ISSN: 2182-2069 / E-ISSN: 2182-2077

Brain Tumor Detection-Based Image Processing

Nashwan Jasim Hussein[1*], Raflaa Hilmi Al-taie[2], and Saif H. Abdulwahid[3]

[1*]Department of Programming, College of Information Technology, University of Babylon, Babylon Governorate, Iraq; Department of Electrical Power Engineering, AL-Hussain University College, Kerbala, Iraq. alsalihnashwan@uobabylon.edu.iq, https://orcid.org/0000-0001-8447-2846

[2]Department of Physiology and Organ Functions, College of Medicine, University of Babylon, Babylon Governorate, Iraq. raflaa.hamid@uobabylon.edu.iq, https://orcid.org/0009-0003-4113-0557

[3]Najaf Technical Institute, Al-Furat Al-Awsat Technical University (ATU), Najaf, Iraq; Department of Media Technology and Communications Engineering, Al-Hussain University College, Kerbala, Iraq. inj.sif@atu.edu.iq, https://orcid.org/0000-0003-3233-8199

Received: January 02, 2026; Revised: February 02, 2026; Accepted: February 18, 2026; Published: May 29, 2026

Abstract

A tumor is a swelling that occurs due to the abnormal growth and division of cells. Brain tumors represent a real challenge to humanity because they threaten a person's life if they are not treated in a timely and appropriate manner. Several methods of diagnosis and treatment, such as surgical intervention, may involve side medical problems. MRI is used for detection and diagnosis. Accurate diagnosis requires expertise from experts, which may not always be available. Diagnosis is done using software methods to help detect and locate tumors. In this research, a method for detecting brain tumors using relatively simple software methods is presented, where the presence of the disease is detected and its location is accurately determined. The proposed method is based on receiving the image, enhancing it, and extracting the features after segmentation to determine the final summary. The quality of the system is evaluated by calculating key parameters and comparing them with previous works.

Keywords: Brain Cancer Detection, Feature Extraction, Soft Computing.

1 Introduction

Brain tumors represent one of the most serious medical challenges facing humanity due to their complexity, diversity, and danger to human life. Detecting brain tumors is important in various medical applications, such as early diagnosis and detection of subtle changes in brain tissue, surgical planning, which helps doctors operate accurately, and treatment monitoring, as image processing allows doctors to monitor the tumor's progress or regression during treatment. Medical imaging plays a role in detecting brain tumors despite these cases' complexity and relevance to patients' lives. Detection methods provide high efficiency in detecting the condition and monitoring the development, and this field has witnessed a significant improvement in the accuracy and reliability of detecting brain tumors. Several imaging modalities, such as magnetic resonance imaging (MRI), computed tomography (CT), and positron

Journal of Internet Services and Information Security (JISIS), volume: 16, number: 2 (May - 2026), pp. 1-10.
DOI: 10.58346/JISIS.2026.I2.001

*Corresponding author: Department of Programming, College of Information Technology, University of Babylon, Babylon Governorate, Iraq; Department of Electrical Power Engineering, AL-Hussain University College, Kerbala, Iraq.

