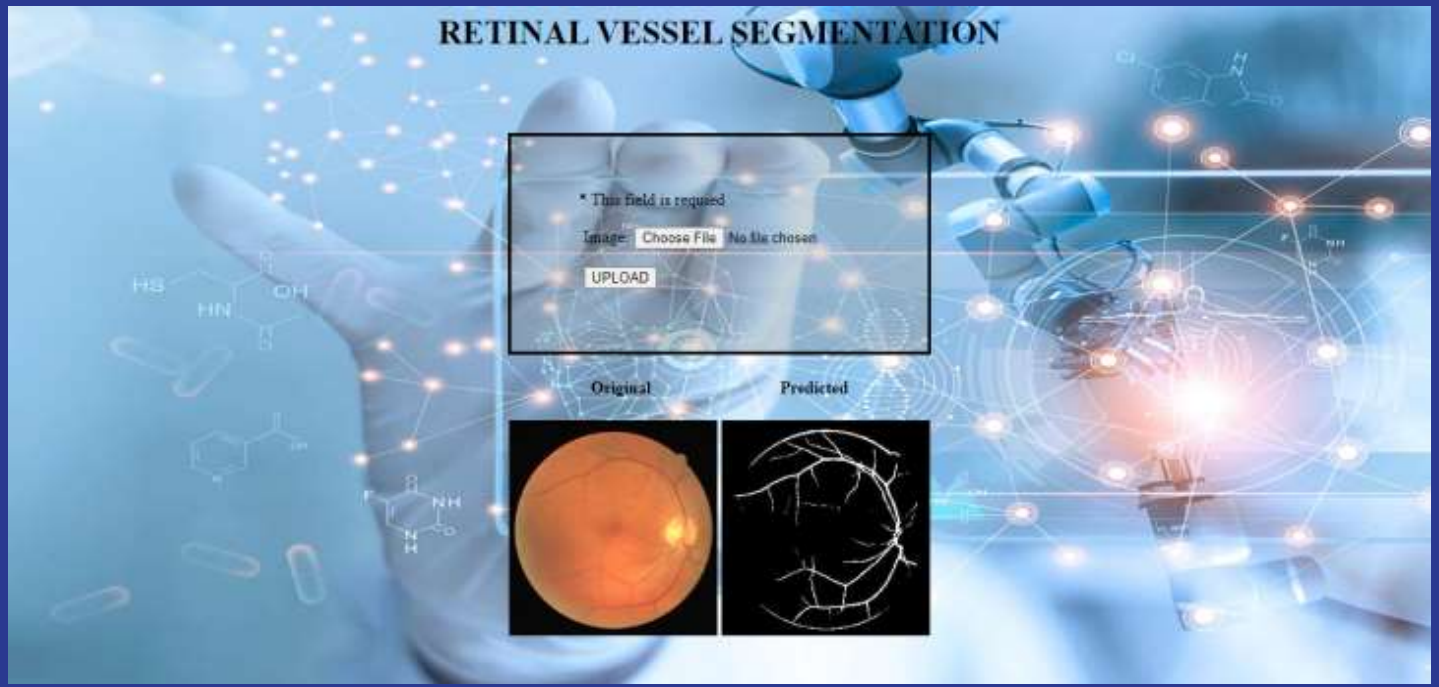
4. DEPLOYMENT ;

In this module, the trained deep learning model is converted into a hierarchical data format file (.h5 file) which is then deployed in our Django framework for providing a better user interface and predicting the output of retinal fundus image. Django is a high-level Python web framework that enables rapid development of secure and maintainable websites.

TESTING ;

Input layer in CNN contain image data. Image data is represented by three dimensional matrixes. It needs to reshape it into a single column. Suppose you have image of dimension 28 x 28 =784, it need to convert it into 784 x 1 before feeding into input. layer is sometimes called feature extractor layer because features of the image Convo are get extracted within this layer. First of all, a part of image is connected to Convo layer to perform convolution operation .

