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An Investigation and Detection of Cardiovascular Disease using the VGG-16 Model of a Convolutional Neural Network

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Abstract: Cardiovascular disease is one of the primary global health issues since it leads to the death of millions of people each year worldwide. To advance the treatment outcomes and alleviate the resulting health care pressure, an early diagnosis plays a vital role. We review in this paper whether the VGG-16 model, specifically one of CNN architectures, may be used to detect CVD automatically with the help of the analysis of medical images. VGG-16 exploits a deep, sequential arrangement by employing small 3x3 convolutional filters to obtain a fully connected configuration capturing fine spatial detail in echocardiogram images, MRI images, and CT scan images for identifying patterns in cardiovascular illnesses that traditional methods cannot match. This investigation further points to the dataset pre-processing technique that has the capacity of enhancing generalization, with regard to model explanations for its prediction and crucially significant for its adoption in a clinical setting. These results ultimately prove that the VGG-16 model is a potentially sound early CVD detector tool and a promising addition to diagnostic practices, especially in contexts with limited access to healthcare professional expertise. The current review contributes to the growing body of literature on the role of deep learning in medical imaging and advocates for the incorporation of AI technologies into routine clinical workflows for enhanced patient care.

Keywords: Cardiovascular Disease, ECG, VGG-16, Convolutional Neural Network, AI-driven diagnostics

1. INTRODUCTION

Cardiovascular disease (CVD) is one of the most common causes of death in the world, with millions of deaths annually. Early detection and diagnosis of CVD are critical to improving patient outcomes, reducing mortality rates, and implementing timely interventions. Advances in deep learning and computer vision, particularly Convolutional Neural Networks (CNNs), have transformed medical imaging analysis, enabling automated detection and classification of complex diseases such as CVD with impressive accuracy. Of all the CNN-based architectures popularized in medical imaging, the VGG-16 model has been the most successful tool because of its deep, sequential structure that can capture detailed spatial features from images. This paper looks at the application of the VGG-16 model for the automated detection of CVD to check whether it can enhance the accuracy of diagnosis and aid in clinical decision-making [1-7].

This model was originally, however, developed by Visual Geometry Group of the University of Oxford and has ever since proved itself to be simple, yet very efficient for complex problems in the area of image classification. It consists of a total of 16 layers of weights, dominated by convolutional layers supplemented with fully connected ones, able to extract sophisticated features from any input image. This helps it achieve a high value while keeping computational complexity manageable when dealing with large-scale images for applications in medical image analysis, such as this study which trains the VGG-16 model on data labelled with various types of CVD and learns the patterns associated with the different kinds of structural or functional impairments of cardiovascular organs and their blood vessels related to early diagnosis [8-13].

Availability of large high-quality datasets is a prime requirement for the success of CNNs like VGG-16 in medical imaging, and for CVD detection usually consists of annotated images based on echocardiograms, MRI, or CT from radiologists forming the bases for model training and validation [14-17]. The network is trained on the images with a VGG-16 model such that it could distinguish the healthy and diseased state with high precision, probably even better than the manual diagnostic methods. The paper further focuses on the pre-processing steps that should be taken in a dataset: normalization and augmentation to make the model generalize to different kinds of patient data and different imaging conditions [18-23].

Besides the VGG-16 model performance, this study goes further with testing the interpretability of this model's output because explain ability is crucial within this clinical domain: there need to be clear, dependable mechanisms by which providers have clear, reliable explanations regarding exactly how the model makes the predictions they do for one to be confident and trusting enough to integrate such results in clinical practice. This study utilizes techniques such as Grad-

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CAM, Gradient-weighted Class Activation Mapping, in order to visualize the regions of the image on which the VGG-16 model focuses during the detection process. Grad-CAM can provide insight into the decision-making process of the model, thus enabling clinicians to understand the basis for the diagnosis made by the model and thereby increase trust in the automated system [24-29].

These overall researches lead to verification of the practicality and reliability of using the model VGG-16 and making it reliable and readable in early disease diagnosis - cardio diseases. As deep learning continues to continue, this study contributes yet another chapter to the swelling knowledge base on the impact of CNNs in elevating healthcare, laying an important foundation for future investigations into how AI-driven diagnoses can be integrated into current clinical practice for CVD and beyond [30-36].

2. OVERVIEW OF CARDIOVASCULAR DISEASE DETECTION METHODS

Cardiovascular diseases encompass a wide range of conditions that affect the heart and blood vessels, causing extensive morbidity and mortality. An early diagnosis and accurate confirmation play an important role in successful management and treatment of the condition. Several methods of diagnosing cardiovascular diseases have been developed, each with certain benefits, drawbacks, and specific clinical uses. Overview: Most applied techniques and mechanisms, clinical relevance, and the role of new technologies like deep learning for detection [37-41].

❖ **Clinical Assessment**

Cardiovascular disease is quite often diagnosed based on a good clinical examination first. This may involve carefully taking a history from a patient and carrying out the appropriate medical examination. A physician generally examines risk factors like hypertension, diabetes, tobacco use, and family histories-all of which are precursors to cardiovascular disease or perhaps indicators of the disorders [42-47]. Physical examination may, for instance, reveal an abnormal heart murmur and abnormal heart sounds or indicate peripheral edema, all of which are signs of cardiovascular disease or disorders. An essential symptom assessment helps because most patients come with classic symptoms of chest pain, shortness of breath, palpitations, and the feeling of being exhausted or tired. It is with respect to their presence, severity, and duration that helps a clinician direct further testing for or against it to mold an overarching approach in caring for any patient.

❖ **Electrocardiogram (ECG)**

An electrocardiogram is a commonly used tool which records the electrical activity of the heart over time. Its critical insights into heart rhythm, size, and functionality make it fundamental in cardiology diagnostics. ECGs are very important for various cardiac abnormalities such as arrhythmias, myocardial ischemia, and infarction. Furthermore, some of the deviations of the basic ECG are Holter monitoring, which captures the recording over a period of 24 hours; it is useful for detection of transient abnormalities not readily observed in a routine test. Although ECGs are very valuable, they have their limitations as well: even when it is taken with extreme precision, it may not reveal all the subtle abnormalities; thus, its interpretation should come from a skilled clinician [48-53].

Stress Testing

Stress testing tests the heart function under physical exertion. These can be performed through either exercise-mostly on a treadmill-and pharmacological agents for patients who cannot exercise. This method is very useful in identifying exercise-induced ischemia, assessing exercise capacity, and evaluating the effectiveness of therapeutic interventions. Although stress tests are helpful, they also have disadvantages; false positives can occur, which sometimes lead to further testing being unnecessary. Furthermore, stress tests are not suited for everyone, especially people with severe mobility problems or severe underlying diseases [54-58].

❖ **Cardiac Imaging Techniques**

There are various cardiac imaging techniques used to elucidate the anatomy and physiology of the heart.

- **Computed Tomography Angiography:** This is a non-invasive imaging test that helps view blood vessels and assess the risk of having coronary artery disease.
- **Magnetic Resonance Imaging:** It utilizes magnetic fields and radio waves to create detailed images of the heart, making it a tool for the assessment of myocardial viability and for the detection of myocardial infarction and cardiomyopathies [59-65].

❖ **Biomarkers and Blood Tests**

Biomarkers and blood tests are used in the identification and management of cardiovascular disease. Some of the frequently used biomarkers include troponin, natriuretic peptides such as BNP, and lipid panels. However, because of the susceptibility of biomarkers towards many factors that may possibly be present in various conditions, their interpretation usually calls for a careful clinical setting, and their use doesn't provide an isolated assessment of the cardiovascular health of a patient [66-73].

❖ **Emerging Technologies and Machine Learning**

The integration of artificial intelligence and machine learning, in particular deep learning algorithms, is beginning to mold the new landscape of detecting cardiovascular diseases. Advanced models including VGG-16 Convolutional

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Neural Network can now scan medical images, for instance, ECG and echocardiography for accurate abnormality detection. These technologies are able to automate the process of detecting disease, eliminate human mistakes, and potentially identify very subtle patterns missed by the traditional means of diagnosis. Some challenges will need to be overcome for their effective deployment, for instance, massive annotated data will be needed for an efficient training model, potential concerns about AI models as black boxes in terms of their interpretability, validation within clinical settings to check reliability and safety [74-81].
The diagnosis of cardiovascular diseases has progressed from simple clinical examination to high-resolution imaging. All diagnostic techniques have strengths and weaknesses, which highlights the need for a more comprehensive approach to disease diagnosis. Advances in machine learning and AI-based emerging technologies might eventually help in better detection with better outcomes. These innovations will find a place in the management and detection of cardiovascular diseases that may herald better times for interventions in the future [82-87].

