

## **A Real-Time Gesture Based Image Classification System with FPGA and Convolutional Neural Network**

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### **ABSTRACT**

Moving diagnostics of objects can be used by reflects the efficiency now to analyze the graphic objective financially. This approach takes a familiar approach into account. Consequently, acceptance and subsequent movement are indicated. Nor are these tasks independent. In particular, the Field Programmable Gate Array (FPGA) was used at an early date to implement the Convolutionary Network in numerous and assembled devices in device speeding agents (CNN). It suggested a CNN based on the FPGA. The objective is to build a neural organization, to streamline and improve the recent memories of the agents' deeply recyclable work using hardware equally. Optimal data from the recorded box can be gathered from the research components of the frame using motion, position, pace, and key verifiable evidence. One intelligent framework is to track the movement information via a movement location. While there is also a moveable article in another technique, these strategies have some constraints to use. This strategy is used to deliver accurate results by the fundamental method of depreciation, which suits continuing uses.

**Keywords;** FPGA, Motion Image Processing, Convolutional Neural Network, Movement detection.

### **1. INTRODUCTION**

It is nonsense to expect that the central canal, genomic tasks, and areas of the moving human body will take over some specific frontier district. Likewise, in a section of the scene regions, the shadow of the moving item can be seen. This affects the accuracy of the objective to be met. The even and perpendicular projection also recognizes the mobility region's heaviness. This is, to some extent pushing the shadow effect. The position of the human physicist is to decide the part from which the person moves.

The organization of neural cells (cellular neural organization) today has significant pictorial advantages. This is especially fascinating because of the use of this article. In order to achieve the perfect result, representation and arrangement, the continuous output of the application can be speeded up, and the distinctive preparation must be carried out. Again, the internal structure of the cluster's field programmable gadget is truly reasonable for equally essential advanced management companies. This explains Field-programmable gates array, which can explain why hard decisions on optimum sign and image treatment can be rearranged (FPGA).

Moreover, because of their flexibility, they are not an obvious calculation, interface, controller and adjustment base alone but, in comparison to the FPGA uses of the Convolutionary Neural Network, they are equally not able to upgrade their microchip further (CNN). Connectivity and flexibility (and costs) will therefore be a fascinating choice. The work of a neural cell organisation on the use of FPGA was zeroed in part. In this work, the FPGA has applied the extended framework of reality, the upsides of neural organization's quality compartments.

## 2. LITERATURE SURVEY

Photography is an essential device for improving the coronary angiography filter picture characteristics from post-emission images to the specific data of the movement, background breathing during the following information ranges. The curiosity of the image motion is thus reduced and the use of a larger door window is increased than is frequently used[1]. It displays a routinely adaptable technique that is appropriate to restore body motion and three-dimensional shape from a series of images and moderate images taken from planar motions simultaneously. This is a suitable procedure, as the mobility of the camera is balanced by anticipating planar move, and depending on the factoring technique the 2D point can also be approximated. A strategy for obtaining a flight photograph by helicopter will be implemented that shows excellent movement and shape reproduction[2].

The relationship often occurs through the evaluation of motion and other alleged mistakes. For example, this is also evident in the field of super-goals. The vector field of motion should be precise to recreate the ordinary image. Although the accurate and high target of the reference images is present, the motion vector can be reached at once with only precise subpixels. This could lead to an unholy assessment that overlooks this partnership by carrying out an evaluation of the image movement[3]. Fractional impacts have both movement assessments and time-efficient indicative capacity for the entire length under review. The technique offered depends on the deformation work model for evaluating cardiovascular motion when looking at the quantity impact part. The movement assessed is added to the non-unbending time measurement. This technology demonstrates that clinical information can be obtained to improve vision[4].

As the review movement changes, the consistency of information technology will be demonstrated by the movements of the right enduring in good looking reverb images and the neutral and motion assessment will re-establish (Tamer). The freedom of movement and direction are assessed in particular by limiting the consistency of the information, including the training of the solid joint structure. We only assess a sub-component of a voxel objective in every phase of our movement quest,[5] in order to address this substantial nonlinear progress adequately. The molecular channel is one of the most widely used visual surveillance strategies currently. Within this system there are two key considerations. Firstly, the general assumption that a number of states in an autonomous period of perception are given to an object. The idea, seldom written, uses the dispersal movement of the previous suggestions. The current perceptions are therefore not huge enough to be considered previously to adapt to unforeseen changes and to be prepared for unrest[6].

The evolving image quality is an important factor during the procurement process. Selfpath rewards reduce old rarities and they can contribute to the evaluated movement out of the information obtained. A carefully examined and accessible reference for free movement data depends on the well-known automatic innovation and registration damage development. The extraordinary relationship of K-space spirals[7] in the proposed strategy results in continuous motion limits. Advanced tomography (diet) is a model for bosom screening. When it is captured while the vibrating pawl bosoms are developing and the perceived surface recognizes the tumour the inner solidity of the core is therefore used. The development of exact 3D characters is usually found in this article in a PC vision framework. Model division re-fits the bosom shape and 3-D surface form to differentiate [8]. Division based on models.

