

# **Automatic Diabetic Retinopathy classification system based on CNN with the evaluation of different models**

*CSE499B report submitted in partial fulfillment of the  
requirements for the degree*

*of*

**Bachelor of Science in Computer Science and Engineering**

*by*

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**NORTH SOUTH UNIVERSITY**

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# DECLARATION

**Project Title** Automatic Diabetic Retinopathy classification system based on CNN with the evaluation of different models

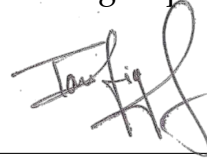
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This report is prepared as a requirement of the Capstone Design Project CSE499 A & B which is a two semester long senior design course. We declare that this CSE499B report entitled *Automatic Diabetic Retinopathy classification system based on CNN with the evaluation of different models* has not been accepted for any degree and is not concurrently submitted in candidature of any other degree. We would like to request you to accept this report as a partial fulfillment of Bachelor of Science degree under Electrical and Computer Engineering Department of North South University.



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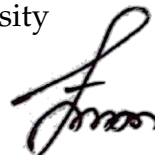
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## APPROVAL

This is to certify that the **CSE499B** report entitled **Automatic Diabetic Retinopathy classification system based on CNN with the evaluation of different models**, submitted by **Md.Tawfiq-Uz-Zaman** (Student ID: 1812832042), **Anika Mehjabin Oishi** (Student ID: 1811399042), and **Mohammad Billal Hossain Emon** (Student ID: 1812447042) are undergraduate students of the **Department of Electrical & Computer Engineering**, North South University. This report partially fulfils the requirements for the degree of *Bachelor of Science in Computer Science and Engineering* on January 9, 2022, and has been accepted as satisfactory.

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# Chapter 1

## Introduction

Diabetic Retinopathy (DR) is a very severe condition experienced by people who have diabetes. DR occurs when the blood glucose level increases excessively, damaging the retinal blood vessels. This causes a discharge of blood and fluid, resulting in critical eyesight problems, which might even lead to blindness [3]. Just like every other acute disease, if precisely diagnosed at an early stage, it is possible to reduce the deadly impacts and risk factors of DR and to offer the patient a suitable treatment [3]. With the advancement of Artificial Intelligence, Computer-Aided Systems (CAD) can be used for fast and automatic detection of abnormalities, and these allow classification of the severity of DR [3].

Artificial Intelligence is advancing medical science over the past few years. Its efficiency, accuracy, and reliability are making it more useful. Computer Aided Diagnosis (CAD) is a useful measure for medical diagnosis as it provides a computer-generated output with higher accuracy. A deep neural network such as Convolutional Neural Network (CNN) is the mean of CAD, which uses an image dataset to compare with an input set of patient's diagnosed image and looks if any abnormality is present. Medical image datasets are difficult to obtain because the annotation and labelling of medical image data are complicated by data privacy. The process is time-consuming and needs expert explanations. To improve image classification efficiency on small datasets, CNN-based approaches require various techniques, such as data augmentation and transfer learning. The traditional way of diagnoses such as previous medical reports, biopsy, and blood tests is a lengthy process, expensive and often results in an anomaly. Thankfully, CNN is a solution to all this. CNN follows image analysis include steps like image pre-processing, segmentation, model training, augmentation, etc.