Performance Comparison of different molecular data in the identification of diabetic retinopathy

ANNOTATED BIBLIOGRAPHY

IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE DEGREE OF BACHELOR OF THE SCIENCE OF ENGINEERING

## Submitted by:

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**ARTICLE 1**

**Chandrasiri H.V.B.L. 2019/E/023**

**Week 1**

(1) Z.-W. Yu *et al.*, “&lt;p&gt;High Serum Neuron-Specific Enolase Level Is Associated with Mild Cognitive Impairment in Patients with Diabetic Retinopathy&lt;/p&gt;,” *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, pp. 1359–1365, Apr. 2020, doi: 10.2147/dmso.s249126.

(2) The article discusses how diabetic retinopathy (DR) can increase the risk of mild cognitive impairment (MCI), which has been confirmed by previous researches. (3) The aim of this study was to investigate the relationship between neuron-specific enolase (NSE) and MCI in patients with DR. (4) This study, which focuses on the association between diabetic retinopathy and mild cognitive impairment, is limited to Chinese patients. (5) This study could be useful for our research as it discusses a potential biomarker (NSE) for MCI in DR patients. (6) One limitation of this study is that it is a cross-sectional study, and thus, it cannot establish a cause-effect relationship between NSE and MCI in patients with DR. (7) The study concludes that a high serum NSE level is an independent risk factor for MCI in DR patients and is expected to be a potential biomarker in DR patients with MCI. (8) This work could fit into our research because providing information about a potential biomarker (NSE) for MCI in DR patients and its relationship with diabetic retinopathy.

**ARTICLE 2**

**Chandrasiri H.V.B.L. 2019/E/023**

**Week 2**

[1] Y. Sun, H. Zou, X. Li, S. Xu, and C. Liu, “Plasma metabolomics reveals metabolic profiling for diabetic retinopathy and disease progression,” *Frontiers*, 29-Sep-2021. [Online]. Available: https://www.frontiersin.org/articles/10.3389/fendo.2021.757088/full. [Accessed: 26-Apr-2023].

(2) Diabetic retinopathy (DR) is the main retinal vascular complication of diabetes mellitus (DM) and is the leading cause of visual impairment and blindness among working-age people worldwide (3) this study aimed to investigate the difference in plasma metabolic profiles in patients with DR better to understand the mechanism of this disease and disease progression. (4) The scope of this study is to use ultrahigh-performance liquid chromatography-mass spectrometry (UHPLC-MS) to analyze plasma metabolic profiles in patients with DR 2. (5) This study may be helpful for our research because providing insights into the metabolic profiling of DR using plasma metabolomics. (6) The study has limitations, such as a relatively small sample size, lack of validation in an independent cohort, and potential confounding factors, which need to be considered when interpreting the results. (7) This study provides evidence that plasma metabolomics could be used as a biomarker for early diagnosis and monitoring of DR. (8) This work may illuminate our research because providing a comparison point for plasma metabolomics as a molecular data source for identifying DR.

**ARTICLE 3**

**Chandrasiri H.V.B.L. 2019/E/023**

**Week 3**

(1) M. Bader Alazzam, F. Alassery, and A. Almulihi, “Identification of diabetic retinopathy through machine learning,” *Mobile Information Systems*, 26-Nov-2021. [Online]. Available: https://www.hindawi.com/journals/misy/2021/1155116/. [Accessed: 02-May-2023].

(2) This study focuses on a cross-sectional analysis of patients with suspected diabetic retinopathy using specialized retinal images analyzed and classified by OPF and RBM models. (3) this study aims to compare the performance of two different image analysis models (OPF and RBM) for the automatic detection of DR, through accuracy, sensitivity, and specificity. (4) The study included 73 people with diabetes (a total of 122 eyes), with 50.7% men and 49.3% women. (5) This study is useful for our research as it compares two machine-learning models in identifying diabetic retinopathy. (6) Limitations include fewer retinographs analyzed than planned and variation in the number of images evaluated in each class. (7) The study concludes that the RBM-1000 model performed best in terms of diagnostic accuracy (89.47 ± 2.64) and that machine learning automatic disease detection models have the potential for use in screening for DR. (8) This work illuminates research on performance comparison of different molecular data in the identification of DR by providing a comparison between two machine learning models.