When the camera develops, movement is very dark and the picture can decrease. The dark image is a complex problem, as there can be a path of motion. Normal strategies for this problem are an optical payment using a darkened view of the movement, balancing the glass and now including the extraordinary sensor due to the effect, which reduces the initial retrieval of the visually impaired time below. This article aims to quantify its movement, develop a half-race camera and the fundamental interaction of imagery measures between space and world purpose[9]. The majority of these clinical images can also be divided into extreme places, including the 2 which move the layer in line. It is known as dual simplicity dispersed. Simplicity and turmoil management, a movement evaluation structure with two levels of X-beam grouping, are the primary commitment of this paper. Square coordination, relative right and angle boundary assessment: There are three phases there[10].

They used the neural convolution, which reinvigorates the CNN, plan and fieldprogrammable gate array. Energy saving is accustomed to two types of distributed assessments, weight guide and nil value. The system uses a unique level collection which decides to re-size the induction in external storage. The weight and decompression of data movement is expected to reduce external memory information transmission[11]. Profound education is mainly done as software at the moment. Some firms such as Google, Facebook and Microsoft developed opensource frameworks for a variety of apps.

The application has recently been rapidly developed in numerous ways, due to the significant learning calculations. The deeper thing, a fake neural organisation used to recognise a broad picture, is a deep learning calculations. It does not in all cases have a stream to encourage the presence of a neurodepth organisation which, for its precision and processing innovation, depends on a neural organisation. [13]. [15]. [13]. [13]. Quick information has been searched for customers who have to meet the high demand for radio strands in the millimetre (mm-wave) electromagnetic mapping of portable end clients. At the same time, a neural organisation that examines its capacity is being suggested to identify a range of problems in the current millimeter wave framework plan for the solution of non-straight effects and different disappointments. In each case, previous exams focus on a general confused structure and an incredible number of limits[14], mainly in order to learn the neural organisation which is fully involved (FC-NN).

Although CNN obtained most of the information used in squares, the sort of data used for elevated subsidy skimming decreases the scale of the data using the viability of procedures in the FPGA. However, this does not jeopardize the truth that is typically used[15].

Although the majority of information on squares has been obtained by CNN, the type of data used to skimm high subsidies reduces the data scale using the viability of FPGA procedures.

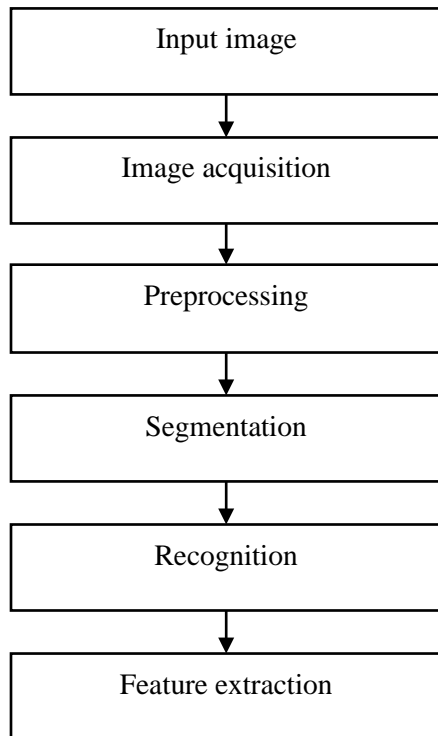
This does not, however, jeopardise the usual truth[15].

In this way, the influenced area devices in the corresponding application must be discerned from revelation and early treatment. The cell breakdown in the lungs is a significant indicator for analysis of a basic continuous aspiratory intransigent infection. The regular strategy will deal with the space vector modulation (SVM) and CT photography (computed tomography) (a quick change of time over Fourier change calculation). The recognition of the cell failure of the lungs depends on the image processing frame[16].

The method utilizes a discrete structure. Due of the information from the constituency of interest using a customary beam. The transmission display components are processed with coupled codes to provide specific motivational responses from different covers. Pictures are reproduced in the right way with a regularised pseudo-reverse administrator. With each channel on the bank to extract echoes from one particular heading in [17], you can upgrade the restoring administrator using a cross-cutting track. Initially, there is a new way of dealing with the quality of the image. Figure a clear picture as a concealed contingent irregular field where the limits of tissue models' distribution areas clad in this arbitrary field. The second commitment in this article is the second period of entirely related, contingent irregular fields, the stochastically cloaked, fully affiliated stringent arbitrary fields (HSFCRF), which consider productive deduction by stochastic factional structures with a significantly reduced computational imprevisibility[18].

