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.	
	Filing date:	
	Amount of Fee paid:	
	CBR No:	
	Signature:	
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
1. Dr. B. R. Ambedkar Chair- Andhra University	INDIAN	INDIA	Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
2. 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
3. Mr.Pushkal Padala	INDIAN	INDIA	Under Graduate Student, B.Tech (4th Year), Department of CSE, The National Institute of Engineering, Mysore, Karnataka, India. Pin Code:570008
4. Mrs.K.Venkata Lakshmi	INDIAN	INDIA	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
5. Prof. Prasad Reddy P.V.G.D.	INDIAN	INDIA	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, 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. Mr.Pushkal Padala	INDIAN	INDIA	Under Graduate Student, B.Tech (4th Year), Department of CSE, The National Institute of Engineering, Mysore, Karnataka, India. Pin Code:570008
3. Mrs.K.Venkata Lakshmi	INDIAN	INDIA	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
4. Prof. Prasad Reddy P.V.G.D.	INDIAN	INDIA	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
5. TITLE OF THE INVENTION			
"A UNIQUE MACHINE LEARNING BASED BIOMEDICAL IMAGE ANALYSIS DEVICE FOR ACCURATE DETECTION OF DISEASE"			
6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.		
	Name		
	Mobile No.		
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	Dr. B. R. Ambedkar Chair-Andhra University	
	Postal Address	Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	
	Telephone No.		

	Mobile No.	9542354100
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~~8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION~~

~~Country~~	~~Application Number~~	~~Filing date~~	~~Name of the applicant~~	~~Title of the invention~~	~~IPC (as classified in the convention country)~~

~~9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)~~

~~International application number~~	~~International filing date~~

~~10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION~~

~~Original (first) application No.~~	~~Date of filing of original (first) application~~

~~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~~

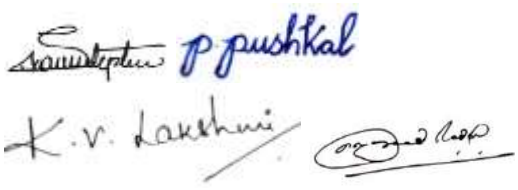
12. DECLARATIONS

(i) Declaration by the inventor(s)

(**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).

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.

(a)Date 03/03/2023

(b)Name	(c)Signature
1. Prof. James Stephen Meka 2. Mr.Pushkal Padala 3. Mrs.K.Venkata Lakshmi 4. Prof. Prasad Reddy P.V.G.D	

(ii) Declaration by the applicant(s) in the convention country

(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)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(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 inParagraph-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 : 12		
No. of Claim(s)	No. of claims : 08 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 03rd Day of March 2023

Name: Dr. B. R. Ambedkar Chair- Andhra University et. al.

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)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

TITLE OF THE INVENTION

"A UNIQUE MACHINE LEARNING BASED BIOMEDICAL IMAGE ANALYSIS DEVICE FOR ACCURATE DETECTION OF DISEASE"

Applicant(s)

NAME	NATIONALITY	ADDRESS
1. Dr. B. R. Ambedkar Chair- Andhra University	Indian	Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
2. Prof. James Stephen Meka	Indian	Dr. B. R. Ambedkar Chair Professor, Dean, A.U. TDR-HUB, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
3. Mr.Pushkal Padala	Indian	Under Graduate Student, B.Tech (4th Year), Department of CSE, The National Institute of Engineering, Mysore, Karnataka, India. Pin Code:570008
4. Mrs.K.Venkata Lakshmi	Indian	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003
5. Prof. Prasad Reddy P.V.G.D.	Indian	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University,

		Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003

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 to the field of the Artificial Intelligence and Machine Learning based reconstructing biomedical images with novel techniques, methods, devices and apparatus. The invention more particularly relates to a machine learning based Biomedical image analysis device for disease detection and working method thereof.

