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(71)Name of Applicant :

1)Andhra University

Address of Applicant :Visakhapatnam, Andhra Pradesh, India.

Pin Code: 530003 -----

Name of Applicant : NA

Address of Applicant : NA

(72)Name of Inventor :

1)Prof. James Stephen Meka

Address of Applicant :Dr. B. R. Ambedkar Chair Professor, Dean, A.U. TDR-HUB, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003 -----

2)Mrs.K.V.Lakshmi

Address of Applicant :Research Scholar, Department of IT & CA, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003 -----

3)Prof.Augustine Tarala

Address of Applicant :Professor, Department of Mathematics, Welfare Institute of Science, Technology & Management (WISTM), Pinagadi, Pendurthy, Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173 -----

4)Mr.I.Ravi Kumar

Address of Applicant :Research Scholar, Department of CS & SE, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003 -----

5)Mr.K. Joseph Noel

Address of Applicant :Associate Professor, Department of Mechanical Engineering, Welfare Institute of Science, Technology & Management (WISTM), Pinagadi, Pendurthy, Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173 -----

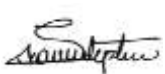
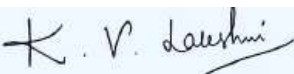

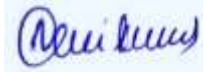

(57) Abstract :

The invention presents a revolutionary system and method for medical image processing, combining advanced algorithms, machine learning, and adaptive feedback mechanisms. Designed to work across multiple imaging modalities, the system offers unparalleled precision in analysing and interpreting medical images. Its unique capability for continual learning ensures that it refines its techniques over time, offering enhanced diagnostic accuracy. Additionally, the system considers individual patient histories and physiological attributes to provide personalized image analysis. With cloud compatibility, it facilitates global collaboration, storage, and remote access. Beyond diagnostics, the invention has applications in treatment monitoring and medical education, aiming to transform the landscape of healthcare diagnostics and patient care. Accompanied Drawing [FIGS. 1-2]

No. of Pages : 18 No. of Claims : 10

“FORM 1 THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT (See section 7, 54 and 135 and sub-rule (1) of rule 20)				(FOR OFFICE USE ONLY)	
				Application No.	
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1. APPLICANT’S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ()		PCT-NP ()	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
Andhra University		Indian	India	Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity (✓)		Startup ()	Others ()
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	
If “No”, furnish the details of the inventor(s)					
Name in Full		Nationality	Country of Residence	Address of the Inventor	
1. Prof. James Stephen Meka		Indian	India	Dr. B. R. Ambedkar Chair Professor, Dean, A.U. TDR-HUB, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	

2. Mrs.K.V.Lakshmi	Indian	India	Research Scholar, Department of IT & CA, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
3. Prof.Augustine Tarala	Indian	India	Professor, Department of Mathematics, Welfare Institute of Science, Technology & Management (WISTM), Pinagadi, Pendurthy, Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173
4. Mr.I.Ravi Kumar	Indian	India	Research Scholar, Department of CS & SE, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
5. Mr.K. Joseph Noel	Indian	India	Associate Professor, Department of Mechanical Engineering, Welfare Institute of Science, Technology & Management (WISTM), Pinagadi, Pendurthy, Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173
5. TITLE OF THE INVENTION			
"A NOVEL SYSTEM AND METHOD FOR MEDICAL IMAGE PROCESSING"			
6. AUTHORISED REGISTERED PATENT AGENT(S)		IN/PA No.	
		Name	
		Mobile No.	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA		Name	Prof. James Stephen Meka
		Postal Address	Dr. B. R. Ambedkar Chair Professor, Dean, A.U. TDR-HUB, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
		Telephone No.	
		Mobile No.	9542354100
		Fax No.	
		E-mail ID	jamesstephenm@yahoo.com , jamesstephenm@gmail.com
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN-CONVENTION			
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11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT					
Main application/patent No.			Date of filing of main application		
12. DECLARATIONS					
i) Declaration by the inventor(s)					
<p>(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).</p> <p>I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.</p> <p>(a) Date 24/08/2023</p>					
(b) Name			(c) Signature		
1. Prof. James Stephen Meka					
2. Mrs.K.V.Lakshmi					
3. Prof. Augustine Tarala					
4. Mr.I.Ravi Kumar					
5. Mr.K. Joseph Noel					
(ii) Declaration by the applicant(s) in the convention country					
<p>(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)</p> <p>I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.</p>					