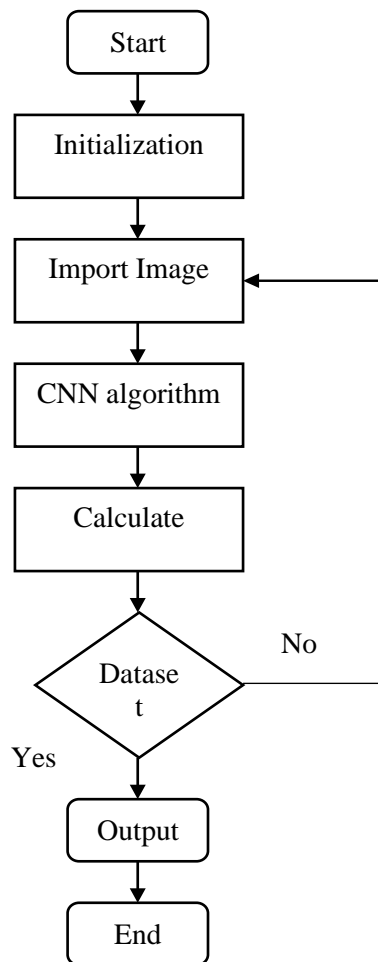
### **3. MATERIALS AND METHODS**

Preparing or acquiring the updated photo is a methodology that separates valuable information from the specific activity of the images. Sign preparation are the information and images, or highlights associated with the idea. While it could easily be intended for a particular representative specimen, the complete storey of this device should recently be fixed at the front of the information plot conglomeration of the Field-Programmable Gate Array (FPGA). When restricting the use of permanent applications in the imaging of alternative size information and changing the image size, FPGA should be redesigned. The first step or cycle important in the preparation of advanced images is shown in figure 1. Figure 1. For instance, a faulty image can be obtained in an image which is basic to a computer structure. Picture upgrade is one of the least sophisticated and attractive image preparation regions. Essentially the educational strategies assess the barrier or highlight certain revenues: image reconstruction, e.g. change and differentiation of brilliance and an area for the presence of the image.

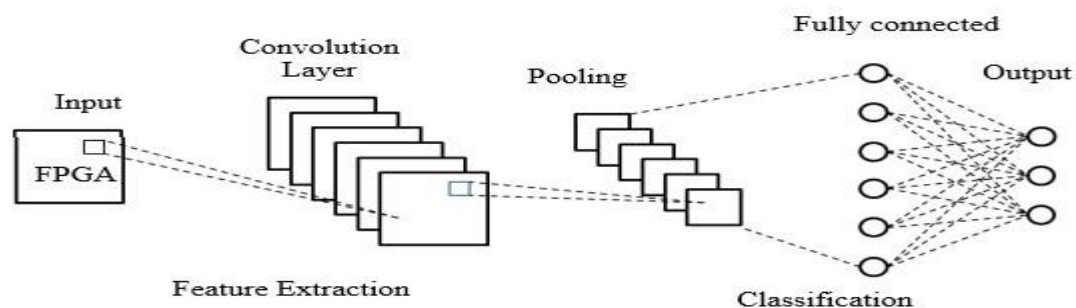


**Figure 1: Image Processing System**

The following period of device preparation shows huge data and significantly improved power. It makes it ideal to advance neural organisations and is a major problem for the vision of the PC. Initially, the progress of the convolution outline is presented to a fraction of the great system of neural convolution organisation. The work guidelines, the method of activity of the convolutional layers and the inspection layer are also detailed. Moreover, But in contrast to the upgrade, the abstract is an article. In this sense, the fixed innovation frequently varies according to the numerical or likely model of image decline. It is flexible with the programming of software, devices and standard FPGA circuit plan system. For the traditional calculation of the neural organisation of convolution the FPGA provides the exact figure. The re-programmable highlights of FPGA also apply to the organisational structure variable of the neural organisation.



**Figure 2: Convolutional Neural Network**



**Figure 3: Image Processing For Convolutional Layer**

The Field Programmable Gate Array (FPGA) plan has become broadly considered, as Figure 3 shows. It offers deep convolutions based quickening agents based on FPGA. In deep pipelines, the FPGA configuration team gives a highly skilled CNN. A coevolutionary neural organisation is a standard, multi-layered neural organisation. They are usually used to improve deep learning practises in machine vision and voice research. The CPU figures are based on conventional neural organisations. These figures are moderate, wasteful and hard to satisfy constant requirements. Therefore, GPU-based

neural organisations are commonly used. In contrast to writing, open-source CNN GPUs have found a few issues with such powerful and smart GPUs.