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 current invention pertains to medical image analysis automation, and more specifically, to automating several types of medical image analysis tasks with deep image-to-image network learning. Landmark detection, anatomy detection, anatomy segmentation, lesion detection, segmentation and characterisation, cross-modality image registration, image denoising, cross-domain image synthesis, etc. are all crucial tasks in medical image analysis. There are many advantages to medical imaging that can be automated by means of computer-based picture analysis. Among the many

advantages of automating medical image analysis jobs is the enhancement of accuracy, reproducibility, and efficiency in image reading through the use of structured image reading and reporting. Personalized scanning at a lower radiation dose, reduced examination time and expense, and improved consistency and reproducibility are all additional advantages of automatic medical image analysis activities.

[005] Accordingly, on the basis of aforesaid facts, there remains a need in the prior art to provide a machine learning based Biomedical image analysis device for disease detection and working method thereof. Therefore, it would be useful and desirable to have a system, method, apparatus and interfaces to meet the above-mentioned needs.

SUMMARY OF THE PRESENT INVENTION

[006] In view of the foregoing disadvantages inherent in the known types of conventional Biomedical image processing systems, methods and techniques, are now present in the prior art, the present invention provides a machine learning based Biomedical image analysis device for disease detection and working method thereof, which has all the advantages of the prior art and none of the disadvantages.

[007] It is an object of the present invention, a means of transmitting the acquired biological image through an image capturing module and the corresponding learning model; and a processing unit with a machine learning module to create a standardised format for the annotation of the acquired medical images using the set of image spots in the acquired biological image data, which isolate many clusters of pixels and creating a network that

represents the various groups of pixels with the labelled form of the acquired medical images, identify at least one biomedical feature for a graph node.

[008] Furthermore, the set of image spots extracted from the acquired biomedical image, and then the machine learning model is applied to the set of image spots to segment the image. In addition, the set of image spots is processed through a convolutional network to construct respective feature maps and a tree structure network configured to process the feature maps collectively to obtain a segmentation mask for the tree structure object.

[009] 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, 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.

[010] 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

[011] 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:

[012] FIG. 1, illustrates a conventional machine learning based Biomedical image analysis device for disease detection and working method thereof, in accordance with an embodiment of the present invention.

[013] FIG. 2, illustrates another conventional schematic diagram of the machine learning based Biomedical image analysis device for disease detection and working method thereof, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[014] 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. 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.

[015] Referring now to the drawings, these are illustrated in FIG. **1** & **2**, the present invention discloses a machine learning based Biomedical image analysis device for disease detection and working method thereof. The system is comprised of, but not limited to, a means of transmitting the acquired biological image through an image capturing module and the corresponding learning model; and a processing unit with a machine learning module to create a standardised format for the annotation of the acquired medical images using the set of image spots in the acquired biological image data, which isolate many clusters of pixels and creating a network that represents the various groups of pixels with the labelled form of the acquired medical images, identify at least one biomedical feature for a graph node.

[016] In accordance with another embodiment of the present invention, the set of image spots extracted from the acquired biomedical image, and then the machine learning model is applied to the set of image spots to segment the image.

[017] In accordance with another embodiment of the present invention, the set of image spots is processed through a convolutional network to construct respective feature maps and a tree structure network configured to process the feature maps collectively to obtain a segmentation mask for the tree structure object.

[018] In accordance with another embodiment of the present invention, the processing unit is provided in the cloud-based network is configured to train the acquired image data such tissue images and result data as well as test sample images from the imaging equipment or elsewhere.

[019] In accordance with another embodiment of the present invention, the machine learning module is configured to produce a series of transform layers, each of which includes a convolutional layer, with each convolutional layer in the first series being smaller than or equal to the size of the convolutional layer it follows in the series of transform layers in order to produce the first set of feature maps of the acquired biomedical image.

[020] Further, the final output image is either a mask image in which only pixels or voxels located within boundaries of the one or more anatomies of interest have non-zero values, or an image with a Gaussian-like band defined surrounding boundaries of the one or more anatomies of interest.

