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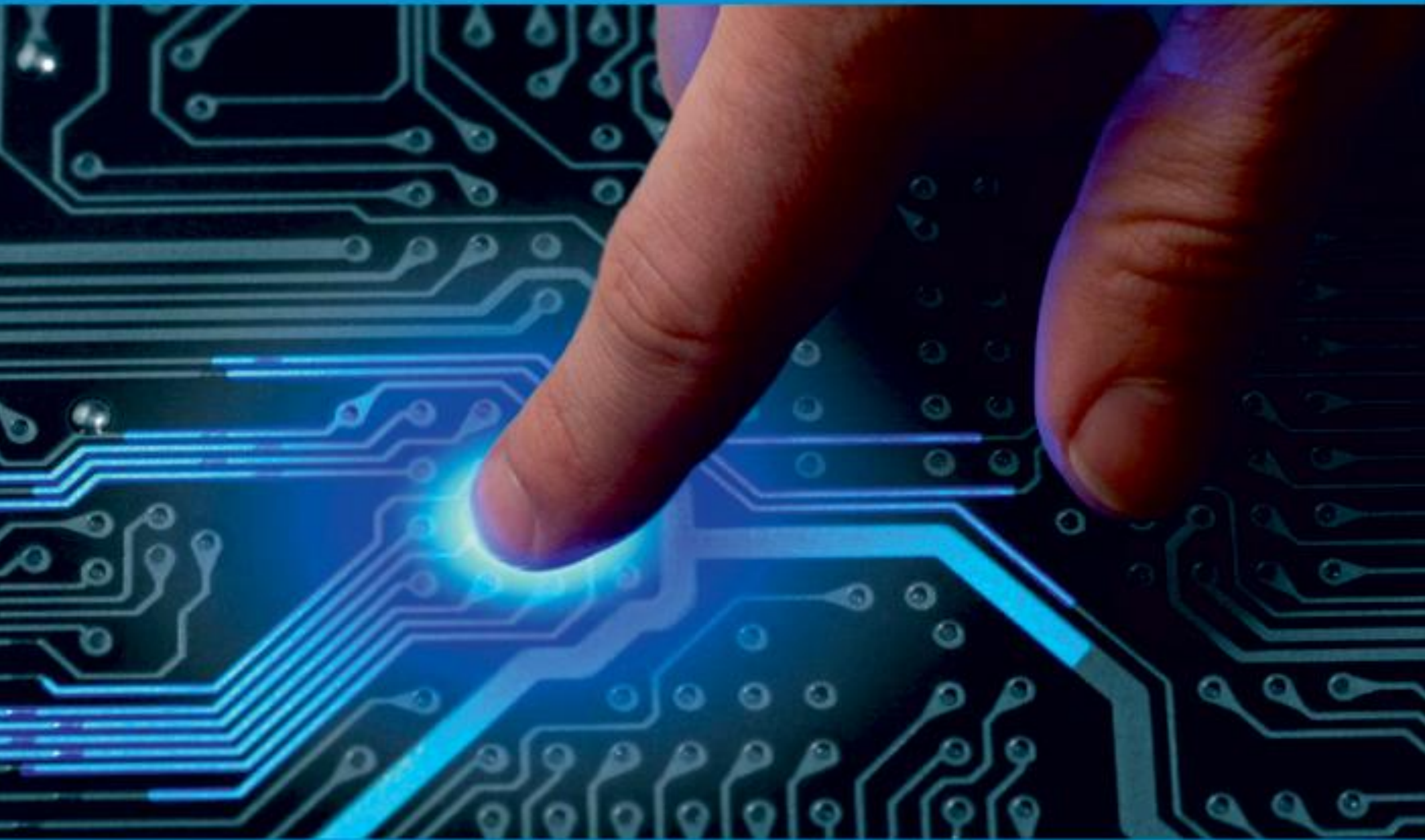

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Wound Analysis Using Machine Learning

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ABSTRACT: It is impossible to overstate the importance of effective surgical wound care. Numerous serious consequences may result from improper management of surgical wounds. It thus grows as a result. It is essential to develop a patient-friendly self-care tool that can help both patients and medical professionals in order to ensure that surgical wounds are treated in the country without the use of specialized medical equipment. In this paper, a self-care device for evaluating surgical wounds is suggested. With the use of a mobile device, the suggested device is intended to let patients take images of their own surgical wounds for examination. The suggested technique, which combines image-processing and gadget-learning strategies, has four tiers. First, images are divided into superpixels, with each superpixel containing the pixels with a similar distribution of shades. Second, these skin-related superpixels are identified, and a skin-related superpixel area is produced. Based on the assertion of the textural difference between skin and wounds, surgical wounds can be removed from this area in about 1/3 of cases.