- (a) Date
- (b) Signature(s)
- (c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- I am/ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- ~~The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.~~
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- I am/we are the true & first inventor(s).
- ~~I am/we are the assignee or legal representative of true & first inventor(s).~~
- ~~The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).~~
- ~~I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.~~
- ~~My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.~~
- ~~The application is divided out of my /our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.~~
- ~~The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.~~

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ Provisional specification) #	No. of pages: 14		
No. of Claim(s)	No. of claims: 10 No. of pages: 02		
Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 No. of pages: 01		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

- (b) Complete specification (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).
- (c) Sequence listing in electronic form
- (d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).
- (e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.
- (f) Translation of priority document/Specification/International Search Report/International Preliminary Report on Patentability.
- (g) Statement and Undertaking on Form 3
- (h) Declaration of Inventorship on Form 5
- (i) Power of Authority

(j) **Total fee ₹.....in Cash/ Banker's Cheque /Bank Draft bearing No.....
Date on Bank.**

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters slated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this 24th day of August 2023

Applicant: Andhra University

To,
The Controller of Patents
The Patent Office, at Chennai

Note: -

- * Repeat boxes in case of more than one entry.
- * To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
- * Tick (/) /cross (x) whichever is applicable/not applicable in declaration in paragraph-12.
- * Name of the inventor and applicant should be given in full, family name in the beginning.
- * Strike out the portion which is/are not applicable.
- * For fee: See First Schedule”;

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

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The Patent Rules, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

10

TITLE OF THE INVENTION

“A NOVEL SYSTEM AND METHOD FOR MEDICAL IMAGE PROCESSING”

Applicant

NAME	NATIONALITY	ADDRESS
Andhra University	Indian	Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003

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The following specification particularly describes the nature of the invention and the manner in which it is performed:

FIELD OF THE INVENTION

[001] The present invention relates generally to the realm of medical imaging and diagnostics. More specifically, the invention pertains to a novel system and method for processing medical images. This system and method are designed to enhance, analyze, interpret, and facilitate a more accurate representation of medical images, aiding in improved diagnostics, better patient care, and optimized medical workflows. The innovative approach of this invention can be applied across various medical imaging modalities, including but not limited to, Magnetic Resonance Imaging (MRI), Computed Tomography (CT), X-rays, Ultrasound, and Positron Emission Tomography (PET).

BACKGROUND OF THE INVENTION

[002] The following description provides the information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[003] Further, the approaches described in this section are approaches that could be pursued, but not necessarily approaches that have been previously conceived or pursued. Therefore, unless otherwise indicated, it should not be assumed that any of the approaches described in this section qualify as prior art merely by virtue of their inclusion in this section.

[004] The advancement of medical imaging has witnessed unprecedented growth over the past few decades, evolving from simple X-ray radiographs to more complex modalities such as Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET). These imaging modalities offer detailed views of the body's internal structures, playing a pivotal role in diagnosing

diseases, planning treatments, and monitoring the progress of various medical conditions. Despite the sophistication of these imaging techniques, the actual interpretation, processing, and analysis of these images largely depend on the expertise of radiologists, often limited by human factors such as fatigue, bias, and the sheer volume of images to be analysed.

[005] Simultaneously, with the surge in technological developments, there has been an exponential increase in the volume of medical image data generated. This explosion in data, paired with the intricate nature of the images, requires more sophisticated systems for effective processing, analysis, and interpretation. Traditional image processing methods, although reliable to an extent, are not equipped to fully harness the potential of this vast and complex data, often missing minute details or patterns that could be significant for patient care.

[006] Moreover, the integration of artificial intelligence and machine learning in various industries has brought about a paradigm shift in how data is processed and analyzed. Medical imaging, being a field rich in data, can benefit immensely from these technological innovations. There has been a pressing need for a system that can not only process and analyze medical images with high accuracy but can also adapt, learn, and improve over time. Existing solutions, while promising, have not been able to holistically address these challenges, necessitating the development of a novel approach.

