Journal of Advances and Scholarly Researches in Allied Education
Vol. 18, Issue No. 4, July-2021, ISSN 2230-7540

A Study on techniques for diabetic retinopathy prediction using a deep learning model

Naresh Kumar[1]*, Dr. Mukesh Kumar[2]

[1] Research Scholar, Sunrise University, Alwar Rajasthan

[2] Associate Professor, Sunrise University, Alwar Rajasthan

Abstract - Data science can either be utilized for analysis, for example, pattern-identification, testing of hypothesis, risk evaluation or forecast, for example, AI models that make appropriate expectations that are the probability of an occasion happening later on, in light of known information factors. A medicinal service covers itemized procedures of the identification or prognosis or diagnosis, treatment and avoidance of ailment. The clinical business or healthcare domain in many nations is advancing at a fast step. The medical-clinical domains with rich information are creating enormous measures of information, including electronic clinical records, managerial reports and different discoveries. This information is anyway being unutilized. Data mining can scan for new and significant data from these bigger databases. Medicinal services information mining is being utilized mostly for anticipating disorders and conclusion for the specialists for settling on their clinical, medical choice. Health informatics presently turning into a very research-serious field and the biggest customer of public-funds. With the development of new innovation and new calculations, medicinal services area has seen an ascent in computer devices and could no longer overlook these rising apparatuses. This is come about into joining of human services parts and registering to shape healthcare informatics. This is relied upon to make more adequacy and proficiency in the healthcare system, while simultaneously, improve the nature of human services and lower cost.

Keywords - Diabetic Retinopathy Prediction, Deep Learning Model, Data science, medicinal service, medical-clinical domains

----------X----------

INTRODUCTION

The main eye problem in diabetes is widely established. Thirty percent of diabetics show indications of retinopathy, and another thirty percent have vision problems that impair their ability to see well. Furthermore, the number is rising. By the year 2040, these numbers are expected to rise dramatically. Having diabetes raises your risk for a wide range of major health issues. There are macro and micro vascular complications with diabetes. In the case of macro and micro blood vessel damage, the terms are used interchangeably. Injuries to the blood arteries that impede kidney function are known as nephropathy, whereas damage to the eyes and nerves are known as retinopathy and neuropathy, respectively. (Fig 1). The concept of using AI in healthcare has already been validated in a variety of settings. The most common usage of artificial intelligence in healthcare is in ophthalmology, where it is used to conduct sophisticated image diagnosis tasks. Medicine can benefit greatly from artificial intelligence. In order to deal with the issues, artificial intelligence is most appropriate for an ophthalmologist. It is crucial that practitioners manage their professional futures by having intelligent algorithms and teaching themselves how to use, appraise, and apply deep learning effectively. With the use of expert algorithms from image datasets, practitioners may make investigations more efficient while also minimizing the likelihood of human error. As a result of advances in artificial intelligence, machine learning, and deep learning, disease-specific patterns can be identified and new structural associations can be made, allowing for fresh scientific insight. Diabetes is characterized by hyperglycemia, which is the primary pathologic feature. Preventing problems caused by increased blood sugar levels is a major concern. Diabetes has both macro and micro vascular consequences that are harmful. In diabetes, the most serious complication is depicted in the figure-1.

