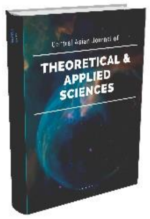


CENTRAL ASIAN JOURNAL OF THEORETICAL AND APPLIED SCIENCES

Volume: 04 Issue: 07 | Jul 2023 ISSN: 2660-5317
https://cajotas.centralasianstudies.org

Automated Blood Cancer Diagnosis with Microscopy and Cell Counting of ALL, AML, CLL, and CML Cells

Azarudeen Shariff
Bachelor of Engineering, Department of Computer Science and Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Md Hasan Raja
Bachelor of Engineering, Department of Computer Science and Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Mohamed Faseeh
Bachelor of Engineering, Department of Computer Science and Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

S. Manimaran
Assistant Professor, Department of Computer Science and Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Received 24th Mar 2023, Accepted 13th Apr 2023, Online 6nd May 2023

Abstract: *White blood cell (WBC) cancer, often known as leukaemia, can cause irreparable harm to the body's blood and bone marrow. If not caught early enough, it can be fatal. Manual diagnosis of malignant neoplastic disease cells is typically performed using complete blood count (CBC) or morphological image analysis. These approaches are labor-intensive and can result in less-than-perfect mounting. In this research, we propose an automatic method for the analysis of microscopic blood images for the diagnosis of leukemias such as acute lymphocytic leukaemia (ALL), acute myeloid leukaemia (AML), chronic lymphocytic leukaemia (CLL), and chronic myeloid leukaemia (CML). White blood cells, red blood cells, and platelets are initially separated from the image using this method. Lymphocytes are then isolated from the rest of the white blood cells. Next, an SVM classifier is fed information about the lymphocytes' shape and colour to determine if they are conventional or blast cells. After that, the white blood cell count is taken to ensure a proper diagnosis. This automated approach for the detection of malignant neoplasms was superior to traditional methods of diagnosis in terms of convenience, speed, and accuracy.*

Keywords: *Automated Blood Cancer Diagnosis, Microscopy, Cell, ALL, AML, CLL, CML Cells*

Introduction

A digital image is a flat image created by a digital computer. In a broader sense, it refers to the use of digital methods on any data that exists in only two dimensions [7]. A digital image is a sequence of bits representing real or complex values. When a computer receives an image in the form of a transparency, slide, photograph, or X-ray, it converts the image into a matrix of binary digits [8]. This digitised picture can be edited and/or seen on a super-detailed TV screen [9]. The display is based on a rapid-access buffer memory that stores the image and refreshes the screen at a rate of 25 frames per second. In order to show or record the final product, an image processor must first acquire the image, then store it, pre-process it, segment it, represent it, recognise it, and interpret it. The following flowchart sums up the main steps of an image processing system [10]. As shown in the diagram, the process begins with the acquisition of an image via an imaging sensor and a digitiser. The second stage, pre-processing, involves enhancing the image before using it as input in subsequent steps. Enhancing, eliminating noise, isolating regions, etc. are standard pre-processing tasks [11]. The process of segmentation divides an image into its individual sections, or objects. Segmentation typically produces raw pixel data, which includes either the boundary of the region or the pixels within the region themselves [12].

Representation is the procedure by which raw pixel data is converted into a form usable by the computer for further processing [13]. Separating one category of objects from another is what description is all about [14]. When an object is recognised, a label is given to it based on the data contained in its attributes. Meaning is ascribed to a group of recognised items when doing interpretation [15]. The problem domain expertise is added to the repository of information. The knowledge base directs the actions of all processing modules and regulates their cooperation. Not all modules must be present to perform a given task. What goes into an image processing system is determined by what that system's purpose is [16]. The standard for the image processor's frame rate is somewhere around 25 frames per second [17].

This study's primary goal is to identify and quantify malignant blood cells in microscopic blood smear images. One of the most critical bodily functions is maintaining a healthy blood circulation. It is responsible for carrying blood to various parts of the body [18]. The arteries, veins, and capillaries that make up this system, along with the heart's pumping action, are all part of the circulatory system. Transporting oxygen, carbon dioxide for gaseous exchange, minerals, nutrients, and cells is critical to maintaining life and health [19-25].

Digital image processing is the standard for processing images in digital formats. While some modern cameras do allow for direct digital capture of images, optical capture remains the norm. Video cameras record the events, which are then digitised. Sampling and quantization are part of the digitalization process. Then, these images undergo one of the five core processes, if not all of them. Enhancing an image can be done in a number of ways, such as by increasing the contrast and brightness, decreasing the amount of noise, or increasing the clarity of the finer features. This improves the image and displays the same data in a more digestible visual style. There is no new data presented there [26].
Restoring an Image: Image restoration, like image enhancement, works to improve the image's quality, but its operations are mostly dependent on the image's known, measurable, or degraded flaws. Camera

motion, incorrect focus, repeated noise, and geometric distortion are only some of the issues that can be fixed using picture restoration. It's a tool for fixing common image flaws [27].

Image analysis is a set of procedures that, given an image, yields numerical or graphical data about the image's properties. They disassemble things in order to put them into categories. They are data dependent upon the image statistics. Scene and image feature extraction and description, automated measurement, and object classification are typical tasks. Machine vision is where image analysis is most commonly applied [28-33].

Image compression and decompression both lessen the amount of information needed to describe an image. Compression is used to get rid of the superfluous data seen in most photographs. The compression results in a size reduction, making storage and transfer much easier. When the image is viewed, it is decompressed. While lossless compression keeps every bit of information from the original image, lossy compression sacrifices accuracy in favour of efficiency [34-39].

The process of generating a picture by combining it with other images or non-image data is known as image synthesis. Most image synthesis processes result in images that would be extremely difficult or impossible to obtain in the real world [40].

Applications of Digital Image Processing

Remote sensing using satellites and other spacecraft, commercial image transmission and storage, medical processing, radar, sonar, and acoustic image processing, robotics, and automated inspection of industrial parts are just some of the many uses for digital image processing [41-43].

X-rays, cine angiograms, projection images from trans-axial tomography, and other medical images from radiology, NMR, and ultrasonic scanning all fall under the purview of medical applications. Screening and monitoring patients, as well as cancer and other disease detection, may all benefit from these photos [44].

Images captured by satellites can be used for a wide variety of environmental monitoring and protection tasks, including crop monitoring, urban growth forecasting, wildfire prevention, and flood prevention. Recognizing and analysing objects in deep space-probe mission imagery is one of the many uses for space photos [45-49].

Broadcast television, teleconferencing, and the transmission of facsimile images for office automation, communication of computer networks, closed-circuit television-based security monitoring systems, and military communications are all examples of fields where images are transmitted and stored [50].

Images captured by radar and sonar are utilised for a wide range of applications, including the detection and identification of targets and the navigation, control, and manoeuvring of aircraft and missiles [51].

It is used in scanning and transmission to digitise paper documents, reduce their file size, and archive them on magnetic tape. Automatic detection and recognition of written properties is another application of this technology in document reading [52].