[021] In accordance with another embodiment of the present invention, the machine learning module is further configured to rebuild a acquired biological image using a predefined set of feature maps produced by an encoder and decoder image processor.

[022] The above-mentioned invention is provided with the preciseness in its real-world applications to provide a machine learning based Biomedical image analysis device for disease detection and working method thereof. Further, in order to extract image spots through a midline of the tree structure object, the machine learning module segment for the acquired biomedical image executes an initial arterial segmentation that is then checked by a plurality of observing modules.

[023] The benefits and advantages that the present invention may offer have been discussed above with reference to particular embodiments. These benefits and advantages are not to be interpreted as critical, necessary, or essential features of any or all of the embodiments, nor are they to be read as

any elements or constraints that might contribute to their occurring or becoming more evident.

[024] Although specific embodiments have been used to describe the current invention, it should be recognized that these embodiments are merely illustrative and that the invention is not limited to them. The aforementioned embodiments are open to numerous alterations, additions, and improvements. These adaptations, changes, additions, and enhancements are considered to be within the purview of the invention.

We Claim:

1. A machine learning based biomedical image analysis device for disease detection, comprising:

a means of transmitting the acquired biological image through an image capturing module and the corresponding learning model;

a processing unit with a machine learning module to create a standardized format for the annotation of the acquired medical images using the set of image spots in the acquired biological image data, which isolate many clusters of pixels and creating a network that represents the various groups of pixels with the labelled form of the acquired medical images, identify at least one biomedical feature for a graph node.

2. The system as claimed in claim **1**, wherein the set of image spots extracted from the acquired biomedical image, and then the machine learning model is applied to the set of image spots to segment the image.

3. The system as claimed in claim **1**, wherein the set of image spots is processed through a convolutional network to construct respective feature maps and a tree structure network configured to process the feature maps collectively to obtain a segmentation mask for the tree structure object.

4. The system as claimed in claim **1**, wherein the processing unit is provided in the cloud-based network is configured to train the acquired image data such tissue images and result data as well as test sample images from the imaging equipment or elsewhere.

5. The system as claimed in claim **1**, wherein the machine learning module is configured to produce a series of transform layers, each of which includes a convolutional layer, with each convolutional layer in the first series being

smaller than or equal to the size of the convolutional layer it follows in the series of transform layers in order to produce the first set of feature maps of the acquired biomedical image.

6. The system as claimed in claim **1**, wherein the final output image is either a mask image in which only pixels or voxels located within boundaries of the one or more anatomies of interest have non-zero values, or an image with a Gaussian-like band defined surrounding boundaries of the one or more anatomies of interest.

7. The system as claimed in claim **1**, wherein the machine learning module is further configured to rebuild a acquired biological image using a predefined set of feature maps produced by an encoder and decoder image processor.

8. The system as claimed in claim **1**, wherein in order to extract image spots through a midline of the tree structure object, the machine learning module segment for the acquired biomedical image executes an initial arterial segmentation that is then checked by a plurality of observing modules.

Dated this 03rd day of March 2023

Applicant(s)

Dr. B. R. Ambedkar Chair- Andhra University et. al.

ABSTRACT

A UNIQUE MACHINE LEARNING BASED BIOMEDICAL IMAGE ANALYSIS DEVICE FOR ACCURATE DETECTION OF DISEASE

[025] The present invention discloses a machine learning based Biomedical image analysis device for disease detection and working method thereof. In the present invention, a means of transmitting the acquired biological image through an image capturing module and the corresponding learning model; a processing unit with a machine learning module to create a standardised format for the annotation of the acquired medical images using the set of image spots in the acquired biological image data, which isolate many clusters of pixels and creating a network that represents the various groups of pixels with the labelled form of the acquired medical images, identify at least one biomedical feature for a graph node.

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

Dated this 03rd day of March 2023

Applicant(s)

Dr. B. R. Ambedkar Chair- Andhra University et. al.