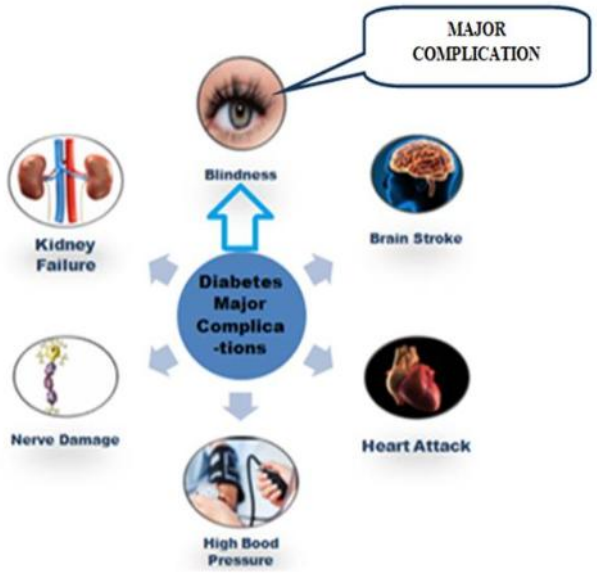


Figure 1: Diabetes Major Complications

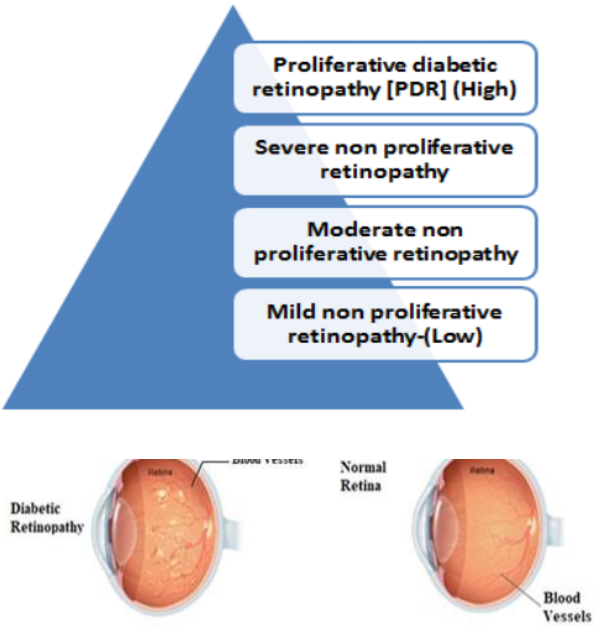


Figure 2: Diabetic retionopathy and Normal Retina

Innovation in the Proposed Research:

Many researchers have worked on diabetic retinopathy. Those offered and executed several machine learning approaches and made associated effort in the health care domain as well as data science fields. As more and more deep learning procedures, packages, and libraries become available, this could be a crucial factor in the model's success. Because of this, the researcher has decided to use a new methodology and platform to study diabetes retinopathy in light of the results and outputs. In this deep learning model researcher has used GPU from Google Colab. From the Kaggle competition website, the dataset can be downloaded. This data is recorded on the server's own memory, and the URLs of each image are transferred into an Excel spreadsheet.

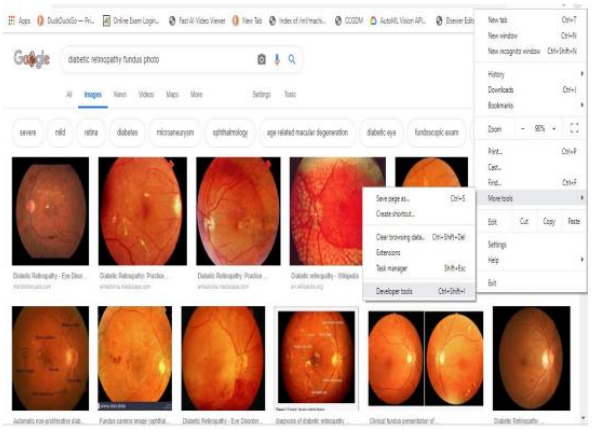
DIABETIC RETINOPATHY

A person is said to have diabetes or diabetes mellitus if their body is unable to properly utilise or store sugar. Because sugar is derived from the bloodstream, the level of blood sugar, which is also known as glucose, rises. Diabetic Retinopathy is caused by damage to the tiny arteries and veins in the eyes as a result of excessive glucose levels in the blood. The human retina's primary role is to detect light emissions. Through optic fiber, these indicators are subsequently translated into human intelligence. This diabetic complication may cause blurred vision and the retina's blood vessels to hemorrhage or leak eye fluid (Fig 2). Cell damage and blurred vision result in the most severe stage of this damage, in which the number of abnormal blood vessels and veins grows on the superficial surface of the retina. Ophthalmological Society of America [NEI]. Progressive four phases of retinopathy are:

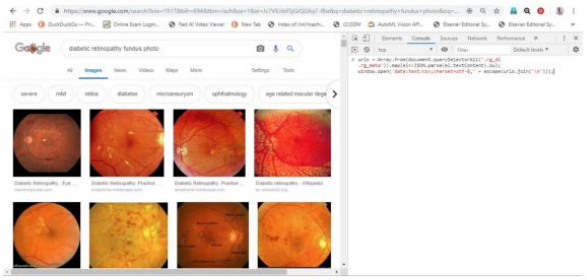
Creating Your Own Dataset from Google Images:

One can create our own dataset from Google images for this we need to follow, following steps.

Step 1: Select the Google img from more tools ◊ Developers Tools



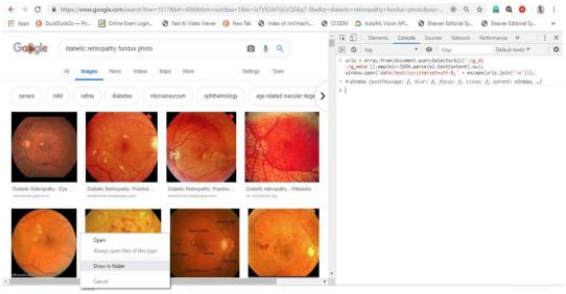
Step 2: Selecting the console tab



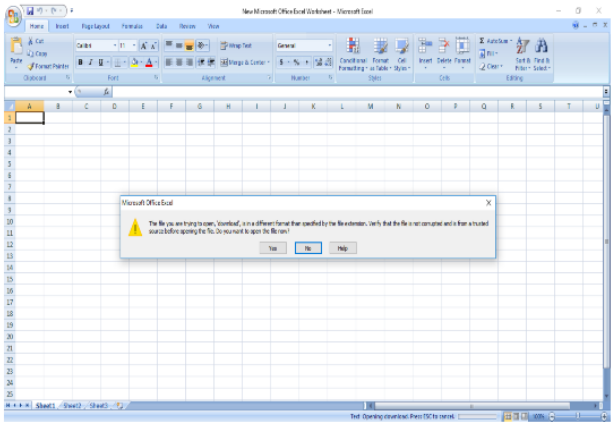
```
urls = Array.from(document.querySelectorAll('.rg_di
.rg_meta')).map(el=>JSON.parse(el.textContent).ou);
window.open('data:text/csv;charset=utf-8,' +
escape(urls.join('\n')));
```

Paste the above code in the console in the browsers window. Then by pressing the enter key the dataset is automatically downloaded.

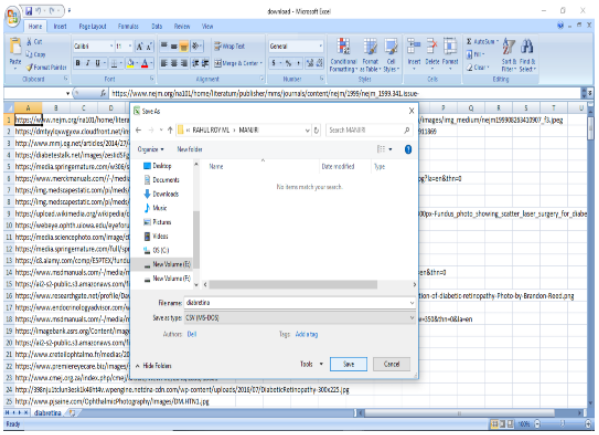
Step 3: If we press enter the file is download with name download

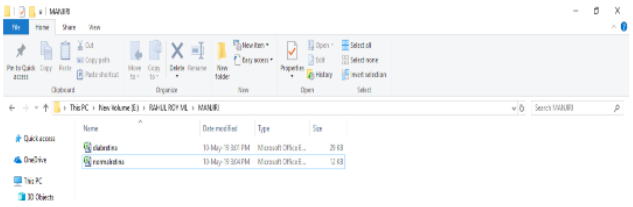


Step 4: Drag and drop this file to excel◊and save it on respective path



Step 5: Save file respective memory location .csv format.