Target acquisition and guidance is used in the defence and intelligence industries for recognising and tracking targets in real-time smart-bomb and missile-guidance systems, and in reconnaissance photo-interpretation for automatic interpretation of earth satellite imagery to look for sensitive targets or military threats [53].

Pre-processing of blood pictures is suggested in this research via the use of histogram equalisation and median filtering [54-61]. Next, white blood cell segmentation using fuzzy c-mean was performed. Gabor texture extraction was used to extract features, and a support vector machine (SVM) was used for classification to distinguish between normal and blast cells (fig.1).

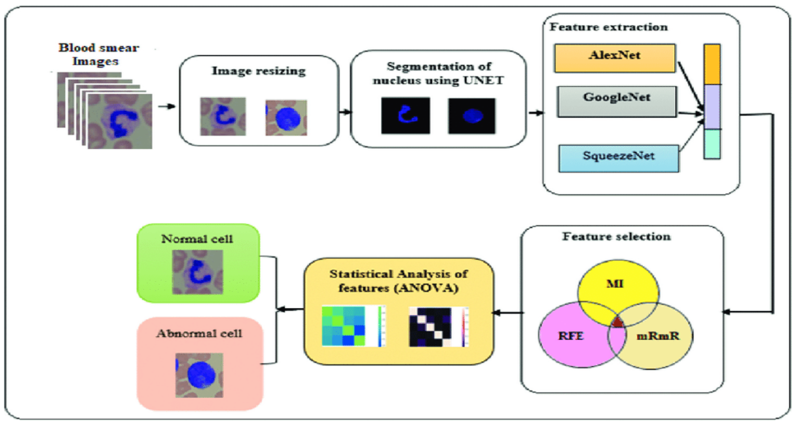


Figure 1: Proposed system architecture for leukaemia detection [6]

Literature Survey

Pre-processing of blood pictures was performed by Karthikeyan and Poornima [1] using histogram equalisation and median filtering. Next, white blood cell segmentation using fuzzy c-mean was performed. Gabor texture extraction was used to extract features, and a support vector machine (SVM) was used for classification to distinguish between normal and blast cells.

When it comes to lymphocytes, Li et al. [2] established a dual threshold strategy that has shown to be rather accurate. They improved upon the traditional single threshold approach by doing a golden section search to choose the most appropriate lymphocyte threshold value.

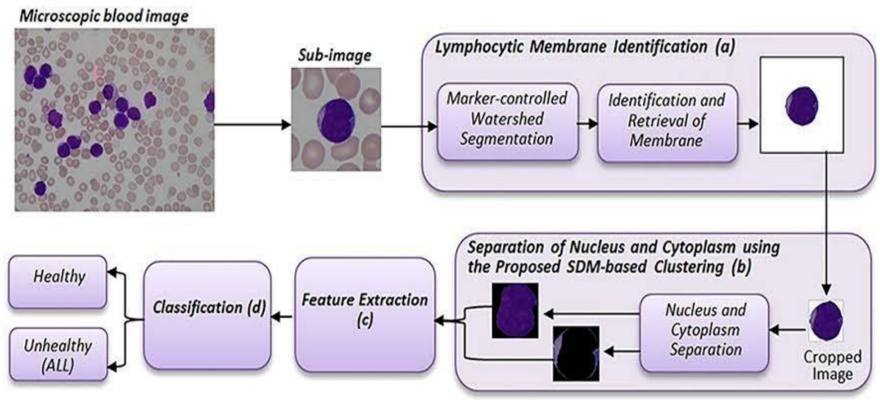
The ALL recognition is processed by using fuzzy c mean clustering for lymphocyte segmentation, as described by Moradiamin et al. [3]. To simplify various shape characteristics, principal component analysis is employed. The normal and blastlymphocytes were then classified using the features learned during SVM training.

White blood cell cancer detection was given by Putzu and Ruberto [4], who used a triangle threshold to separate white blood cells. Shape, colour, and texture information were all retrieved using GLCM. Next, blast and normal cells were separated using SVM.

Mohapatra et al. [5] preprocessed the pictures with contrast enhancement and selective median filtering. The nucleus, cytoplasm, and background were then separated from the lymphocytes using Shadowed c-mean clustering. The lymphocytes were then analysed to determine and extract a variety of properties, such as fractal dimension, shape-based features, colour features, and texture features. The two types of cells were then taught to be distinguished by training an ensemble classifier (Naive Bayesian, K-nearest neighbour, Multilayer perceptron, Radial basis functional neural network, and Support vector machines).

Proposed Method

In this study, we argue that efforts have been made to use image processing techniques to detect four types of leukaemia from microscopic blood images: acute lymphoblastic leukaemia, acute myeloid leukaemia, chronic lymphocytic leukaemia, and chronic myeloid leukaemia [62-69]. After applying some pre-processing to the photos to get rid of the background noise, segmentation was used to locate the



lymphocytes. After extracting shape and colour data, lymphocytes are separated using watershed before cell counting; SVM is then used to distinguish normal and blast cells based on their appearance (fig.2)

Figure 2: Performing to Detect Lymphocytes

Proposed System Advantages

- With this method, we are able to more precisely separate the WBC cells based on their size and shape thanks to the usage of colour space conversion and the WATERSHED segmentation algorithm.
- The correct size and form of WBC cells must be used to distinguish between healthy and cancerous cells.
- We not only find the cancer cells, but we also count the WBC cells so the doctor can make a proper diagnosis. When compared to the current system, the output accuracy of this method is higher.

SCOPE OF THE PROJECT

One of the most critical bodily functions is maintaining a healthy blood circulation. It is responsible for carrying blood to various parts of the body [70]. The arteries, veins, and capillaries that make up this system, along with the heart's pumping action, are all part of the circulatory system [71]. Transporting oxygen, carbon dioxide for gaseous exchange, minerals, nutrients, and cells is critical to maintaining life and health. Red blood cells (RBCs), white blood cells (WBCs), platelets (PTNs), and plasma are all types of blood cells. Monocytes, lymphocytes, neutrophils, basophils, and eosinophils are the five subsets of white blood cells [72-81]. The various parts of blood cells work together to keep the body functioning and healthy. A healthy body relies on a specific ratio of nutrients. Diseases like leukaemia and anaemia are linked to deficiencies in blood cell production and the abnormal shape of red blood cells (RBCs) [82-85]. WBC counts are useful indicators of a person's overall health. This is because the presence of these cells is predictive of future disease based on the individual's current state of health. The immune system of the human body relies heavily on WBCs. The WBC levels in Jamaicans are similar to those of African descent, therefore medical professionals will benefit immediately from learning the normal range of WBC counts in Afro-Caribbean people. Widespread illnesses, migratory populations in wealthy countries, and societal issues are just a few ecological factors that can alter the outcome. As a result, for precise analysis in cell counting, the orientation value of WBC must be obtained from their natural habitat population [86-92].