Step 1: Operation Convolution

Step 2: Layer of Convolution

Step 3: Set Layer Pooling

Step 4: Layer connection

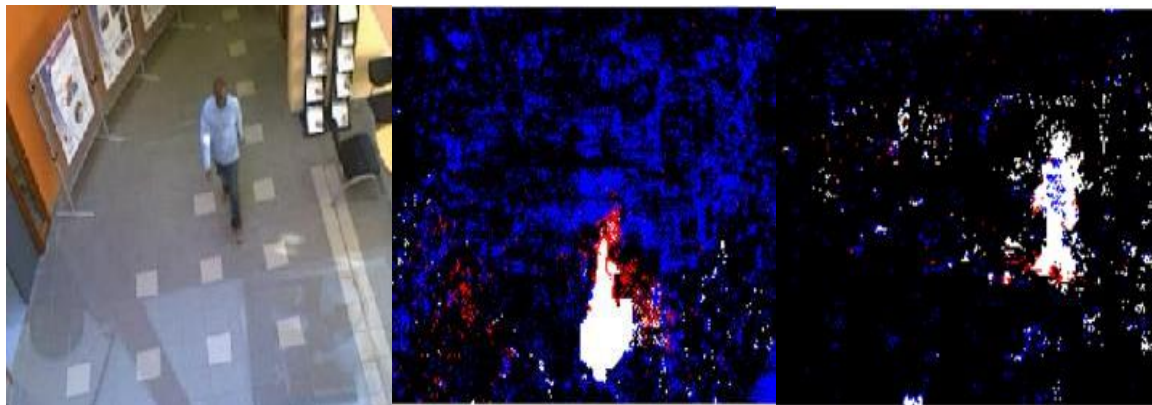
Step five: Go

Step 6: Exit

The bulk of the convolutions layer consists of the coupled layers and is fully linked to them, the model organisational structure of the neural group. A coevolutionary neural organisation is solved as an immediate image of the information and the results of the recognition spread over most layers of convolution.

#### 4. RESULT AND DISCUSSION

In the dual image compared to the outcome, the anatomical comment is applied. The ability of the related front area must be determined in order to isolate the genuine closer view from the commotion. Human science, for example, is an intriguing feature of human invention.



Input Image (A)

Output Image (B)

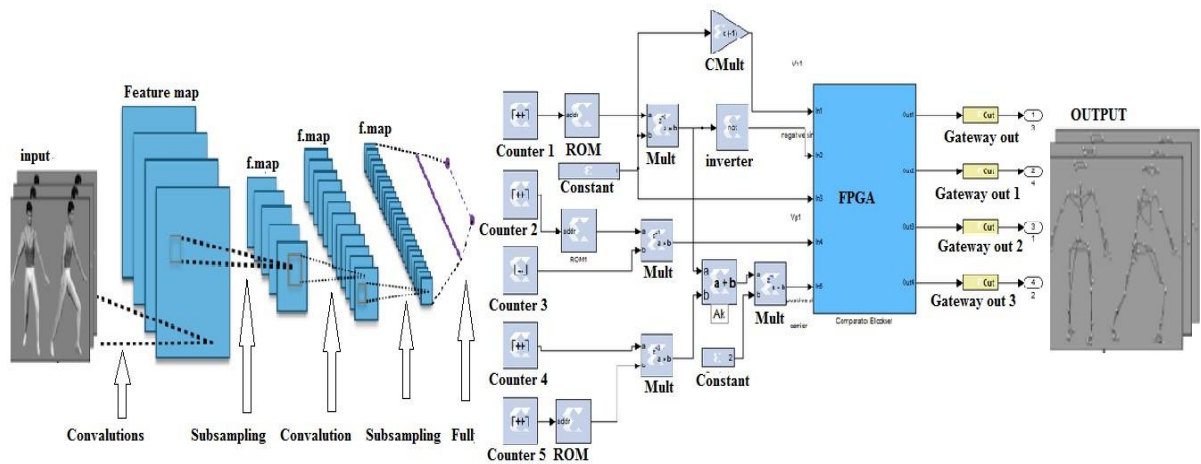
Motion Capture Figure 4: Motion Image

#### Classification

Figure 4 shows that the nearer object is the strongest thing, the F is known, but it clearly states that the entire arrangement has not been modified in this model. Figure 4 In the morphological post preparatory phase, when the remainder curious aspects are engraved, they are used to enhance the closer perspective. The frame is measured in contrast with antagonistic lighting by means of internal and external arrangements.