emission tomography (PET), can detect brain tumors. These methods effectively image soft tissues and detect abnormalities in the brain. MRI faces technical challenges (such as noise and patient motion) and diagnostic challenges (disease similarity), in addition to high cost and difficulty in integrating artificial intelligence. Clinical application requires improving instrument accuracy, integrating multimodal imaging, and developing interpretable artificial intelligence models to ensure diagnostic reliability and practical feasibility (Abdusalomov et al., 2023). There are different methods to help detect tumors. They are easy to use, such as: Gaussian and median filters for Noise removal, Thresholding and edge detection (Sobel operator) for Segmentation, Morphological operations (erosion, dilation), and texture analysis for Feature extraction, rule-based decision-making for tumor severity (benign/malignant) for Classification. Image processing is a technique that treats images as a data set that can be modified and improved. The image is entered into special algorithms, and the improvement, feature extraction, and decision-making processes are carried out. MRI faces significant challenges in detecting brain diseases, including limited resolution and noise, and difficulty distinguishing early pathological changes from normal anatomical variation. The similarity of manifestations across different diseases and the complexity of image analysis call for the use of advanced technologies such as artificial intelligence and multimodality imaging. Furthermore, high cost and long scan times remain practical barriers. Overcoming these challenges requires the development of high-resolution MRI devices, improved artificial intelligence algorithms, and the integration of complementary technologies to enhance diagnostic accuracy (Bahya & Hussein, 2023; Al-taie & Hussein, 2025). Intelligent programming methods work efficiently to find solutions to unavailable problems. Soft computing represents many classical or intelligent algorithms, such as neural, genetic, and fuzzy, which provide intelligent solutions in applications such as wireless communications, estimation systems, and disease diagnosis (Hussein, 2021; Ali & Hreshee, 2023). The Internet and cloud computing promise a bright future for medical and technical applications (Ameer et al., 2022; Abdulmahdi et al., 2023; Rahaim et al., 2024). Many researchers have presented ideas in image processing and tumor diagnosis, some of which are presented as follows: Zaw et al. (2019) used the Naïve Bayes classifier and other methods for diagnosing brain tumors and determining their severity using methods. Raut et al., in (2020), used the K-Means Back propagation algorithm for brain tumor diagnosis. Venkatachalam et al. (2021) used the Content-Based Medical Image retrieval method to extract the image from extensive data; the Gabor filtering technique was used for feature extraction. Walsh-Hadamard transform is used for image recovery. Fuzzy C-Means clustering, Minkowski distance metric used for evaluating the similarity between selected images and databases. Veeramuthu et al. (2022) present a combined feature and image-based classifier method, which uses various deep neural networks and deep convolutional neural networks. Saeedi et al. (2023) used a 2D Convolutional Neural Network, a convolutional auto-encoder network, and K-nearest neighbors for brain tumor detection. Our proposed method combines efficient and straightforward software techniques to achieve high accuracy without relying on complex deep learning models. This approach reduces computational costs while maintaining competitive performance. We have added a dedicated subsection in the Introduction and Proposed Method sections to highlight this feature and its advantages over existing techniques clearly.

2 Brain Tumor

Cancer detection methods are among the most complex tasks, based on many reports, and the important one was (AANS), the American surgeons' report in 2019, which makes it difficult to detect the disease in cases of the absence of apparent symptoms. Thus, detecting the disease using CT scans appears to be an efficient method for detecting cancer instead of performing time-consuming and dangerous surgeries. Magnetic resonance imaging is suitable because it can show the tumor's characteristics without the need for therapeutic intervention. However, it requires a high level of expertise in the field (Green et al., 2015).

A tumor, as a term, refers to a mass that grows abnormally and uncontrolled and poses a threat to human life, whether it is benign, which does not represent cancer, or malignant, which represents cancer. Cancer is the cause of death for one-sixth of humans. Early detection helps in recovery if treatment is done correctly. Research has shown that the incidence rate increases with population density due to environmental pollution and high radiation levels. Also, the development of diagnosis in some places is a reason for the high incidence rate. Therefore, research in tumors and cancers is a promising field that needs more research and development (Salah & Hussein, 2023).

The brain is the center of the human central nervous system, consisting of 50-100 billion nerve cells with a complex tissue structure. The tumor growth stage begins when uncontrolled and random growth occurs in the tissue mass. The tumor's growth disrupts the cells' functions and prevents them from communicating with and influencing other tissues (Hussein et al., 2024). The basic steps in detecting tumors are obtaining images, where brain images are taken using MRI or CT. Providing high-resolution images is required for accurate detection and diagnosis. Image processing and noise reduction using Gaussian filters; median filters, and wave transforms to improve image quality. Adjusting image density through normalization. Contrast enhancement is based on improving the visibility of areas of interest. Image segmentation: The image is divided into distinct regions to isolate the tumor using Thresholding, edge detection, and segmentation techniques. Then the feature extraction phase begins, including tumor size, shape, and location. The final phase is to classify the disease in terms of its severity. There are several challenges in the detection of brain tumors, as tumors vary significantly in size and shape and, therefore, cannot be easily standardized. The overlap in intensity between healthy and damaged tissues and the effect of machine noise affect detection accuracy (Mir et al., 2024; Khudhair et al., 2023). Image processing techniques perform the tasks of tumor detection through pre-processing, including reducing the brightness and displaying the image in a way suitable for interpretation. Segmentation is used to identify tumor regions. Feature extraction is based on determining the size and shape of the tumor. Classification is used to determine the nature of the tumor, whether malignant or benign (Hussein et al., 2016).