Leukocytes (white blood cells; WBCs) begin growing abnormally in patients with acute lymphoblastic leukaemia, a form of blood cancer [93]. When these aberrant cells invade the blood and bone marrow, they weaken the immune system. In addition, it prevents the body from producing enough healthy red blood cells and platelets, which can result in anaemia [94-99]. In addition to rapidly populating the human blood, these aberrant leukocytes can invade and take over other organs and tissues, including the kidney, liver, spleen, brain, and lymph nodes. The sort of white blood cells that become infected determines whether the leukaemia is considered lymphoblastic or myelogenous. Take granulocytes and monocytes as examples of the infected cell types. If the infected cells are myeloid, then the ninth leukaemia is called acute myeloid leukaemia (AML), and if they are lymphoid, then it is called lymphoblastic leukaemia (LBL) (ALL) [100]. The three subtypes of ALL recognised by the French American British (FAB) classification system are designated as L1, L2, and L3. In general, L1-type cells are tiny and uniform in shape, with very little cytoplasm. Their nuclei have nice, round shapes and clear organisation. When opposed to L1 cells, those of the L2 type are larger and more irregular in shape. There is cytoplasmic and structural diversity in their nucleus. The nuclei of L3-type cells are uniform in size and shape, being either round or oval. A sufficient number of cytoplasmic vacuoles are present. Typically, they're bigger than L1 [101-105].

RGB Color Image

Addition of red, green, and blue light produces a wide range of colours in the RGB colour model, which is an additive colour model. The acronym of the additive primary colors—red, green, and blue—serves as the model's name [106-111]. The RGB colour model was developed primarily for use in electronic devices, such as televisions and computers, for the sensing, representation, and display of images. However, traditional photography has also made use of this technique. Even before the advent of electronics, there was a well-established theory to support the RGB colour model [112-117]. Color elements (such as phosphors or dyes) and their response to the specific R, G, and B values change from manufacturer to manufacturer, or even within the same device over time, making RGB a device-dependent colour model. Therefore, without any sort of colour management, an RGB value cannot consistently define a colour across devices. Color televisions and video cameras, image scanners, and digital cameras are all examples of RGB input devices. Devices such as computer monitors, mobile phone screens, video projectors, multicolor LED displays, and even giant screens like JumboTrons are all examples of RGB output devices. However, colour printers are not RGB devices, but rather subtractive colour devices (typically CMYK colour model) [118-121].

The value of each pixel in a grayscale or greyscale digital image is a single sample, representing simply the intensity of the corresponding colour. This category of pictures, which goes by the name "black and white," consists entirely of tones of grey, from black at the lowest intensity to white at the highest. Unlike one-bit bi-tonal black-and-white images, which only have two colours (black and white) in computer imaging, grayscale images contain a range of tones (also called bilevel or binary images) [122]. There are various intermediate tones of grey in grayscale photographs. Images with only one colour (grayscale) are also known as monochromatic (chrome). Measurements of light intensity at each pixel in a single spectral band typically produce grayscale images (e.g. infrared, visible light, ultraviolet, etc.). When only one frequency is picked up, they take on a monochrome appearance. See also the section on grayscale conversion for how they can be synthesised from a full-color image. A filter is what a mask does. Masking, or spatial filtering, is a similar concept. Filtering and masking are synonyms. In this idea, we only have to worry about the filtered image itself [123-125]. A kernel, convolution matrix, or mask is a tiny matrix used in image processing for many purposes, such as blurring, sharpening, embossing, and detecting edges. The convolution of a kernel with an image achieves this result. The mask is developed in order to pinpoint specific processes inside an image. In order to locate the issues or characteristics we need to investigate in a picture. In order to identify all of an image's details, a border-corrected mask has its edges sealed off.

Segmentation

Picture segmentation is a technique used in computer vision for dividing an image into smaller parts (sets of pixels, also known as superpixels). The purpose of segmentation is to transform an image's representation into one that is more digestible and informative. Segmenting an image is a common technique for finding features like lines, curves, and other boundaries inside a picture. Specifically, image segmentation is the process of categorising an image by labelling each pixel so that like pixels are grouped together. When a picture is segmented, the resulting sets of segments or contours encompass the full original image (see edge detection). Similarity between pixels in a region is measured by comparing some metric or computed property, like hue, saturation, or texture. The same feature varies greatly between neighbouring places (s). Applying image segmentation to a series of photos, as is common in medical imaging, yields contours that can be used in conjunction with interpolation methods like marching cubes to generate 3D reconstructions.

Connected Component Analysis (CCA) And Objects extraction

Common component analysis (CCA) is a standard method in image processing that divides a picture into labelled parts by looking at the connections between its individual pixels. To pinpoint where each individual object is within the newly created binary image, an additional eight-point CCA stage is carried out. One possible input and output of this stage is an N-element array of objects. Image input reading and displaying. Use the In-read command to bring an image into the editing space. In the field of image processing, this term refers to the process of obtaining an image for further processing from a storage medium, typically a hardware-based one. Since image processing relies on having an image to begin with, this is the initial step in the workflow sequence. The captured image is raw and unfiltered. As a general term, "pre-processing" is used to refer to processes performed on images at the most primitive level. Intensity images are used for input and output. The purpose of pre-processing is to enhance the image data by reducing artefacts and boosting key visual elements before they are used in the final product. Pre-processing techniques for photos make heavy use of image redundancy. In genuine photos, neighbouring pixels that all represent the same item share a comparable brightness value. Thus, it is typically possible to recover deformed pixels as an average value of neighbouring pixels.

Segmentation is a typical method in digital image processing and analysis for dividing a picture into distinct sections, frequently according to the properties of individual pixels. Image Segmentation is a technique used in computer vision that divides a digital image into smaller parts (or segments; these groups of pixels are sometimes called "superpixels"). Pixels with comparable characteristics can be grouped together through a technique called segmentation. Image Segmentation is the process of dividing an image into discrete, non-overlapping parts wherein no two neighbouring regions have any common features. To find and recognise objects and boundaries (lines, curves, etc.), an image's pixels must have some homogeneity criterion, such as colour, intensity, or texture. The effectiveness of the automated analysis method relies on how well the data is segmented.

Converting between different colour spaces is the process of changing the underlying colour representation. This occurs frequently when moving from one colour space to another, with the aim of maintaining as much visual coherence as possible between the source and target images. In this case, white blood cell segmentation is accomplished using RGB to YCbCr colour space conversion. The processing of images based on their morphology, or how their features are shaped, involves a number of non-linear procedures. In computer vision, morphology refers to a wide variety of processes used to process images on the basis of their shapes. Morphological operations take an input image and use it as a template to generate an identically sized new image. Methods of segmentation include,

Feature extraction is the first step in many machine learning, pattern recognition, and image processing workflows. It creates derived values (features) that are meant to be useful and non-redundant, which helps with the learning and generalisation phases that come after and, in certain situations, results in superior human interpretations. Dimensionality reduction and feature extraction are closely linked. The input data to an algorithm can be translated into a smaller set of features if it is anticipated to be redundant (such as the same measurement in both feet and metres or the repetitiveness of visuals provided in pixels) (also named a feature vector). Features election refers to the process through which a subset of the initial features is determined. The goal is to find a subset of features that adequately represents the input data such that the intended job can be executed without access to the full dataset.