KEYWORDS: Inception V3, Machine Learning, Superpixel.

I. INTRODUCTION

One cannot undervalue the importance of effective surgical wound care. In order to ensure the First-class of surgical wound cares, patients are required to live in a health facility under statement, which places a significant load on them. Uncontrolled wounds can result in infection symptoms, the improvement of persistent wounds, or even the possibility of existence. Patients' self-care will become one of the most effective strategies for medical professionals to effectively use their limited resources for patient care patients are educated by medical professionals to increase their involvement in the care process, and medical professionals can periodically check the state of surgical wounds. In addition to easily relieving the workload of scientific professionals, this approach also guarantees great surgical wound care effectiveness. Easy verbal communication between patients and medical professionals is crucial to achieving a successful self-care approach. So that medical personnel can be informed and involved as needed, patients will be able to quickly understand the condition of their surgical wounds. Patients would therefore need a practical tool that might help them ascertain the state of their surgical wounds, as opposed to experienced medical professionals.

II. RELATED WORK

Here we have selected few key literatures after exhaustive literature survey and listed as below:

Ammara Masood et.al [1] reported data and outcomes from the most significant installations to date. They analyzed the results and contrasted the effectiveness of various classifiers created especially for diagnosing skin lesions. Whenever possible, information on different circumstances that have an impact on how well the strategy works is provided.

Nazia Hameed et.al [2] analyzed current practices in various stages of computer-aided diagnosis systems and reviewed the state-of-the-art in these systems. The most significant and recent implementations' statistics and outcomes are examined and published.

Maciej Ogorzałek et.al [3] The proposed approach for Computer Aided Detection and Classification of Skin Lesions for Diagnostic Support integrates medical expertise with a number of cutting-edge technologies, including image processing, pattern classification, statistical learning, and assembling methods of model-based classifiers. It also demonstrated excellent results.

Fabio Santos et.al [4] focus on the state of automated skin lesion diagnosis while also offering a thorough understanding of the difficulties and potential in dermatology treatment.

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Shetu Rani Guha et.al [5] proposed a method for categorizing seven different skin conditions based on machine learning using convolutional neural networks (CNN). On the International Skin Imaging Collaboration 2018 (ISIC) dataset, transfer learning and CNN have been utilized to increase classification accuracy.

A D Mengistu et.al. [6] developed a method for utilizing digital image processing to identify and predict the various forms of skin malignancies. The system of classification was overseen in accordance with the predetermined classes of the different types of skin cancer.

Uzma Bano Ansari et.al. [7] An image of a skin cancer captured with a dermoscopy is pre-processed using a variety of methods to reduce noise and improve the image. After that, segmentation using the Thresholding approach is applied to the image.

Enakshi Jana et.al. [8] conducted a thorough review of the literature on the state-of-the-art algorithms for skin cancer diagnosis and a precise comparison of them. A thorough literature review of the most recent innovations in skin cancer diagnosis is conducted.

III. PROBLEM STATEMENT

In self-care situations, surgical wound images are often taken by nonprofessional photographers using nonprofessional cameras. These images have unique quality, making it crucial to use advanced techniques. Surgical wounds vary in size and shape, and their size depends on the technique and location. Early detection of signs and symptoms is crucial to prevent worsening development and prevent complications. However, it is difficult to detect symptoms in the early stages, even in small percentages of surgical wounds.

IV. METHODOLOGY

This section examines a few paintings that are connected to the suggested Gadget. Both picture-processing-related works and medical-related works are then highlighted because the proposed device has a tendency to analyze signs and symptoms on surgical wounds utilizing images captured with the help of nonprofessional cameras.