Table 1: Comparative Analysis of Deep Learning Models in Medical Diagnostics.

Reference	Advantages	Dataset	Implementation
Khan et al. (2021) [77]	High accuracy of DL over ML; CNN excels in image-based diagnoses, autonomously extracts intricate patterns	Medical data	SVM, NN, and CNN for disease classification; CNN outperforms in complex, image-based diagnoses
Kiliçarslan (2023) [78]	PSO+GWO hybrid optimization improves CNN accuracy, reduces computational cost	Cardiovascular data	PSO+GWO hybrid approach to optimize CNN hyperparameters for cardiovascular disease detection
Lachmann et al. (2022) [84]	Transfer learning with VGG-16 enables fast, resource-efficient analysis for complex cardiovascular patterns	Ultrasound images (heart)	Pre-trained VGG-16 CNN model for feature extraction and unsupervised classification of aortic outflow profiles
Lu et al. (2021) [85]	Dilated CNN architecture allows fine-grained feature capture, critical for cancerous tissue localization	Lung cancer imaging data	Dilated CNN based on VGG16 for lung cancer detection, enhancing feature capture without added parameters
Martins et al. (2021) [92]	Video-based DL model captures dynamic, progressive changes, providing high diagnostic accuracy for rheumatic heart disease	Echocardiographic videos	Video-based DL approach to analyze temporal heart patterns for automated rheumatic heart disease diagnosis
Mohana et al. (2022) [93]	IoT-CNN integration allows continuous remote monitoring and real-time diagnostics, aiding chronic disease management	IoT healthcare data	IoT framework combined with CNN for real-time monitoring and diagnostic alert system, enhancing remote healthcare

3. EVOLUTION OF CONVOLUTIONAL NEURAL NETWORKS (CNNS)

Convolutional neural networks are a class of deep models especially suitable for handling complex visual data, therefore having unique utility in image classification or recognition or segmentation tasks. CNNs are a hierarchical architecture model based on the visual processing mechanisms within the human brain. This architecture enables the CNNs to learn representations at multiple resolutions of scale-from very coarse edge and texture representations up to highly detailed shape and object descriptions. In contrast to fully connected neural networks, the CNNs make use of convolutional layers where filters or kernels are slid across the image to detect spatial hierarchies based on local relationships between pixels. This reduces the computational load by focusing its attention solely on important features, rather than processing the whole image pixel-wise[88-93].
CNNs can be expected to have one or more layers of various types such as convolution, pooling, and fully connected layers. Convolutional layers are at the heart of all CNNs; they allow feature maps that highlight various patterns to be produced using filters slid over the images. Pooling layers occur after the convolutional layer; these down-sample such feature maps, reducing dimensionality but retaining the crucial information in them, preventing overfitting and thereby improving the efficiency of computation further. These features are then taken into the fully connected layers that appear at the end of the network to do the final classification or regression task. This layered approach enables CNNs to automatically learn the refinement of feature detection during training, which in turn causes the network to have a high accuracy in different visual tasks [94-97].

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The ability to automatically learn from data makes CNNs the most successful machine learning algorithms and models developed to date with regard to identifying patterns within complex data related to the visual context. They can be described as the pioneers in certain areas, particularly computer vision, medical imaging, or autonomous driving applications. What they have developed in using them for diagnosis, such as the identification of tumors, a means of recognizing cardiovascular disease, or explaining radiological images, have been monumental steps in a field where extremely accurate and high-speed assessments give clinicians the appropriate basis from which to base their informed decisions [98-103].

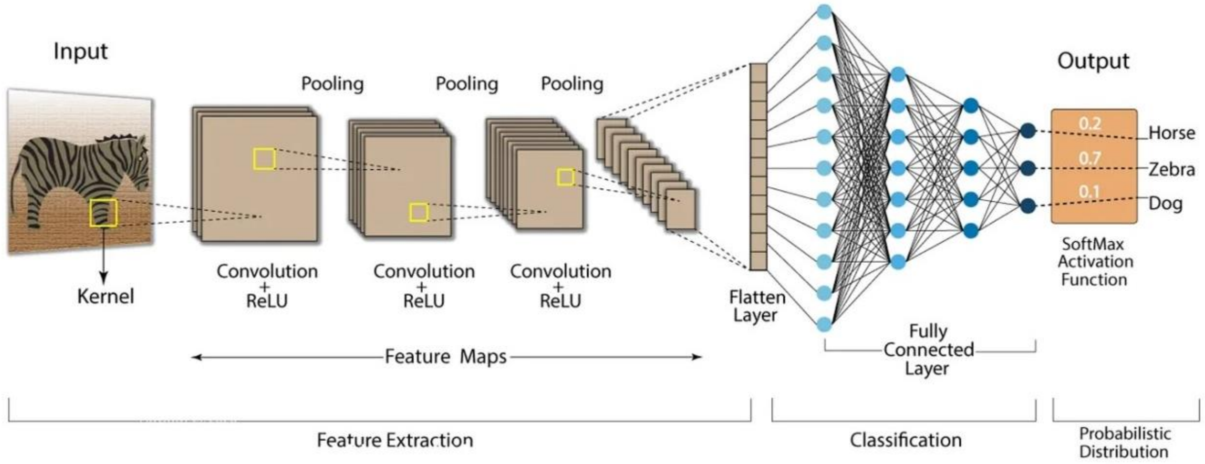

Figure 2: Overview of Convolutional Neural Networks (CNNS).

3.1. Structure and Function of CNNs in Image Analysis

CNNs are thus structures specifically mimicking and drawing inspiration from the human eye while processing visual data. Simply put, CNNs can be defined as a series of several layers that reduce in size spatially, but carry only the relevant features towards final analysis. Each layer type has an inherent role of progressive refinement of information from the input image that the model captures through the network.

1. Input Layer

Input CNN layers, the input will need to be an image whose dimensions are actually one three-dimensional matrix given by height, width and color channels-RGB. This input is normally normalized and pre-processed in order to enhance feature detection by improving the accuracy of the model.

2. Convolutional Layers

There exist fundamental layers named Convolutional Layers in a CNN. They are defined for the automatic detection of major features such as edges, texture and shape. Such layers will take small filters also named as kernels that move over the input matrices or the image so that the mathematical operation known as the convolution can be taken in place [104-107].

3. Activation Function (ReLU)

After convolution, the Rectified Linear Unit (ReLU) activation function is typically applied in order to introduce non-linearity into the model.

4. Pooling Layers

Pooling layers - typically max pooling - reduce spatial dimensions of feature maps. This down samples data, hence making the network more efficient and robust. Pooling layers retain only the maximum information within each small region by choosing the maximum value within that small region in case of max pooling. [108-113].

5. Fully Connected Layers

This is done by flattening feature maps and feeding them into fully connected layers where each neuron is connected to every neuron in the previous layer. This part of the network is essentially an ordinary neural network, processing high-level features extracted by the convolutional layers and the pooling layers to make the final classification or prediction.

6. Output Layer

The output layer is the last layer from where the network generates the outputs it produces. With images mainly for classification work, such a layer primarily requires applying the SoftMax activation function that gives one's respective probability to different classes as to which particular class would be assigned more as having high confidence values toward classification of the image submitted to the research work [114-119].

3.2. Function of CNNs in Image Analysis

The CNNs are the ones that have great strengths in image analysis due to the hierarchical representation that can allow for the progressive detection of increasingly complex visual features. It can capture basic edges and textures with the

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earlier layers and extract more abstract representations such as shapes and patterns using the deeper layers. With such hierarchical structures, CNNs can succeed in high accuracy and efficiency in performing tasks in image classification, object detection, and image segmentation tasks. The structure and function of CNNs allow the model to learn essential features from the massive amounts of visual data without manual feature extraction; thus, CNNs are extremely effective and widely applied in applications such as facial recognition, autonomous driving, and medical diagnostics, where the correct and fast analysis of visual information is of prime importance[120-124].