The attributes of an object's appearance are its shape qualities. For items with a circle, triangle, or other regular shape, the perimeter boundary, border diameter, etc. Intuitively, we recognise the shown characteristics as shape characteristics. Color and texture histograms, as well as colour schemes covering the entire image, are examples of global features. Sub-images, segmented sections, and interest points all have their own local properties, such as colour, texture, and shape. Images are matched and retrieved using the features that were collected from them. Features of an item that may be described by its geometry, such as points, lines, curves, or surfaces, are called geometric features. Feature detection algorithms can pick up on things like corners, edges, blobs, ridges, prominent points, and other subtle variations in the texture of a picture. Area, diameter, and density are employed in this case. The texture of a picture can be measured with a set of metrics calculated in image processing. Information regarding the geographical distribution of colour or intensity can be gleaned from an image's texture. Here, we conduct our analysis of texture features using the Grey Level Co-occurrences Matrix (GLCM). Image classification is one such feature extraction method; it involves separating various kinds of data from a multiband raster image. Image classification's output raster can be used to generate thematic maps. For optimal results, use the Image Classification toolbar for your classification and multivariate analysis needs. Several examples of available classification algorithms are provided below (figs 3 and 4).

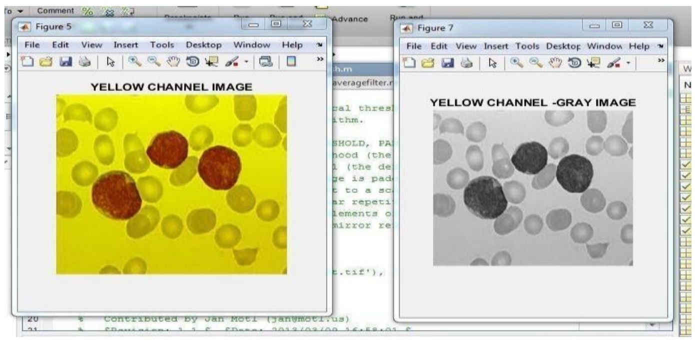


Figure 3: Selected Y-Channel & Gray Converted Y-Channel

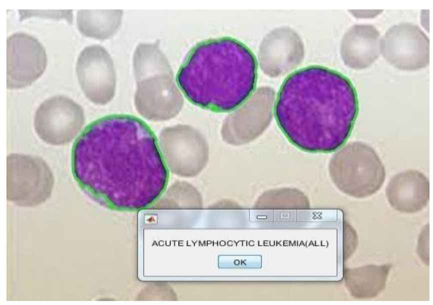


Figure 4: Final Output Image

Conclusion

In this study, efforts have been made to detect and count acute lymphoblastic leukaemia from microscopic blood images by utilising image processing techniques. These images were obtained through a blood microscope. The photos were first subjected to pre-processing in order to get rid of any noise, and then segmentation was carried out in order to identify lymphocytes within the image. After extracting the properties of form and colour, the lymphocytes are separated using watershed, and support vector machines are utilised to differentiate between normal and blast cells. We will be able to make further improvements to this system in the future so that it can detect many forms of leukaemia and other blood-related disorders.

References

1. D. T. Karthikeyan and N. Poornima, Microscopic Image Segmentation Using Fuzzy C Means For Leukemia Diagnosis. 2017.
2. Y. Li, R. Zhu, L. Mi, Y. Cao, and D. Yao, "Segmentation of white blood cell from Acute Lymphoblastic Leukemia images using the dual-threshold method," Comput. Math. Methods Med., vol. 2016, p. 9514707, 2016.
3. M. Moradiamin, N. Samadzadehaghdam, S. Kermani, and A. Talebi, "Enhanced Recognition of Acute Lymphoblastic Leukemia Cells in microscopic Images based on Feature Reduction using PrincipleComponent Analysis," Frontiers in Biomedical Technologies, vol. 2, no. 3, pp. 128–136.
4. L. Putzu and C. D. Ruberto, "White Blood Cells Identification and Counting from Microscopic Blood Image"," Health, Biomedical and Pharmaceutical Engineering, vol. 7, no. 1, pp. 15–22, 2013.
5. Mohapatra, S., Patra, D. & Satpathy, S. An ensemble classifier system for early diagnosis of acute lymphoblastic leukaemia in blood microscopic images. Neural Comput & Applic 24, 1887–1904 (2014).
6. S. Alagu, A. Priyanka, Kavitha, and B. Bagan, "Automatic detection of acute lymphoblastic leukaemia using UNET based segmentation and statistical analysis of fused deep features," Appl. Artif. Intell., vol. 35, no. 15, pp. 1952–1969, 2021.
7. M., M., & Mesbah, S. (2016). Effective e-government and citizens adoption in Egypt. International Journal of Computer Applications, 133(7), 7–13.
8. Ead, W. M., & Abbassy, M. M. (2021). IOT based on plant diseases detection and classification. 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS).
9. Ead, W., & Abbassy, M. (2018). Intelligent Systems of Machine Learning Approaches for developing E-services portals. EAI Endorsed Transactions on Energy Web, 167292.
10. Sadek, R. A., Abd-alazeem, D. M., & Abbassy, M. M. (2021). A new energy-efficient multi-hop routing protocol for heterogeneous wireless sensor networks. International Journal of Advanced Computer Science and Applications, 12(11).
11. Derindere Köseoğlu, S., Ead, W. M., & Abbassy, M. M. (2022). Basics of Financial Data Analytics. Financial Data Analytics, 23–57.
12. Ead, W. M., & Abbassy, M. M. (2022). A general cyber hygiene approach for financial analytical environment. Financial Data Analytics, 369–384.
13. Abbassy, M. M., & Ead, W. M. (2020). Intelligent Greenhouse Management System. 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS).
14. Khalifa, I., Abd Al-glil, H., & M. Abbassy, M. (2013). Mobile hospitalization. International Journal of Computer Applications, 80(13), 18–23.
15. Abbassy,M.M., & Mohamed A.A.(2016). "Mobile Expert System to Detect Liver Disease Kind", International Journal of Computer Applications, 14(5), 320–324.
16. Khalifa, I., Abd Al-glil, H., & M. Abbassy, M. (2014). Mobile hospitalization for Kidney Transplantation. International Journal of Computer Applications, 92(6), 25–29.
17. Ead, W. M., Abbassy, M. M., & El-Abd, E. (2021). A general framework information loss of utility-based anonymization in Data Publishing. Turkish Journal of Computer and Mathematics Education, 12(5), 1450–1456.
18. Abbassy, M. M., & Abo-Alnadr, A. (2019). Rule-based emotion AI in Arabic Customer Review. International Journal of Advanced Computer Science and Applications, 10(9).
19. Abbassy, M. M. (2020). The human brain signal detection of Health Information System IN