**ARTICLE 4**

**Chandrasiri H.V.B.L. 2019/E/023**

**Week 4**

(1) G. L. D’Adamo, J. T. Widdop, and E. M. Giles, “The future is now? clinical and translational aspects of ‘OMICS’ technologies,” *Immunology & Cell Biology*, vol. 99, no. 2, pp. 168–176, 2020.

(2) This review discusses the integration of “omics” technologies into clinical practice and the potential for precision medicine. (3) This review aims to explore the areas of clinical medicine where omics and big data are already shaping clinical management or are on the cusp of doing so. (4) The review covers omics in oncology, complex diseases, microbiome research, and the challenges ahead for clinicians and researchers. (5) This review provides an overview of how omics technologies are used in clinical practice and could help understand how different molecular data can be used to identify diabetic retinopathy. (6) The review acknowledges practical and ethical challenges to implementing omics technologies in clinical practice. (7) The review concludes that while there is enormous potential for omics technologies in clinical medicine, there are also significant challenges that policymakers, funders, and clinicians must address. (8) This work illuminates our topic by providing an overview of how omics technologies are used in clinical practice and could provide insight into how different molecular data can be used to identify diabetic retinopathy.

**ARTICLE 5**

**Chandrasiri H.V.B.L. 2019/E/023**

**Week 5**

(1) L. Adlung, Y. Cohen, U. Mor, and E. Elinav, “Machine learning in clinical decision making,” *Med*, vol. 2, no. 6, pp. 642–665, Jun. 2021, doi: <https://doi.org/10.1016/j.medj.2021.04.006>.

(2) Machine learning is increasingly being integrated into clinical practice with applications ranging from pre-clinical data processing to early warning as part of primary and secondary prevention. (3) The article aims to provide an overview of machine learning in clinical decision-making and discusses the challenges and pitfalls in their application. (4) The scope of the article includes pre-clinical data processing, bedside diagnosis assistance, patient stratification, treatment decision-making, and early warning as part of primary and secondary prevention. (5) This article provides a broad overview of machine learning in clinical decision-making and could help understand the potential applications of machine learning in identifying diabetic retinopathy. (6) The article discusses the technological, medical, and ethical challenges of integrating machine learning into clinical practice. (7) The article concludes that machine learning has the potential to revolutionize clinical decision-making, but challenges still need to be addressed. (8) This work provides a broad overview of machine learning in clinical decision-making. It could help understand how machine learning could be applied to identifying diabetic retinopathy. It could also provide insights into the challenges and limitations of using machine learning in this context.

**ARTICLE 06**

**ASHFA A.G.F.**

**2019/E/011**

(1)Kamble, Vaibhav V., and Rajendra D., “Automated diabetic retinopathy detection using radial basis function”, Procedia Computer Science, vol.167, no. , pp. 799-808, 2020. Available: 10.1016/j.procs.2020.03.429.

(2) This paper automatically detected retinal image as Non DR or DR based on radial basis function (RBF) neural network classifier. (3) This paper prior diabetic retinopathy system using RBF which includes image dataset in order to the extract feature set, and at last feature classification to detect retinal funds image as DR or Non DR. (4) RBF Classifier utilization to recognized red lesion in retinal images. (5) This paper is used one of the method was RBF and feature extraction. Here on extracting Ophthalmic/clinic feature like exudate, blood vessels, and microaneurysms. And DIARETDB0 and DIARETDB datasets were used. This will be used for our research. (6) But, here mainly used in retinal image. We will mainly targeted molecular data identification. (7) The system was tested using two datasets, DIARETDB0 and DIARETDB, and achieved a sensitivity of 0.83 and 0.94, respectively, with low specificities. The researcher suggest incorporating a multiple classifier system (MCS) to improve the accuracy of the system in the future. (8) This research based retinal image on RBF method. Our research is based on molecular data in the identification of DR. Here take blood vessels identification blood vessels have most of the molecular data and suggest incorporating a MCS for better performance.

**ARTICLE 07**

(1)Das, D., Biswas, S.K. and Bandyopadhyay, S., “A critical review on diagnosis of diabetic retinopathy using machine learning and deep learning”, *Multimedia Tools and Applications*, vol.*81* (18), no., pp.25613-25655, 2022. Available: 10.1007/s11042-022-12642-4.