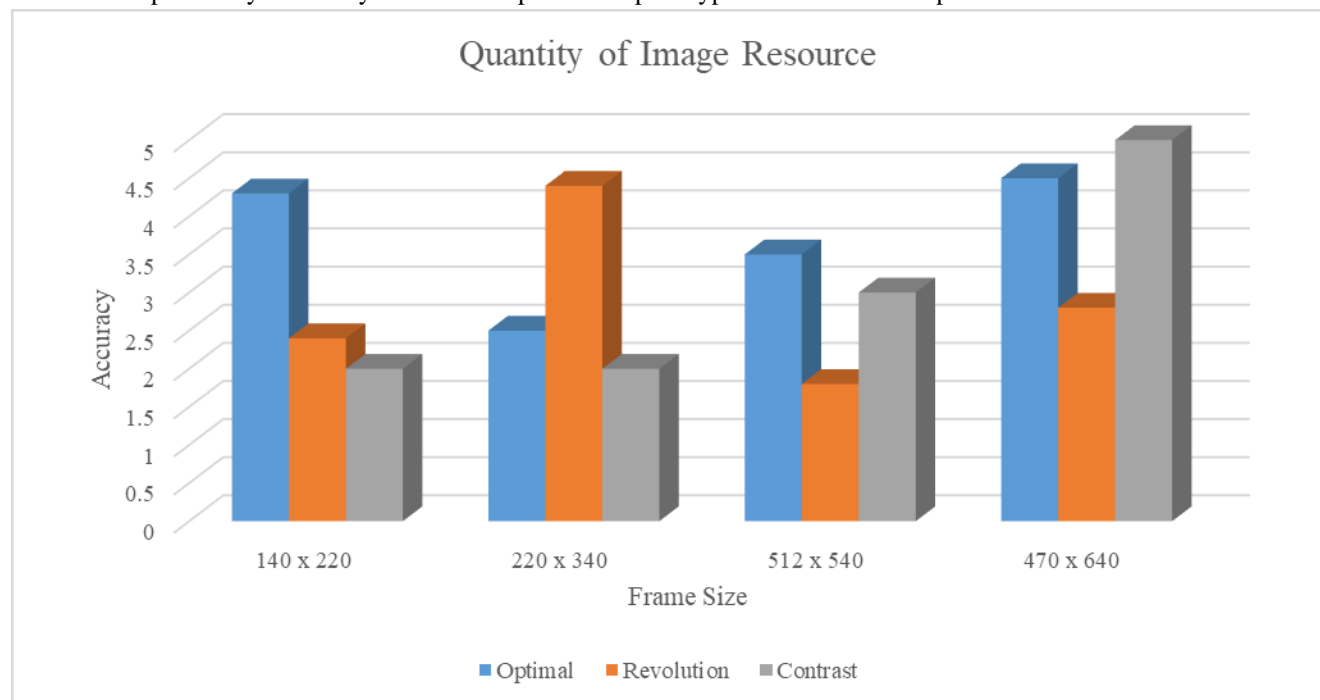
In order to prepare images, to explain them, computed images on the Internet are important and have become increasingly important. You can remember a dividing system in the sophisticated region, separate the image and display and handle the shade of the segment or article. Generally speaking, an autonomous department is one of the worst in advanced image management. The test set contextualises the impact of the preparation scheme critical level of memory designation. It suggests the methodology divided according to a certain edge support default for the analysis of how the use of impacts and strength of assets in the overall picture governance structure is affected.





**Figure 5 Circuit Diagram of Image Processing System Based On FPGA and Convolutional Neural Network**

The design of high level photo box pictures with low memory frame capability is considerably enhanced for an FPGA which is widely used as the transmission of insignificant image handling applications. Displaying Figure 5 One of the current application preconditions for innovation in the segment calculation plan can be identified in a course for managing users and setting up space efficiency. During the tests, the calculation was managed with significant level images. The results show that division estimates can reduce absolute strength utilisation by up to 25% and 30% individually without trade-offs. Speaks for use of normal optical stream movement. The process is material in any FPGA arrangement, and the recent on-chip memory can easily achieve new points and prototypes for future FPGA phases.



**Figure 6: Image Quantity Analysis**

In addition, the main focus is on utilising the medium motion subsequently in order to make more efficient and improved production of the appropriate memory distribution and daily image size 320, high price premises and parts of each pixel 24,  $M = 16$ ,  $N =$  equally., The key to the test. Key. Key. Key. It opts to highlight the non-direct connection between conscious efficiency and power. Different installations have unique expertise and generate an alternate use of force for 320 to 240 cases. The productivity scheme outlined in 512 is the same. Nevertheless, force use will change even. But two sizes are of the same quality, nine by 2098, better than four by 4096.

Frame	Usage	Bit mode	Optimization
140x220	20	8	9x2098
220x340	60	16	9x2098
512x540	120	22	9x2098
470x640	330	32	9x2098

Table 1 showed reduced size of the edge surrounded by white static force recognition, apart from the sizes 512 and 1280 of the proposed default methodology. A fixed, rational and excessive (static) productivity-based contrast and an extra feature is proposed. It must be understood that the rate of use and the power of the major issue are clearly distinct.