EDSAC: A novel cipher text attribute based encryption with EDSAC distributed storage access control. Journal of Advanced Research in Dynamical and Control Systems, 12(SP7), 858–868.
20. Abbassy, M. M. (2020). Opinion mining for Arabic customer feedback using machine learning. Journal of Advanced Research in Dynamical and Control Systems, 12(SP3), 209–217.
21. Jain, Rituraj, Chakravarthi, M. Kalyan, Kumar, P. K., Hemakesavulu, O., Ramirez-Asis, Edwin, Pelaez-Diaz, Guillermo and Mahaveerakannan, R.. "Internet of Things-based smart vehicles design of bio-inspired algorithms using artificial intelligence charging system" Nonlinear Engineering, vol. 11, no. 1, pp. 582-589, 2022.
22. Pradeep Reddy, Gogulamudi, Yellapragada Venkata Pavan Kumar, Maddikera Kalyan Chakravarthi, and Aymen Flah., "Refined Network Topology for Improved Reliability and Enhanced Dijkstra Algorithm for Optimal Path Selection during Link Failures in Cluster Microgrids" Sustainability 14, no. 16: 10367, 2022.
23. Reddy, Gogulamudi Pradeep, Yellapragada Venkata Pavan Kumar, and Maddikera Kalyan Chakravarthi., "Communication Technologies for Interoperable Smart Microgrids in Urban Energy Community: A Broad Review of the State of the Art, Challenges, and Research Perspectives" Sensors 22, no. 15: 5881. 2022.
24. C. R. Mahesha, R. Suprabha, Nellore Manoj Kumar, Koushik Kosanam, Harishchander Anandaram, S. C. V. Ramana Murty Naidu, M. Kalyan Chakravarthi, Venkatesan Govindarajan, "Effect of Friction Stir Welding on the Mechanical and Microstructural Behaviour of AA7075 Aluminium Alloy", Advances in Materials Science and Engineering, vol. 2022, 8 pages, 2022.
25. B. Deepa, K. Gayathiridevi, M. Kalyan Chakravarthi, A. Shajahan, B Shanti Sree, Mohammed Imran Anees, Mohammad Habeeb, ”Slow evaporation technique to grow 3 – Amino benzene sulfonic acid single crystal for Non-Linear optical (NLO) transmission”, Materials Today: Proceedings, Vol. 62, Part.4, pp.2119-2123, 2022.
26. A, V. V. ., T, S. ., S, S. N. ., & Rajest, D. S. S. . (2022). IoT-Based Automated Oxygen Pumping System for Acute Asthma Patients. European Journal of Life Safety and Stability (2660-9630), 19 (7), 8-34.
27. Zannah, S. Rachakonda, A. M. Abubakar, S. Devkota, and E. C. Nneka, “Control for Hydrogen Recovery in Pressuring Swing Adsorption System Modeling,” FMDB Transactions on Sustainable Energy Sequence, vol. 1, no. 1, pp. 1–10, 2023.
28. Khelifi and A. Abran, "Design steps for developing software measurement standard etalons for iso 19761 (cosmic-ffp)," in WSEAS International Conference on COMPUTERS, 2007.
29. Khelifi and K. H. Hyari, "A mobile device software to improve construction sites communications" MoSIC"," International Journal of Advanced Computer Science and Applications, vol. 7, no. 11, pp. n/a, 2016.
30. Khelifi, A. Abran, and L. Buglione, "2.4 a system of reference for software measurements with ISO 19761 (COSMIC FFP)," in COSMIC Function Points: Theory and Advanced Practices, vol. 142, 2016.
31. Khelifi, M. Aburrous, M. A. Talib, and P. V. S. Shastry, "Enhancing protection techniques of e-banking security services using open source cryptographic algorithms," in 2013 14th ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing, pp. 89-95, 2013.
32. Khelifi, Y. Grisi, D. Soufi, D. Mohanad, and P. V. S. Shastry, "M-Vote: a reliable and highly secure mobile voting system," in 2013 Palestinian International Conference on information and communication technology, pp. 90-98, 2013.
33. Ldbyani and M. H. A. Al-Abyadh, “Relationship between Dark Triad, Mental Health, and Subjective Well-being Moderated by Mindfulness: A Study on Atheists and Muslim Students,” Islamic Guidance and Counseling Journal, vol. 5, no. 1, pp. 71–87, 2022.
34. R. Yeruva and V. B. Ramu, “Optimising AIOps system performance for e-commerce and online

retail businesses with the ACF model," Int. J. Intellect. Prop. Manag., vol. 1, no. 1, p. 1, 2022.

35. Abdelazim, M. A., Nasr, M. M., & Ead, W. M. (2020). A survey on classification analysis for cancer genomics: Limitations and novel opportunity in the era of cancer classification and Target Therapies. Annals of Tropical Medicine and Public Health, 23(24).
36. AbdulKader, H., ElAbd, E., & Ead, W. (2016). Protecting Online Social Networks Profiles by Hiding Sensitive Data Attributes. Procedia Computer Science, 82, 20–27.
37. Alshadidi, A. A. F., Alshahrani, A. A., Aldosari, L. I. N., Chaturvedi, S., Saini, R. S., Hassan, S. A. B., Cicciù, M., & Minervini, G. (2023). Investigation on the Application of Artificial Intelligence in Prosthodontics. Applied Sciences, 13(8), 5004.
38. Alsheref, F. K., Fattoh, I. E., & M.Ead, W. (2022). Automated prediction of employee attrition using ensemble model based on machine learning algorithms. Computational Intelligence and Neuroscience, 2022, 1–9.
39. Amit Kumar Jain, "Hybrid Cloud Computing: A Perspective," International Journal of Engineering Research & Technology, vol. 11, no. 10, p. 1, 2022.
40. Amit Kumar Jain, "Multi-Cloud Computing & Why do we need to Embrace it," International Journal Of Engineering Research & Technology, vol. 11, no. 09, p. 1, 2022.
41. Amit Kumar Jain, "Overview of Serverless Architecture," International Journal of Engineering Research & Technology, vol. 11, no. 09, p. 3, 2022.
42. Aryal, A., Stricklin, I., Behzadirad, M., Branch, D. W., Siddiqui, A., & Busani, T. (2022). High-Quality Dry Etching of LiNbO3 Assisted by Proton Substitution through H2-Plasma Surface Treatment. Nanomaterials, 12(16), 2836.
43. Adgaonkar, D. R. Patil, and B. S. Borkar, 'Availability-Aware Multi-Objective Cluster Allocation Optimization in Energy-Efficient Datacenters', in 2022 2nd Asian Conference on Innovation in Technology (ASIANCON), 2022, pp. 1–6.
44. S. Borkar, D. R. Patil, A. V. Markad, and M. Sharma, 'Real or Fake Identity Deception of Social Media Accounts using Recurrent Neural Network', in 2022 International Conference on Fourth Industrial Revolution Based Technology and Practices (ICFIRTP), 2022, pp. 80–84.
45. Cristian Laverde Albarracín, Srinath Venkatesan, Arnaldo Yana Torres, Patricio Yánez-Moretta, Juan Carlos Juarez Vargas, "Exploration on Cloud Computing Techniques and Its Energy Concern", MSEA, vol. 72, no. 1, pp. 749–758, Feb. 2023.
46. R. Patil and M. Sharma, 'Dynamic Resource Allocation and Memory Management Using Machine Learning for Cloud Environments', International Journal of Advanced Trends in Computer Science and Engineering, vol. 9, no. 04, pp. 5921–5927, 2020.
47. R. Patil and R. Purohit, 'Dynamic Resource Allocation and Memory Management using Deep Convolutional Neural Network', IJEAT, vol. 9, no. 02, pp. 608–612, 2019.
48. D. R. Patil, B. Borkar, A. Markad, S. Kadlag, M. Kumbhkar, and A. Jamal, 'Delay Tolerant and Energy Reduced Task Allocation in Internet of Things with Cloud Systems', in 2022 International Interdisciplinary Humanitarian Conference for Sustainability (IIHC), 2022, pp. 1579–1583.
49. D. R. Patil, B. S. Borkar, A. V. Markad, and H. P. Singh, 'Applications of Artificial Intelligence using Baye's Theorem: Survey', Universal Review, vol. 8, no. 02, pp. 198–203, 2019.
50. D. R. Patil, G. Mukesh, S. Manish, and B. Malay, 'Memory and Resource Management for Mobile Platform in High Performance Computation Using Deep Learning', ICIC Express Letters:Part B: Applications, vol. 13, no. 9, pp. 991–1000, 2022.
51. D. Saxena, S. Khandare and S. Chaudhary, "An Overview of ChatGPT: Impact on Academic Learning," FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 1, pp. 11–20, 2023.
52. Vashishtha and G. Dhawan, "Bridging Generation Gap on Analysis of Mentor-Mentee Relationship in Healthcare Setting," FMDB Transactions on Sustainable Health Science Letters, vol. 1, no. 1, pp. 21–30, 2023.
53. E. Vashishtha and G. Dhawan, "Comparison of Baldrige Criteria of Strategy Planning and