4. VGG-16 MODEL ARCHITECTURE

The VGG-16 architecture is a deep architecture from a convolutional neural network, which was proposed in 2014 by the Visual Geometry Group at the University of Oxford. It attracted popularity mainly because of the simplicity and ability to effectively act on datasets like ImageNet-it achieved high precision in such classification tasks. The model contains 16 layers of weights, thereby calling it "VGG-16." The philosophies behind this design are small convolutional filters throughout the network, meaning very minimal size (3x3).
The architecture of VGG-16 is organized in the form of a chain of convolutional blocks, wherein every block consists of some consecutive layers of convolutions and one max-pooling layer. In this manner, the first two blocks are composed of two consecutive layers of convolutions followed by max-pooling. These are carried out to reduce spatial dimensions in the feature map so that this can curtail computational complexities and hence prevent overfitting by doing progressive summarizations of these features. This layout of five convolutional blocks leads to very high-level feature representations[125-127].
Following the convolutional blocks, VGG-16 comprises three fully connected (FC) layers. Both the first two fully connected layers have 4096 neurons along with the use of ReLU activation functions to capture features learned in the convolutional layers and perform higher-level more complex decision-making. The final layer is a SoftMax layer with 1000 nodes. This layer has been designed to output a probability distribution over the 1000 classes in the ImageNet dataset. The activation of SoftMax helps in interpreting the output as class probabilities, and hence every input image can be classified under one of the target categories.
The main advantage of VGG-16 is the usage of small filters (3x3) stacked in a deep configuration, thus enabling it to learn fine-grained and hierarchical patterns across images while keeping the number of parameters manageable as compared to larger filter sizes. It had very high depth and quite a number of parameters such that its computing and memory can become very demanding, leading to slow training and inference speeds on standard hardware.

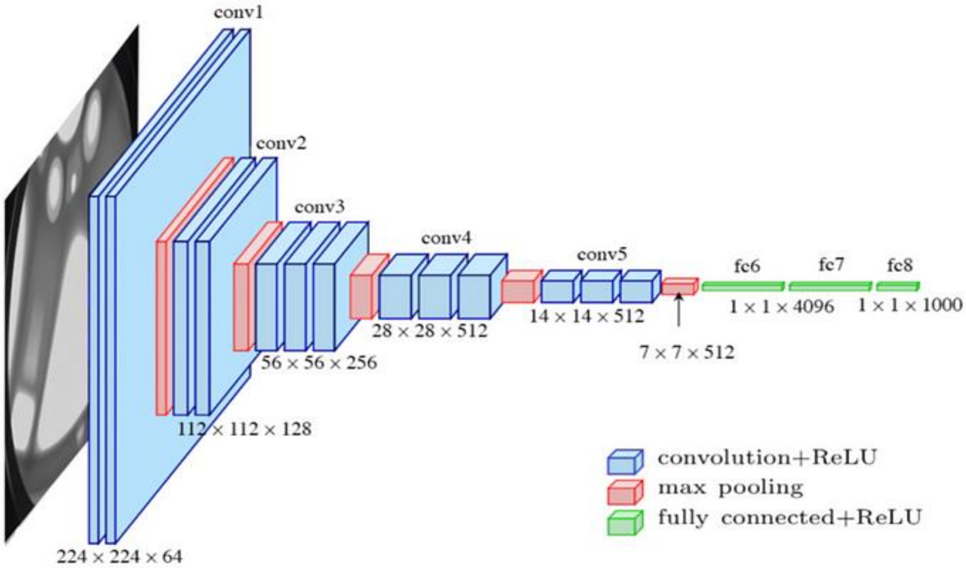

Figure 3: The Architecture of VGG16 Model.

4.1. Structure of the VGG-16 Model

This model, VGG-16, is a deep convolutional neural network architecture. Its elegance for image-classification tasks arises from its simplicity and uniform architecture. Here below, the architecture is further elaborated in detail from one layer to the other in terms of how components function together for image processing effectively.

1. Input Layer

VGG-16 takes its input images as 224 x 224 pixels, having three color channels in RGB. This has a fixed input size so that consistency could be obtained over architecture for running and testing the model.

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2. Convolutional Layers

The VGG-16 architecture has at its core 13 convolutional layers, all of which utilize small 3x3 filters. Convolutional layers apply the following steps:

- **Convolution Operation:** Each filter moves over the input image (or the output from the previous layer) and performs a convolution operation. Using small filters allows for more nonlinearities and possibly capture complex features while maintaining a reasonable parameter count.
- **Activation Function:** The ReLU (Rectified Linear Unit) activation function is applied after each convolution operation. This non-linear function introduces non-linearity into the model, enabling it to learn more complex patterns [128-131].

3. Pooling Layers

This is aimed at reducing the spatial dimensionality of the feature maps so as to reduce overfitting.

- **Max-Pooling Layer:** After every 2 convolutional layers or so, a 2x2 max-pooling layer with stride 2. This layer selects the max value from each patch in the feature map and so down samples the spatial dimension by half.

4. Structure Breakdown

The architecture of VGG-16 can be structured into five main blocks of convolutional layers interleaved with max-pooling layers, as shown below:

- **Block 1**:
    - 2 Convolutional Layers: Each with 64 filters of size 3x3
    - 1 Max-Pooling Layer: 2x2 with stride 2
- **Block 2**:
    - 2 Convolutional Layers: Each with 128 filters of size 3x3
    - 1 Max-Pooling Layer: 2x2 with stride 2
- **Block 3**:
    - 3 Convolutional Layers: Each with 256 filters of size 3x3
    - 1 Max-Pooling Layer: 2x2 with stride 2
- **Block 4**:
    - 3 Convolutional Layers: Each with 512 filters of size 3x3
    - 1 Max-Pooling Layer: 2x2 with stride 2
- **Block 5**:
    - 3 Convolutional Layers: Each with 512 filters of size 3x3
    - 1 Max-Pooling Layer: 2x2 with stride 2

5. Fully Connected Layers

After the final pooling layer, the output feature map is flattened and passed to three fully connected (FC) layers:

- **First Fully Connected Layer**: 4096 neurons
- **Second Fully Connected Layer**: 4096 neurons
- **Third Fully Connected Layer**: 1000 neurons (corresponding to the 1000 classes in the ImageNet dataset)

6. Output Layer

The final layer is SoftMax, which transforms the output of the last fully connected layer to a probability distribution over 1000 classes. Because the outputs of the SoftMax function add up to one, this layer can be viewed as class probabilities [132-135].

7. Summary of Parameters

In total, VGG-16 contains approximately 138 million parameters. This can be expected, since the major contribution is from fully connected layers, which keep most of the weights. The depth and parameter count enable the network to learn rich feature representations, which is important to classify images accurately.

Comparison with Other CNN Architectures

VGG-16 is a pioneering design but was highly effective and one in a sea of other CNN architectures, all having distinct characteristics and strengths. A detailed comparison between VGG-16 and some prominent CNN architectures such as Alex Net, ResNet, Inception, and Mobile Net is provided below:

Table 2: Summary of Comparison

Architecture	Year Introduced	Top-5 Error Rate	Key Features	Strengths
AlexNet	2012	15.3%	5 convolutional layers, large filters	Simplicity, speed in training
VGG-16	2014	7.3%	16 layers, small 3x3 filters	High accuracy, effective feature

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				extraction
ResNet	2015	3.57%	Deep architecture with skip connections	Very deep networks without degradation
Inception	2014	6.67%	Multi-scale features via inception modules	Efficient computation, multi-scale capture
MobileNet	2017	Competitive	Depth wise separable convolutions	Lightweight, real-time applications

VGG-16 is the most basic model in the landscape of deep learning architectures. It is well known for its depth and effective feature extraction capabilities. It provides many advantages, especially when using transfer learning compared to more recent architectures such as ResNet and Inception, which provide more accuracy, efficiency, and capabilities. Ultimately, the choice depends on the application requirements such as computational resources, the accuracy required, and the environments of deployment [136-139].

