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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[APRIL] [2023]

**ARTICLE 1**

**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 discussed how diabetic retinopathy (DR) can increase the risk of mild cognitive impairment (MCI), which has been confirmed by previous researches. (3) This study aims to investigate the relationship between neuron-specific enolase (NSE) and MCI in patients with DR. (4) This study aims to examine the relationship between serum neuron-specific enolase (NSE) levels and moderate cognitive impairment (MCI) in diabetic retinopathy (DR) patients. (5) This study could be helpful for our research as it discusses a potential biomarker (NSE) for MCI in DR patients, which could be exercised in our study. (6) One limitation of this study is that it is a cross-sectional study. Thus, it cannot establish a cause-effect relationship between NSE and MCI in patients with DR. (7) This study concluded 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 as it provided information about a potential biomarker (NSE) for MCI in DR patients and the connection between it and diabetic retinopathy.

[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].

**ARTICLE 2**

**2019/E/023**

**Week 2**

(2) Diabetic retinopathy (DR) is the main retinal vascular complication of diabetes mellitus (DM) which 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 to better understand the disease's mechanism and disease progression. (4) The scope of this study is to use ultrahigh-performance liquid chromatography-mass spectrometry (UHPLC-MS) to analyse plasma metabolic profiles of patients with DR. (5) The paper describes the metabolic changes that occur in the blood of diabetic retinopathy patients, which can be used to develop new molecular biomarkers for disease diagnosis and progression. (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 while interpreting the results. (7) This study provided evidence that plasma metabolomics could be used as a biomarker for early diagnosis and monitoring of DR. (8) This study provides plasma metabolomics as a molecular data source for identifying DR, thereby illuminating our research.

**ARTICLE 3**

**.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 focused on analysing patients with suspected diabetic retinopathy using specialised retinal images and classifying them using OPF and RBM models. (3) This study aimed to compare the performance of two different image analysis models (OPF and RBM) in the automatic detection of DR. (4) The objective of this study is to assess the efficacy of two machine learning models, OPF and RBM, in identifying diabetic retinopathy from retinal images. (5) This study is helpful for our research as it compares two machine-learning models in identifying diabetic retinopathy. (6) Limitation includes using fewer retinographs in the analysis than planned and unbalanced data. (7) The study concluded that the RBM-1000 model performed best in terms of diagnostic accuracy (89.47 ± 2.64) and that the automatic disease detection model could be used in practice. (8) This work also compares performance between different molecular data in identifying DR using two machine learning models.

**ARTICLE 4**

**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 discussed the possibilities of integrating “omics” technologies with clinical practice and the potential for precision medicine. (3) This review explores 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 covered omics in oncology, complex diseases, microbiome research, and the challenges ahead for clinicians and researchers. (5) This review provided an overview of how omics technologies are used in clinical practices and helped understand how different molecular data can be used to identify diabetic retinopathy. (6) The review acknowledged practical and ethical challenges in implementing omics technologies for clinical practice. (7) The review concluded 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 provides information on our topic by providing an overview of how omics technologies are utilised in clinical practices and their insight into how various molecular data can be used to identify diabetic retinopathy.

**ARTICLE 5**

**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: .

(2) Machine learning is increasingly being integrated into clinical practice, with its applications ranging from pre-clinical data processing to early warning as part of primary and secondary prevention. (3) The article aimed to provide an overview of machine learning in clinical decision-making and discussed the challenges and pitfalls in their applications. (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 provided 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 discussed the technological, medical, and ethical challenges of integrating machine learning into clinical practice. (7) The article concluded that machine learning has the potential to revolutionize clinical decision-making, but challenges still need to be addressed. (8) This work provided a broad overview of machine learning in clinical decision-making. It could help understand how machine learning could be applied in identifying diabetic retinopathy.

**ARTICLE 06**

**2019/E/011**

**WEEK 01**

(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 images as Non-Diabetic Retinopathy or Diabetic Retinopathy based on the radial basis function (RBF) neural network classifier. (3 Using RBF neural networks, the article sought to build an automated approach for detecting diabetic retinopathy. (4) The research paper "Automated diabetic retinopathy detection using radial basis function" aims to develop an automated system for detecting diabetic retinopathy. (5) This document uses RBF and feature extraction, two methods of Ophthalmic/clinical characteristics such as exudate, blood vessels, and microaneurysms. In addition, the DIARETDB0 and DIARETDB datasets were utilised. (6) The article has several limitations, including a small sample size, a single type of neural network, and a lack of evaluation of images with different levels of severity of diabetic retinopathy and from different ethnic groups. (7) The system was tested using two datasets and achieved a sensitivity of 0.83 and 0.94, respectively. The researcher suggests incorporating multiple classifier systems (MCS) to improve the system’s accuracy in the future. (8) This research also used machine learning algorithms to separate DR and non-DR patients.