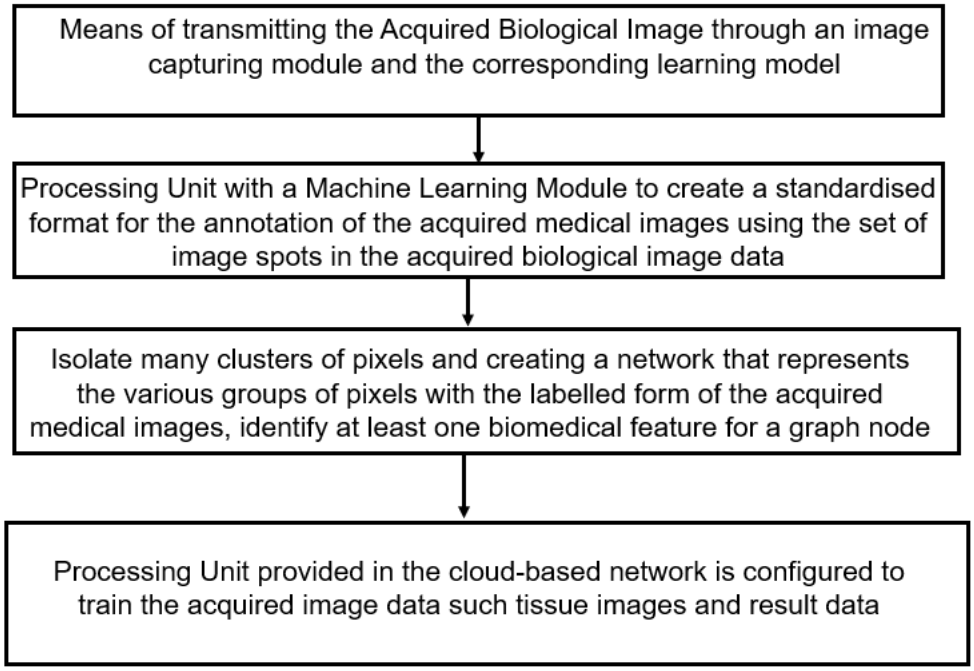


Figure 1

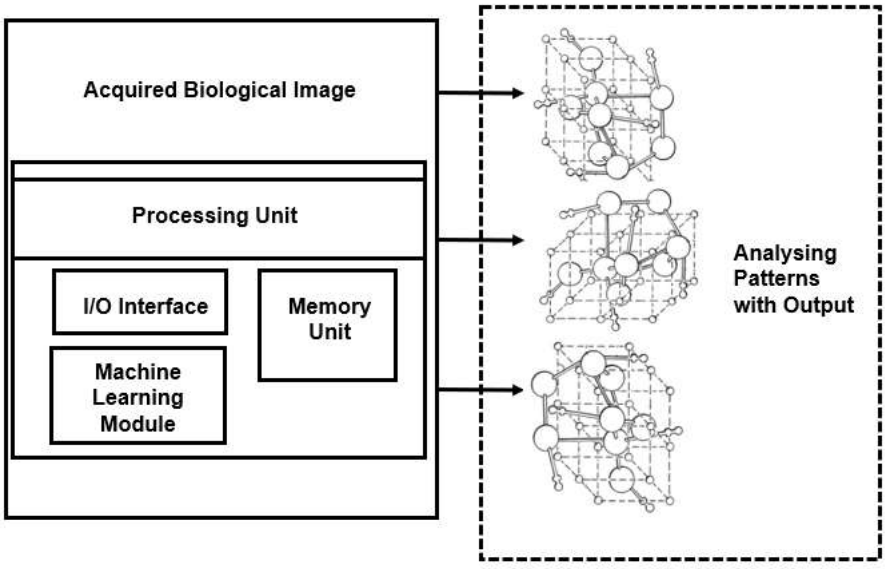


Figure 2

Dated this 03rd day of March 2023