5. CONCLUSION

The exploration conducted in this work regarding the deployment of VGG-16 as an application for cardiovascular disease (CVD) detection truly puts into perspective the possibility and vast potential of deep learning applications in medical diagnosis. This study has demonstrated how the deep architecture of VGG-16 was able to seize highly sophisticated spatial features of data taken from medical imaging with such great efficiency and has shown that it is possible to have accuracy and reliability in detecting CVD far above what might be achieved using more conventional methods. The model learns the subtle patterns indicative of a wide range of cardiovascular conditions, making early diagnosis possible with timely interventions, by using large high-quality datasets and strong pre-processing techniques. Besides this, the integration of methods for interpretability such as Grad-CAM allows clinicians to gain valuable insights into the decision-making process of the model, thus fostering greater trust and confidence in AI-assisted diagnostics. The findings call out VGG-16 as a promising addition to the current practices of diagnosis, particularly in resource-limited settings where specialized medical knowledge may be scarce. The ground this research lays will form the basis of further studies in CNNs towards enhancing health outcomes, hence stressing that more collaboration between experts in machine learning and health providers must be ensured in order to integrate AI technology into routine clinical practice.

REFERENCES

[1]. AL, A. (2023). A Deep Learning Framework for Automatic Cardiovascular Classification from Electrocardiogram images.
[2]. Shaikh Abdul Hannan, “The Investigation Of Machine Learning And Deep Learning Classification Of Internet Of Things (IoT) Enabled Medical Devices”, International Journal of Innovative Research in Advanced Engineering (IJIRAE), Volume 11, Issue 10, October 2024. Pp 787-793, ISSN: 2349-2163.
[3]. Mukesh Soni, Maher Ali Rusho, Haewon Byeon, Azzah Alghamdi, Shaikh Abdul Hannan, Parth Ramchandra Dave, “Artificial Intelligence-based Service Chains Scheduling for Medical Emergency in Healthcare”, 7th International Conference on Contemporary Computing and Informatics (IC3I), Sept-2024. Pp 1576-1582, ISBN:979-8-3503-5007-4.
[4]. Haewon Byeon, Prashant GC, Shaikh Abdul Hannan, Faisal Yousef Alghayadh, Arsalan Muhammad Soomar, Mukesh Soni, Mohammed Wasim Bhatt, “Deep Neural Network model for enhancing disease prediction using auto encoder based broad learning”, SLAS Technology, Elsevier, Volume 29, Issue 3, June 2024, 100145.
[5]. Shaikh Abdul Hannan, Pushparaj, Mohammed Junaid Khan , Anil Kumar, Taranpreet Kaur, “Detection of brain disorders using artificial neural networks”, Frontier Scientific Publishing, Journal of Autonomous Intelligence, Vol 7, No. 5, pp 1-17, April- 2024.
[6]. Arjmand, A., Tsakai, O., Christou, V., Tzallas, A. T., Tsipouras, M. G., Forlano, R., ... &Giannakeas, N. (2022). Ensemble convolutional neural network classification for pancreatic steatosis assessment in biopsy images. Information, 13(4), 160.
[7]. Shaikh Abdul Hannan, “Advancing Parkinson's Disease Severity Prediction using Multimodal Convolutional Recursive Deep Belief Networks”, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol 15, No. 2, pp 467-479, Feb 2024.
[8]. Mohamoud Aboughaly, Shaikh Abdul Hannan, “Enhancing Quality-of-Service in Software-Defined Networks Through the Integration of Firefly-Fruit Fly Optimization and Deep Reinforcement Learning”, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol 15, No. 1, pp 408-419, Jan 2024.

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DOI: 10.17148/IARJSET.2025.12647

[9]. Shaikh Abdul Hannan, Pushparaj, Ashfaque M.W., Lamba A., Kumar A, "Analysis of detection and recognition of Human Face using Support Vector Machine", Artificial Intelligence of Things, ICAIoT 2023, Communication in Computer and Information Science, Vol 1930, Springer.

[10]. Mohd Waseem Ashfaque, Sohail Iqbal Malik, Charansing Kayte, Sayyada Sara Banu, Awatef Salem Balobaid, Shaikh Abdul Hannan, "Design and Implementation: Deep Learning-based Intelligent Chatbot", 3rd IEEE International Conference on Computing and Information Technology (ICCIT), September 2023, Tabuk, Kingdom of Saudi Arabia.

[11]. Balakrishna, C., Dadashzadeh, S., &Soltaninejad, S. (2018). Automatic detection of lumen and media in the IVUS images using U-Net with VGG16 Encoder. arXiv preprint arXiv:1806.07554.

[12]. Dubey, K., Srivastava, V., & Mehta, D. S. (2018). Automated in vivo identification of fungal infection on human scalp using optical coherence tomography and machine learning. *Laser Physics*, *28*(4), 045602.

[13]. Rimi, T. A., Sultana, N., &Foysal, M. F. A. (2020, May). Derm-NN: skin diseases detection using convolutional neural network. In *2020 4th international conference on intelligent computing and control systems (ICICCS)* (pp. 1205-1209). IEEE.

[14]. Shaikh Abdul Hannan, "Artificial Intelligence and Nanotechnology for Diagnosis of Heart Disease", Journal of Nutrition and Human Health", Vol 7, Issue 5, October 2023, London, United Kingdom.

[15]. Dr. Venkateswara Rao Naramala, B.Anjanee Kumar, Dr. Vuda Sreenivasa Rao, Dr. Annapurna Mishra, Shaikh Abdul Hannan, Prof. Ts. Dr. Yousef A.Baker El-Ebiary, R. Manikandan, "Enhancing Diabetic Retinopathy Detection Through Mahcine Learning with Restricted Boltzmann Machines", *(IJACSA) International Journal of Advanced Computer Science and Applications,*, Vol 14, Issue 9, September 2023.

[16]. Haewon Byeon, Chintureena Thingom, Ismail Keshta, Mukesh Soni, Shaikh Abdul Hannan, Herison Surbakti, "A logic Petri net Model for dynamic multi agent game decision-making", Elsevier, Decision Analytics Journal 9 (2023), 100320.

[17]. Shaikh Abdul Hannan, "Artificial Intelligence and Blockchain Technology for secure data and privacy" Journal of Advance Research in Computer Science and Engineering, Vol 9, Issue 7, September 2023.

[18]. BalaKrisna G, Shaikh AHAM, Tiwari M et al (2023) Artificial intelligence and nanotechnology in biosensors. In: Ranjith R, Davim JP (eds) Handbook of research on advanced functional materials for orthopedic applications. IGI Global, Hershey, PA, pp 47–64.

[19]. Bhan, A., Mangipudi, P., & Goyal, A. (2023). Deep and Transfer Learning based methods for Left Ventricle segmentation from cardiac MRI images to identify cardiovascular ailments.

[20]. Atul Tiwari, Shaikh Abdul Hannan, Rajasekhar Pinnamaneni and Abdul Rahman Mohammed Al-Ansari, "Optimized Ensemble of Hybrid RNN-GAN Models for Accurate and Automated Lung Tumour Detection from CT Images" International Journal of Advanced Computer Science and Applications (IJACSA), 14(7), 2023.

[21]. Shaikh Abdul Hannan, "Study and evaluation of "Se-2-Seq" model competency in AI-based educational Chabot for the Marathi language", European Chemical Bulletin, Volume 12, Special Issue 13, July 2023, pp 223-232.

[22]. Shaikh Abdul Hannan, "Application of Neural Networks and Deep Transfer Learning Methods Transfer Learning methods for Thyroid Cancer", European Chemical Bulletin, Volume 12, Special Issue 9, July 2023, pp 2093-2105.

[23]. Shaikh Abdul Hannan, "A Blockchain Technology and Internet of Things to Secure in Healthcare System", Journal of Advance Research in Computer Science & Engineering, Volume 9, Issue 04, pp 12-19, April 2023.

[24]. Shaikh Abdul Hannan, "Development of Digital Transformation in Higher Education Institutions", Journal of Computer Science & Computational Mathematics, Volume 13, Issue 01, pp 1-8, March 2023.

[25]. Shaikh Abdul Hannan, Pushparaj Pal, "Detection and classification of kidney disease using convolutional neural networks", Journal of Neurology and Neurorehabilitation Research, Vol 8, Issue 2, pp 1-7, 2023.

[26]. Camara, J. R., Tomihama, R. T., Pop, A., Shedd, M. P., Dobrowski, B. S., Knox, C. J., ... & Kiang, S. C. (2022). Development of a convolutional neural network to detect abdominal aortic aneurysms. Journal of Vascular Surgery Cases, Innovations and Techniques, 8(2), 305-311.