SCREEN SHOT ;


RETINAL VESSEL SEGMENTATION
* This field is required
Image: Choose File No file chosen
UPLOAD
Original
Predicted

OUTPUT ;

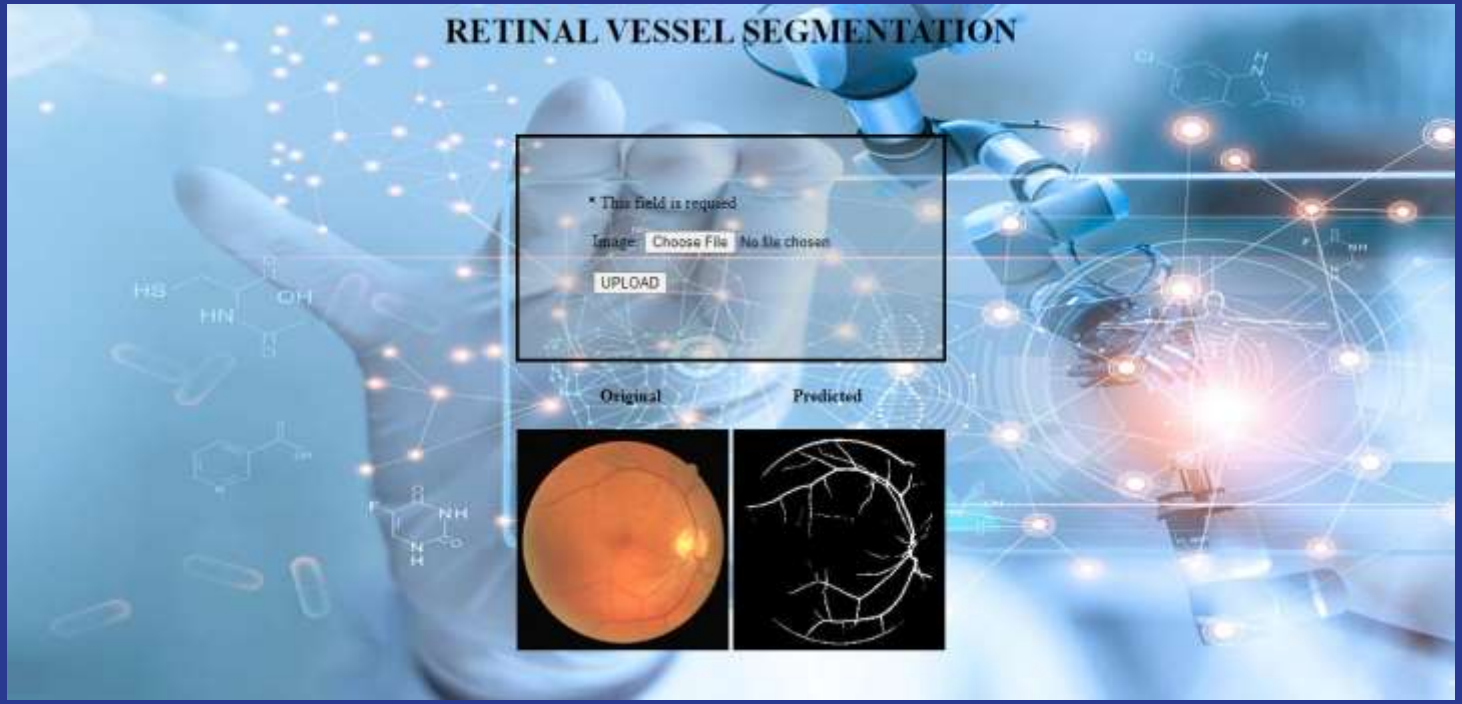

RETINAL VESSEL SEGMENTATION
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Image: Choose File No file chosen
UPLOAD
Original
Predicted

CONCLUSION ;

Image segmentation is a very useful task in computer vision that can be applied to a variety of use-cases in medical domain. Here we analyse the data how it is available and train the data. The best architecture is picked form the trained architecture and it is converted into model. The bulid model is used in django framework to segment the retinal fundus image. Further improvement in the network’s accuracy can be achieved through the following practices .

REFERENCE ;

[1]P. Saeedi et al., “Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the international diabetes federation diabetes atlas,” Diabetes Res. Clin. Pract., vol. 157, 2019, Art. no. 107843.

[2] T. Y. Wong and C. Sabanayagam, “Strategies to tackle the global burden of diabetic retinopathy: From epidemiology to artificial intelligence,” Ophthalmologica, vol. 243, no. 1, pp. 9–20, 2020.

[3] C. Bascaran et al., “Effectiveness of task-shifting for the detection of diabetic retinopathy in low-and middle-income countries: A rapid review protocol,” Systematic Rev., vol. 10, no. 1, pp. 1–5, 2021.

[4] R. Klein, B. E. Klein, and S. E. Moss, “Visual impairment in diabetes,” Ophthalmology, vol. 91, no. 1, pp. 1–9, 1984.

[5] L. Sifre and S. Mallat, “Rigid-motion scattering for texture classification,”2014, arXiv:1403.1687.