Harrison Text," FMDB Transactions on Sustainable Management Letters., vol. 1, no. 1, pp. 22-31, 2023.
54. E. Vashishtha and H. Kapoor, "Implementation of Blockchain Technology Across International Healthcare Markets," FMDB Transactions on Sustainable Technoprise Letters., vol. 1, no. 1, pp. 1–12, 2023.
55. Ead, W. M., Abdel-Wahed, W. F., & Abdul-Kader, H. (2013). Adaptive Fuzzy Classification-Rule Algorithm In Detection Malicious Web Sites From Suspicious URLs. Int. Arab. J. E Technol., 3, 1–9.
56. Fattoh, I. E., Kamal Alsheref, F., Ead, W. M., & Youssef, A. M. (2022). Semantic sentiment classification for covid-19 tweets using universal sentence encoder. Computational Intelligence and Neuroscience, 2022, 1–8.
57. Nirmala, R. Premavathy, R. Chandar, J. Jeganathan, "An Explanatory Case Report on Biopsychosocial Issues and the Impact of Innovative Nurse-Led Therapy in Children with Hematological Cancer," FMDB Transactions on Sustainable Health Science Letters, vol. 1, no. 1, pp. 1–10, 2023.
58. Giovanny Haro-Sosa , Srinath Venkatesan, "Personified Health Care Transitions With Automated Doctor Appointment System: Logistics", Journal of Pharmaceutical Negative Results, pp. 2832–2839, Feb. 2023
59. H. Abdel Azeem and M. H. A. Al-Abyadh, "Self-compassion: the influences on the university students' life satisfaction during the COVID-19 outbreak," Int. J. Hum. Rights Healthc., vol. ahead-of-print, no. ahead-of-print, 2021.
60. Nayak, A, Kushwaha, P.C. Behera, N.C. Shahi, K.P.S. Kushwaha, A. Kumar and K.K. Mishra, "The pink oyster mushroom, Pleurotus djamor (Agaricomycetes): A potent antioxidant and hypoglycemic agent," International Journal of Medicinal Mushrooms, vol. 23, no. 12, p. 29-36, 2021.
61. Haq, M. A., & Baral, P. (2019). Study of permafrost distribution in Sikkim Himalayas using Sentinel-2 satellite images and logistic regression modelling. Geomorphology, 333, 123–136.
62. Haq, M. A., Ahmed, A., Khan, I., Gyani, J., Mohamed, A., Attia, E.-A., Mangan, P., & Pandi, D. (2022). Analysis of environmental factors using AI and ML methods. Scientific Reports, 12(1), 13267.
63. Haq, M. A., Alshehri, M., Rahaman, G., Ghosh, A., Baral, P., & Shekhar, C. (2021). Snow and glacial feature identification using Hyperion dataset and machine learning algorithms. Arabian Journal of Geosciences, 14(15).
64. Haq, M. A., Ghosh, A., Rahaman, G., & Baral, P. (2019). Artificial neural network-based modeling of snow properties using field data and hyperspectral imagery. Natural Resource Modeling, 32(4).
65. J. L. María, O. C. C. Polo, and T. Elhadary, "An Analysis of the Morality and Social Responsibility of Non-Profit Organizations," FMDB Transactions on Sustainable Technoprise Letters., vol. 1, no. 1, pp. 28–35, 2023.
66. Jeganathan, S. Vashist, G. Nirmala, R. Deep, "A Cross Sectional Study on Anxiety and Depression Among Patients with Alcohol Withdrawal Syndrome," FMDB Transactions on Sustainable Health Science Letters, vol. 1, no. 1, pp. 31–40, 2023.
67. Jerusha Angelene Christabel G, Shynu T, S. Suman Rajest, R. Regin, & Steffi. R. (2022). The use of Internet of Things (Iot) Technology in the Context of "Smart Gardens" is Becoming Increasingly Popular. International Journal of Biological Engineering and Agriculture, 1(2), 1–13.
68. Srinivas, P. R. Velmurugan, and N. Andiyappillai, "Digital Human Resources and Management Support Improve Human Resources Effectiveness," FMDB Transactions on Sustainable Management Letters., vol. 1, no. 1, pp. 32-45, 2023.
69. K. Venkitaraman and V. S. R. Kosuru, "Hybrid Deep Learning Mechanism for Charging Control