[27]. Shaikh Abdul Hannan; Ms. Preeti Gupta; P. Vanitha; Rajesh Singh; Dimple Saini; Mohit Tiwari, "Analysis of blockchain technology based on digital management systems and data mining technology", IEEE Xplore**,** 22 March 2023, ISBN**:**979-8-3503-9827-4

[28]. Heena Vig, Shaikh Abdul Hannan, Asok Kumar, Rajshree Singh, Juhi Juwairiyaah, Neen Kuriakose, "Gender and Age Classification Enabled Blockchain Security Mechanism for assisting Mobile Application, IEEE Xplore, 22nd March 2023, ISBN: 979-8-3503-9827-4.

[29]. Hannan A. A Blockchain Technology to Secure Electronic Health Records in Healthcare System. *London Journal of Research In Computer Science and Technology* 2023;23(1):1–13.

DOI: 10.17148/IARJSET.2025.12647

[30]. Shaikh Abdul Hannan, "Challenges of Blockchain Technology using Artificial Intelligence in Healthcare System" International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), Vol 12, Issue 01, page 64-74, Jan 2023.

[31]. Shaikh Abdul Hannan, "Application and Scope of Blockchain in Technical Research and Higher Education" Vol 20, Issue 15, page 6185-6191, NeuroQuantology, Nov 2022.

[32]. Shaikh Abdul Hannan, "An Examination of the Blockchain Technology: Challenges and Future Opportunities", International Journal of Engineering and Computer Science, Vol 11, Issue 11, Nov 2022.

[33]. Shaikh Abdul Hannan, Manjusha Hivre, Lata, M., Krishna, B. H., Sathyasiva, S., & Arshad, M. W.. Brain damage detection using Machine learning approach", International Journal of Health Sciences, Special Issue VIII, 27 Sept. 2022, PP 4910-4924, ISSN 2550-6978.

[34]. Dubey, A., Mujoo, S., Shaikh Abdul Hannan., Satpathy, G., Arshad, M. W., & Manikandan, E., "Cancer detection using RNA sequencing and deep learning", International Journal of Health Sciences, Special Issue VIII, 27 Sept. 2022, PP 4925-4939, ISSN 2550-6978.

[35]. Arun Prasad, Shaikh Abdul Hannan, Kavita Panjwani, Muthe Ramu, Kawaender Singh Sidhu, Nagabhusanam Tida, "Detailed Investigation of the role of Artificial Intelligence in stock market predictions, British Journal of Administrative Management, Vol 58, Issue 06, 6th Sept 2022, UK.

[36]. Candemir, S., Rajaraman, S., Thoma, G., &Antani, S. (2018, October). Deep learning for grading cardiomegaly severity in chest x-rays: an investigation. In 2018 IEEE Life Sciences Conference (LSC) (pp. 109-113). IEEE.

[37]. Swati Saxena, Shaikh Abdul Hannan, **"**Women Warrior – Android Mobile Application for Women Security" International Journal of Computer Science and Information Technologies, Volume 13, Issue 3, PP 76-84, India, June 2022.

[38]. Swati Saxena, Shaikh Abdul Hannan, "A Quaitative Review on Intervention of Robotics in Medical Science", International Journal of Computer Application(IJCA), Vol. 179, Number 46, 2021, ISSN 0975-8887, USA.

[39]. Yogesh Rajput, Shaikh Abdul Hannan, Design New Wavelet Filter for Detection and Grading of Non-proliferative Diabetic Retinopathy Lesions, International Conference on Recent Trends in Image Processing and Pattern Recognition, Jan 2020, Springer, Singpore.

[40]. Sagar Vakhare, Ramesh Manza, Abdul Hannan Shaikh and Anubha Jain, "Time Series Analysis and Forecasting of Temperatures Records in Aurangabad District of Maharashtra", Springer FICR International Conference on Rising Threats in Expert Applications and Solutions. 2020 at IIS University, 17-19 Jan, 2020 Jaipur.

[41]. Anupriya Kamble, Shaikh Abdul Hannan, Yogesh Rajput and Ramesh Manza, "Prediction of Prediabetes, No Diabetes and Diabetes Mellitus-2 using Pattern Recognition", Springer FICR International Conference on Rising Threats in Expert Applications and Solutions. 2020 at IIS University, 17-19 Jan, 2020 Jaipur.

[42]. Yogesh Rajput, Shaikh Abdul Hannan, Dnyaneshwari Patil, Ramesh Manza "Design New Wavelet Filter for Detection and Grading of Non-Proliferative Diabetic Retinopathy Lesions" The 3rd International Conference on recent Trends in Image Processing and pattern recognition, Springer conference, Jan 2020, Aurangabad, Maharashtra, India.

[43]. Diker, A., Cömert, Z., Avcı, E., Toğaçar, M., &Ergen, B. (2019, November). A novel application based on spectrogram and convolutional neural network for ECG classification. In 2019 1st International Informatics and Software Engineering Conference (UBMYK) (pp. 1-6). IEEE.

[44]. Santosh Maher, Shaikh Abdul Hannan, Sumegh Tharewal, K. V. Kale " HRV based Human Heart Disease Prediction and Classification using Machine Learning " December 2019, (Vol. 17 No. 2 International Journal of Computer Science and Information Sec Applicatiion (IJCA), New York, USA.

[45]. Santosh K. Maher, Sumegh Tharewal, Abdul Hannan, "Review on HRV based Prediction and Detection of Heart Disease", International Journal of Computer Applications (0975 – 8887), Pag 7-12, Volume 179 – No.46, June 2018.

[46]. Shaikh Abdul Hannan and Mir Arif Ali, "Analysis of Polyalphabetic Transposition Cipher Techniques used for Encryption and Decryption", International Journal of Computer Science and Software Engineering (IJCSSE), Volume 6, Issue 2, February 2017, Dubai, UAE.

[47]. Yogesh, Ramesh Manza, Anupriya Kamble Shushil G., Abdul Hannan, "Novel Approach for person identification Based on Iris Statistical Features and Retinal Blood Vessels Bifurcation points, Second International Conference on Cognitive Knowledge Engineering, 21-23 December 2016 (ICKE-2016) , Aurangabad, Maharashtra, India. ISBN 978-93-80876-89-4.

[48]. Anupriya Kamble, Abdul Hannan, Yogesh, Dnyaneshwari, "Association Detection of Regular Insulin and NPH Insulin Using Statistical Features", Second International Conference on Cognitive Knowledge Engineering, 21-23 December 2016 (ICKE-2016) , Aurangabad, Maharashtra, India ISBN 978-93-80876-89-4.

DOI: 10.17148/IARJSET.2025.12647

[49]. Shaikh Abdul Hannan, “An Overview of Big Data and Hadoop”, International Journal of Computer Application”, Volume 154, Number 10, ISSN – 0975-887, November 2016, New York, USA.

[50]. Mahammed Waseem, Naushad Ahmed Osmani, Shaikh Abdul Hannan, “ A Survey on E-education of information and Communication ‘Technology”, European Journal of Computer Science and Information Technology (EJCSIT), Vol. 4, Issue 6, ISSN 2054-0965, October 2016.

[51]. Eltrass, A. S., Tayel, M. B., & Ammar, A. I. (2021). A new automated CNN deep learning approach for identification of ECG congestive heart failure and arrhythmia using constant-Q non-stationary Gabor transform. Biomedical signal processing and control, 65, 102326.

[52]. Hannan, S. A. (2025)., “Approaches to Risk Assessment and Early Hernia Detection Using Artificial Intelligence And Machine Learning”, Journal of Advance Research in Computer Science & Engineering (ISSN 2456-3552), 10(1), 1-7.

[53]. Shaikh Abdul Hannan, "Heart Disease Diagnosis by using FFBP and GRNN algorithm of Neural Network", International Journal of Computer Science and Information Security, Vol 12, Number 6, June 2014, ISSN 1945-5500, United States of America.

[54]. Mir Arif Ali, Shaikh Abdul Hannan, "A Review on Modern and Classical Encryption Techniques", International Journal of Engineering Trends and Technology, Volume 12, Number 4, June 2014, ISSN 2231-5381, India.

