DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
Perambalur – 621 212
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.
(An ISO 9001-2008 certified Institution)
Accredited with 'A' Grade by NAAC.
Accredited By NBA for BME,ECE & EEE

OCULAR DISEASE RECOGNITION IN DEEP LEARNING

LITERATURE SURVEY

BATCH NO: 03

GUIDE BY:

Mr. V. GOKULAKRISHNAN., M.E.,MBA.,(PhD).,
ASSISTANT PROFESSOR,
Computer Science and Engineering

PREPARED BY:

- MADHUBALAN S DSUG20104088
- MANO A DSUG20104093
- RAKESH J DSUG20104124
- RAMKUMAR R DSUG20104125

TABLE OF CONTENT

S.NO	TITLE	AUTHOR	PAGE NO
1	**Deep Transfer Learning Strategy to Diagnose Eye-Related Conditions and Diseases: An Approach Based on Low-Quality Fundus Images**	GABRIEL D. A. ARANHA	
2	**A Novel Meibomian Gland Morphology Analytic System Based on a Convolutional Neural Network**	MENGTING LIU	
3	**A Novel System for Ocular Surface Temperature Measurement and Tracking**	ALEXANDER WONG	
4	**An Engineering Platform for Clinical Application of Optogenetic Therapy in Retinal Degenerative Diseases**	BOYUAN YAN	
5	**An Optimal Visual Fatigue Relief Method for Workers Considering Rest Time Allocation**	XIAOHUI REN	
6	**Automatic Segmentation and Intuitive Visualisation of the Epiretinal Membrane in 3D OCT Images Using Deep Convolutional Approaches**	JOAQUIM DE MOURA	
7	**Automatic Segmentation of Retinal Layers in Multiple Neurodegenerative Disorder Scenarios**	Jorge Novo	
8	**Autonomous Stabilization of Retinal Videos for Streamlining Assessment of Spontaneous Venous Pulsations**	SAHAR SHARIFLOU	

9	**Classification of Companion Animals' Ocular Diseases: Domain Adversarial Learning for Imbalanced Data**	MARY G. NAM	
10	**Continuous and Discrete Volterra-Laguerre Models with Delay for Modeling of Smooth Pursuit Eye Movements**	Alexander Medvedev	
11	**Coupling Between Posture and Respiration Among the Postural Chain: Toward a Screening Tool for Respiratory-Related Balance Disorders**	Baptiste Sandoz	
12	**e-Pupil: IoT-Based Augmentative and Alternative Communication Device Exploiting the Pupillary Near Reflex**	GIOVANNI CHIARION	
13	**Eye Movements and Vestibulo-Ocular Reflex as User Response in Virtual Reality**	GEOVANNY PALOMINO-ROLDÁN	
14	**Human-Ocular-Physiological-Characteristics Based Adaptive Console Design**	HANYU WANG	
15	**Measurement and Analysis of Eye Movements Performance to Predict Healthy Brain Aging**	IRENE PULIDO VALDEOLIVAS	
16	**MTRA-CNN: A Multi-Scale Transfer Learning Framework for Glaucoma Classification in Retinal Fundus Images**	SANLI YI	
17	**Multi-Label Classification of Fundus Images With EfficientNet**	JING WANG	
18	**Nuclear Cataract Database for Biomedical and Machine Learning Applications**	ISRAEL CRUZ-VEGA	

19	**Saccadic eye movement variables as biomarkers for cognitive decline in elderly individuals**	Kahye Kim, Kun Ho Lee	
20	**The Implementation of Ocular Health Service System Using Android Platform**	Woongsik Kim	
21	**Two-Stage Cross-Domain Ocular Disease Recognition With Data Augmentation**	QIONG WANG	

S.NO	TITLE	ALGORITHM	MERITS	DEMERIST
1	**Deep Transfer Learning Strategy to Diagnose Eye-Related Conditions and Diseases: An Approach Based on Low-Quality Fundus Images**	Convolutional Neural Network (CNN)	Efficient use of resources	Overfitting & Limited adaptivity
2	**A Novel Meibomian Gland Morphology Analytic System Based on a Convolutional Neural Network**	Convolutional Neural Network (CNN)	Automated analysis	Dependency on Training Data Quality
3	**A Novel System for Ocular Surface Temperature Measurement and Tracking**	Visual & Image Ranking	Non-Invasive Monitoring	Accuracy and Precision
4	**An Engineering Platform for Clinical Application of Optogenetic Therapy in Retinal Degenerative Diseases**	Neural Signal Generation	Versatile Optogenetic Delivery	Complexity and Cost
5	**An Optimal Visual Fatigue Relief Method for Workers Considering Rest Time Allocation**	Analytic model development	Customized Rest Time Allocation	Privacy and Ethical Considerations