and Management of Electric Vehicles", EJECE, vol. 7, no. 1, pp. 38–46, Jan. 2023.
70. K.S. Nisar, A. Aqeel, M. Inc, M. Farman, H. Rezazadeh, L. Akinyemi, M.M. Mannan, "Analysis of dengue transmission using fractional order scheme", Aims Math, vol. 7 no. 5, pp. 8408–8429, May 2022.
71. Kaur, K., Suneja, B., Jodhka, S., Saini, R. S., Chaturvedi, S., Bavabeedu, S. S., Alhamoudi, F. H., Cicciù, M., & Minervini, G. (2023). Comparison between Restorative Materials for Pulpotomised Deciduous Molars: A Randomized Clinical Study. Children, 10(2), 284.
72. Kumar A, Saini RS, Sharma V , Rai R U , Gupta P, Sabharwal P (2021) , Assessment of Pattern of Oral Prosthetic Treatment and Prevalence of Oral Diseases in Edentulous Patients in North Indian Population: A Cross-sectional Study. J Pharm Bioallied Sci. 2021 Jun; 13(Suppl 1): S187–S189.
73. Talib, A. Khelifi, A. Abran, and O. Ormandjieva, "Techniques for quantitative analysis of software quality throughout the sdlc: The swebok guide coverage," in 2010 Eighth ACIS International Conference on Software Engineering Research, Management and Applications, pp. 321-328, 2010.
74. Talib, A. Khelifi, and L. Jololian, "Secure software engineering: A new teaching perspective based on the SWEBOK," in Interdisciplinary Journal of Information, Knowledge, and Management, vol. 5, pp. 83-99, 2010.
75. M. A. Talib, A. Khelifi, and T. Ugurlu, "Using ISO 27001 in teaching information security," in IECON 2012-38th Annual Conference on IEEE Industrial Electronics Society, pp. 3149-3153, 2012.
76. M. A. Talib, O. Ormandjieva, A. Abran, A. Khelifi, and L. Buglione, "Scenario-based Black Box Testing in COSMIC-FFP: a case study," in Software Quality Professional, vol. 8, no. 3, pp. 22, 2006.
77. M. Aburrous and A. Khelifi, "Phishing detection plug-in toolbar using intelligent Fuzzy-classification mining techniques," in The international conference on soft computing and software engineering [SCSE'13], San Francisco State University, San Francisco, California, USA, 2013.
78. M. Farman, A. Akgül, M.T. Tekin, M. M. Akram, A. Aqeel , E. E. Mahmoud, I. S. Yahia, "Fractal fractional-order derivative for HIV/AIDS model with Mittag-Leffler kernel", Alex. Eng. J, vol. 61, no. 12,pp. 10965-10980, April 2022.
79. M. H. A. Al-Abyadh and H. A. H. Abdel Azeem, "Academic achievement: Influences of university students' self-management and perceived self-efficacy," J. Intell., vol. 10, no. 3, p. 55, 2022.
80. M. P. Ocoró, O. C. C. Polo, and S. Khandare, "Importance of Business Financial Risk Analysis in SMEs According to COVID-19," FMDB Transactions on Sustainable Management Letters., vol. 1, no. 1, pp. 12-21, 2023.
81. M. Ravinder and V. Kulkarni, "A Review on Cyber Security and Anomaly Detection Perspectives of Smart Grid," 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, 2023, pp. 692-697.
82. M.M. Akram, M. Farman, A. Akgül, M. U. Saleem, A. Ahmad, M. Partohaghigh, F. Jarad, "Analysis of HIV/AIDS model with Mittag-Leffler kernel", Aims Math, vol. 7 no. 7, pp. 13383-13401, July 2022.
83. Mangan, P., Pandi, D., Haq, M. A., Sinha, A., Nagarajan, R., Dasani, T., Keshta, I., & Alshehri, M. (2022). Analytic Hierarchy Process Based Land Suitability for Organic Farming in the Arid Region. Sustainability, 14(4542), 1–16.
84. Mohamed J. Saadh, Andrés Alexis Ramírez-Coronel, Ravinder Singh Saini, José Luis Arias-Gonzáles, Ali H. Amin, Juan Carlos Orosco Gavilán & Ioan Sârbu (2023) Advances in mesenchymal stem/stromal cell-based therapy and their extracellular vesicles for skin wound healing .Human Cell (2023).

85. S. Al-Abrat and M. H. A. Alabyad, “The Extent of Awareness of Faculty Members at Al-bayda University About the Concept of Educational Technology and Their Attitudes Towards It,” in New Trends in Information and Communications Technology Applications. NTICT 2021, vol. 1511, A. M. Al-Bakry, Ed. Cham: Springer, 2021.
86. Pandit, “On the Context of Diabetes: A Brief Discussion on the Novel Ethical Issues of Non-communicable Diseases,” FMDB Transactions on Sustainable Health Science Letters, vol. 1, no. 1, pp. 11–20, 2023.
87. Paramasivan, “A Novel Approach: Hydrothermal Method of Fine Stabilized Superparamagnetics of Cobalt Ferrite (CoFe2O4) Nanoparticles,” Journal of Superconductivity and Novel Magnetism, vol. 29, pp. 2805–2811, 2016.
88. P. Paramasivan, “Comparative investigation of NiFe2O4 nano and microstructures for structural, optical, magnetic and catalytic properties,” Advanced Science, Engineering and Medicine, vol. 8, pp. 392–397, 2016.
89. P. Paramasivan, “Controllable synthesis of CuFe2O4 nanostructures through simple hydrothermal method in the presence of thioglycolic acid,” Physica E: Low-dimensional Systems and Nanostructures, vol. 84, pp. 258–262, 2016.
90. P. Paramasivan, S. Narayanan, and N. M. Faizee, “Enhancing Catalytic Activity of Mn3O4 by Selective Liquid Phase Oxidation of Benzyl Alcohol,” Advanced Science, Engineering and Medicine, vol. 10, pp. 1–5, 2018.
91. P. S. Kuragayala, “A Systematic Review on Workforce Development in Healthcare Sector: Implications in the Post-COVID Scenario,” FMDB Transactions on Sustainable Technoprise Letters., vol. 1, no. 1, pp. 36–46, 2023.
92. P.S. Venkateswaran and P. Viktor, “A Study on Brand Equity of Fast-Moving Consumer Goods with Reference to Madurai, Tamil Nadu,” FMDB Transactions on Sustainable Technoprise Letters., vol. 1, no. 1, pp. 13–27, 2023.
93. P.S. Venkateswaran, S. Singh, P. Paramasivan, S. S. Rajest, M. E. Lourens, R. Regin, “A Study on The Influence of Quality of Service on Customer Satisfaction Towards Hotel Industry,” FMDB Transactions on Sustainable Social Sciences Letters, vol. 1, no. 1, pp. 1–11, 2023.
94. Paldi, Robynne L., Arjun Aryal, Mahmoud Behzadirad, Tito Busani, Aleem Siddiqui, and Haiyan Wang. "Nanocomposite-seeded Single-Domain Growth of Lithium Niobate Thin Films for Photonic Applications." In 2021 Conference on Lasers and Electro-Optics (CLEO), pp. 1-2. IEEE, 2021.
95. Priscila, S. S., Rajest, S. S., T, S. and G, G. (2022) “An Improvised Virtual Queue Algorithm to Manipulate the Congestion in High-Speed Network”, Central Asian Journal of Medical and Natural Science, 3(6), pp. 343-360.
96. M and V. Kulkarni, "Energy-Efficient Algorithm for Cluster Formation and Cluster Head Selection for WSN," 2022 IEEE Bombay Section Signature Conference (IBSSC), Mumbai, India, 2022, pp. 1-6.
97. Oak, M. Du, D. Yan, H. Takawale, and I. Amit, “Malware detection on highly imbalanced data through sequence modeling,” in Proceedings of the 12th ACM Workshop on Artificial Intelligence and Security - AISec’19, 2019.
98. R. Regin, Steffi. R, Jerusha Angelene Christabel G, Shynu T, S. Suman Rajest (2022), “Internet of Things (IoT) System Using Interrelated Computing Devices in Billing System”, Journal of Advanced Research in Dynamical and Control Systems, Vol.14, no.1, pp. 24-40.
99. Rajest, S. S. ., Regin, R. ., T, S. ., G, J. A. C. ., & R, S. . (2022). Production of Blockchains as Well as their Implementation. Vital Annex : International Journal of Novel Research in Advanced Sciences, 1(2), 21–44.
100. Rathi, S., Chaturvedi, S., Abdullah, S., Rajput, G., Alqahtani, N. M., Chaturvedi, M., Gurumurthy, V., Saini, R., Bavabeedu, S. S., & Minervini, G. (2023). Clinical Trial to Assess Physiology and