## 5. CONCLUSION

For the arrangements for image manipulation, the convolutional neural network (CNN) is used, and FPGA gadgets are chosen to fulfill the conditions of implementation. A view of the low climate of the patient with the suggested frame is based on a head-mounted display technique that overlays form the data removed from camera images by upgrading fluoroscopy. In this respect, people are improving their ability, limited items, positioning and roads. This results in an attainable and reasonable framework. FPGAs are dynamically rebuilt to meet the requirements of space. This component depends on a change in perspective, whether it tends to reduce picture management energy based on heuristic strategies and runtime choices, from static to active device plans. There remains an unresolved problem.

## REFERENCES

1. D. Manke, P. Rosch, K. Nehrke, P. Bornert and O. Dossel, "Model evaluation and calibration for prospective respiratory motion correction in coronary MR angiography based on 3-D image registration," in IEEE Transactions on Medical Imaging, vol. 21, no. 9, pp. 1132-1141, Sept. 2002.
2. I. Miyagawa and K. Arakawa, "Motion and shape recovery based on iterative stabilization for modest deviation from planar motion," in IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 28, no. 7, pp. 1176-1181, July 2006.
3. C. Debes, T. Wedi, C. L. Brown and A. M. Zoubir, "Motion Estimation using a Joint Optimisation of the Motion Vector Field and a Super-Resolution Reference Image," 2007 IEEE International Conference on Image Processing, San Antonio, TX, 2007, pp. II - 497-II - 500.



4. T. Marin, M. N. Wernick, Y. Yang and J. G. Brankov, "Motion-compensated temporal summation of cardiac gated SPECT images using a deformable mesh model," 2009 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, MN, 2009, pp. 3657-3660.
5. M. W. Haskell, S. F. Cauley and L. L. Wald, "TARgeted Motion Estimation and Reduction (TAMER): Data Consistency Based Motion Mitigation for MRI Using a Reduced Model Joint Optimization," in IEEE Transactions on Medical Imaging, vol. 37, no. 5, pp. 1253-1265, May 2018.
6. J. Odobez, D. Gatica-Perez and S. O. Ba, "Embedding Motion in Model-Based Stochastic Tracking," in IEEE Transactions on Image Processing, vol. 15, no. 11, pp. 3514-3530, Nov. 2006.
7. G. Vaillant, C. Prieto, C. Kolbitsch, G. Penney and T. Schaeffer, "Retrospective Rigid Motion Correction in k-Space for Segmented Radial MRI," in IEEE Transactions on Medical Imaging, vol. 33, no. 1, pp. 1-10, Jan. 2014.
8. T. Botterill, T. Lotz, A. Kashif and J. G. Chase, "Reconstructing 3-D Skin Surface Motion for the DIET Breast Cancer Screening System," in IEEE Transactions on Medical Imaging, vol. 33, no. 5, pp. 1109-1118, May 2014.
9. S. K. Nayar and M. Ben-Ezra, "Motion-based motion deblurring," in IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 26, no. 6, pp. 689-698, June 2004.
10. V. Auvray, P. Bouthemy and J. Lienard, "Motion Estimation in X-Ray Image Sequences with Bi-Distributed Transparency," 2006 International Conference on Image Processing, Atlanta, GA, 2006, pp. 1057-1060.
11. D. Stalin David, 2020, 'An Intellectual Individual Performance Abnormality Discovery System in Civic Surroundings' International Journal of Innovative Technology and Exploring Engineering, Volume 9, Issue 5, PP.2196-2206.
12. D. Stalin David, 2020, 'Machine learning for the prelude diagnosis of dementia', International Journal of Pharmaceutical Research, Volume 13, Issue 3, PP.2329-2335.
13. Stalin David D, Saravanan D, 2020, 'Multi-perspective DOS Attack Detection Framework for Reliable Data Transmission in Wireless Sensor Networks based on Trust', International Journal of Future Generation Communication and Networking, Volume 13, Issue 4, PP.1522-1539.
14. J. K. S and D. S. David, "A Novel Based 3D Facial Expression Detection Using Recurrent Neural Network," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), Pondicherry, India, 2020, pp. 1-6, doi: 10.1109/ICSCAN49426.2020.9262287.
15. Stalin David D, Saravanan D, "Enhanced Glaucoma Detection Using Ensemble based CNN and Spatially Based Ellipse Fitting Curve Model", Solid State Technology, Volume 63, Issue 6, PP.3581-3598.
16. Stalin David D, Saravanan M, Jayachandran A, "Deep Convolutional Neural Network based Early Diagnosis of multi class brain tumour classification", Solid State Technology, Volume 63, Issue 6, PP.3599-3623.
17. R. Parthiban, Dr. K. Santhosh Kumar, Dr. R. Sathya, D. Saravanan, "A Secure Data Transmission And Effective Heart Disease Monitoring Scheme Using Mecc And Dlmnn In The Cloud With The Help Of Iot", International Journal of Grid and Distributed Computing, ISSN: 2005 - 4262, Vol. 13, No. 2, (2020), pp. 834 - 856.
18. H. Wang et al., "Convolutional Neural Network Accelerator on FPGA," 2019 IEEE International Conference on Integrated Circuits, Technologies and Applications (ICTA), Chengdu, China, 2019, pp. 61-62.