[55]. Satish Misal, Shaikh Abdul Hannan, Santosh Lomte, ”Comparative study of image processing Techniques on Geometrical shapes”, International Journal of Emerging Technology & Advanced Engg., An ISO 9001:2008 Certified International Journal, Vol 2, Issue 9, New Delhi.

[56]. Di Vaio, A., R. Palladino, R. Hassan, and O. Escobar. 2020. Artificial Intelligence and business models in the sustainable development goals perspective: A systematic literature review. Journal of Business Research 121 (December):283–314. doi: 10.1016/j.jbusres.2020.08.019.

[57]. Aqueel Ahmed, Shaikh Abdul Hannan, “Data Mining Techniques to Find Out Heart Diseases: An Overview”, International Journal of Innovative Technology and Exploring Engineering (IJITEE), An ISO 9001:2008 Certified International Journal, Volume-1, Issue-4, September 2012, ISSN: 2278-3075, New Delhi, India.

[58]. Shaikh Abdul Hannan, Jameel Ahmed, Naveed Ahmed, Rizwan Alam Thakur, “Data Mining and Natural Language Processing Methods for Extracting Opinions from Customer Reviews”, International Journal of Computational Intelligence and Information Security, pp 52-58, Vol. 3, No. 6, July 2012. (ISSN: 1837-7823).

[59]. M. J. Baheti, A. V. Mane, Shaikh Abdul Hannan, K. V. Kale, “Comparison of PCA and SVM for a west Indian Script- Gujarati”, CiiT Journal of Digital Image Processing, Vol. 3. No. 11, pp. 709-715, July 2011.

[60]. Sunilkumar Sangme, Shaikh Abdul Hannan and R.J. Ramteke, “Isolated Handwritten Text (Word) for Optical Character Recognition Using Future Extraction”, International Journal of Computer Sciences, Systems Engineering and Information Technology, P-151-155, ISSN : 0974-5807, July to dec 2009.

[61]. Priya Chaudhary, Shaikh Abdul Hannan, Ramesh Manza “Program analysis and Code Optimization using Syntax Analyzer”, “International Journal of Artificial Intelligence and Computational Research (IJAICR)", 1(2), 2009, pp. 101-106, July to December 2009, International Science Press, Gurgaon, Haryana, India. ISSN 0975-3974.

[62]. Fatema, K., Montaha, S., Rony, M. A. H., Azam, S., Hasan, M. Z., &Jonkman, M. (2022). A robust framework combining image processing and deep learning hybrid model to classify cardiovascular diseases using a limited number of paper-based complex ECG images. Biomedicines, 10(11), 2835.

[63]. Gour, N., & Khanna, P. (2021). Multi-class multi-label ophthalmological disease detection using transfer learning based convolutional neural network. Biomedical signal processing and control, 66, 102329.

[64]. Mir Arif Ali, Shaikh Abdul Hannan and R.J. Ramteke, “Text Data Hiding In The Form of Images”, International Journal of Image Analysis and Pattern Classification (IJIAPC, July to December 2009, International Science Press, Gurgaon, Haryana, India. ISSN 0975-6116

[65]. Imran Khan, Shaikh Abdul Hannan and R.J. Ramteke, “Urdu Word Typology and Word Segmentation Methods – Review”, International Journal of Artificial Intelligence and Computational Research (IJAICR)", July to December 2009, International Science Press, Gurgaon, Haryana, India, ISSN 0975-6116.

[66]. Shaikh Jameel, Shaikh Abdul Hannan and R.R. Manza, “An Emerging Biometric Technology for Personal Identification in Iris Recognition System“, “International Journal of Computer Engineering", July to December 2009, Serials Publication, New Delhi, India. ISSN 0974-5897

[67]. Manoj Khandare, Shaikh Abdul Hannan and R.J. Ramteke, “Technique used in TTS for International Language : Review”, journal of Advance Research In Computer Engineering: An International Journal ", July to December 2009, issue of the journal.

[68]. Satish Misal, Shaikh Abdul Hannan and R.J. Ramteke, “Shape Identification in an image using Moment Invariant Technique, International Journal of Computer Science, System Engineering and Information Technology", July to December 2009, Serials Publication, New Delhi, India, ISSN 0974-5807.

DOI: 10.17148/IARJSET.2025.12647

[69]. Shaikh Abdul Hannan, R.R. Manza and R.J. Ramteke, "Heart Disease relationship between Disease, Symptoms, Medicine and its side effects", Journal of Advance Research In Computer Engineering: An International Journal ", July to December 2009, Serials Publication, New Delhi, India, ISSN 0973-6794.

[70]. Hong, D., Zheng, Y. Y., Xin, Y., Sun, L., Yang, H., Lin, M. Y., ... & Wang, S. S. (2021). Genetic syndromes screening by facial recognition technology: VGG-16 screening model construction and evaluation. Orphanet Journal of Rare Diseases, 16, 1-8.

[71]. Imaduddin, H., Sigit, R., &Risnumawan, A. (2021, November). Multidimensional Echocardiography Image Segmentation Using Deep Learning Convolutional Neural Network. In International Conference on Innovation in Science and Technology (ICIST 2020) (pp. 326-330). Atlantis Press.

[72]. Irmak, E. (2022). COVID-19 disease diagnosis from paper-based ECG trace image data using a novel convolutional neural network model. Physical and Engineering Sciences in Medicine, 45(1), 167-179.

[73]. Jothiaruna, N., &Leema, A. A. (2023). Retracted Article: Lw-Dn161: a cardiovascular disorder classification from 12 lead ECG images using convolutional neural network. Soft Computing, 1-1.

[74]. Shaikh Abdul Hannan, V. D. Bhagile, R. R. Manza, R. J. Ramteke, "Diagnosis and Medical Prescription of Heart Disease Using Support Vector Machine and Feed forward Back propagation technique", International Journal on computer science and Information Security, – August 2010, Vol. 2, Issue 6, ISSN: 0975–3397.

[75]. Shaikh Abdul Hannan, Pravin Yannawar, R.R. Manza and R.J. Ramteke, "Expert System Data Collection Technique for Heart Disease", in International Journal of Innovative Research in Science and Techniques (IJIRST), Vol 1, No.1 , Jan – June 2010, PP 31-35, ISSN:2229-3116, India.

[76]. Shaikh Jameel, Shaikh Abdul Hannan and Ramesh Manza, "An Emerging Biometric Technology for Personal Identification in Iris Recognition System", Journal of Advance Research in Computer Engineering: An International Journal ", July to December 2009.

[77]. Khan, M. R. A., Muhib, M., & Khan, M. M. A. (2021). Classification of Various Diseases Using Machine Learning and Deep Learning Algorithms. Journal of Science & Technology (JST), 6(4), 25-31.

[78]. Kiliçarslan, S. (2023). PSO+ GWO: a hybrid particle swarm optimization and Grey Wolf optimization-based Algorithm for fine-tuning hyper-parameters of convolutional neural networks for Cardiovascular Disease Detection. Journal of Ambient Intelligence and Humanized Computing, 14(1), 87-97.

[79]. Shaikh Abdul Hannan, Ramesh Manza, R. J. Ramteke, "Relationship between Heart Disease and Symptoms", International Journal of Computational Intelligent, Vol. 3, No.2, July-December 2009, pp. 289-292, ISSN 0974-5807.

[80]. Shaikh Abdul Hannan, V. D. Bhagile, R. R. Manza, R. J. Ramteke, "Diagnosis and Medical Prescription of Heart Disease Using Support Vector Machine and Feed forward Back propagation technique", International Journal on computer science and engineering, IJCSE – August 2010, Vol. 2, Issue 6, ISSN: 0975–3397.

[81]. Shaikh Abdul Hannan, V.D. Bhagile, R. R. Manza and R.J. Ramteke, "Expert System for Diagnosis and Appropriate Medical Prescription of Heart Disease Using Radial Basis Function", CiiT International Journal of Artificial Intelligent Systems and Machine Learning, August 2010, ISSN 0974–9667 & Online: ISSN 0974–9543.

[82]. Shaikh Abdul Hannan, R. R. Manza, R. J. Ramteke, "Generalized Regression Neural Network and Radial Basis Function for Heart Disease Diagnosis", International Journal of Computer Applications (IJCA) Vol. 7, No. 13, October 2010 Edition. New York, USA. ISSN: 09758887.

