**Avinashilingam Institute for Home Science and Higher Education for Women**
(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with 'A++' Grade by NAAC.CGPA 3.65/4, Category I by UGC
Coimbatore – 641 043, Tamil Nadu, India

# PLAGIARISM CHECK REPORT (THESES)

| | | |
|---|---|---|
| 1. | Name of the Research Scholar | K. Santhiya Lakshmi |
| 2. | Roll No. and Year of Registration | 21PHELF001, 2021 |
| 3. | Department | Electronics and Communication Engineering |
| 4. | Name of the Research Guide | Dr. B. Sargunam |
| 5. | Title of the Thesis / Dissertation | Classification of Diabetic Retinopathy Stages using Deep Learning Architectures |
| 6. | Similarity Content (%) Identified | **6%** |
| 7. | Software Used | Turnitin |
| 8. | Date of Verification | 13-08-2025 |

**Note :** The report is excluding 14 Consecutive words, Review of Literature and Quoted Materials.

Checked by :

13/8/25
**Information Scientist**

K. Santhiya Lakshmi 13/8/25
**Research Scholar**

13.08.25
**Assistant Librarian**

13/8/25
**Research Guide**

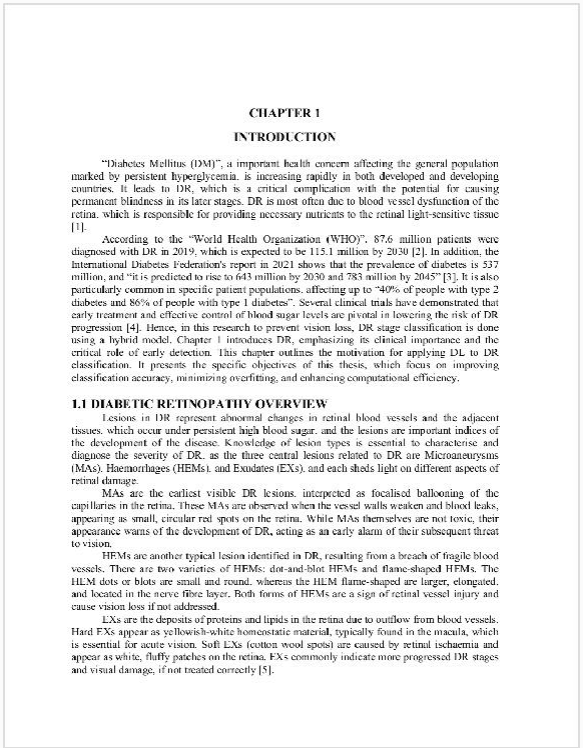
Date: 13-08-2025

# Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

| | |
|---|---|
| Submission author: | Central Library Avinashilingam |
| Assignment title: | Paper 2024 |
| Submission title: | Classification of Diabetic Retinopathy Stages using Deep Learn… |
| File name: | santhiya_thesis_13.08.25.docx |
| File size: | 2.9M |
| Page count: | 86 |
| Word count: | 29,426 |
| Character count: | 169,239 |
| Submission date: | 13-Aug-2025 12:33PM (UTC+0530) |
| Submission ID: | 2379043806 |



CHAPTER 1

INTRODUCTION

"Diabetes Mellitus (DM)", a important health concern affecting the general population marked by persistent hyperglycemia, is increasing rapidly in both developed and developing countries. It leads to DR, which is a critical complication with the potential for causing permanent blindness in its later stages. DR is most often due to blood vessel dysfunction of the retina, which is responsible for providing necessary nutrients to the retinal light-sensitive tissue [1].

According to the "World Health Organization (WHO)", 87.6 million patients were diagnosed with DR in 2019, which is expected to be 115.1 million by 2030 [2]. In addition, the International Diabetes Federation's report in 2021 shows that the prevalence of diabetes is 537 million, and "it is predicted to rise to 643 million by 2030 and 783 million by 2045" [3]. It is also particularly common in specific patient populations, affecting up to "40% of people with type 2 diabetes and 86% of people with type 1 diabetes". Several clinical trials have demonstrated that early treatment and effective control of blood sugar levels are pivotal in lowering the risk of DR progression [4]. Hence, in this research to prevent vision loss, DR stage classification is done using a hybrid model. Chapter 1 introduces DR, emphasizing its clinical importance and the critical role of early detection. This chapter outlines the motivation for applying DL to DR classification. It presents the specific objectives of this thesis, which focus on improving classification accuracy, minimizing overfitting, and enhancing computational efficiency.

## 1.1 DIABETIC RETINOPATHY OVERVIEW

Lesions in DR represent abnormal changes in retinal blood vessels and the adjacent tissues, which occur under persistent high blood sugar, and the lesions are important indices of the development of the disease. Knowledge of lesion types is essential to characterise and diagnose the severity of DR, as the three central lesions related to DR are Microaneurysms (MAs), Haemorrhages (HEMs), and Exudates (EXs), and each sheds light on different aspects of retinal damage.

MAs are the earliest visible DR lesions, interpreted as focalised ballooning of the capillaries in the retina. These MAs are observed when the vessel walls weaken and blood leaks, appearing as small, circular red spots on the retina. While MAs themselves are not toxic, their appearance warns of the development of DR, acting as an early alarm of their subsequent threat to vision.

HEMs are another typical lesion identified in DR, resulting from a breach of fragile blood vessels. There are two varieties of HEMs: dot-and-blot HEMs and flame-shaped HEMs. The HLM dots or blots are small and round, whereas the HLM flame-shaped are larger, elongated, and located in the nerve fibre layer. Both forms of HEMs are a sign of retinal vessel injury and cause vision loss if not addressed.

LXs are the deposits of proteins and lipids in the retina due to outflow from blood vessels. Hard EXs appear as yellowish-white homeostatic material, typically found in the macula, which is essential for acute vision. Soft LXs (cotton wool spots) are caused by retinal ischaemia and appear as white, fluffy patches on the retina. EXs commonly indicate more progressed DR stages and visual damage, if not treated correctly [5].

# Classification of Diabetic Retinopathy Stages using Deep Learning Architectures

*by* Central Library Avinashilingam

---

**Submission date:** 13-Aug-2025 12:33PM (UTC+0530)
**Submission ID:** 2379043806
**File name:** santhiya_thesis_13.08.25.docx (2.9M)
**Word count:** 29426
**Character count:** 169239

# Classification of Diabetic Retinopathy Stages using Deep Learning Architectures

ORIGINALITY REPORT

| 6% | 3% | 6% | 2% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

PRIMARY SOURCES

| | |
|---|---|
| www.mdpi.com<br>Internet Source | <1% |
| Submitted to Lebanese International University<br>Student Paper | <1% |
| Arvind Dagur, Karan Singh, Pawan Singh Mehra, Dhirendra Kumar Shukla. "Intelligent Computing and Communication Techniques - Volume 2", CRC Press, 2025<br>Publication | <1% |
| dev.mrdbourke.com<br>Internet Source | <1% |
| "Advances in Distributed Computing and Machine Learning", Springer Science and Business Media LLC, 2024<br>Publication | <1% |
| Afaf M. Abd El-Hameed, Ahmed S. Farahat, Khaled Y. Youssef, M. Elfarran, I. M. Selim. "Analysis of space solar array arc images based on deep learning techniques", Scientific Reports, 2025<br>Publication | <1% |
| "Proceedings of the 5th International Conference on Data Science, Machine Learning and Applications; Volume 1", Springer Science and Business Media LLC, 2025<br>Publication | <1% |