Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

Artificial Intelligence in Ophthalmology: Approaches to Electronic Patient Record Information

[1]Dr. Nisar Ahmed Khan, Dr. Nadia Sajjad, [3]Zoya Abbas Qadri, [4] Dr. Makhdoom Anwar ulHaq, [5]Dr. Muhammad Shuaib, [6]Dr. Umaar Ahmed

1Associate professor ophthalmology, Indus Medical College Hospital Tando Muhammad Khan, nisargh2001@yahoo.com

2Medical Officer, Aims Hospital Muzaffarabad AJK, nadiasajjad777@gmail.com

3Medical Officer, RHC Chikar AJK, Muzaffarabad, dr.zoya.qadri@gmail.com

4Demonstrator AJK Medical College Muzaffarabad Azad Kashmir, makhdoomanwarulhaq@gmail.com

[5]Associate Professor Department of Medicine, Mohiuddin Teaching Hospital, Mirpur, AJK, drshuaibm@yahoo.com

6Medical Officer, RHC Chikar, Muzaffarabad, ahmedumaar0@gmail.com

ABSTRACT:

The growing use of electronic health history has caused in vast volumes of medicalinformation being collected. The number of data gathered in EHR systems in ophthalmology, forthe instance, has been steadily increasing. However, because of the data's complexity and heterogeneity, making actual secondary use of our current EHR information for enhancing individual care also aiding medical decision-making has proven difficult. Artificial intelligence approaches provide a viable method of analyzing multimodal informationgroups. Whereas AI approaches have been widely used to imaging data, only a few researchers have used AI techniques to analyze medicalstatistics from EHR. The goal of our current paper remains to offer an impression of several AI algorithms used in the area of ophthalmology to analyze EHR data. With application of AI approaches, secondary usage of EHR information has concentrated on glaucoma, diabetic retinopathy, age-connected macular degeneration, in addition spectacles, according to our current research. Such methods wereutilized to enhance the analysis, dangervaluation, also progression forecast of ocular diseases. The most popular tactics developed in the publications analyzed were supervised machine learning, deep learning, also language processing.

Keywords: Artificial Intelligence, ophthalmology.

INTRODUCTION:

Large amounts of medical studies have been created as a result of the fast acceptance of electronic health history in latest generations, with the possibility for secondary use in research. Likewise, one of the most common justifications for EHR adoption was to aid in collecting and processing of "big data" in order to get useful visions [1]. Owing to obvious recompences of secondary sourcerecycle over original data collection, the medical research community has establishedansnowballingnotice in creating effectualmethods for reusing clinical data from EHRs. When compared to typical clinical research, researchers that reuse EHR informationcan not need to recruit individuals or gather fresh information, thereby saving money [2]. Furthermore, EHR informationfrequentlycomprisevaluable observational studies on theindividual's state, medical therapy, and diseasegrowth, that wasestablished to helpexperimental judgment, medical impression extraction, prognosis, alsodangerous analysis. Nonetheless, repurposing HER statistics comes with its own set of problems, owing to its complexity and heterogeneity [3]. Healthcare information in EHRs in ophthalmology, for instance, can comprise statistical profiles, diagnoses, laboratory tests, prescriptions, eye exams, imaging, and surgical records. Computer science and, additionalusually, artificial intelligence methods are used to interpret this diverse data using tactics including information extraction, dimension reduction, and predictive modeling. AI has proven successful in a number of disciplines when applied to EHR data. For example, AI approaches using EHR data have been widely employed in cardiology research to diagnose heart failure earlier, forecast the start of heart problems, and enhance dangervaluation in clinically suspected coronary artery illness [4]. Machine learning techniques using EHR data have also been applied in ophthalmology to forecast hazards of cataract postoperative problems, enhance detection of glaucoma also age-connected macular degeneration, also evaluate diabetic retinopathy hazard. Despite the use of AI to analyze EHR data linked to eye disorders has grown in recent years, there have been no published evaluations of the literature. In 2020-21, a review of literature of machine learning approaches in ophthalmology remainedavailable; though, papers comprised mostly attentive on request of machine learning methods to imaging information rather than EHR information. Our current paper fills in the gaps in our expertise by analyzing the research on AI algorithms for eye illness diagnosis and monitoring using EHR data. Researchers examine the types of AI algorithms employed, their effectiveness, also how AI wasutilized to various ocular disorders in this overview, as well as possible futures for clinical settings [5].