[83]. Shaikh Abdul Hannan, V. D. Bhagile, R. R. Manza, R. J. Ramteke, "Development of an Expert System for Diagnosis and appropriate Medical Prescription of Heart Disease Using Support Vector Machine and Radial Basis Function", International Journal of Computer Science and Information Security, (IJCSIS) August issue (Vol. 8 No. 5), 2010, Pages/record No.: 245-254. ISSN: 19475500.

[84]. Lachmann, M., Rippen, E., Rueckert, D., Schuster, T., Xhepa, E., Von Scheidt, M., ... &Laugwitz, K. L. (2022). Harnessing feature extraction capacities from a pre-trained convolutional neural network (VGG-16) for the unsupervised distinction of aortic outflow velocity profiles in patients with severe aortic stenosis. European Heart Journal Digital Health, 3(2), 153-168.

[85]. Lu, Y., Liang, H., Shi, S., & Fu, X. (2021, August). Lung cancer detection using a dilated CNN with VGG16. In Proceedings of the 2021 4th International Conference on Signal Processing and Machine Learning (pp. 45-51).

[86]. Shaikh Abdul Hannan, R. R. Manza and R.J. Ramteke, "Association Rules for Filtering The Medicine To Avoid Side Effects Of Heart Patients", on 16 -19 Dec 2009, at Advances in Computer Vision and Information Technology – 09, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

[87]. Shaikh Abdul Hannan, A.V. Mane, R. R. Manza and R. J. Ramteke, "Prediction of Heart Disease Medical Prescription Using Radial Basis Function", IEEE International Conference on Computational Intelligence and Computing Research at Tamilnadu College of Engineering, Coimbatore, Tamilnadu, India, ICCIC-2010, December 28-29, 2010.

[88]. Shaikh Abdul Hannan, V. D. Bhagile, R.R. Manza, R. J. Ramteke, "Heart Disease Diagnosis By Using FFBP algorithm of Artificial Neural Network", International Conference on Communication, Computation, Control and

DOI: 10.17148/IARJSET.2025.12647

Nanotechnology, ICN-2010 Organized by Rural Engineering College Bhalki-585328, during October 29-30, 2010.

[89]. Shaikh Abdul Hannan, Pravin Yannawar, R. R. Manza and R.J. Ramteke, "Association Rules for Filtering the Medicine to Avoid Side Effect of Heart Patient", IEEE Sponsored International Conference on Advances in Computer Vision and Information Technology (IEEE-ACVIT-09) 16th-19th December,2009, Aurangabad (MS)-India.

[90]. Monoj Khandare, Shaikh Abdul Hannan and R.J. Ramteke, "Text to speech system of Indian Languages: Review", on 16 -19 Dec 2009, at Advances in Computer Vision and Information Technology – 09, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

[91]. Mir Arif Ali, Shaikh Abdul Hannan and R.J. Ramteke, "Comparative Study of Techniques for Data Hiding" on 16 -19 Dec 2009, at Advances in Computer Vision and Information Technology – 09, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

[92]. Martins, J. F. B., Nascimento, E. R., Nascimento, B. R., Sable, C. A., Beaton, A. Z., Ribeiro, A. L., ... &Pappa, G. L. (2021). Towards automatic diagnosis of rheumatic heart disease on echocardiographic exams through video-based deep learning. Journal of the American Medical Informatics Association, 28(9), 1834-1842.

[93]. Mohana, J., Yakkala, B., Vimalnath, S., Benson Mansingh, P. M., Yuvaraj, N., Srihari, K., ... &Sundramurthy, V. P. (2022). Application of internet of things on the healthcare field using convolutional neural network processing. Journal of Healthcare Engineering, 2022(1), 1892123.

[94]. Imran Khan, Shaikh Abdul Hannan and R.J. Ramteke, "Appearance of Word in Urdu Language: Review", on Innovations in Natural Computing –INC' 09 from 12 – 13 Dec 2009 in Cochin University of Science and Technology, Cochin ,India .

[95]. Shaikh Abdul Hannan and R. R. Manza, "Review on Fingerprint Matching Technique" , in IT & Business Intelligence, on 06-08 Nov 2009, Organized By IMT, Nagpur, India.

[96]. Shaikh Abdul Hannan, Pravin Yannawar, R. R. Manza and R.J. Ramteke, "Data Mining Technique for Detection of Cardiac Problems Using Symptoms Medicine and Its Side effects", in IT & Business Intelligence -09 , in IT & Business Intelligence, on 06-08 Nov 2009, Organized By IMT, Nagpur, India.

[97]. Shaikh Abdul Hannan, Pravin Yannawar, R.R. Manza and R.J. Ramteke, "Expert System Data Collection Technique for Heart Disease" , in IT & Business Intelligence, on 06-08 Nov 2009, Organised By IMT, Nagpur, India.

[98]. Mir Arif Ali, Shaikh Abdul Hannan and R.J. Ramteke, "Classification of data hiding and comparison of bitmap images" , in IT & Business Intelligence, on 06-08 Nov 2009, Organised By IMT, Nagpur, India.

[99]. Monoj Khandare, Shaikh Abdul Hannan and R.J. Ramteke, "Text to speech in International Language : Review" , in IT & Business Intelligence, on 06-08 Nov 2009, Organised By IMT, Nagpur, India.

[100]. Panda V.K and Shaikh Abdul Hannan, "Application of Computer Vision and object tracking using Kalman Filter" , in IT & Business Intelligence, on 06-08 Nov 2009, Organized By IMT, Nagpur, India.

[101]. Shaikh Abdul Hannan, R. R. Manza and R.J. Ramteke, "Data mining Techniques for verification of Medicine Contents Relation to Cardiac Problem", on 07-09 Aug 2009 in International Conference on Information Processing , in Organized by The Society of Information Processing, Banglore, India.

[102]. Moujahid, H., Cherradi, B., Al-Sarem, M., &Bahatti, L. (2020, December). Diagnosis of COVID-19 disease using convolutional neural network models-based transfer learning. In International Conference of Reliable Information and Communication Technology (pp. 148-159). Cham: Springer International Publishing.

[103]. Nagaraj, J. (2023). An Exhaustive Study on Deep Neural Network-based Prediction of Heart Diseases and its Interpretations. The Open Biomedical Engineering Journal, 17(1).

[104]. Nimitha, N., Abbiraamavallee, S., Elakiya, E., Harini, J., &Kotishree, Y. (2022, April). Supervised chromosomal anomaly detection using VGG-16 CNN model. In AIP Conference Proceedings (Vol. 2405, No. 1). AIP Publishing.

[105]. Shaikh Abdul Hannan, Pravin Yannawar, R.R. Manza and R.J. Ramteke, "Data Mining For Heart Patient And Its Medical Prescription" , on 06 - 08 Aug 2009 in International Conference organized by Bharathidasan University Technology Park(BUTP) with Cauvary College for women ,Tiruchirapalli, Tamilnadu, India.

[106]. Mir Arif Ali, Shaikh Abdul Hannan and R.J. Ramteke, "Relationship between bitmap image in Various Fonts", in second International Conference On Signal and Image Processing, on 12-14 Aug 2009 organized By Vidya Vikas Institute of Engineering & Technology, Mysore, Kanataka, ,India.

[107]. Manoj Khandare, Shaikh Abdul Hannan and R.J. Ramteke, "Technique for Text to speech System for Indian Language", on 12-14 Aug 2009 in second International Conference On Signal and Image Processing, organized By Vidya Vikas Institute of Engineering & Technology, Mysore, Kanataka ,India.

[108]. Shaikh Abdul Hannan, R.R. Manza and R.J. Ramteke, "Relationship between Symptoms Medicine and Side Effect of Heart Patients", on 12-14 Aug 2009, in second International Conference on Signal and Image Processing, organized By Vidya Vikas Institute of Engineering & Technology, Mysore, Kanataka, India.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

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DOI: 10.17148/IARJSET.2025.12647

[109]. Önal, M. N., Güraksin, G. E., &Duman, R. (2023). Convolutional neural network-based diabetes diagnostic system via iridology technique. Multimedia tools and Applications, 82(1), 173-194.