Image Noise

Noise in an image is the change in brightness and image data that occurs arbitrarily and uncontrolled by external influences. When taking an image, unwanted artifacts appear in the image, known as noise. Different types of noise exist, such as Gaussian poi, son noise, and speckle noise. The quality of the medical image is essential in diagnosis; therefore, removing noise from images is an important and somewhat complex issue. The moving average filter is a simple digital linear filter that is easy to use and understand. It works by smoothing the image by determining the intensity contrast between neighboring pixels, where the pixel is replaced by a pixel with an average value. Edge detection is a key part of many applications, and the goal is to calculate the edges and identify the important edges in an image. Edges are detected by the difference in color intensity between two different regions. Edge detection is a vital process to recognize the differences in different regions in an image (Abdulah et al., 2023; Chai et al., 2017).

Edge Detection

Edge detection is a key part of many applications, and the goal is to calculate the edges and identify the important edges in an image. Edges are detected by the difference in color intensity between two different regions. Edge detection is a vital process for recognizing the differences in different regions of an image. There are different methods for detecting edges, such as the Sobel method and partial derivatives. It uses masks numerically to find the first-order derivatives. The Roberts operator is a quick and easy way to calculate the gradient of an image. The gradient value of the input image can be indicated at each point by using the absolute magnitude value of the image. The weakness of this method is that it detects sharp edges and is less sensitive to weak edges. Prewitt's method is similar to Sobel's but differs in that the mask values are only zeros and ones, with negative and positive values. The canny operator is one of the best edge detection methods based on changes in image intensity and identifying object boundaries within the image. Canny Edge provides perfect edge detection using Gaussian filters based on the noise filtering process. It implements the Canny algorithm for accurate calculation based on variable elements like standard deviation applied to the Gaussian filter, which helps to adapt to the conditions instead of other methods based on permanent kernels that cannot be changed (Abdulsahib et al., 2021).

Image Segmentation

To facilitate the study and analysis of the image, it is necessary to segment according to controls such as texture, gray level, color, and intensity. The image is separated to extract the image of interest by separating the regions in the entire image. Segmentation requires high accuracy to isolate and detect the important regions from other regions and avoid mixing between the isolation regions. Threshold-based segmentation is the simplest method, where the threshold is determined based on the histogram of each image, either manually or automatically, using a threshold algorithm. It is an important method for segmenting images based on light areas representing the areas of interest and dark areas representing the background. The clustering method is based on dividing into groups called clusters. It is a method that works on the principle of clustering based on organizing things according to the characteristics of pixels. The process of segmentation based on regional growth involves identifying locations based on pixel density, where pixels are scanned and added to the corresponding area. Supervision is required to complete this work and cannot be used alone, as it is insufficient. Segmentation-based watersheds method is an effective and simple method based on the similarity of the depth gradient of each point to its gray level (Kadhim et al., 2023; Sandić-Stanković et al., 2022).

Morphological Operator

A morphological operator is a way to represent the shape of a segment in image processing, consisting of erosion, dilation, opening, and closing operations. It is also used in pre- and post-processing to reduce noise and preserve shape. The erosion operator is used in image processing to erode the object's boundaries and reduce the gaps between pixels. The dilation operator extends the stretch factor over the foreground area, increasing the size and the gaps between pixels. Open and close operators are a method of tracking erosion and dilation processes. Open actuator is a technique that removes noise by removing unwanted pixels and opening the gap between pixels. The close operator closes the gap between pixels (Patil et al., 2024).

