

RETINAL IMAGE CLASSIFICATION USING NEURAL NETWORK BASED ON A CNN METHODS

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ABSTRACT: This article is to develop a system for distinguishing retinal diseases from fundus images. Accurate and programmed analysis of retinal images is believed to be an effective method for determining retinal disorders such as diabetic retinopathy, hypertension and atherosclerosis. In this task, a convoluted neural network is used to extract various retinal features such as the retina, optic nerve, and lesions, and to detect multiple retinal diseases in fundus photographs participating in a structured analysis (STARE) database of the retina. I applied the base model. He described an innovative solution that used convolutional neural networks (CNNs) to enable efficient disease detection and deep learning, with great success in the classification of various retinal diseases. Various neural and slice-by-slice visualization techniques were applied using CNNs trained on publicly available retinal disease image datasets. Neural networks have been observed to be able to capture the color and texture of disease-specific lesions at diagnosis. This is similar to human decision making. And this model for deploying the Django web framework. Experiment with various retinal features as input to a convolutional neural network for effective classification of retinal images.

Keywords: Retinal, deep learning, TensorFlow, Keras, CNN

1. INTRODUCTION

Data science uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured and unstructured data, and apply knowledge and practical insights from data in a variety of application disciplines. It is an interdisciplinary field to do. The term "data science" can be traced back, when Peter Naur proposed it as an alternative to computer science. In 1996, the International Association of Classification Societies was the first conference dedicated to data science. But the definition was still in flux.

The term "data science" was first coined by DJ. Patil and Jeff Hammerbacher, pioneers in data and analytics

efforts on LinkedIn and Facebook. In less than a decade, it has become one of the hottest and trendiest professions in the world. Data science is a research discipline that combines subjectual knowledge, programming skills, and knowledge of mathematics and statistics to derive meaningful insights from data. Data science can be defined as a combination of mathematics, business sense, tools, algorithms and machine learning techniques. All of this helps reveal insights and patterns hidden from raw data that are very helpful in initiating good business decisions.

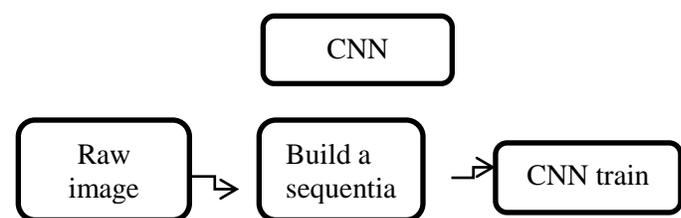
Data scientists find out which questions need to be answered and where the relevant data is. In addition to business insight and analytical skills, you have the ability to mine, clean up, and present data. Enterprises use data scientists to procure, manage, and analyze large amounts of unstructured data.

Required Skills for a Data Scientist

Programming: Python, SQL, Scala, Java, R,

Machine Learning: Natural Language Processing, Classification, Clustering. Data Visualization: Tableau, SAS, D3.js, Python, Java, R libraries. Big data platforms: MongoDB, Oracle, Microsoft Azure, Cloudera.

Model Preprocessing and Training (CNN): The dataset is preprocessed. B. Image conversion, resizing, and conversion to array format. The same process is performed on the test image. For example, a dataset consisting of images of retinal disease. Each image can be used as a software test image.



The training dataset is used to train the model (CNN). This allows the model to identify the test image and the disease. CNN has various layers such as Dense, Dropout, Activation, Flatten, Convolution2D and MaxPooling2D. After the model has been successfully trained, the software can identify the disease if a retinal image is included in the dataset. After successful training and pretreatment, the test image and the trained model are compared to predict the disease.

Requirements are the basic constraints needed to develop a system. Requirements are collected during system design. The following are the requirements to be discussed.

1. Functional requirements
2. Non-Functional requirements
3. Environment requirements

Functional requirements:

Software requirements specifications are technical specifications of software product requirements. This is the first step in the requirements analysis process. Lists the requirements for a particular software system. The following details follow special libraries such as TensorFlow, Keras, Matplotlib.

Non-Functional Requirements:

Process of functional steps,

1. Problem define
2. Preparing data
3. Evaluating algorithm
4. Improving results

BACKGROUND STUDY

Carlos Hernandez-Matasa , Antonis A. Argyrosa,b , Xenophon Zabulisa [1] The first fundus images were acquired after the invention of the ophthalmoscope. The concept of storing and analyzing retinal images for diagnostic purposes exists ever since. The first work on retinal image processing was based on analog images and regarded the detection of vessels in fundus images with fluorescein . The fluorescent agent enhances the appearance of vessels in the image, facilitating their detection and measurement by the medical professional or the computer. However, fluorescein angiography is an invasive and time-consuming procedure and is associated with the cost of the fluorescent agent and its administration. Digital imaging and digital image

processing have proliferated the use of retinal image analysis in screening and diagnosis. The ability to accurately analyze fundus images has promoted the use of noninvasive, fundus imaging in these domains. Moreover, the invention of new imaging modalities, such as optical coherence tomography (OCT) and scanning laser ophthalmoscopy (SLO), has broadened the scope and applications of retinal image processing. This review regards both fundus imaging, as implemented by fundus photography and SLO and OCT imaging.