**ARTICLE 07**

**2019/E/011**

**WEEK 02**

(1)Das, D., Biswas, S.K. and Bandyopadhyay, S., “A critical review on the 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 reviewed the studies related to automated detection systems using deep learning methods in the early detection of diabetic retinopathy using images. (3) This research paper critically evaluates the current approaches and challenges associated with using machine learning and deep learning to diagnose diabetic retinopathy. (4) The research paper offers a comprehensive analysis of the current state of machine learning and deep learning techniques for diagnosing diabetic retinopathy. (6) This research helps use machine learning and deep learning to diagnose diabetic retinopathy. It discusses innovative techniques and the obstacles that must be surmounted to create a dependable and accurate system. (7) ML and DL can improve the diagnosis of DR. These techniques are more accurate than traditional methods of DR diagnosis. (8) The paper discussed challenges such as data acquisition, preprocessing, and model constraints. These discussions and challenges are helpful for our research.

**ARTICLE 08**

**2019/E/011**

**WEEK 03**

(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)Diabetic retinopathy is a leading cause of blindness in adults. This paper proposes a new hybrid machine-learning approach for diabetic retinopathy detection using smartphone images. (3) This study aimed to develop an optimized hybrid machine-learning approach for smartphone-based DR detection. (4) The research paper presents an optimized hybrid machine learning approach for detecting diabetic retinopathy using a smartphone-based platform (5) The paper is helpful and interested in using machine learning to detect diabetic retinopathy, particularly those exploring the potential of the smartphone-based platform. (6) The model was developed and evaluated using a small dataset of fundus images. Further studies are needed to confirm this paper's findings using many images. (7) The optimized hybrid machine learning approach can accurately and efficiently detect diabetic retinopathy using a smartphone-based platform and potentially improve healthcare access for diabetic patients. (8) This research is the effectiveness of a machine learning approach for smartphone-based DR detection.

**ARTICLE 09**

**2019/E/011**

**WEEK 04**

(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) can potentially improve diabetes care by automating tasks, making personalized recommendations, and predicting future outcomes. (3) The paper aims to review the literature on the use of AI in diabetes management and prediction and to identify the opportunities and challenges associated with its use. (4) The paper covered various AI applications in diabetes management, such as automated retinal screening, clinical decision support, predictive population risk stratification and patient self-management tools. (5) This paper provided a comprehensive overview of the current state of AI in diabetes care. (6) The paper focuses on the opportunities and challenges of AI in diabetes management and prediction. Still, it does not provide a detailed discussion of specific implementation strategies or technical aspects of AI. (7) AI has enormous potential for improving diabetes management and prediction, but further research is needed to address technical, ethical, and regulatory issues. (8) The authors found that AI-based models can outperform traditional methods for detecting DR. AI could be a valuable tool for early diagnosis and treatment of this condition.

**ARTICLE 10**

**2019/E/011**

**WEEK 05**

(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 effective in various healthcare applications, including disease diagnosis, prognosis, and treatment planning. (3) This paper reviewed the current state of DL in healthcare, discussed the opportunities and challenges in using this technology and provided recommendations for future research. (4) The paper covered various topics related to DL in healthcare. (5)This paper is helpful for researchers in the field of healthcare and provides a comprehensive overview of the potential uses of deep learning in healthcare. (*6)*The paper mainly focuses on the opportunities and challenges of deep learning in healthcare but doesn’t provide a detailed discussion on specific applications or implementation strategies. (7)The authors concluded that DL has the potential to revolutionize healthcare. However, they also alert that several challenges must be addressed before applying this technology. (8)The authors discussed the potential of DL to improve the accuracy of disease diagnosis, which supports the scope of our study.

In summary, this response contains eight sentences covering the following aspects:

1. Citation
2. Introduction
3. Aims and Research methods
4. Scope
5. Usefulness to our research
6. Limitation
7. Conclusion
8. Reflection.