Feature Extraction

Feature extraction is based on reducing the dimensions of images for ease of discussion. The features are adopted to reduce the data through characteristics. The feature represents the important and enjoyable part of the image. It is adopted to reduce the input data by identifying the relevant features. It helps to provide a better description for use in the classifier (Hussein et al., 2024). The binary object features extraction method is helpful in binary images. Its work is based on the images' shape and the density of pixels. Texture feature is one of the important methods for extracting features in images. It works with grayscale images and works based on pixel intensity. It works based on statistical methods such as Fourier power spectra. Texture feature is one of the important methods for extracting features in images. It works with grayscale images and works based on pixel intensity. It works based on statistical methods such as Fourier power spectra. The Fourier transform and wavelet transform methods focus on the frequency details. The Fourier transform is sensitive to symmetry and repetition. In contrast, the wavelet transforms method works by repeatedly dividing the image into approximations and details, which is suitable for studying a large set of different data (Nithyashri et al., 2025).

Proposed Brain Tumor Detection

In order to detect brain tumors, several steps must be implemented. The brain image is entered into the system regardless of its source, whether from a hospital or the databases available on the Internet (in this work, 256 images taken from Al-Najaf Teaching Hospital in Iraq were used). The image is improved by removing noise through a filter. Completing the segmentation process and determining the threshold for analysis, performing erosion, expansion, opening, and closing operations to improve the image and remove unwanted pixels, applying morphological factor methods, and extracting features related to the tumor area The last step is to determine whether the tumor is present and its degree of severity (benign or malignant). That is shown in figure 1. The accuracy, sensitivity, and specificity are calculated to calculate the system's efficiency and compare with other works shown in the (1-3) equations.

$$\text{Accuracy} = \frac{\text{True positive+True negative}}{\text{True positive+True negative+False positive +False negative}} \quad (1)$$

$$\text{Sensitivity} = \frac{\text{True positive}}{\text{True positive+False negative}} \quad (2)$$

$$\text{Specificity} = \frac{\text{True negative}}{\text{True negative+False positive}} \quad (3)$$

Where: True positive refers to correctly identified. True negative refers to a correctly rejected. A false positive refers to an incorrect identification. False negative refers to an incorrect rejection.

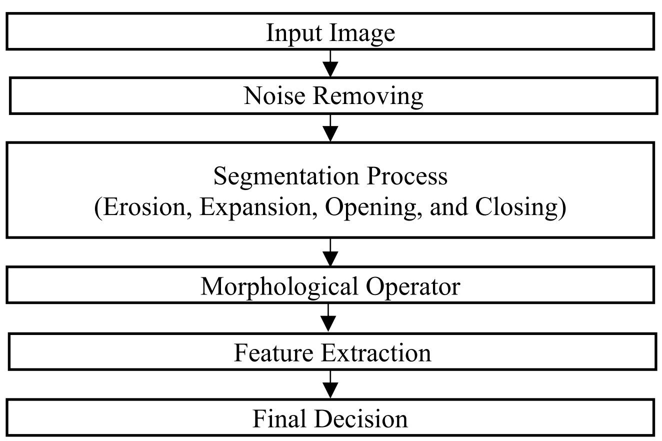

Figure 1: Brain tumor detection block diagram

3 Simulation Result and Discussion

In this part, the proposed method for detecting brain tumors is implemented using the MATLAB 2021 program. Figure 2 presents the stages of detecting a tumor in an image that contains a malignant brain tumor, shown in images figure 2 (a) to figure 2 (d). Each image was taken and entered into the system as in figure 2 (a). The noise was removed from the image as in figure 2 (b). Segmentation was done as in figure 2 (c). The final image was created and output as in figure 2 (d), which represents the presence of the tumor and accurately determines its location. Figure 3 (a,b,c,d) presents the stages of processing a brain image that does not contain a tumor. Table 1 represents sample information from images used in diagnosis. Table 2 represents the performance comparison between the proposed system and previous works in the literature review. The proposed system represents a relatively simple method for detecting brain tumors, giving good results compared to other works.