[2] Rubina sarki , Khandakar Ahmed , (senior member, IEEE), Hua wang , (Member, IEEE), and Yanchun zhang Diabetes Mellitus, or Diabetes, is a disease in which a person's body fails to respond to insulin released by their pancreas, or it does not produce sufficient insulin. People suffering from diabetes are at high risk of developing various eye diseases over time. As a result of advances in machine learning techniques, early detection of diabetic eye disease using an automated system brings substantial benefits over manual detection. A variety of advanced studies relating to the detection of diabetic eye disease have recently been published. This article presents a systematic survey of automated approaches to diabetic eye disease detection from several aspects, namely: i) available datasets, ii) image preprocessing techniques, iii) deep learning models and iv) performance evaluation metrics. The survey provides a comprehensive synopsis of diabetic eye disease detection approaches, including state of the art field approaches, which aim to provide valuable insight into research communities, healthcare professionals and patients with diabetes.

Baidaa Al-Bander [3] The interpretation of ophthalmic images is typically performed by trained clinical experts. However, due to the volume and complexity of these images, and the large variation in pathology, in addition to the variation among experts, there has been increasing interest in computer-assisted assessment and diagnosis of such images. There has been particular interest in finding a cost-effective approach with high sensitivity and specificity, independent of human intervention, and robust enough to be applied to large populations in a timely manner to identify retinal diseases. This thesis introduces novel deep learning methodologies based on convolutional neural networks (CNNs) to address key challenges in different retinal image analysis tasks. Three retinal image analysis objectives have been considered in this research project: fovea and optic disc (OD) localisation, choroid and optic disc/cup segmentation, and disease and lesion classification tasks. In the first retinal image analysis task, simultaneous detection of the centres of the fovea and the optic disc from colour fundus images is considered as a regression problem.

Suvajit Dutta, Bonthala CS Manideep, Syed Muzamil Basha, Ronnie D. Caytiles¹ and N. Ch. S. N. Iyengar² [4] Diabetes or more precisely Diabetes Mellitus (DM) is a metabolic disorder happens because of high blood sugar level in the body. Over the time, diabetes creates eye deficiency also called as Diabetic Retinopathy (DR) causes major loss of vision. The symptoms can originate in the retinal area are augmented blood vessels, fluid drip, exudates, hemorrhages, and micro aneurysms. In modern medical science, images are the indispensable tool for precise diagnosis of patients. In the meantime evaluation of contemporary medical imageries remains complex. In recent times computer vision with Deep Neural Networks can train a model perfectly and level of accuracy also will be higher than other neural network models. In this study fundus images containing diabetic retinopathy has been taken into consideration. The idea behind this paper is to propose an automated knowledge model to identify the key antecedents of DR. Proposed Model have been trained with three types, back propagation NN, Deep Neural Network (DNN) and Convolutional Neural Network (CNN) after testing models with CPU trained Neural network gives lowest accuracy because of one hidden layers whereas the deep learning models are out performing NN. The Deep Learning models are capable of quantifying the features as blood vessels, fluid drip, exudates, hemorrhages and micro aneurysms into different classes. Model will calculate the weights which gives severity level of the patient's eye. The foremost challenge of this study is the accurate verdict of each feature class thresholds.

Carlos Hernandez-Matasa , Antonis A. Argyros^{a,b} , Xenophon Zabulisa [5] The diabetes retinopathy is the application of medical image processing. The retinal images are evaluated to diagnose the DR. It is however, time consuming and resource demanding to manually grade the images such that the severity of DR can be defined. When the tiny blood vessels present within the retina are damaged, only then can one notice this problem. Blood will flow from this tiny blood vessel and features are formed from the fluid that exists on retina. The kinds of features involved here due to the leakage of fluid and blood from the blood vessels are considered to be the most important factors to study this problem. The diabetes retinopathy detection techniques has the three phase which pre-processing, segmentation and classification. In this work, NN approach is used for the classification of diabetes portion from the image. The proposed model is implemented in MATLAB and results are analyzed in terms of certain parameters.

PROPOSED METHODOLOGY:

The proposed approach consists stage pretreatments were performed in retinal images from data sets and standardize them to size then classification was made by Convolutional Neural Network which is a deep learning algorithm and success was achieved to deep learning technique so that a person with lesser expertise in software should also be able to use it easily. It proposed system to predicting retinal disease. It explains about the experimental analysis of Samples of images are collected that comprised of different retinal. The primary attributes of the image are relied upon the shape and texture oriented features. An efficient disease detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various retinal diseases. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available retinal disease given image dataset. The sample screenshots displays the retinal disease detection using color based classification model. And to deploy this model in web application for Django framework.

Increasing throughput & reducing subjectiveness arising from human experts in detecting the retinal disease. It is essential to detect a particular disease. In our country many farmers are not so educated to get correct information about all diseases.