[007] In this backdrop, the present invention emerges as a beacon, aiming to revolutionize the way medical images are processed. It takes into account the nuances and intricacies of medical images, ensuring that no detail, however minute, is overlooked. Through this innovation, healthcare professionals are

provided with a robust tool that can significantly augment their diagnostic capabilities, leading to better patient outcomes and more streamlined medical workflows. The introduction of this novel system and method for medical image processing promises not only to address the current challenges faced in the domain but also to set a new standard for future innovations.

[008] The present invention does more than merely apply a new layer of technology atop existing systems; it seeks to reimagine the entire process from the ground up. The importance of a holistic understanding of medical imaging cannot be overstated, as it directly impacts the lives of millions. A slight improvement in image processing can lead to early detection of ailments which, in turn, can significantly increase the likelihood of successful treatments. It's not just about identifying anomalies in an image, but understanding the intricate web of physiological connections behind those images, ensuring that the context isn't lost in translation.

[009] Furthermore, the ever-evolving nature of diseases and medical conditions, combined with the continuous introduction of new imaging techniques, demands a system that is both adaptable and forward-looking. Traditional systems, bound by their rigid frameworks, often struggle to incorporate these rapid changes effectively. The novel system, however, is designed with flexibility at its core, ensuring seamless integration of new insights, methodologies, and data sources. This adaptability, combined with state-of-the-art processing capabilities, ensures that the system remains at the forefront of medical image processing, providing healthcare professionals with the most accurate and comprehensive insights.

[010] Additionally, as the medical field becomes more globalized, there's a growing need for systems that can operate across different equipment brands, regional standards, and varying levels of medical infrastructure. The invention is not merely confined to high-end hospitals in developed nations but has the potential to make a significant impact in regions where medical resources are limited. By offering a more accurate and efficient processing system, it can help in bridging the gap, ensuring that every patient, regardless of their location, has access to top-tier diagnostic insights.

[011] Lastly, as the nexus between medical research and clinical practice grows tighter, the utility of such an advanced system becomes even more evident. The insights derived from enhanced image processing can feed directly into medical research, propelling our understanding of diseases and conditions at an unprecedented rate. The feedback loop thus created can lead to rapid advancements in both the realms of medical practice and research.

[012] Title: Enhanced System and Method for Medical Image Analysis Using Deep Learning Algorithms

Summary: This patent describes a method of utilizing deep learning algorithms to analyze and interpret medical images, thereby improving diagnostic accuracy. It highlights the training of neural networks on large datasets for optimized image interpretation.

[013] Title: Adaptive Medical Image Processing System

Summary: This system adapts its image processing techniques based on the type of imaging modality. By recognizing the source of the image, it can apply specialized algorithms to improve image clarity and highlight potential areas of concern.

[014] Title: Integrated Medical Imaging and Data Analysis Suite

Summary: An integrated software suite that merges medical image processing with patient data analysis, aiming to provide a holistic view of a patient's health status. It can cross-reference image findings with medical histories and other relevant data.

[015] Title: Real-time Enhancement of Medical Images Using Edge Detection

Summary: This patent discusses a method to enhance the edges within medical images in real-time, aiding radiologists in quickly spotting abnormalities during live imaging sessions, such as surgeries or real-time diagnostics.

[016] Title: Cloud-based Medical Image Processing and Storage Solution

Summary: A system that processes medical images in a cloud environment, offering advantages in terms of scalability, data storage, and allowing multiple professionals to analyze and collaborate on the same image dataset remotely.

SUMMARY OF THE PRESENT INVENTION

[017] The proposed invention offers an innovative system and method for medical image processing. It is designed to harness the potential of medical image data by providing enhanced analysis, interpretation, and representation of images to aid in improved diagnostics and patient care. Unlike traditional systems, this invention is not only equipped to process intricate details within the images but also to learn and adapt over time, ensuring optimal accuracy and efficiency.