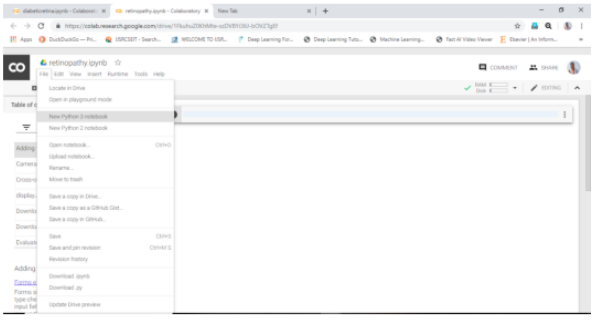




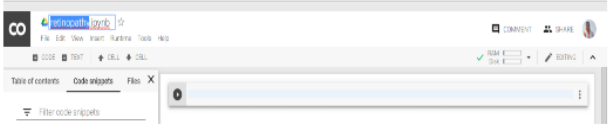
I've attached two csv files, one with retinopathy and the other with a normal eye. Some of the kaggle diabetic retinopathy dataset and web-based storage space were used in this study. As of this writing, the pictures dataset is accessible via the web server. The image's web address is i.e. URL are stoared as dataset in comma deliminted CSV format for further processing.

Steps for creating CNN using Colab runtime GPU:

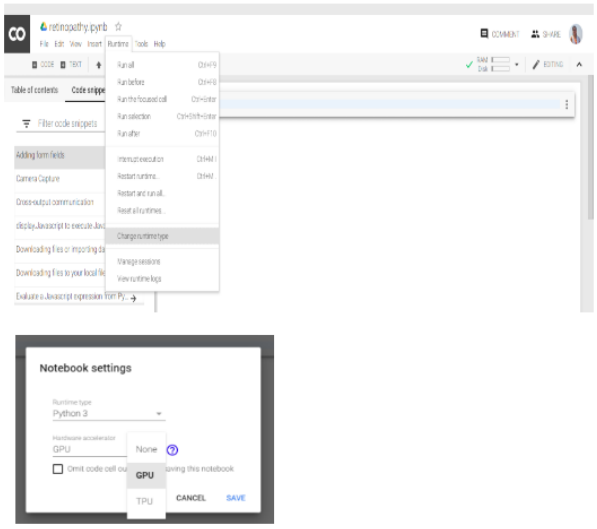
1. Open Google Colab with secure Google Login ◊ File◊New Python 3 notebook.