Here is an overview of what we are going to cover:

1. Installing the Python anaconda platform.
2. Loading the dataset.
3. Summarizing the dataset.
4. Visualizing the dataset.
5. Evaluating some algorithms
6. Making some predictions.

Download and install anaconda and get the most useful package for machine learning in Python. Load a dataset and understand its structure using statistical summaries and data visualization.

Machine learning models, pick the best and build confidence that the accuracy is reliable.

Python is a popular and powerful interpreted language. Unlike R, Python is a complete language and platform that you can use for both research and development and developing production systems. There are also a lot of

modules and libraries to choose from, providing multiple ways to do each task. overwhelming.

When you are applying machine learning to your own datasets, you are working on a project. A machine learning project may not be linear, but it has a number.

The best way to really come to terms with a new platform or tool is to work through a machine learning project end-to-end and cover the key steps. Namely, from loading data, summarizing data, evaluating algorithms and making some predictions.

Deploying the model in Django Framework and predicting output

In this module the trained deep learning model is converted into hierarchical data format file (.h5 file) which is then deployed in our django framework for providing better user interface and predicting the output whether the given OCT image is CNV / DME / DRUSEN / NORMAL.

DJANGO

Django is a high-level Python web framework that enables rapid development of secure and maintainable websites. Built by experienced developers, Django takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It is free and open source, has a thriving and active community, great documentation, and many options for free and paid-for support. Django helps you write software that is:

COMPLETE

Django follows the "Batteries included" philosophy and provides almost everything developers might want to do "out of the box". Because everything you need is part of the one "product", it all works seamlessly together, follows consistent design principles, and has extensive and up-to-date documentation.

Versatile

Django can be (and has been) used to build almost any type of website — from content management systems and wikis, through to social networks and news sites. It can work with any client-side framework, and can deliver content in almost any format (including HTML, RSS feeds, JSON, XML, etc). The site you are currently reading is built with Django!

Internally, while it provides choices for almost any functionality you might want (e.g. several popular

databases, templating engines, etc.), it can also be extended to use other components if needed.

SECURE

Django helps developers avoid many common security mistakes by providing a framework that has been engineered to "do the right things" to protect the website automatically. For example, Django provides a secure way to manage user accounts and passwords, avoiding common mistakes like putting session information in cookies where it is vulnerable (instead cookies just contain a key, and the actual data is stored in the database) or directly storing passwords rather than a password hash. A password hash is a fixed-length value created by sending the password through a cryptographic hash function.

Django can check if an entered password is correct by running it through the hash function and comparing the output to the stored hash value. However due to the "one-way" nature of the function, even if a stored hash value is compromised it is hard for an attacker to work out the original password. Django enables protection against many vulnerabilities by default, including SQL injection, cross-site scripting, cross-site request forgery and clickjacking (see Website security for more details of such attacks).

SCALABLE

Django uses a component-based "shared-nothing" architecture (each part of the architecture is independent of the others, and can hence be replaced or changed if needed). Having a clear separation between the different parts means that it can scale for increased traffic by adding hardware at any level: caching servers, database servers, or application servers. Some of the busiest sites have successfully scaled Django to meet their demands (e.g. Instagram and Disqus, to name just two).

MAINTAINABLE

Django code is written using design principles and patterns that encourage the creation of maintainable and reusable code. In particular, it makes use of the Don't Repeat Yourself (DRY) principle so there is no unnecessary duplication, reducing the amount of code. Django also promotes the grouping of related functionality into reusable "applications" and, at a lower level, groups related code into modules (along the lines of the Model View Controller (MVC) pattern).

PORTABLE

Django is written in Python, which runs on many platforms. That means that you are not tied to any particular server platform, and can run your applications on many flavours of Linux, Windows, and Mac OS X. Furthermore, Django is well-supported by many web hosting providers, who often provide specific infrastructure and documentation for hosting Django sites.

RESULT AND DISCUSSION



FIGURE 1 : INPUT

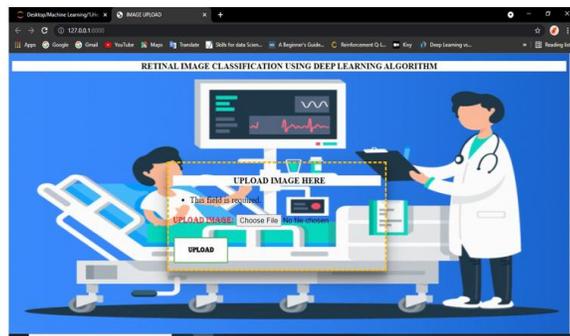


FIGURE 2: OUTPUT

CONCLUSION

It focused on how to use CNN models to predict patterns of retinal disease using images from specific datasets (trained datasets) and previous datasets. This provides some of the following insights into the prediction of retinal disease: The main advantage of the CNN classification framework is the ability to automatically classify images. Eye disorders are a major cause of blindness and are often too late to correct. This study provided an overview of how to detect retinal image anomalies, including retinal image dataset collection, preprocessing techniques, feature extraction techniques, and classification schemes.

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