(2)This article is one of the review. DR is caused by irregular blood flow and leakage in retinal blood vessels, and automated detection systems using deep learning methods are proposed for early detection, as traditional machine learning methods are not suitable for analyzing large and complex image data. (3) The authors discuss the different machine learning and deep learning techniques that have been used for DR diagnosis, as well as the performance of these techniques. (4) This paper focuses on the use of machine learning and deep learning for the diagnosis of DR. The paper does not discuss the use of these techniques for other aspects of DR management, such as treatment and prognosis. (5) This paper is useful for researchers and clinicians who are interested in using ML and DL for the diagnosis of DR. (6) One limitation of this paper is that it is limited to the use of ML and DL for the diagnosis of DR. (7) ML and DL have the potential to improve the diagnosis of DR. These techniques have been shown to be more accurate than traditional methods of DR diagnosis, such as fundus photography. (8) The paper also discusses challenges such as data acquisition, preprocessing, and model constraints. This discussions and challenges are used for our research.

**ARTICLE 08**

(1)Gupta, S., Thakur, S. and Gupta, A., “Optimized hybrid machine learning approach for smartphone based diabetic retinopathy detection”, *Multimedia Tools and Applications*, vol.*81* (10), pp.14475-14501, 2022. Available: 10.1007/s11042-022-12103-y.

(2)This paper smartphones can be used as portable retinal imaging devices for DR screening, especially in rural areas with limited access to equipment and expertise. (3) The aim of this was to develop an optimized hybrid machine learning approach for smartphone-based DR detection. (4) The scope was developed and evaluated using a dataset of fundus images from patients with DR. (5) This paper has the potential to be used to detect DR in its early stages in low-resource settings. This could help to prevent blindness in people with DR. (6) The paper was developed and evaluated using a small dataset of fundus images. Further studies are needed to evaluate the paper using a large dataset of fundus images. (7) The optimized hybrid machine learning approach developed in this study is a promising tool for smartphone-based DR detection. Further studies are needed to evaluate the research in a larger clinical setting. (8) This research effectiveness of a machine learning approach for smartphone-based DR detection. This is an important finding, as it could lead to the development of new diagnostic and treatment strategies for DR.

**ARTICLE 09**

(1)Nomura, A., Noguchi, M., Kometani, M., Furukawa, K. and Yoneda, T., “Artificial intelligence in current diabetes management and prediction”, *Current Diabetes Reports*, vol.*21*(12), pp.61, 2021. Available: 10.1007/s11892-021-01423-2.

(2)Artificial Intelligence (AI) has the potential to improve diabetes care by automating tasks, providing personalized recommendations, and predicting future outcomes. (3) The authors conducted a literature review of AI applications in diabetes management and prediction. (4) The paper covers a wide range of AI applications in diabetes management and prediction. Such as, automated retinal screening, clinical decision support, predictive population risk stratification, and patient self-management tools. (5) This paper provides a comprehensive overview of the current state of AI in diabetes care. (6) The paper limited AI and ML based medical devices and prediction models regarding diabetes. (7) The paper emphasizes the accuracy of AI, specifically ML and DL, in predicting vast amounts of data. Although the FDA has approved AI based medical devices for diabetes, traditional statistical techniques remain superior in predicting disease onset. (8) The authors found that AI-based models were able to outperform traditional methods for detecting DR, AI could be a valuable tool for early diagnosis and treatment of this condition.

**ARTICLE 10**

(1)Miotto, R., Wang, F., Wang, S., Jiang, X., & Dudley, J. T., Deep learning for healthcare: review, opportunities and challenges, Briefings in bioinformatics, vol.19(6), pp.1236-1246, 2018. Available: 19/6/1236/3800524

(2) Deep learning is a powerful machine learning technique that has been shown to be effective in a variety of healthcare applications, including disease diagnosis, prognosis, and treatment planning. (3)This paper review the current state of DL in healthcare, discuss the opportunities and challenges of this technology, and provide recommendations for future research. (4)The paper covers a wide range of topics related to DL in healthcare, such as the use of DL for disease diagnosis, the use of DL for prognosis, the use of DL for treatment planning, the challenges of using DL in healthcare and the ethical considerations of using DL in healthcare. (5)This paper is a valuable resource for researchers and clinicians who are interested in learning more about the potential of DL in healthcare. (6)The field of DL is rapidly evolving, and there have been many advances in this area since this paper was published. (7)The authors conclude that DL has the potential to revolutionize healthcare. However, they also caution that there are a number of challenges that need to be addressed before this technology can be fully realized. (8)The authors discuss the potential of DL to improve the accuracy of disease diagnosis, and they identify a number of challenges that need to be addressed before this technology can be realized. The work of author provides a valuable foundation for future research on the use of DL for disease diagnosis.