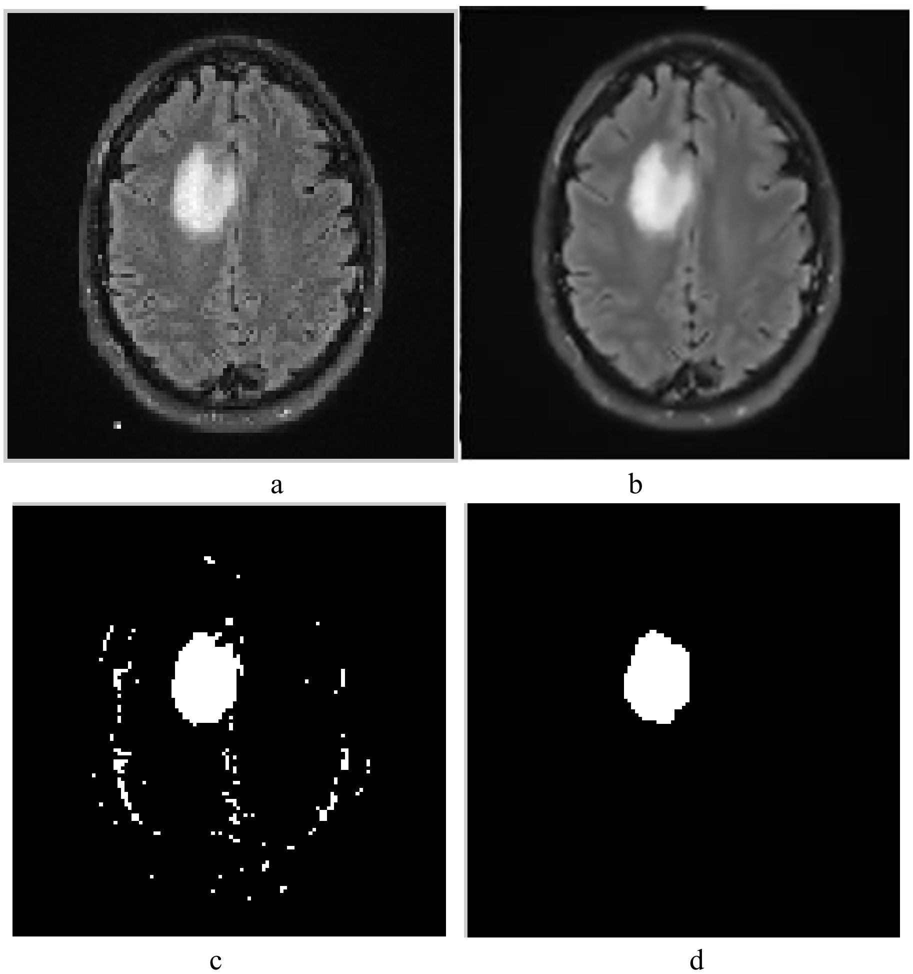

Figure 2: Stages of detection of an image containing a tumor. a: original input image with noise. b: Image after noise removal. c: Image after segmentation. d: Final image after the morphological operator.