[110]. Pant, H., Lohani, M. C., Bhatt, A. K., Pant, J., & Sharma, R. K. (2021, April). Thoracic disease detection using deep learning. In 2021 5th International Conference on Computing Methodologies and Communication (ICCMC) (pp. 1197-1203). IEEE.

[111]. Papandrianos, N. I., Feleki, A., Papageorgiou, E. I., & Martini, C. (2022). Deep learning-based automated diagnosis for coronary artery disease using SPECT-MPI images. Journal of Clinical Medicine, 11(13), 3918.

[112]. Shinde V.K., Manoj Khandare and Shaikh Abdul Hannan, "A Review of I-Smell Technology", International Conference on emerging trends in Computer Science, Communication and Information Technology, organized by the Department of Computer Science, Yeshwant Mahavidyalaya, Nanded (Maharashtra) on Jan 09-11, 2010.

[113]. Satish Misal, Shaikh Abdul Hannan and R.J. Ramteke, "Chain Code and moment invariant technique in image for shape identification", International Conference on emerging trends in Computer Science, Communication and Information Technology, organized by the Department of Computer Science, Yeshwant Mahavidyalaya, Nanded (Maharashtra) on Jan 09-11, 2010.

[114]. Qayyum, A., Meriaudeau, F., & Chan, G. C. (2018, December). Classification of atrial fibrillation with pre-trained convolutional neural network models. In 2018 IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES) (pp. 594-599). IEEE.

[115]. Dr. Abdul Hannan Abdul Mannan Shaikh, , "Introduction to Machine Learning and Big Data", November 2023, ISBN-978-93-5757-922-3, PP 1 – 256, Scientific International Publishing House, India.

[116]. Mohammad Salauddin Sagar, Dr. Abdul Hannan Abdul Mannan Shaikh, Prof. Saurabh Sharma, Dr. Anju Asokan, "Cloud Computing", 28th March 2023, ISBN-10 : 9355158556, ISBN-13 : 978-9355158550, PP 1-219, Book Rivers Publication, Lucknow, Uttar Pradesh, India.

[117]. Raaza, A. (2021). Detection and Prediction of Cardiac Amyloidosis disease using deep learning algorithms-Comparative Study. Turkish Online Journal of Qualitative Inquiry, 12(6).

[118]. Rezaee, K., Khosravi, M. R., Jabari, M., Hesari, S., Anari, M. S., &Aghaei, F. (2022). Graph convolutional network-based deep feature learning for cardiovascular disease recognition from heart sound signals. International Journal of Intelligent Systems, 37(12), 11250-11274.

[119]. Dr. Abdul Hannan Abdul Mannan Shaikh, , "Data Mining for Beginners", 16 January 2023, ISBN-13 979-8889511588, PP 1 – 290, Book Nation Press, Ltd. Chennai, Tamil Nadu, India.

[120]. Dr. Abdul Hannan Abdul Mannan Shaikh, "Artificial Intelligence" Nov 2022, ISBN: 9789395331616, Nov 2022, RK Publication, Tamil Nadu, India.

[121]. Dr. Abdul Hannan Abdul Mannan Shaikh, Dr. Sumit Chauhan, Mrs. Suma S., Dr. Sumit Bhattacharjee, "Internet of Things", 4 November 2022, ISBN-10 : : 9355155433, ISBN-13 ,PP 1- 210 ,978-9355155436 Book Rivers Publication, Lucknow, Uttar Pradesh, India.

[122]. Sarpotdar, S. S. (2022). Cardiomegaly detection using deep convolutional neural network with U-net. arXiv preprint arXiv:2205.11515.

[123]. Sertkaya, M. E., Ergen, B., &Togacar, M. (2019, June). Diagnosis of eye retinal diseases based on convolutional neural networks using optical coherence images. In 2019 23rd International conference electronics (pp. 1-5). IEEE.

[124]. Suedumrong, C., Leksakul, K., Wattana, P., &Chaopaisarn, P. (2022). Application of deep convolutional neural networks vgg-16 and googlenet for level diabetic retinopathy detection. In Proceedings of the Future Technologies Conference (FTC) 2021, Volume 2 (pp. 56-65). Springer International Publishing.

[125]. Dr. Abdul Hannan Abdul Mannan Shaikh, Swati Saxena, "Fundamentals of Internet of Things : A Design Perspective", 3 Nov 2022, ISBN-13 979-8888498453, PP 1 – 336, Book Nation Press, Ltd. Chennai, Tamil Nadu, India.

[126]. Dr. Abdul Hannan Abdul Mannan Shaikh, "Blockchain Technology for Beginners", 1 Nov 2022, ISBN-13 : , 979-8888497654, PP 1- 218Book Nation Press, Ltd. Chennai, Tamil Nadu, India.

[127]. Asif, A. A., Shaikh, A., Manza, R. R., & Ramteke, R. J. (2010). Conversion of Bitmap Text Images for Data Hiding. Computational Intelligence and Computing Research (ICCIC), 2010 IEEE International Conference, 1 – 4

[128]. Prof. Nighar Rafique Sheikh, Dr. Abdul Hannan Abdul Mannan Shaikh, Prof. Jayant S. Rohankar, Prof. Firdous Sadaf M. Ismail, "Artificial Intelligence and Machine Learning", Nov 2022, ISBN: 9789395331685, RK Publication, Tamil Nadu, India.

[129]. Tanvir, N. K., Yeasin, M. D., MD Mahmuduzzaman, S., & Ara, J. (2022). An efficient deep learning approach to predict heart failure from image data using ejection fraction (Doctoral dissertation, Brac University).

[130]. Ullah, W., Siddique, I., Zulqarnain, R. M., Alam, M. M., Ahmad, I., & Raza, U. A. (2021). Classification of arrhythmia in heartbeat detection using deep learning. Computational Intelligence and Neuroscience, 2021(1), 2195922.

DOI: 10.17148/IARJSET.2025.12647

[131]. Van-Binh, N., & Thai-Nghe, N. (2022, July). Cardiovascular Disease Detection on X-Ray Images with Transfer Learning. In International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems (pp. 173-183). Cham: Springer International Publishing.

[132]. Wang, S. H., Khan, M. A., & Zhang, Y. D. (2022). VISPNN: VGG-inspired stochastic pooling neural network. Computers, materials & continua, 70(2), 3081.

[133]. Keras for Deep Learning and Artificial Intelligence, By Dr. Abdul Hannan Abdul Mannan Shaikh, 17 October 2022, ISBN-13 : , 979-8888339190, PP 1-186Book Nation Press Ltd., Chennai, Tamil Nadu, India.

[134]. Mayank Sharma, Pramod Singh Kunwar, Dr. Abdul Hannan Abdul Mannan Shaikh, K. Sai Krishna, "Advanced Artificial Intelligence", 25th September 2022, ISBN-10 : : 9355155190, ISBN-13 ,978-9355155191 ,PP 1-231Book Rivers Publication, Lucknow, Uttar Pradesh, India.

[135]. Shaikh(2025), "Artificial Intelligence and Deep Learning Technique for Risk Assessment and Early Prediction of Heart and Kidney Cancer Detection", International Journal of Innovative Research in Information Security, Volume 11, Issue 01, Pages 52-58.

[136]. Xu, E., Nemati, S., &Tremoulet, A. H. (2022). A deep convolutional neural network for Kawasaki disease diagnosis. Scientific reports, 12(1), 11438.

[137]. Yao, G., Jiao, Y., Li, N., & Mao, X. (2021). Pulse Analysis and Identification of Obese People Based on VGG-16 Net. In Bio-Inspired Computing: Theories and Applications: 15th International Conference, BIC-TA 2020, Qingdao, China, October 23-25, 2020, Revised Selected Papers 15 (pp. 359-368). Springer Singapore.

[138]. Younis, A., Qiang, L., Nyatega, C. O., Adamu, M. J., &Kawuwa, H. B. (2022). Brain tumor analysis using deep learning and VGG-16 ensembling learning approaches. Applied Sciences, 12(14), 7282.

[139]. Zamzmi, G., Hsu, L. Y., Li, W., Sachdev, V., &Antani, S. (2019, December). Echo doppler flow classification and goodness assessment with convolutional neural networks. In 2019 18th IEEE International Conference on Machine Learning and Applications (ICMLA) (pp. 1744-1749). IEEE.