6	**Automatic Segmentation and Intuitive Visualisation of the Epiretinal Membrane in 3D OCT Images Using Deep Convolutional Approaches**	Optical Coherence tomography (OCT)	Intuitive Visualization	Data Requirements
7	**Automatic Segmentation of Retinal Layers in Multiple Neurodegenerative Disorder Scenarios**	Optical Coherence tomography (OCT)	Early Disease Detection	Sensitivity to noise
8	**Autonomous Stabilization of Retinal Videos for Streamlining Assessment of Spontaneous Venous Pulsations**	Shortest vector problem(SVP) & Orthogonal Distance Regression (ODR)	Improved clarity	Computational complexity
9	**Classification of Companion Animals' Ocular Diseases: Domain Adversarial Learning for Imbalanced Data**	Natural language process & Convolutional Neural Network (CNN)	Robustness to imbalanced data	Computational cost
10	**Continuous and Discrete Volterra-Laguerre Models with Delay for Modeling of Smooth Pursuit Eye Movements**	Volterra-Laguere	Explicit time delay	Computational complexity

11	**Coupling Between Posture and Respiration Among the Postural Chain: Toward a Screening Tool for Respiratory-Related Balance Disorders**	Convolutional Neural Network (CNN)	Interpretabilit	Limited generalizable
12	**e-Pupil: IoT-Based Augmentative and Alternative Communication Device Exploiting the Pupillary Near Reflex**	Alternating least Square(ALS)	Potential for clinical applications	Trade-off between accuracy and complexity
13	**Eye Movements and Vestibulo-Ocular Reflex as User Response in Virtual Reality**	vestibulo-ocular reflex(VOR)	Objective and Consistent Measurement	Long-Term Safety and Efficacy
14	**Human-Ocular-Physiological-Characteristics Based Adaptive Console Design**	CATIA Algorithm	Objective Fatigue Assessment	Privacy and Ethical Considerations
15	**Measurement and Analysis of Eye Movements Performance to Predict Healthy Brain Aging**	Expectation–maximization (EM)	Non-Invasive Monitoring	Accuracy and Precision
16	**MTRA-CNN: A Multi-Scale Transfer Learning Framework for Glaucoma Classification in Retinal Fundus Images**	Convolutional Neural Network (CNN)	Continuous Monitorin	Technical Complexity

17	**Multi-Label Classification of Fundus Images With EfficientNet**	Convolutional Neural Network (CNN)	Improved Performance	Annotation Effort
18	**Nuclear Cataract Database for Biomedical and Machine Learning Applications**	Convolutional Neural Network (CNN)	Robustness to Noise and Variability	Annotation Effort
19	**Saccadic eye movement variables as biomarkers for cognitive decline in elderly individuals**	Optical Coherence tomography (OCT)	Utilization of Pre-trained Models	Dependency on Training Data Quality
20	**The Implementation of Ocular Health Service System Using Android Platform**	Convolutional Neural Network (CNN)	Fatigue Assessment	Computational complexity
21	**Two-Stage Cross-Domain Ocular Disease Recognition With Data Augmentation**	Optical Coherence tomography (OCT)	Potential for application	Precision is not perfect

BASE PAPER

1.TITLE: Deep Transfer Learning Strategy to Diagnose Eye-Related Conditions and Diseases: An Approach Based on Low-Quality Fundus Images

Author : GABRIEL D. A. ARANHA

Published Year : 2023

Algorithm : CNN

ABTRACT:

Data from the World Health Organization indicate that billion cases of visual impairment could be avoided, mainly with regular examinations. However, the absence of specialists in basic health units has resulted in a lack of accurate diagnosis of systemic or asymptomatic eye diseases, increasing the cases of blindness. In this context, the present paper proposes an ensemble of convolutional neural networks, which were submitted to a transfer learning process by using 38,727 high-quality fundus images. Next, the ensemble was tested with 13,000 low-quality fundus images acquired by low-cost equipment

MERITS:

- Transfer learning allows leveraging pre-trained deep learning models, which are trained on large datasets for general tasks like image recognition. This reduces the need for a massive dataset for training, which might be difficult to obtain for specific medical conditions.