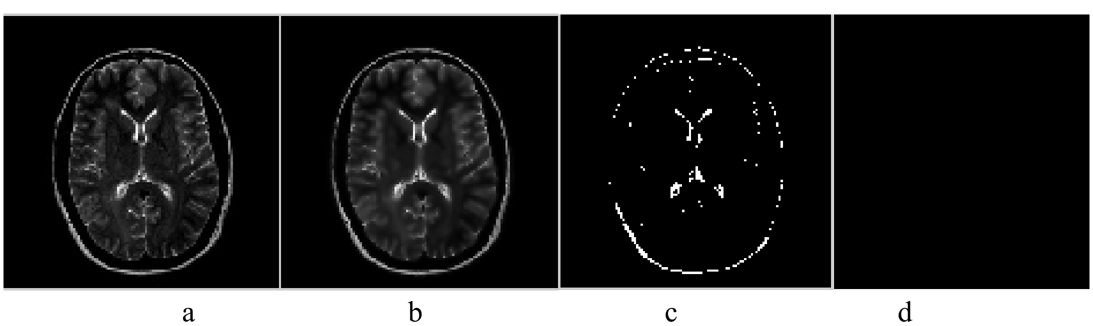

Figure 3: Stages of detection image containing no tumor. a: original input image with noise. b: image after noise removal. c: image after segmentation. d: Final image after the morphological operator.

Table 1: Image parameters

Area:	32789
Centroid:	[112.8935 112.8500]
Bounding area:	[1.5000 1.5000 223 223]
Max picture Length	300.4753
The area of a convex unit	49729
No of circuitry units	0.5445
image per unit	[223×223 logically per unit]
Field using	[223×223 logically per unit]
The diameter area	315.3696
Angle feret	135
Coordinates the maximum value of Feret	[2×2 double]
Diameter with the minimum value of Feret	223
Angle with minimum value	-90
Coordinate value in the minimum case	[2×2 double]

Table 2: Comparison with other works

No. of references	Accuracy	Sensitivity	Specificity
Green et al., (2015)	99.96%	97.13%	100%
Salah & Hussein, (2023)	99.26%	95.23%	99.43%
Hussein et al., (2024)	94%	81.25%	100%
Mir et al., (2024)	98.97%	98.86%	97.41%
Proposed	98%	99%	97%

4 Conclusion

This paper presents a method for detecting brain tumors using simple but effective software techniques. The proposed system involves image processing through optimization, segmentation, and feature extraction to accurately detect the presence of tumors and determine their location. The method does not require prior training or databases for decision-making. The proposed method is scalable using advanced intelligent algorithms to benefit the largest possible area.

References

[1] Abdulah, C. S. K., Rohani, M. N. K. H., Ismail, B., Isa, M. A. M., Rosmi, A. S., Mustafa, W. A. W., ... & Jamil, M. K. M. (2023). Review study of image de-noising on digital image processing and applications. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *30*(1), 331-343. https://doi.org/10.37934/araset.30.1.331343

[2] Abdulmahdi, M., Ali, A. H., Abdul-Rahaim, L. A., & Alhasani, A. T. (2023, July). IoT system of medical equipment monitoring and ambulance tracking. In *2023 6th International Conference on Engineering Technology and its Applications (IICETA)* (pp. 571-574). IEEE. https://doi.org/10.1109/iiceta57613.2023.10351201

[3] Abdulsahib, A. A., Mahmoud, M. A., Mohammed, M. A., Rasheed, H. H., Mostafa, S. A., & Maashi, M. S. (2021). Comprehensive review of retinal blood vessel segmentation and classification techniques: intelligent solutions for green computing in medical images, current challenges, open issues, and knowledge gaps in fundus medical images. *Network Modeling Analysis in Health Informatics and Bioinformatics*, *10*(1), 20. https://doi.org/10.1007/s13721-021-00294-7

[4] Abdusalomov, A. B., Mukhiddinov, M., & Whangbo, T. K. (2023). Brain tumor detection based on deep learning approaches and magnetic resonance imaging. *Cancers*, *15*(16), 4172. https://doi.org/10.3390/cancers15164172

[5] Ali, A. H., & Hreshee, S. S. (2023). GFDM transceiver based on ann channel estimation. *Kufa Journal of Engineering*, *14*(1), 33-49. https://doi.org/10.30572/2018/kje/140103

[6] Al-taie, R. H., & Hussein, N. J. (2025, January). Renal tumor classification and detection based on artificial intelligence. In *Third International Conference on Communications, Information System, and Data Science (CISDS 2024)* (Vol. 13519, pp. 107-114). SPIE. https://doi.org/10.1117/12.3058690