METHODOLOGY:

In any area of papers, a comprehensive search remained conducted in PubMed database by means of search phrases linked to "Artificial intelligence," "Electronic health records," also "Eye." The whole query may be seen in the Appendix. Research that employed solely imaging data without slightly EHR informationremained rejected following a review of namealso abstract for lack of influence. Publications that did not have a direct therapeutic potential or were unrelated to the subject were removed. Figure 1 summarizes the review procedure. Using a manual title, abstract, and content evaluation, one author picked papers for inclusion. The purpose, illness, methodology, particular procedures, performance evaluation, and conclusion of the papers that satisfied the following criteria were retrieved by two writers for each research, as presented in the Table.

RESULTS:

Besides deleting three duplicates, a total of 167 articles have been examined. Then, based on the title and abstract, 123 articles were eliminated for lack of seriousness. There was a total of 15 articles that matched the requirements for inclusion (Fig. 1). Only one research employed deep learning alone, while another used NLP without any additional approaches (Table). Figure 2 depicts the link between these three strategies and a simulated machine acquisition of knowledge. In the nutshell, NLP canremainutilized to excerpt relevant information from text-based data and change it into the machine-readable format. Those and other structured information sets can then be utilized to conceptforecast models or classifications using supervised machine learning approaches, some of which include deep learning algorithms. The model learns from the training set without labelled output also discovers hidden designs or structures in the input information in unsupervised learning. Machine learning has now been extensively employed in medicine to increase diagnostic ability and early illness identification in fields just like radiology, cardiology, cancer, also ophthalmology. Logistic regression is a

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

generalization of regression model, as seen in Figure 3B. (Fig. 3A). The informationremains described as the linear association that may remainutilized to forecastthe value for theassumed input in linear regression. The non-linear due to information transportation and logistics turns guess values into binary classes depending on the criterion in logistic regression. The least extreme shrinkage and selecting operator are two strategies that may remainutilized to enhance forecastcorrectness of logistic regression. LASSO is a quantitative approach for improving precision and universal applicability by selecting a smaller selection of response variable that are most connected to the outcome variable and shrinking predictive relevance. Another well-known machine learning model for categorization analysis is SVM. A border is built to partition input data into two different groups, as illustrated in Figure 3C, and it may remainutilized to categories fresh information into alikeseparategroups. A algorithm remains a supervised computer vision technique that is widely used. A decision tree is seen in Figure 3D, through the root node at the top, trailedthrough branching nodes in addition terminal nodes. The best predictor variable remains represented by root node, which is the initial decision node. The output of a particular input parameter is represented by each branching node.

Table 1:

	Pseudophakia	**Aphakia**	**1 eye + Pseudophakia**
Bilateral	112	172	-
Unilateral	98	114	-
Overall	210	286	16+

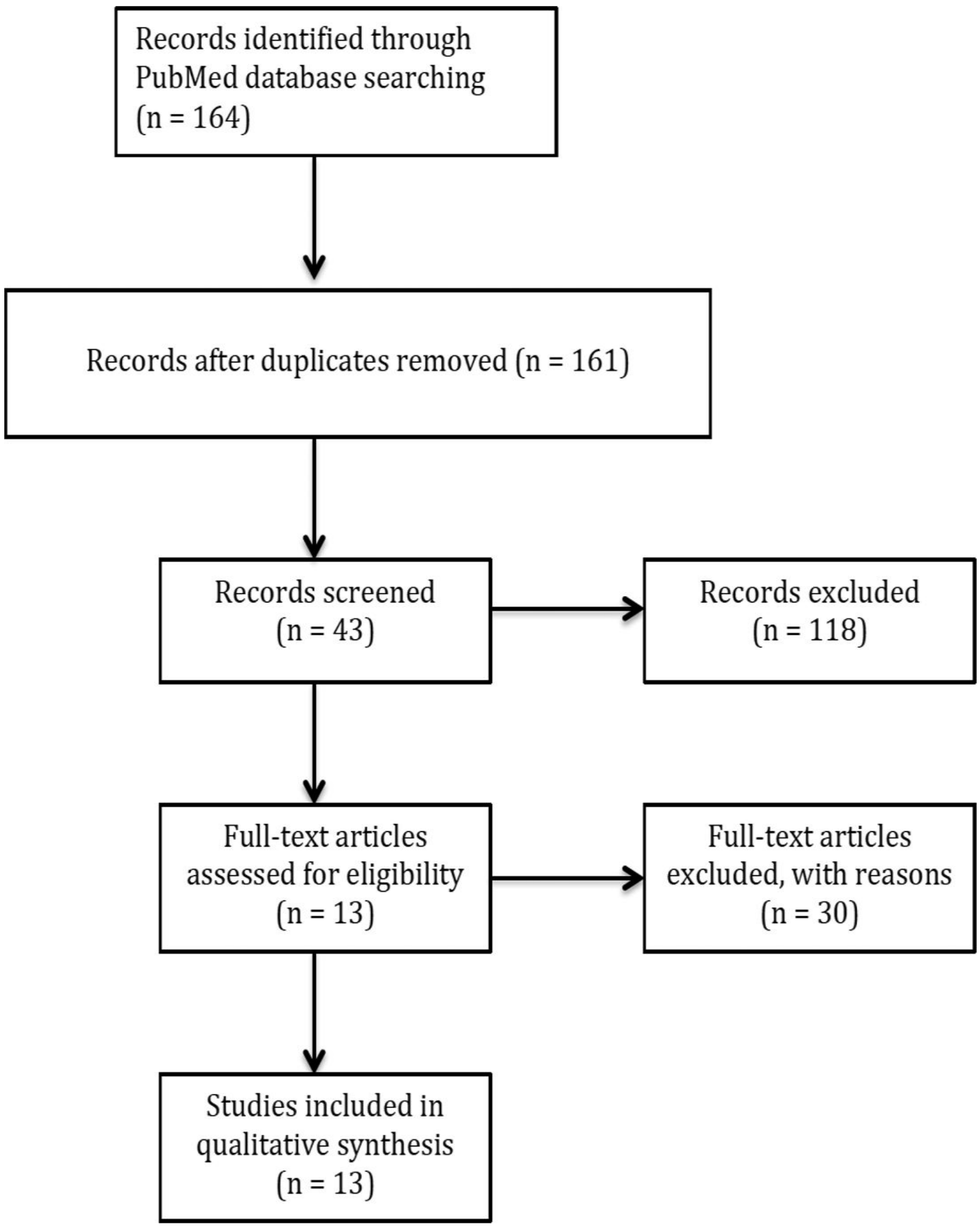
Table 2:

Demographics	**Mean + SD**	**Range**
Age	71.3+11.4	11-95
BCVA	0.28+0.21	0-0.96
Sphere	2.37+5.28	30-9.6
Cylinder	16.28+3.25	9-25

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

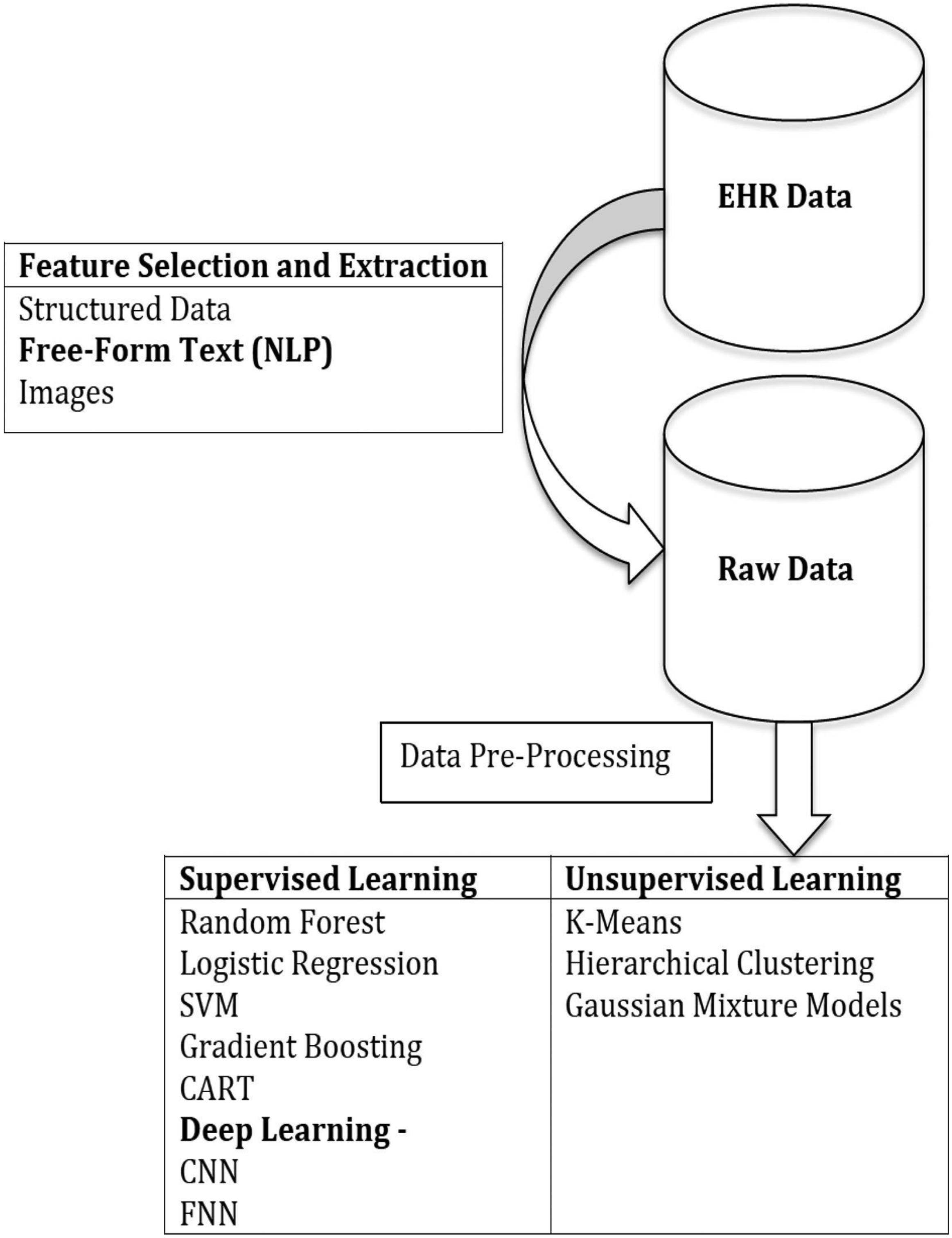
Spherical Equaling	24.90+3.09	18-23.5
IOP	45.18+2.75	34.5-53.15
Axial Length	4.10+0.49	3.24-5.05