DEMERITS:

- Pre-trained models might not generalize well to low-quality fundus images, especially if they were trained on high-quality datasets.

2.TITLE : A Novel Meibomian Gland Morphology Analytic System Based on a Convolutional Neural Network

Author : MENGTING LIU

Published Year : 2023

Algorithm : CNN

ABTRACT:

Meibomian glands dysfunction (MGD) is the main cause of dry eyes. Biological parameters of meibomian gland (MG) such as height, tortuosity and the degree of atrophy are closely related to its function . However Thus an effective quantitative diagnostic tool is needed for clinical diagnosis. Automatic quantification of MGs' morphological features could be a challenging task and play an important role in MGD diagnosis and classification. We proposed a novel MGs extraction method based on convolutional neural network (CNN) with enhanced mini U-Net.

MERITS:

- small sample expansion, automatic gland morphology description/calculation, improvement of detection rate of early micro-lesions, and simplified CNN can reduce calculation time.
- This system increased the precision of MGD diagnosis, reduced high intra observer variability and medical professionals' workloads, reduce analysis time, and assisting ophthalmologists with limited expertise

DEMERITS:

- MG morphology recognition is expected to have greater accuracy. Additionally , the sample size of the study is considered small.

3.TITLE : A Novel System for Ocular Surface Temperature Measurement and Tracking

Author : ALEXANDER WONG

Published Year : 2023

Algorithm : VIS and IR

ABSTRACT:

Ocular surface temperature (OST) is affected by changes in eye physiology caused by normal homeostasis, environmental changes, or systemic and local disease. OST can help a physician diagnose eye disease with improved accuracy and provide useful information for eye research. This paper presents a novel system, including novel hardware design and novel algorithms, capable of automatically measuring and tracking OST from the cornea over any period of time.

Merits:

- The novel system provides comprehensive imaging and analysis, improving accuracy in Ocular Surface Temperature (OST) measurement and aiding in diagnosing eye diseases more accurately.
- It offers capabilities to compensate for head or eye movements, remove artifacts, and track reliable OST changes over time, enhancing understanding of ocular surface health.

Demerits:

- Potential drawbacks may include factors such as cost, complexity, and potential limitations in real-world clinical settings, which need to be carefully considered.

4.TITLE : An Engineering Platform for Clinical Application of Optogenetic Therapy in Retinal Degenerative Diseases

Author : BOYUAN YAN

Published Year : 2023

Algorithm : Neural Signal Generation

ABSTRACT:

Optogenetics is a new approach for controlling neural circuits with numerous applications in both basic and clinical science. In retinal degenerative diseases, the photoreceptors die, but inner retinal cells remain largely intact. By expressing light sensitive proteins in the remaining cells, optogenetics has the potential to offer a novel approach to restoring vision. In the past several years, optogenetics has advanced into an early clinical stage, and promising results have been reported

Merits:

- Precision: Optogenetics allows for precise control of neural activity, enabling targeted stimulation of specific retinal cells.
- Potential Restoration of Vision: By targeting inner retinal cells with light-sensitive proteins, optogenetics holds the promise of restoring vision in individuals with retinal degenerative diseases.

Demerits:

- Safety Concerns: Introducing foreign proteins into the retina may pose safety risks, including inflammation or immune reactions.
- Efficacy Challenges: While promising, the efficacy of optogenetics in restoring vision needs further validation, and the extent of vision restoration may vary among individuals.

5.TITLE: An Optimal Visual Fatigue Relief Method for Workers Considering Rest Time Allocation

Author : XIAOHUI REN

Published Year : 2023

Algorithm : Analytic model development

ABSTRACT:

Working under the visual display terminal for several hours may lead to serious visual fatigue. Productivity will be reduced and the health of workers will be damaged. To address the problem, an optimal visual fatigue relief method for workers considering rest time allocation has been proposed in this paper. First, an analytic model is established to depict the relationship between the visual fatigue change and continuous work time.