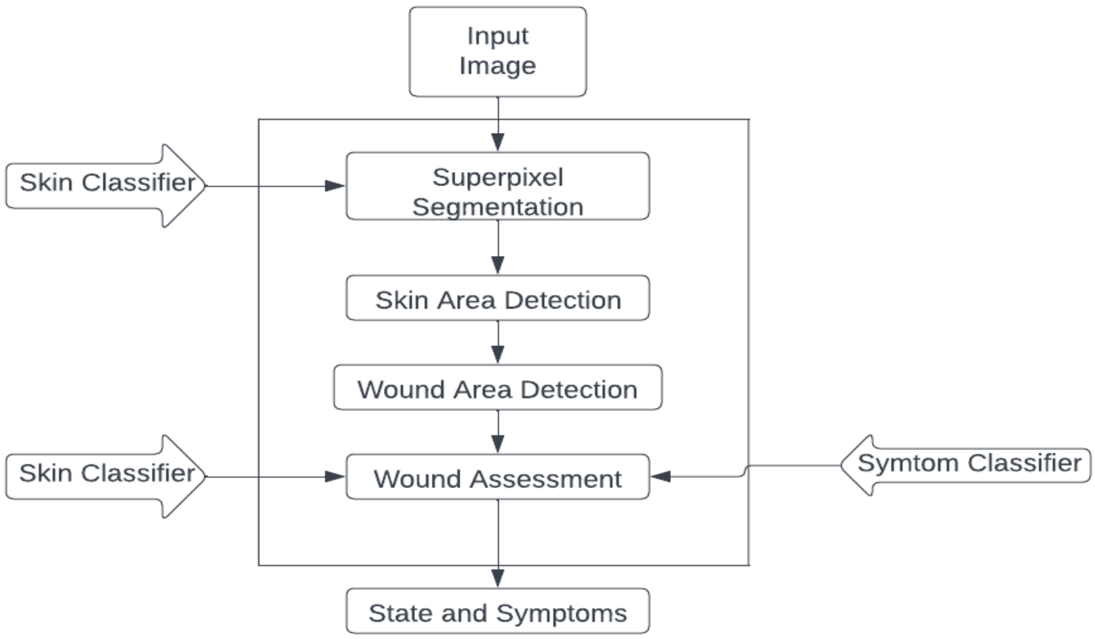

Fig 1: Proposed System Architecture

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- **Superpixel:** Superpixels refer to a connected arrangement of pixels that may be comparable to one another in terms of color intensity or other properties.
- **Skin Detection:** To increase the precision of the detections, it used skin color and pores detection. It could be quite helpful to use skin color to understand the skin's pores and skin.
- **Wound Detection:** The modern methods used to solve these issues include: assessing wounds by estimating wound areas the use of digital imaging software for planimetry.

Key steps of the methodology included:

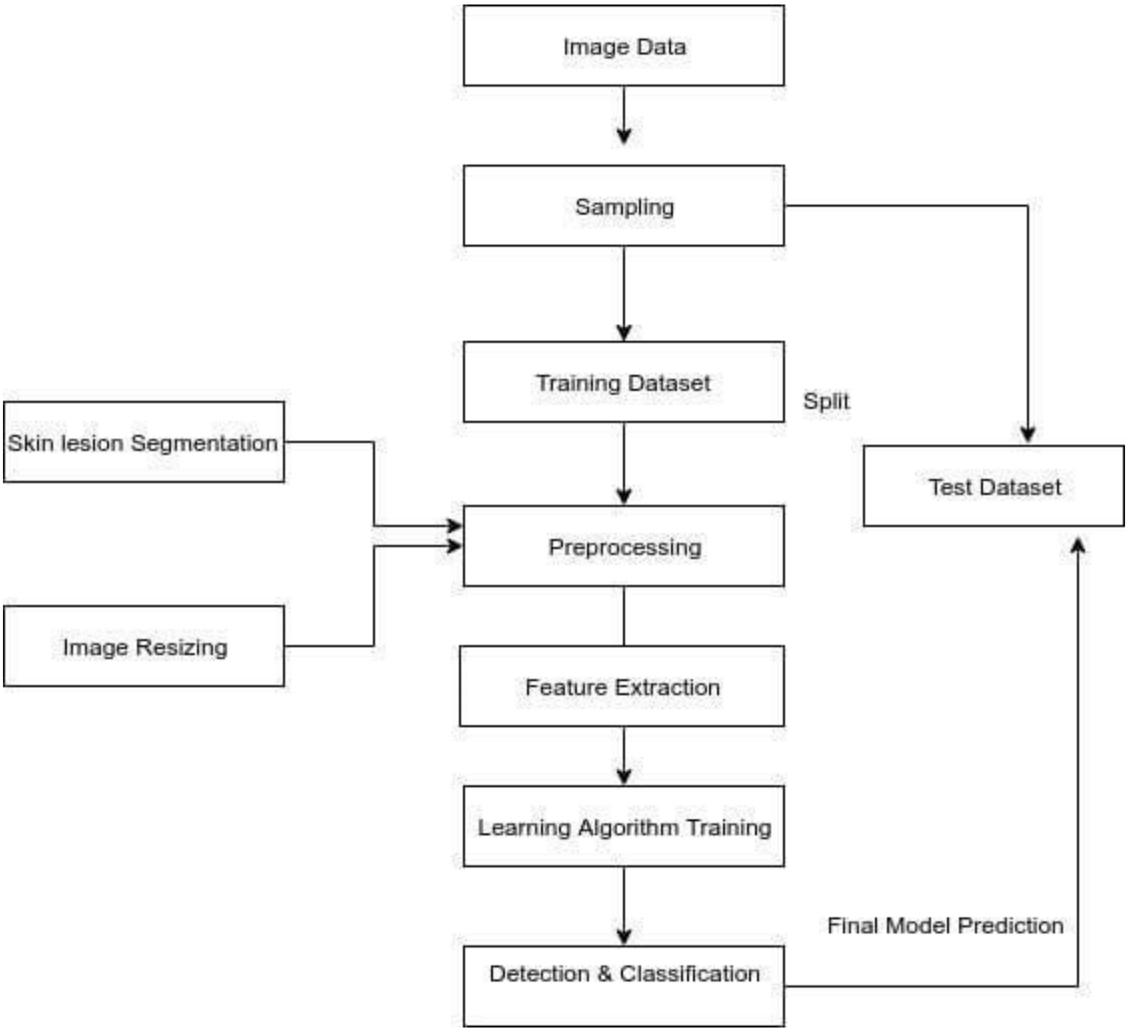

Fig 2: Training and Testing Process

1. **Data Collection:** Gather a wide range of representative wound images. The range of wound kinds, sizes, locations, and healing stages should be covered by this dataset.
2. **Data Pre-processing:** For consistency, reduce the wound photos' size and standardize their resolution.
3. **Feature Extraction:** To extract pertinent features from the wound photos, use image processing techniques.
4. **Feature Selection:** The efficiency and computational complexity of the model can be improved by removing unnecessary or redundant elements.
5. **Model Development:** Divide the pre-processed dataset into training and testing sets. Typically, k-fold cross-validation is used to evaluate the model's performance.

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6. **Model Evaluation:** For qualitative analysis, think about showing the model's predictions and contrasting them with ground truth labels.
7. **Deployment and Monitoring:** Track the model's performance over time and gather user input to spot any biases or potential problems.

V. RESULTS AND DISCUSSION

Despite difficulties encountered during implementation, encouraging outcomes were attained. However, it should be emphasized that the outcomes were comparable regardless of the regularizer and dropout level setup. Recurring trends can be discovered by comparing the images that were correctly and wrongly categorised.

Training				**Validation**			
Level of Dropout				Level of Dropout			
	10%	20%	30%		10%	20%	30%
Loss	0.088	0.103	0.097	Loss	0.281	0.272	0.305
Accuracy	96.83%	96.83%	97.22%	Accuracy	87.50%	89.58%	87.50%
Precision	97.86%	95.83%	95.71%	Precision	87.50%	88.00%	87.50%
Recall	99.28%	100%	97.10%	Recall	87.50%	91.67%	87.50%

Table 1: Results when training the network with L1 regularise and different dropout.

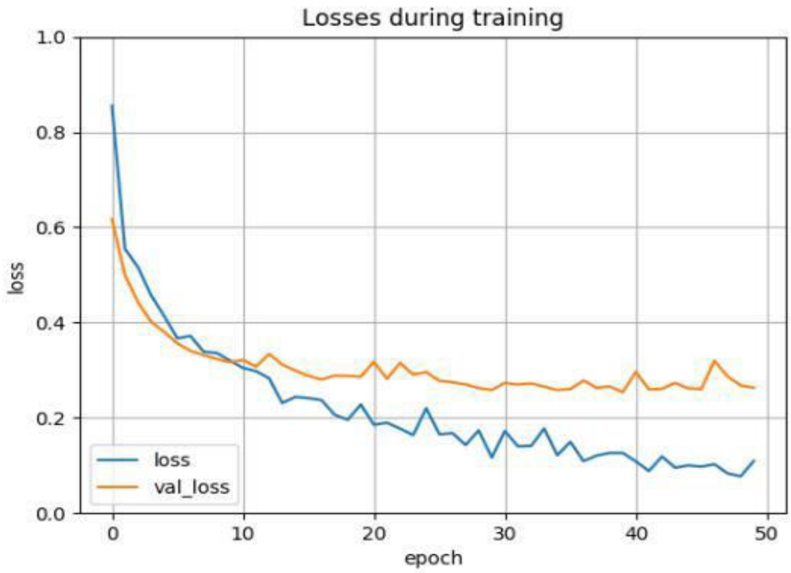

Fig 3: Losses during training

In the above figure 3 shows the loss versus epochs with L2 regulariser and dropout 20%. The difference between the losses at the last epoch is approximately 0.15.