2. Rename the file name◊ Click on Runtime ◊ Change Runtime Type as GPU

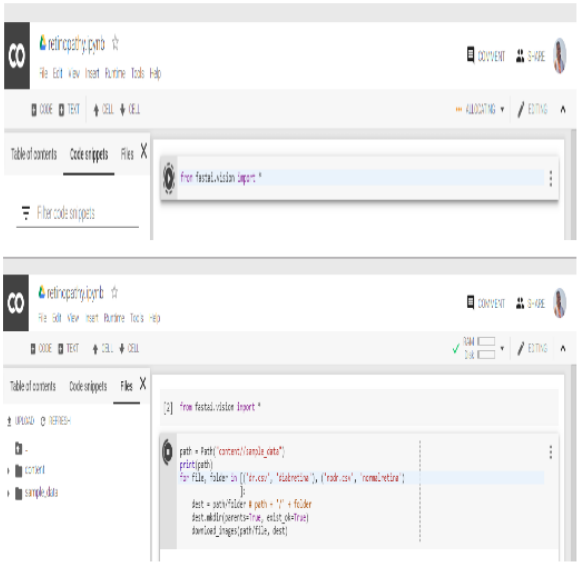


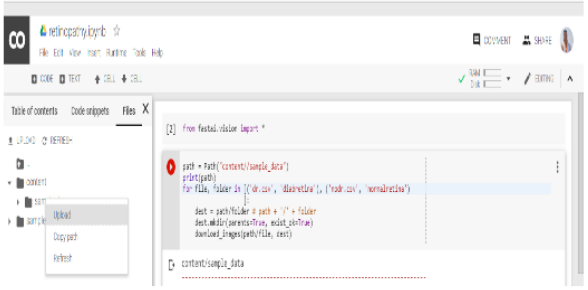
3. Change Runtime Type as GPU



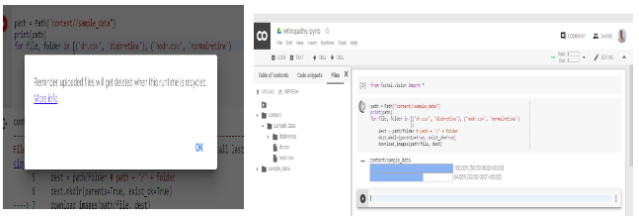
4. Start Writing Code◊ Set the path◊ Upload the Data◊

5. Start Writing Code◊ Set the path◊ Upload the Data◊

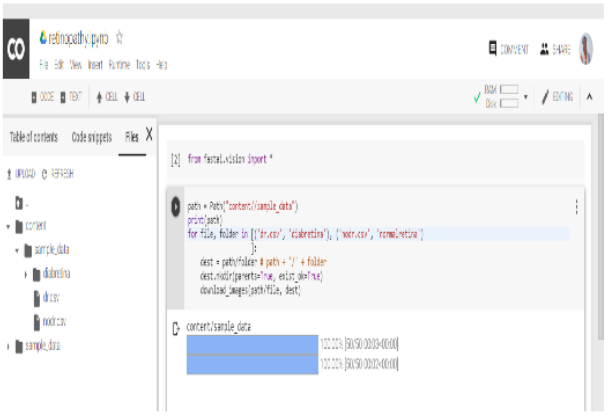




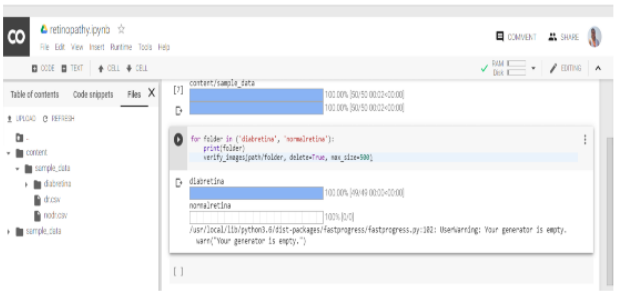
6. The researcher will get the default massage from the application that uploaded files get deleted during each runtime recycling.



7. Download images: As a result of FastAI's functionalities, anyone can download images from a document using the universal resource location (URL). For each document, the Uniform Resource Locator (URL) and the desired location must be provided. Using this feature will allow you to save and download images that can't be viewed or opened because of a viewing or display issue.



8. Then the removed images that cannot be opened.



CONCLUSION

The designed and developed Convolution Neural Network model for prediction of diabetic retinopathy is effective in term for the image processing which is trained with GPU system provided by Google Colab. This CNN model for prediction of diabetic retinopathy has 80% accuracy. Deep learning methodologies cover all the domains in the healthcare system and are progressively more effective in image processing, risk assessment and disease prediction. This proposed model for diabetic retinopathy prediction uses Fast AI libraries. With the help of Fast AI libraries anyone can create and design model using very less number of programming code. This CNN model is effective in term for the image processing model is trained with GPU system provided by Google Colab. The pre-compiled neural network will help in getting a timely and accurate

result. This proposed model classifies images of diabetic retinopathy images with the normal retina. This CNN can assistance the ophthalmologists for clinical diagnosis. Regular and good research in the area of healthcare is always in demand, which help for more accurate prediction for diagnosis, prognosis of many diseases.