Merits:

- Enhanced worker health and productivity through targeted rest breaks tailored to individual visual fatigue levels.
- Reduction of long-term health risks associated with prolonged screen exposure, fostering a healthier work environment.

Demerits:

- Potential disruption to workflow as workers adapt to new rest break schedules, impacting short-term productivity
- Implementation complexity may arise due to the need for customizing the algorithm to specific work settings and educating workers.

6.TITLE: Automatic Segmentation and Intuitive Visualisation of the Epiretinal Membrane in 3D OCT Images Using Deep Convolutional Approaches

Author : JOAQUIM DE MOURA

Published Year : 2021

Algorithm : OCT

ABSTRACT:

Epiretinal Membrane (ERM) is a disease caused by a thin layer of scar tissue that is formed on the surface of the retina. When this membrane appears over the macula, it can cause distorted or blurred vision. Although normally idiopathic, its presence can also be indicative of other pathologies such as diabetic macular edema or vitreous haemorrhage. ERM removal surgery can preserve more visual acuity the earlier it is performed.

Merits:

- Early removal of Epiretinal Membrane (ERM) can help preserve visual acuity by preventing further distortion or blurriness in vision.
- Timely surgery can potentially address underlying pathologies such as diabetic macular edema or vitreous hemorrhage, reducing the risk of complications and improving overall eye health.

Demerits:

- ERM removal surgery carries inherent risks, including infection, retinal detachment, and decreased visual acuity post-surgery.
- The decision for surgery must be carefully weighed as it may not always guarantee complete restoration of vision and could involve a prolonged recovery period.

7.TITLE: Automatic Segmentation of Retinal Layers in Multiple Neurodegenerative Disorder Scenarios

Author : Jorge Novo

Published Year : 2023

Algorithm : OCT

ABSTRACT:

Retinal Optical Coherence Tomography (OCT) allows the non-invasive direct observation of the central nervous system, enabling the measurement and extraction of biomarkers from neural tissue that can be helpful in the assessment of ocular, systemic and Neurological Disorders (ND). Deep learning models can be trained to segment the retinal layers for biomarker extraction.

Merits:

- Retinal OCT with deep learning segmentation offers precise biomarker extraction, aiding in comprehensive assessment of ocular, systemic, and neurological disorders.
- Non-invasive nature of OCT reduces patient discomfort, while deep learning enhances efficiency, but dependency on data quality and interpretation complexity remain challenges.

Demerits:

- Deep learning models for OCT segmentation require extensive annotated data and may struggle with poor image quality.
- Interpretation of segmented biomarkers may demand specialized expertise, potentially complicating diagnosis and treatment decisions.

8.TITLE: Autonomous Stabilization of Retinal Videos for Streamlining Assessment of Spontaneous Venous Pulsations

Author : SAHAR SHARIFLOU

Published Year : 2023

Algorithm : SVP & ODR

ABSTRACT:

Spontaneous retinal Venous Pulsations (SVP) are rhythmic changes in the caliber of the central retinal vein and are observed in the optic disc region (ODR) of the retina. Its absence is a critical indicator of various ocular or neurological abnormalities. Recent advances in imaging technology have enabled the development of portable smartphone-based devices for observing the retina and assessment of SVPs.

Merits:

- Smartphone-based retinal imaging enhances accessibility for observing Spontaneous retinal Venous Pulsations (SVPs), aiding in early detection of ocular and neurological abnormalities.
- However, limitations such as poor video quality and lack of standardization may impede accurate SVP observation and clinical reliability.

Demerits:

- Smartphone-based retinal imaging's limitations in image quality and stability can impede accurate Spontaneous retinal Venous Pulsations (SVPs) observation.
- Absence of standardized protocols and calibration may compromise reliability, requiring careful interpretation in clinical settings

9.TITLE: Classification of Companion Animals' Ocular Diseases: Domain Adversarial Learning for Imbalanced Data

Author : MARY G. NAM

Published Year : 2023

Algorithm : NLP & CNN

ABSTRACT:

In contrast to the widespread implementation of computer-aided **diagnosis of human diseases, the limited availability of veterinary image** datasets has hindered its application in animals. Additionally, while most medical imaging data are captured in clinical settings, such as optical coherence tomography and fundus photography, diagnosis based on digital camera or smartphone images can be more beneficial for pet owners.