19. M. Zhu, Q. Kuang, J. Lin, Q. Luo, C. Yang and M. Liu, "A Z Structure Convolutional Neural Network Implemented by FPGA in Deep Learning," IECON 2018 - 44th Annual Conference of the IEEE Industrial Electronics Society, Washington, DC, 2018, pp. 2677-2682.
20. P. Samudra, P. Shende and V. Jaiswal, "Optimizing Performance of Convolutional Neural Network Using Computing Technique," 2019 IEEE 5th International Conference for Convergence Technology (I2CT), Bombay, India, 2019, pp. 1-4.
21. J. Lee, J. He and K. Wang, "Neural Networks and FPGA Hardware Accelerators for Millimeter-Wave Radio-over-Fiber Systems," 2020 22nd International Conference on Transparent Optical Networks (ICTON), Bari, Italy, 2020, pp. 1-4.
22. Min Xu, Image processing system based on FPGA and convolutional neural network, Microprocessors and Microsystems, 2020, 103379, ISSN 0141-9331.
23. Zhang Man, Collaborative system of industry, university and research institute based on FPGA and convolutional neural network, Microprocessors and Microsystems, 2020, 103467, ISSN 0141-9331.
24. Jian Shen and E. S. Ebbini, "Filter-based coded-excitation system for high-speed ultrasonic imaging," in IEEE Transactions on Medical Imaging, vol. 17, no. 6, pp. 923-934, Dec. 1998, doi: 10.1109/42.746625.
25. M. J. Shafiee et al., "Apparent Ultra-High b<sub>0</sub>-Value Diffusion-Weighted Image Reconstruction via Hidden Conditional Random Fields," in IEEE Transactions on Medical Imaging, vol. 34, no. 5, pp. 1111-1124, May 2015, doi: 10.1109/TMI.2014.2376781.
26. U. Palani, D. Saravanan, R. Parthiban, S. Usharani, "Lossy Node Elimination Based on Link Stability Algorithm in Wireless Sensor Network", International Journal of Recent Technology and Engineering (IJRTE), Volume 7, Issue 6S5.
27. S. G. Sandhya, D. Saravanan, U. Palani, S. Usharani, "Handover Priority to the Data at Knob Level in Vanet", International Journal of Recent Technology and Engineering (IJRTE), Volume 7, Issue 6S5.
28. D. Saravanan, R. Parthiban, U. Palani, S. G. Sandhya, "Sheltered and Efficient Statistics Discrimination for Cluster Based Wireless Antenna Networks", International Journal of Recent Technology and Engineering (IJRTE), Volume 7, Issue 6S5.
29. D. Saravanan, Dr. K. Santhosh Kumar, R. Sathya, U. Palani, "An IoT Based Air Quality Monitoring And Air Pollutant Level Prediction System Using Machine Learning Approach – DLMN", International Journal of Future Generation Communication and Networking, Vol. 13, No. 4, (2020), pp. 925–945.
30. M. Sudha, D. Saravanan, S. Usharani, "Security Improvement of Dropper Elimination Scheme for IoT Based Wireless Networks", International Journal of Engineering Trends and Technology (IJETT), Volume-45 Number3 -March 2017.
31. K. Gayathri, D. Saravanan, "An Innovative IOT security Enhancing Schema Based Gamed Theory Decryption Percentage", International Journal of Advanced Research in Science and Technology, Volume 6, Issue 2, 2017, pp. 666-671.
32. E. Kowsalya, D. Saravanan, R. Parthiban, "Energy Aware Resource Allocation for Throughput Maximized IOT Network", International Journal of Computer Trends and Technology (IJCTT) – Volume 45 Issue 2- March 2017.
33. D. Raghu Raman, S. Gowsalya Devi, D. Saravanan, "Locality based violation vigilant system using mobile application", 2020 International Conference on System, Computation, Automation and Networking (ICSCAN-IEEE).
34. K. Dhivya, P. Praveen Kumar, D. Saravanan, M. Pajany, "Evaluation of Web Security Mechanisms Using Vulnerability & SQL Attack Injection", International Journal of Pure and Applied Mathematics, Volume 119, Issue 14, 2018.