REFERENCES

1. IoannisKavakiotis, Olga Tsave, AthanasiosSalifoglou, NicosMaglaveras, IoannisVlahavas, IoannaChouvarda, "Machine Learning and Data Mining Methods in Diabetes Research", Computational and Structural Biotechnology Journal Volume 15, 2017, Pages 104- 116
2. ShaiShalev-Shwartz, Shai Ben-David "Understanding Machine Learning", Cambridge University Press,United States of America, ISBN 978-1-107-05713-5
3. Francois Chollet , "Deep Learning with Python", Manning Publications Co, Shelter Island, NY, 9781617294433
4. Joshi SR, Parikh RM. India - diabetes capital of the world: now heading towards hypertension. J Assoc Physicians India. 2017;55:323–4
5. Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. Australas Med J. 2018;6(10):524–31.
6. Kaveeshwar SA, Cornwall J.The current state of diabetes mellitus in India.Australas Med J. 2014;7:45–8"
7. Ravi Sanakal, Smt. T Jayakumari, "Prognosis of Diabetes Using Data mining ApproachFuzzy C Means Clustering and Support Vector Machine", International Journal of Computer Trends and Technology (IJCTT) – volume 11 number 2 – May 2014 ISSN: 2231-2803 , Page94
8. NahlaBarakat, Andrew P. Bradly, Mohamed Nabil H. Barakat "Intelligible Support Vector Machines for Diagnosis of Diabetes Mellitus" IEEE Transactions on Information Technology in Biomedicine, Volume 14 Issue 4 , July-2015
9. G. Parthiban ,S.K.Srivatsa, " Applying Machine Learning Methods in Diagnosing Heart Disease for Diabetic Patients", International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 3– No.7, August 2017
10. BerinaAlic, LejlaGurbeta, AlmirBadnjevic "2017 6th Mediterranean Conference on Embedded Computing (MECO)" Bar, ISBN: 978-1-5090-6742-8
11. Han Wu, Shengqi Yang, Zhangqin Huang, Jian He, Xiaoyi Wang, " Type 2 diabetes mellitus prediction model based on data mining", ,Informatics in Medicine Unlocked 10 (2018) 100–107
12. DeeptiSisodia, Dilip Singh Sisodia, "Prediction of Diabetes using Classification Algorithms", Procedia Computer Science 132 (2018) 1578–1585
13. SajidaPerveen, Muhammad Shahbaz, Aziz Guergachi, KarimKeshavjee, "Performance Analysis of Data Mining Classification Techniques to Predict Diabetes", Procedia Computer Science 82 (2016) 115 – 121
14. Saba Bashir, UsmanQamar, Farhan Hassan Khan,"IntelliHealth: A medical decision support application using a novel weighted multi-layer classifier ensemble framework", Journal of Biomedical Informatics 59 (2016) 185–200
15. NajmehHosseinpour, SaeedSetayeshi, Karim Ansari-asl, Mohammad Mosleh, " Diabetes Diagnosis by Using Computational Intelligence Algorithms",International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 12, December 2012 ISSN: 2277 128X
16. Dilip Kumar Choubey, Sanchita Paul and Joy Bhattachrjee , "Soft Computing Approaches for Diabetes Disease Diagnosis: A Survey", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 9, Number 21 (2019) pp. 11715-11726

Corresponding Author

Naresh Kumar*

Research Scholar, Sunrise University, Alwar Rajasthan