[7] Bahya, T. M., & Hussein, N. (2023, July). Machine learning techniques to classify brain tumor. In *2023 6th international conference on engineering technology and its applications (IICETA)* (pp. 609-614). IEEE. https://doi.org/10.1109/iiceta57613.2023.10351260

[8] bAmeer, H. A., Mohammedali, M. A., Abdul-Rahaim, L. A., & Al-Kharsan, I. H. (2022, May). Design of surgical arm robot based on cloud computing. In *2022 5th International Conference on Engineering Technology and its Applications (IICETA)* (pp. 289-293). IEEE. https://doi.org/10.1109/iiceta54559.2022.9888457

[9] Chai, X., Yang, K., & Gan, Z. (2017). A new chaos-based image encryption algorithm with dynamic key selection mechanisms. *Multimedia Tools and Applications*, *76*(7), 9907-9927. https://doi.org/10.1007/s11042-016-3585-x

[10] Green, T., Atkin, K., & Macleod, U. (2015). Cancer detection in primary care: insights from general practitioners. *British journal of cancer*, *112*(1), S41-S49. https://doi.org/10.1038/bjc.2015.41

[11] Hussein, N. J. (2021). Acute Lymphoblastic Leukemia Classification with Blood Smear Microscopic Images Using Taylor-MBO based SVM. Webology, 18(Special Issue 02), 357–366. https://doi.org/10.14704/web/v18si02/web18104

[12] Hussein, N. J., Abdulameer, H. A., & Al-taie, R. H. (2024, May). Deep Learning and Histogram Gradient Algorithm to Detect Visual Information Based on Artificial Intelligent. In *Proceedings of the 2024 5th International Conference on Computing, Networks and Internet of Things* (pp. 577-581). https://doi.org/10.1145/3670105.3670206

[13] Hussein, N. J., Hu, F., Hu, H., & Rahem, A. T. (2016). IR and multi scale retinex image enhancement for concealed weapon detection. *Indonesian Journal of Electrical Engineering and Computer Science*, *1*(2), 399-405. https://doi.org/10.11591/ijeecs.v1.i2.pp399-405

[14] Hussein, N. J., Saeed, S. R., & Hatem, A. S. (2024). Design of a nano-scale optical 2-bit analog to digital converter based on artificial intelligence. *Applied Optics*, *63*(19), 5045-5052. https://doi.org/10.1364/ao.527448

[15] Kadhim, K. A., Najjar, F. H., Waad, A. A., Al-Kharsan, I. H., Khudhair, Z. N., & Salim, A. A. (2023). Leukemia classification using a convolutional neural network of AML images. *Malaysian Journal of Fundamental and Applied Sciences*, *19*(3), 306-312. https://doi.org/10.11113/mjfas.v19n3.2901

[16] Khudhair, K. T., Najjar, F. H., Waheed, S. R., Al-Jawahry, H. M., Alwan, H. H., & Al-khaykan, A. (2023, February). A novel medical image enhancement technique based on hybrid method. In *Journal of Physics: Conference Series* (Vol. 2432, No. 1, p. 012021). IOP Publishing. https://doi.org/10.1088/1742-6596/2432/1/012021

[17] Mir, M., Madhi, Z. S., Hamid AbdulHussein, A., Khodayer Hassan Al Dulaimi, M., Suliman, M., Alkhayyat, A., ... & Lu, L. (2024). Detection and isolation of brain tumors in cancer patients using neural network techniques in MRI images. *Scientific Reports*, *14*(1), 23341. https://doi.org/10.1038/s41598-024-68567-5

[18] Nithyashri, J., Ramesh, S., Geetha, R., Thilagavathi, P., & Vidhyaze, S. (2025). AI-driven strategies for enhancing circular economy and reducing industrial waste. In *Emerging Technologies In Sustainable Innovation, Management and Development* (pp. 30-33). Routledge.