35. K Dheepa, D Saravanan, R Parthiban, K Santhosh Kumar, " Secure And Flexible Data Sharing Scheme Based On Hir-Cp-Abe For Mobile Cloud Computing", International Journal of Pure and Applied Mathematics, Volume 119, Issue 14, 2018.
36. D.Saravanan S. Usharani, " Survey on Security Based Novel Context Aware Mobile Computing Scheme Via Crowdsourcing", International Journal of Scientific Research in Computer Science, Engineering and Information Technology.
37. S. Usharani, D.Saravanan, " Security Improvement of Dropper Elimination Scheme for Iot Based Wireless Networks", International Journal of Engineering Trends and Technology.
38. R Parthiban, S Usharani, D Saravanan, " Survey of Security Improvement of Dropper Elimination Scheme for IoT Based Wireless Networks", International Journal of Engineering Trends and Technology (IJETT).
39. M. Rajdhev, D. Stalin David, "Internet of Things for Health Care", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 2 Issue 2, pp. 800-805, March-April 2017.
40. P. Prasanth, D. Stalin David, "Defensing Online Key detection using Tick Points",  
International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 2 Issue 2, pp. 758-765, March-April 2017.
41. A. Sudalaimani, D. Stalin David, "Efficient Multicast Delivery for Data Redundancy Minimization over Wireless Data Centres", International Journal of Scientific Research in  
Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 24563307, Volume 2 Issue 2, pp. 751-757, March-April 2017.
42. R. Abish, D. Stalin David, "Detecting Packet Drop Attacks in Wireless Sensor Networks using Bloom Filter", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 2 Issue 2, pp. 730-735, March-April 2017.
43. A. Vignesh, D. Stalin David, "Novel based Intelligent Parking System", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 2 Issue 2, pp. 724-729, March-April 2017.
44. D. Stalin David and T. Joseph George, 2020. Identity-based Sybil attack detection and localization. Artech J. Eff. Res. Eng. Technol., 1: 94-98.
45. David, D.S. and S. Namboodiri, 2020. Improvement of framework for the grouping of CA diseases by investigating big data. Artech J. Eng. Appl. Technol., 1: 7-14.
46. D. Jayakumar; Dr.U. Palani; D. Raghuraman; Dr.D. StalinDavid;  
D. Saravanan; R. Parthiban; S. Usharani. "Certain Investigation On Monitoring The Load Of Short Distance Orienteering Sports On Campus Based On Embedded System Acceleration Sensor". European Journal of Molecular & Clinical Medicine, 7, 9, 2021, 2477-2494.
47. R. Parthiban; S. Usharani; D. Saravanan; D. Jayakumar; Dr.U. Palani; Dr.D. StalinDavid; D. Raghuraman. "Prognosis Of Chronic Kidney Disease (Ckd) Using Hybrid Filter Wrapper Embedded Feature Selection Method". European Journal of Molecular & Clinical Medicine, 7, 9, 2021, 2511-2530.
48. Dr.U. Palani; D. Raghuraman; Dr.D. StalinDavid; R. Parthiban; S. Usharani; D. Jayakumar; D. Saravanan. "An Energy-Efficient Trust Based Secure Data Scheme In Wireless Sensor Networks". European Journal of Molecular & Clinical Medicine, 7, 9, 2021, 2495-2510.

49. D.Raghu Raman; D. Saravanan; R. Parthiban; Dr.U. Palani; Dr.D.Stalin David; S. Usharani; D. Jayakumar. "A Study On Application Of Various Artificial Intelligence Techniques On Internet Of Things". European Journal of Molecular & Clinical Medicine, 7, 9, 2021, 2531-2557.
50. D.Saravanan; Dr.D.Stalin David; S.Usharani; D.Raghuraman; D.Jayakumar; Dr.U.Palani; R.Parthiban. "An Energy Efficient Traffic-Less Channel Scheduling Based Data Transmission In Wireless Networks". European Journal of Molecular & Clinical Medicine, 2020, Volume 7, Issue 11, Pages 5704-5722.
51. S.Usharani; D.Jayakumar; Dr.U.Palani; D.Raghuraman; R.Parthiban; D.Saravanan; Dr.D.Stalin David. "Industrialized Service Innovation Platform Based On 5g Network And Machine Learning". European Journal of Molecular & Clinical Medicine, 2020, Volume 7, Issue 11, Pages 5684-5703.
52. M. Vijayaragavan and S. S. Darly, "Automatic Electricity Bill Calculation Using Arduino," *2019 International Conference on Smart Structures and Systems (ICSSS)*, Chennai, India, 2019, pp. 1-3, doi: 10.1109/ICSSS.2019.8882859.
53. M. Vijayaragavan & S. S. Darly (2020) Power flow management of grid connected HRES system using a CFANN technique, International Journal of Electronics, DOI: 10.1080/00207217.2020.1831080
54. Selvamani, Sathish, Vignesh , Vijayaragavan, 2016, Self Monitoring Automatic Routine Technique, International Journal of Engineering Research & Technology (IJERT) Volume 05, Issue 03 (March 2016), <http://dx.doi.org/10.17577/IJERTV5IS030998>.
55. Dr. D. Stalin David, Mr. D. Saravanan, "Certain Investigation On Iot Therapeutic Image Recognition And Rivaroxabanpreclude Thrombosis In Patients", 2021, pg.no:51-66, ISBN: 978-81-948555-1-4.