Merits:

- Domain adversarial learning effectively mitigates class imbalance in companion animals' ocular disease classification, improving diagnostic accuracy and treatment outcomes.
- However, complex implementation and computational overhead may be incurred, limiting practical applicability and scalability in real-world veterinary settings.

Demerits:

- Domain adversarial learning's effectiveness heavily relies on data quality and diversity, which may not always be readily available or representative of all ocular diseases in companion animals.

10.TITLE: Continuous and Discrete Volterra-Laguerre Models With Delay for Modeling of Smooth Pursuit Eye Movements

Author : Alexander Medvedev

Published Year : 2023

Algorithm : VL

ABSTRACT:

The mathematical modeling of the human smooth pursuit system from eye-tracking data is considered. Recently developed algorithms for the estimation of Volterra-Laguerre (VL) models with explicit time delay are applied in continuous and discrete time formulations to experimental data collected from Parkinsonian patients in different medication states and healthy controls.

Merits:

- Continuous and discrete Volterra-Laguerre models with delay offer comprehensive frameworks for accurately modeling the dynamics of smooth pursuit eye movements, providing insights into neurological processes.
- These models account for temporal dependencies and nonlinear interactions, enhancing predictive capabilities and facilitating deeper understanding of eye movement behaviors.

Demerits:

- Complexity in parameter estimation and model selection may arise, requiring sophisticated computational techniques and potentially limiting practical implementation.

11.TITLE: Coupling Between Posture and Respiration Among the Postural Chain: Toward a Screening Tool for Respiratory-Related Balance Disorders

Author: Baptiste Sandoz

Published Year : 2023

Algorithm : CNN

ABSTRACT:

Alteration of posturo-respiratory coupling (PRC) may precede postural imbalance in patients with chronic respiratory disease. PRC assessment would be appropriate for early detection of respiratory-related postural dysfunction. PRC may be evaluated by respiratory.

Merits:

- Investigating the coupling between posture and respiration provides insights into respiratory-related balance disorders, potentially leading to the development of effective screening tools.
- Understanding the interplay between posture and respiration enhances diagnostic accuracy and facilitates early detection of balance disorders associated with respiratory dysfunction.

Demerits:

- Developing screening tools based on posture-respiration coupling may require complex algorithms and specialized equipment, limiting accessibility and feasibility in clinical settings.
- The multifactorial nature of balance disorders necessitates consideration of additional contributing factors beyond posture and respiration, potentially reducing the specificity of screening tools.

12.TITLE: e-Pupil: IoT-Based Augmentative and Alternative Communication Device Exploiting the Pupillary Near-Reflex

Author : GIOVANNI CHIARION

Published Year : 2023

Algorithm : ALS

ABSTRACT:

So far, very little attention has been paid to the role of the autonomic nervous system in augmentative alternative communication solutions. In this regard, the pupil near reflex, one component of the triadic accommodative response to a visual plane shift in-depth, may play a key role. Such reflex does not necessitate any requirement of skeletal muscles, and thus may be preserved in diseases affecting somatic motoneurons, such as the amyotrophic lateral sclerosis.

Merits:

- **The e-Pupil device, leveraging IoT technology and the pupillary near-**reflex, offers a non-invasive and intuitive means of augmentative and alternative communication (AAC) for individuals with speech impairments.
- Its IoT connectivity allows for real-time data transmission and remote monitoring, enhancing accessibility and usability for both users and caregivers.

Demerits:

- Reliability and accuracy of the pupillary near-reflex as a communication tool may vary among users, potentially leading to challenges in consistent interpretation and usage.
- Privacy and security concerns associated with IoT devices, such as data breaches or unauthorized access to sensitive communication data.

13.TITLE: Eye Movements and Vestibulo-Ocular Reflex as User Response in Virtual Reality

Author : GEOVANNY PALOMINO-ROLDÁN

Published Year : 2023

Algorithm : VOR

ABSTRACT:

Virtual reality (VR) is increasingly used in gaming, training, and health-related applications. However, the level of immersion and presence generated by VR can significantly influence the user and the achievement of desired outcomes. Therefore, methods to assess levels of immersion and presence need to be established.

Merits:

- Utilizing eye movements and vestibulo-ocular reflex (VOR) as user responses in virtual reality (VR) offers a more natural and immersive interaction experience.
- Leveraging these physiological responses enhances realism and precision in user interaction, potentially leading to more engaging and effective VR experiences.