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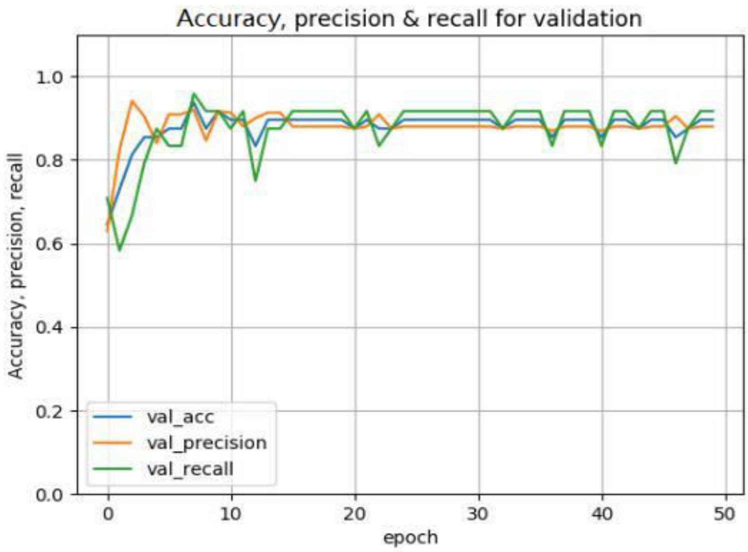

Fig 4: Accuracy, precision and recall validation

In the above figure 4 shows the performance metrics during training for the validation set with the best set-up from all tests, L2 regulariser with 20 % dropout level.

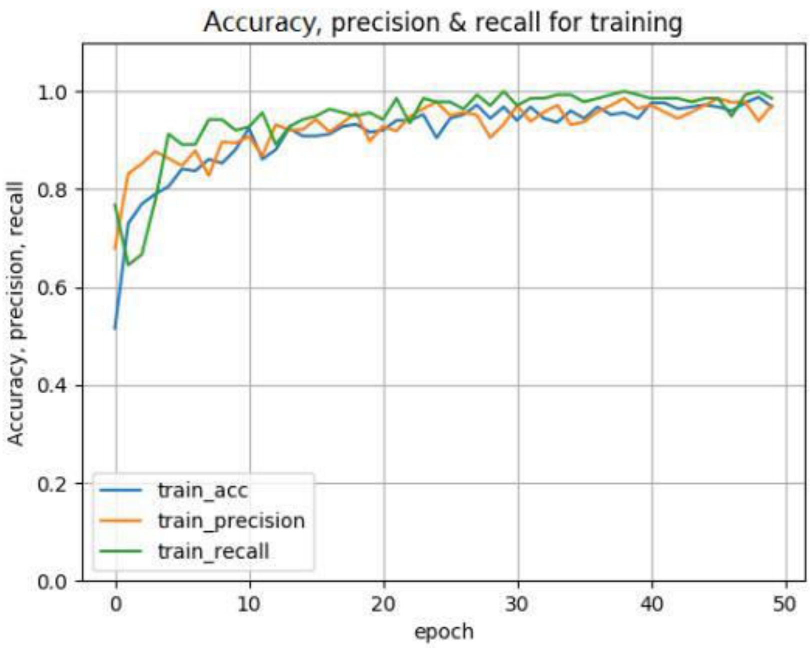

Fig 5:Accuracy,precision & recall for training

In the above figure 5 Illustrates the performance metrics during training for the training set with the best set-up from all tests, L2 regulariser with 20 % dropout level.

VI. CONCLUSION

In order to mechanically assess wounds following surgeries, this project offers surgical evaluation equipment for self-care, four phases make up the suggested approach. Superpixel segmentation: the process of superpixel extraction is

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used to group pixels with similar color distributions. Pores and skin location detection: the pores and skin-classifier is designed to find the skin's superpixels and uses the ellipse-fitting method to locate surgical wounds. Wound site detection: using the observation that the texture of surgical wounds differs from that of normal skin, the nook detection approach is employed to precisely capture superpixels that are surgical wounds; wound assessment classifiers are designed to recognize not only the state but also the symptoms of superpixels with open wounds, there are large-scale experiments carried out.

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