[018] The system is versatile and can be applied to various imaging modalities such as MRI, CT, X-rays, Ultrasound, and PET. Furthermore, it takes into account the nuances of medical images and aims to provide healthcare professionals with a robust tool that can significantly augment their diagnostic

capabilities. By combining precision, adaptability, and forward-thinking methodologies, the invention promises to revolutionize medical image processing, paving the way for better patient outcomes and streamlined medical workflows.

5 **[019]** In this respect, before explaining at least one object of the invention in detail, it is to be understood that the invention is not limited in its application to the details of set of rules and to the arrangements of the various models set forth in the following description or illustrated in the drawings. The invention is capable of other objects and of being practiced and carried out in various ways,
10 according to the need of that industry. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

15 **[020]** These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

20 **[021]** When considering the following thorough explanation of the present invention, it will be easier to understand it and other objects than those mentioned above will become evident. Such description refers to the illustrations in the annex, wherein:

[022] FIG. 1, illustrates a general functional working diagram, in accordance with an embodiment of the present invention.

[023] FIG. 2, illustrates a concept of the functional flow diagram, accordance with an embodiment of the present invention.in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[024] The following sections of this article will provide various embodiments of the current invention with references to the accompanying drawings, whereby the reference numbers utilised in the picture correspond to like elements throughout the description. However, this invention is not limited to the embodiment described here and may be embodied in several other ways. Instead, the embodiment is included to ensure that this disclosure is extensive and complete and that individuals of ordinary skill in the art are properly informed of the extent of the invention.

[025] Numerical values and ranges are given for many parts of the implementations discussed in the following thorough discussion. These numbers and ranges are merely to be used as examples and are not meant to restrict the claims' applicability. A variety of materials are also recognised as fitting for certain aspects of the implementations. These materials should only be used as examples and are not meant to restrict the application of the innovation.

[026] Referring now to the drawings, these are illustrated in FIG. 1&2, The proposed invention seeks to redefine the boundaries of medical image processing by introducing a system and method that go beyond the conventional scope. At its core, the invention revolves around harnessing the

wealth of data contained in medical images, interpreting this data with unparalleled precision, and providing insightful analyses that directly aid in diagnostics and patient care. Traditional systems, despite their merit, often fall short in fully leveraging the intricate details embedded within medical images.

5 **[027]** They also face challenges when tasked with the vast volume of data generated by modern medical imaging technologies. The novel invention addresses these concerns, bringing to the forefront a sophisticated combination of advanced algorithms, machine learning, and adaptive feedback mechanisms.

10 **[028]** Every medical image, whether sourced from MRI, CT, X-ray, Ultrasound, or PET, is a treasure trove of information. However, tapping into this treasure demands more than just computational power; it requires an intricate understanding of the human physiology, pathologies, and the specific nature of the imaging modality in use. The invention integrates these diverse domains of
15 knowledge. Through its advanced processing capabilities, the system is able to delineate and highlight areas of interest, flagging potential anomalies for further investigation.

[029] Yet, the true strength of the invention lies in its learning capabilities. As it processes more images, the system refines its techniques, adapting and
20 evolving to provide even more accurate results. This continual learning ensures that the system remains cutting-edge, irrespective of the rapid advancements in medical imaging technologies. Additionally, the adaptability of the system allows it to cater to the specific needs of individual patients, factoring in their medical histories and unique physiological attributes.

[030] The global reach of medical diagnostics means that images come from various equipment brands, each with its nuances and peculiarities. Our invention is equipped to understand and adapt to these variances, ensuring consistent and high-quality processing across the board. The result is a universal tool, suitable for deployment in any medical setting, from the most advanced hospitals in urban centers to remote clinics in underserved regions.

[031] Moreover, the invention isn't just about passive image processing. It aims to actively assist medical professionals in their diagnostic endeavors. By providing clear, refined, and insightful interpretations of images, it acts as an invaluable companion to radiologists and other specialists, magnifying their capabilities and ensuring that no critical detail is overlooked.

[032] In the ever-evolving realm of medical imaging, the line between technology and human expertise is becoming increasingly blurred. This invention, with its forward-thinking approach, strives to further bridge this gap. While the system is rooted in complex algorithms and computational prowess, its end goal is inherently human: enhancing patient care, improving diagnostic accuracy, and ultimately, saving lives.