Demerits:

Variability in individual eye movements and VOR responses may affect the consistency and accuracy of user input, leading to challenges in interpreting and responding to user actions in VR environments.

14.TITLE: Human-Ocular-Physiological-Characteristics Based Adaptive Console Design

Author : HANYU WANG

Published Year : 2023

Algorithm : CATIA

ABSTRACT:

A console is an important platform for controlling indoor operations and displaying information. It is an important device for human-computer interactions. Whether an operator is comfortable using a console is an important issue of concern in industry. However, previous works have focused only on the joint angle and muscle fatigue of the console user, with few works focusing on the eye comfort of users.

Merits:

- Designing consoles based on human ocular physiological characteristics ensures ergonomic compatibility, reducing eye strain and fatigue during prolonged use.
- Adaptive design elements tailored to individual ocular characteristics enhance user comfort, usability, and overall satisfaction with the console interface.

Demerits:

- Implementing adaptive features requires comprehensive understanding of ocular physiology, increasing design complexity and potentially raising production costs.
- User variability in ocular characteristics may pose challenges in achieving universal design solutions, necessitating.

15.TITLE: Measurement and Analysis of Eye Movements Performance to Predict Healthy Brain Aging

Author : IRENE PULIDO VALDEOLIVAS

Published Year : 2023

Algorithm : EM

ABSTRACT:

This article presents the healthy pattern of eye movements (EM) in 145 healthy volunteers from 20 to 86 years old. Volunteers were classified into four groups according to their age. A saccadic paradigm, in horizontal and vertical axes, was performed. We described a pattern behavior in healthy volunteers to demonstrate that it can be used to measure the aging and functionality of the brain.

Merits:

- Eye movement performance analysis provides a non-invasive and easily accessible method for predicting healthy brain aging, facilitating early detection and intervention.
- Comprehensive measurement and analysis of eye movements offer valuable insights into cognitive function and neural integrity, aiding in the development of preventive strategies for age-related cognitive decline.

Demerits:

- Variability in individual eye movement patterns and cognitive function may complicate the prediction accuracy of healthy brain aging based solely on eye movement performance.
- Standardization and validation challenges in eye movement measurement and analysis hinder widespread clinical application.

16.TITLE: MTRA-CNN: A Multi-Scale Transfer Learning Framework for Glaucoma Classification in Retinal Fundus Images

Author : SANLI YI

Published Year : 2023

Algorithm : CNN

ABSTRACT:

In the diagnosis of glaucoma based on deep learning, it is more meaningful for ophthalmologist to make a graded diagnosis using fundus images to reflect the degree of disease. Such multi-classification diagnosis tasks require a larger amount of data to enable the neural network to extract more feature information, while it is very difficult in medical field. To address these issues, we propose a novel Multi-Scale Transfer Learning framework (MTRA-CNN).

Merits:

- MTRA-CNN offers enhanced glaucoma classification accuracy through multi-scale transfer learning, leveraging knowledge from diverse data sources to improve diagnostic performance.
- Transfer learning facilitates efficient model training, reducing the need for large labeled datasets and potentially accelerating the development of glaucoma diagnostic tools.

Demerits:

- Implementation of multi-scale transfer learning frameworks may require computational resources and expertise, potentially limiting accessibility and scalability in clinical settings.

17.TITLE: Multi-Label Classification of Fundus Images With EfficientNet

Author : JING WANG

Published Year : 2023

Algorithm : CNN

ABSTRACT:

Convolutional neural network (CNN) has achieved remarkable success in the field of fundus images due to its powerful feature learning ability. Computer-aided diagnosis can obtain information with reference value for doctors in clinical diagnosis or screening through proper processing and analysis of fundus images.

Merits:

- EfficientNet enables efficient and accurate multi-label classification of fundus images, allowing simultaneous detection of various retinal pathologies from a single image.

The use of EfficientNet reduces computational overhead, facilitating faster processing times and enabling scalable deployment in clinical settings.

Demerits:

- Training EfficientNet for multi-label classification may require large and diverse datasets, posing challenges in data acquisition and annotation.
- Fine-tuning EfficientNet architecture for specific retinal pathologies may require expertise in deep learning and ophthalmology, limiting accessibility to specialized research teams.