Activity of Masticatory Muscles of Complete Denture Wearer Following Vitamin D Intervention. Medicina, 59(2), 410.

101. Ravinder M and Kulkarni V (2023), Intrusion detection in smart meters data using machine learning algorithms: A research report. Front. Energy Res. 11:1147431.
102. Regin, D. R., Rajest, D. S. S., T, S., G, J. A. C., & R, S. (2022). An Automated Conversation System Using Natural Language Processing (NLP) Chatbot in Python. Central Asian Journal Of Medical And Natural Sciences, 3(4), 314-336.
103. S Silvia Priscila, M Hemalatha, " Diagnosisof heart disease with particle bee-neural network" Biomedical Research, Special Issue, pp. S40-S46, 2018.
104. S Silvia Priscila, M Hemalatha, "Heart Disease Prediction Using Integer-Coded Genetic Algorithm (ICGA) Based Particle Clonal Neural Network (ICGA-PCNN)", Bonfring International Journal of Industrial Engineering and Management Science 8 (2), 15-19, 2018.
105. Ambika, T. A. Sivakumar, and P. Sukantha, "Preparation and characterization of nanocopper ferrite and its green catalytic activity in alcohol oxidation reaction," Journal of Superconductivity and Novel Magnetism, vol. 32, pp. 903–910, 2019.
106. S. S. Priscila, S.S. Rajest, S. N. Tadiboina, R. Regin and S. András, "Analysis of Machine Learning and Deep Learning Methods for Superstore Sales Prediction," FMDB Transactions on Sustainable Computer Letters., vol. 1, no. 1, pp. 1–11, 2023.
107. S. S. Rajest, R. Regin, S. T, J. A. C. G, and S. R, "Improving Infrastructure and Transportation Systems Using Internet of Things Based Smart City", CAJOTAS, vol. 3, no. 9, pp. 125-141, Sep. 2022.
108. S. Shruthi and B.R. Aravind, "Engaging ESL Learning on Mastering Present Tense with Nearpod and LearningApps.org for Engineering Students," FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 1, pp. 21–31, 2023.
109. S. Tripathi and A. Al -Zubaidi, "A Study within Salalah's Higher Education Institutions on Online Learning Motivation and Engagement Challenges during Covid-19," FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 1, pp. 1–10, 2023.
110. S. Tripathi and M. Al-Shahri, "Problems and Prospects on the Evolution of Advertising and Public Relations Industries in Oman," FMDB Transactions on Sustainable Management Letters., vol. 1, no. 1, pp. 1–11, 2023.
111. Shifat, A. Z., Stricklin, I., Chityala, R. K., Aryal, A., Esteves, G., Siddiqui, A., & Busani, T. (2023). Vertical Etching of Scandium Aluminum Nitride Thin Films Using TMAH Solution. Nanomaterials, 13(2), 274.
112. Solanki, J., Jain, R., Singh, R., Gupta, S., Arya, A., & Tomar, D. (2015). Prevalence of Osteosclerosis Among Patients Visiting Dental Institute in Rural Area of Western India. Journal of clinical and diagnostic research : JCDR, 9(8), ZC38–ZC40.
113. Srinath Venkatesan, "Utilization of Media Skills and Technology Use Among Students and Educators in The State of New York", Neuroquantology, Vol. 21, No 5, pp. 111-124, (2023).
114. Srinath Venkatesan, "Challenges of Datafication: Theoretical, Training, And Communication Aspects of Artificial Intelligence" Ion exchange and adsorption. Volume 23, Issue 1, 2023.
115. Srinath Venkatesan, "Design an Intrusion Detection System based on Feature Selection Using ML Algorithms", MSEA, vol. 72, no. 1, pp. 702–710, Feb. 2023
116. Srinath Venkatesan, "Identification Protocol Heterogeneous Systems in Cloud Computing", MSEA, vol. 72, no. 1, pp. 615–621, Feb. 2023.
117. Srinath Venkatesan, "Perspectives and Challenges of Artificial Intelligence Techniques in Commercial Social Networks"Volume 21, No 5 (2023).
118. Srinath Venkatesan, Sandeep Bhatnagar, Iván Mesias Hidalgo Cajo, Xavier Leopoldo Gracia Cervantes, "Efficient Public Key Cryptosystem for wireless Network", Neuroquantology, Vol. 21, No 5, pp. 600-606, (2023).

119. Srinath Venkatesan, Sandeep Bhatnagar, José Luis Tinajero León, "A Recommender System Based on Matrix Factorization Techniques Using Collaborative Filtering Algorithm", neuroquantology, vol. 21, no. 5, pp. 864-872, march 2023.
120. Srinath Venkatesan, Zubaida Rehman, “The Power Of 5g Networks and Emerging Technology and Innovation: Overcoming Ongoing Century Challenges” Ion exchange and adsorption, Volume 23, Issue 1, 2023.
121. SS Priscila, M Hemalatha, “Improving the performance of entropy ensembles of neural networks (EENNS) on classification of heart disease prediction”, Int J Pure Appl Math 117 (7), 371-386, 2017.
122. T, S., Rajest, S. S., Regin, R., Christabel G, J. A., & R, S. (2022). Automation And Control Of Industrial Operations Using Android Mobile Devices Based On The Internet Of Things. Central Asian Journal of Mathematical Theory and Computer Sciences, 3(9), 1-33.
123. Ramu and A. R. Yeruva, “AIOps research innovations, performance impact and challenges faced,” Int. J. Syst. Syst. Eng., vol. 13, no. 3, p. 1, 2023.
124. Nithyanantham, “Study Examines the Connection Between Students' Various Intelligence and Their Levels of Mathematical Success in School,” FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 1, pp. 32–59, 2023.
125. S. R. Kosuru and A. K. Venkitaraman, “Developing a Deep Q-Learning and Neural Network Framework for Trajectory Planning”, EJENG, vol. 7, no. 6, pp. 148–157, Dec. 2022.