[033] As the medical field advances, the sheer diversity and complexity of diseases being diagnosed grow. New pathogens emerge, previously unknown medical conditions come to light, and the human body's intricate maze continues to baffle and amaze. In this dynamic landscape, the ability of the system to not just adapt, but to proactively evolve, positions it as an indispensable asset. By continually assimilating new medical knowledge and integrating advancements in imaging techniques, the invention ensures that it remains perennially at the cutting edge.

[034] Another facet of this innovation lies in its collaborative potential. By being digital and cloud-compatible, it can act as a nexus for medical professionals worldwide. A radiologist in New York could seamlessly collaborate with a neurologist in Tokyo, analyzing the same set of images in real-time, discussing findings, and drawing on the system's analytical capabilities. This global collaborative potential could herald a new era of medical research and shared knowledge, breaking down geographical barriers.

[035] The broader implications of this invention also touch upon medical education. As the system processes and learns from millions of medical images, it amasses a wealth of data that can be used for training purposes. Medical students and budding radiologists can access this data, coupled with the system's insights, to better understand diagnostic processes, learn about rare conditions, and hone their skills. Over time, this could elevate the overall standard of medical education, producing professionals who are better equipped to handle the challenges of modern medicine.

[036] Beyond the immediate realm of diagnostics, the system's advanced processing capabilities have potential applications in treatment planning and monitoring. By tracking the progress of a disease or the efficacy of a treatment through sequential images, the system can provide invaluable feedback to medical practitioners. This feedback loop, informed by both historical and real-time data, could be pivotal in making timely interventions, adjusting treatment regimens, or predicting patient outcomes.

We Claim:

1. A system for medical image processing, wherein said system utilizes a combination of advanced algorithms, machine learning, and adaptive feedback mechanisms to analyze and interpret medical images across multiple modalities.
5
2. The system of claim 1, wherein it is capable of continual learning from processed images, refining its techniques to provide enhanced accuracy in subsequent analyses.
3. The system of claim 1, wherein it adapts its processing techniques based on the specific imaging modality from which the image originates, recognizing and optimizing for nuances inherent to each modality.
10
4. A method for processing medical images, wherein the method involves comparing the processed image against a vast database of known medical conditions, anomalies, and patterns to enhance diagnostic accuracy.
5. The system of claim 1, wherein it incorporates the medical history and physiological attributes of individual patients to tailor its image processing and analysis, providing personalized diagnostics.
15
6. A method for collaborative medical image analysis, allowing multiple medical professionals to simultaneously analyze, annotate, and discuss findings in real-time, facilitated by the system of claim 1.
20
7. The system of claim 1, equipped with cloud compatibility, allowing for remote access, storage, and collaboration on medical images from diverse geographical locations.

8. A method wherein the system of claim 1 tracks and monitors the progression of diseases or the efficacy of treatments through sequential images, offering timely feedback to medical practitioners.

5 9. The system of claim 1, wherein its processing capabilities are employed for educational purposes, offering training modules, insights, and a vast database of medical images for learning and skill enhancement.

10 10. A system and method as described in claim 1, wherein the analytical outcomes are presented in an intuitive user interface, highlighting areas of interest, potential anomalies, and providing context-based suggestions for further investigations or actions.

Dated this 24th day of August 2023

Applicant

Andhra University

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ABSTRACT

A NOVEL SYSTEM AND METHOD FOR MEDICAL IMAGE PROCESSING

5 [037] The invention presents a revolutionary system and method for medical image processing, combining advanced algorithms, machine learning, and adaptive feedback mechanisms. Designed to work across multiple imaging modalities, the system offers unparalleled precision in analysing and interpreting medical images. Its unique capability for continual learning ensures that it refines its techniques over time, offering enhanced diagnostic accuracy. Additionally, the system considers individual patient histories and physiological attributes to provide personalized image analysis. 10 With cloud compatibility, it facilitates global collaboration, storage, and remote access. Beyond diagnostics, the invention has applications in treatment monitoring and medical education, aiming to transform the landscape of healthcare diagnostics and patient care.

Accompanied Drawing **[FIGS. 1-2]**

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Dated this 24th day of August 2023

Applicant

Andhra University

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