18.TITLE: Nuclear Cataract Database for Biomedical and Machine Learning Applications

Author : ISRAEL CRUZ-VEGA

Published Year : 2023

Algorithm : CNN

ABSTRACT:

A cataract is a medical condition causing an opacity in the ocular nucleus due to various factors such as age and diseases. Starting from traditional image processing techniques for processing and extracting relevant features, using computational intelligence methods is essential to help experts in the medical pre-diagnosis for automatic classification and grading of the disease.

Merits:

- The Nuclear Cataract Database provides a valuable resource for biomedical research and machine learning applications, offering a standardized dataset for studying cataract progression and treatment outcomes.
- Access to a comprehensive database enhances collaboration and facilitates the development of innovative diagnostic tools and treatment strategies for cataract management.

Demerits:

- Data privacy and security concerns may arise when sharing sensitive medical information, requiring careful handling and compliance with privacy regulations.
- Limitations in dataset size or representativeness may impact the generalizability and applicability of machine learning models trained on the Nuclear Cataract Database, necessitating validation on diverse patient.

19.TITLE: Saccadic eye movement variables as biomarkers for cognitive decline in elderly individuals

Author : Kahye Kim, Kun Ho Lee

Published Year : 2023

Algorithm : OCT

ABSTRACT:

Alzheimer's disease (AD) is the leading cause of Dementia, and mild cognitive impairment (MCI) is often considered a precursor to the development of AD dementia and other types of Dementia. Biomarkers such as amyloid beta are specific and sensitive in identifying AD and can identify individuals who have biological evidence of the disease but have no symptoms, but clinicians and researchers may not easily use them on a large scale.

Merits:

- Saccadic eye movement variables serve as non-invasive biomarkers for early detection of cognitive decline in elderly individuals, enabling timely intervention and treatment..
- Utilizing saccadic eye movements offers a cost-effective and easily accessible method for cognitive assessment, facilitating widespread screening and monitoring of cognitive health in aging populations.

Demerits:

- Variability in saccadic eye movement patterns among individuals may limit the specificity and accuracy of using these variables as standalone biomarkers for cognitive decline.
- Interpretation of saccadic eye movement data requires specialized expertise and may be influenced by factors such as medication, fatigue.

20.TITLE: The Implementation of Ocular Health Service System Using Android Platform

Author : Woongsik Kim

Published Year : 2023

Algorithm : CNN

ABSTRACT:

As the life expectancy of human increases, having a long and healthy life, Well-Aging, Wellness, and Anti-Aging become more important. There is a paradigm shift from diagnosis and treatment in the healthcare field to prognosis and prevention in daily life. The human part with the most capillary blood vessels is the inside of human eyes or the fundus oculi.

Merits:

- Utilizing the Android platform for an ocular health service system enhances accessibility, allowing users to access eye health resources and services conveniently from their smartphones.
- Integration with Android devices facilitates data collection and real-time monitoring, enabling personalized health insights and interventions for users.

Demerits:

- Compatibility issues with various Android devices may arise, requiring extensive testing and optimization to ensure seamless functionality across different models and operating system versions.
- Security and privacy concerns related to storing and transmitting sensitive health data on Android devices need to be addressed to maintain user trust and compliance with regulatory requirements.

21.TITLE : Two-Stage Cross-Domain Ocular Disease Recognition With Data Augmentation

Author : QIONG WANG

Published Year : 2023

Algorithm : OCT

ABSTRACT:

Ophthalmic diseases afflict many people, and can even lead to irreversible blindness. Therefore, the search for effective early diagnosis methods has attracted the attention of many researchers and clinicians. At present, although there are some ways for the early screening of ophthalmic diseases, the early screening of fundus images based on deep learning is generally favored by the medical community due to its noncontact characteristic, non-invasive characteristic and high recognition accuracy

Merits:

- Two-stage cross-domain ocular disease recognition with data augmentation enhances model performance by leveraging both source and target domain data, improving accuracy and robustness.
- Data augmentation techniques increase the diversity of training data, allowing the model to generalize better across different domains and improve classification performance.

Demerits:

- Implementation complexity may arise due to the need for integrating multiple stages of domain adaptation and data augmentation techniques, potentially increasing computational overhead and development time.