[19] Patil, B., Rumma, S. S., & Hangarge, M. (2024, December). Facial Texture Features for Age Classification. In *International Conference on Responsible Artificial Intelligence* (pp. 247-262). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-96-8441-0_16

[20] Rahaim, L. A. A., Hasan, D. S., & Ali, A. H. (2024). Smart Cars Parking Systems of Big Cities based on the Internet of Things. *Journal of Internet Services and Information Security (JISIS)*, *14*(3), 380-392. https://doi.org/10.58346/JISIS.2024.I3.023

[21] Raut, G., Raut, A., Bhagade, J., Bhagade, J., & Gavhane, S. (2020, February). Deep learning approach for brain tumor detection and segmentation. In *2020 International Conference on Convergence to Digital World-Quo Vadis (ICCDW)* (pp. 1-5). IEEE. https://doi.org/10.1109/iccdw45521.2020.9318681

[22] Saeedi, S., Rezayi, S., Keshavarz, H., & R. Niakan Kalhori, S. (2023). MRI-based brain tumor detection using convolutional deep learning methods and chosen machine learning techniques. *BMC medical informatics and decision making*, *23*(1), 16. https://doi.org/10.1186/s12911-023-02114-6

[23] Salah, A., & Hussein, N. (2023, June). Recognize facial emotion using landmark technique in deep learning. In *2023 International Conference on Engineering, Science and Advanced Technology (ICESAT)* (pp. 198-203). IEEE. https://doi.org/10.1109/icesat58213.2023.10347313

[24] Sandić-Stanković, D. D., Kukolj, D. D., & Le Callet, P. (2022, May). Morphological difference of closings operator for no-reference quality evaluation of DIBR-synthesized images. In *2022 IEEE Zooming Innovation in Consumer Technologies Conference (ZINC)* (pp. 104-107). IEEE. https://doi.org/10.1109/zinc55034.2022.9840562

[25] Veeramuthu, A., Meenakshi, S., Mathivanan, G., Kotecha, K., Saini, J. R., Vijayakumar, V., & Subramaniyaswamy, V. (2022). MRI brain tumor image classification using a combined feature and image-based classifier. *Frontiers in Psychology*, *13*, 848784. https://doi.org/10.3389/fpsyg.2022.848784

[26] Venkatachalam, K., Siuly, S., Bacanin, N., Hubálovský, S., & Trojovský, P. (2021). An efficient Gabor Walsh-Hadamard transform based approach for retrieving brain tumor images from MRI. *IEEE Access*, *9*, 119078-119089. https://doi.org/10.1109/access.2021.3107371

[27] Zaw, H. T., Maneerat, N., & Win, K. Y. (2019, July). Brain tumor detection based on Naïve Bayes Classification. In *2019 5th International Conference on engineering, applied sciences and technology (ICEAST)* (pp. 1-4). IEEE. https://doi.org/10.1109/iceast.2019.8802562

Authors Biography

Nashwan Jasim Hussein Received a Bachelor's Degree in Computer and Software Engineering from the University of Technology, Baghdad, Iraq, a Master's Degree in Computer Engineering and Information Technology from the University of PUNE, India, and joined a Ph.D. Research student in 2015 in Electronics, Communication Engineering Department of Telecommunication, Huazhong University of Science and Technology, China. His general research interests lie in AI, image processing, signaling analysis, and object detection.

Raflaa Hilmi Al-taie Received a Bachelor's Degree in Computer and Software Engineering from the University of Technology, Baghdad, Iraq, and an MSc in Engineering, a Master's Degree in Computer Engineering and Information Technology from the University of Orate, Malaysia in 2018, and now a teacher in the Physiology and Organ Functions Department, College of Medicine, University of Babylon.

Saif H. Abdulwahed received a Bachelor's Degree from the University of Kufa, Najaf, in 2011 in Electrical Engineering, and an M.Sc. Degree from the University of Technology, Baghdad, in 2014 in Communication Engineering. He got a Ph.D. in 2023 in Electronics and Communication Engineering. His Research Covers Most Fields in Optics.