Figure 1:



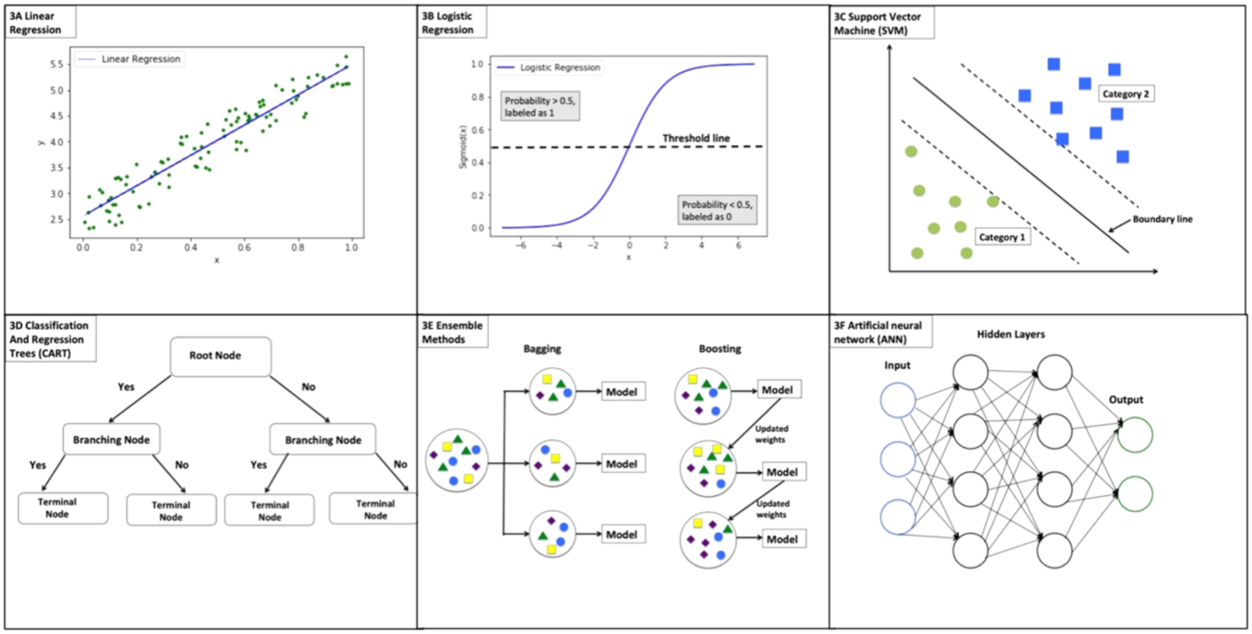
Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

Figure 2:



Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

Table 3:



DISCUSSION:

This chapter investigates the research on using AI approaches to analyze EHR data to help in the identification and assessment process of eye diseases. The presentation will be focused on three areas: AI approaches used to evaluate EHR data, approach effectiveness, and the most typically examined eye disorders. First, AI approaches may be utilized to enhance eye illness diagnostics, vulnerability assessments, and tumor growth by using secondary EHR data [6]. With a median AUC of 92 percent, the prediction models across the 9 classifiers performed well. One research found that predicting postoperative problems after surgical treatment had a modest efficiency of 68 percent, probably due to a lack of variables, such as surgeon-relevant information. Furthermore, the occurrence of certain comorbidities may have an impact on the predictability of results [7]. Because of the unbalanced data, typical proposed methods may not be able to handle an uncommon recurrence problem adequately. That whenever a dataset comprises a small number of illness or problem instances, there isn't enough data for the model to learn how to forecast them properly [8]. In few types of research, on other hand, found the good presentation of classifiers trained on integrated EHR also picture information. In future research, using the hybrid model that incorporates both standard EHR statistics and imaging information sets to provide a fuller view of individual factors linked throughthe result of interest could be a viable path. Second, the most prevalent approach for analyzing eye illnesses using EHR data was trained machine learning. This research aimed to improve diagnosis, forecast progression, or estimate risk in order to identify cancer earlier [9]. The illness lifestyle factors, demographic variables discovered via literature analysis, and practical training were used to develop the classifiers. None of the research looked at employed uncontrolled machine learning methods, which are used when the intended output and connection among result variable alsoforecastersremainunidentified. These approaches are used to find comparable groups of informationin addition may aid in the discovery of hidden variables that can assist improve diagnostics. Unsupervised learning, on the other hand, has been effectively employed in other domains. Marlin et al., for instance, showed that a probabilistic clustering model for time-series data from real-world EHRs may identify physiological trends and be utilized to build a fatality forecasting model [10].

CONCLUSION:

Artificial intelligence (AI) is quickly gaining traction in ophthalmology, with probable to enhance the quality and delivery of ocular treatment. Furthermore, assumedobtainability of large-scale information sets also analytic methodologies, secondary usage of EHR informationremainsandeveloping area for medical research incorporating AI. We address AI applications to ocular disorders and concerns like as diagnostic correctness, illness progression, alsodangervaluation in this analysis, and we find that amount of published papers in our current field has been rather restricted owing to limitations through existing EHR information excellence. We anticipate AI based on EHR data to become more frequently used in ophthalmic care in the future, especially as methodologies improve and EHR data quality problems are handled.

REFERENCES:

1. Wang W, Yan W, Müller A, Keel S, He M. Association of socioeconomics with prevalence of visual impairment and blindness. JAMA Ophthalmol. 2021;135(12):1295–302.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 2712 - 2720
Received 08 November 2021; Accepted 15 December 2021.

2. Liu H, Li L, Wormstone IM, Qiao C, Zhang C, Liu P, et al. Development and validation of a deep learning system to detect glaucomatous optic neuropathy using fundus photographs. JAMA Ophthalmol. 2019;137(12):1353–60.
3. Khan SM, Liu X, Nath S, Korot E, Faes L, Wagner SK, et al. A global review of publicly available datasets for ophthalmological imaging: barriers to access, usability, and generalisability. Lancet Digit Health. 2021;3(1):e51-66.
4. De Fauw J, Ledsam JR, Romera-Paredes B, Nikolov S, Tomasev N, Blackwell S, et al. Clinically applicable deep learning for diagnosis and referral in retinal disease. Nat Med. 2018;24(9):1342–50.
5. Creswell A, White T, Dumoulin V, Arulkumaran K, Sengupta B, Bharath AA. Generative adversarial networks: an overview. IEEE Signal Process Mag. 2021;35:53–65.
6. Goodfellow I, Pouget-Abadie J, Mirza M, Xu B, Warde-Farley D, Ozair S, et al. Generative adversarial nets. In: Proceedings of the 27th International Conference on Neural Information Processing Systems. Montreal, Canada; p. 2672–2680.
7. Barbedo JGA. Impact of dataset size and variety on the effectiveness of deep learning and transfer learning for plant disease classification. Comput Electron Agric. 2018;153:46–53.
8. Sorin V, Barash Y, Konen E, Klang E. Creating artificial images for radiology applications using generative adversarial networks (GANs)-a systematic review. AcadRadiol. 2020;27(8):1175–85.
9. Wolterink JM, Mukhopadhyay A, Leiner T, Vogl TJ, Bucher AM, Išgum I. Generative adversarial networks: a primer for radiologists. Radiographics. 2021;41(3):840–57.
10. Yi X, Walia E, Babyn P. Generative adversarial network in medical imaging: a review. Med Image Anal. 2019;58:101552.