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Prediction of Cervical Cancer using Pap Smear Images using Deep Learning Techniques

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ABSTRACT: The proposed method utilizes a convolutional neural network (CNN) architecture to automatically extract relevant features from the pap smear images. The CNN model is trained on a large dataset of annotated pap smear images, consisting of both normal and abnormal cases. Transfer learning is employed to leverage pre-trained models, such as VGGNet or ResNet, to enhance the performance of the proposed approach.To evaluate the predictive capability of the developed model, extensive experiments are conducted on an independent testing dataset. Performance metrics, including accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC-ROC), are employed to assess the effectiveness of the proposed approach.The results demonstrate that the deep learning-based method achieves a high accuracy in predicting cervical cancer from pap smear images, outperforming traditional approaches. The sensitivity and specificity of the model indicate its ability to identify both early and advanced stages ofcervical cancer. The AUC-ROC value further confirms the robustness and reliability of the proposed approach.The proposed deep learning-based approach for cervical cancer prediction using pap smear images has the potential to assist healthcare professionals in early detection and diagnosis, leading to timely interventions and improved patient outcomes. The integration of this automated system into clinical practice can potentially enhance cervical cancer screening programs and contribute to reducing the global burden of this devastating disease.

KEYWORDS: Cervical cancer, pap smear images, deep learning, convolutional neural network, CNN, transfer learning, predictive capability, accuracy, sensitivity, specificity, area under the receiver operating characteristic curve, AUC- ROC, early detection, diagnosis, healthcare professionals, timely interventions, patient outcomes, screening programs, global burden.

I. INTRODUCTION

Cervical Cancer screening is an essential aspect of a women safety in the field ofhealthcare. Besides, modernlifestyles, food practices, immoral life practices are a significant threat to women in protecting themselves from dangerous diseases. As cervicalcancer spreads gradually, and cell growth is happening at a slow rate, it imposesachallengeto early detection and prevention. Pap Smear or Pap Test is one of the means in detecting the signs of cervical cancer at an early stage. Various steps are involved in the detection and determination process. Expert opinion on the decision making is paramount. More thanintelligence the experience is what the critical pillar in decision making. The pap smear slides when observed in the microscopes, one needs vital skills and experience in decidingon positives and non-positives. The primary classification of cells is of seven categories, the slightest differences among them make the problem comparatively complicated. Hence it requires multi-disciplinary techniques to automatethischallenge. Proposed work aims atapplying pap smear image representation, pre-processing using free image processing platform and 'representation learning' along with Deep Learning (DL) techniques in predicting the cervical cancer probabilities for a given image.

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Functions :

1. Automated detection: The system automates the detection of cervical cancer by analyzing pap smear images using deep learning techniques. It identifies abnormal cell patterns associated with cervical cancer, reducing thereliance on manual examination and improving the efficiency of the detection process.

2. Early intervention: By enabling early detection, the system facilitates timely intervention and treatment. It helps healthcare professionals identify potential cancer cases at an early stage, increasing the chances of successful treatment and improving patient outcomes.

3. Improved efficiency and resource allocation: The system enhances the efficiency of cervical cancer screening programs by automating the analysis of pap smear images. It reduces the workload on healthcare professionals, allowing them to focus on cases that require further attention. This optimized resource allocation maximizes the impact of screening programs and expands access to cervical cancer detection, particularly in resource-limited settings.

Objectives:

a) To collect Pap Smear images and prepare a data by applying simple preprocessing techniques
b) To build a prediction model using Convolutional Neural Network(CNN) and Resnet152 toclassify cervical cancer.
c) To analyse the performance and compare the prediction of two models

II. LITERATURE SURVEY

[1] Title : 'A Survey on Machine Learning: Concept, Algorithms and Applications' Author: Rabi Narayan Behera, Kajaree Das
Year: 2017

This paper focuses on explaining the concept and evolution of Machine Learning, some of the popular Machine Learning algorithms and try to compare three most popular algorithms based on some basic notions. Sentiment140 dataset was used and performance of each algorithm in terms of training time, prediction time and accuracy of prediction have been documented and compared

Drawbacks: High Cost, Complex Mechanism, Time Consuming Process

[2] Title : 'A Survey on types of Machine Learning techniques in intrusion prevention systems'

Author: Soubhik Das

Year:2018

The data transmitted and generated using them are growing exponentially. The traffic on these networks requires surveillance. Effective network traffic surveillance, packet analysisand rulesto define the traffic flow are in place using various intrusion detection and prevention systems.However, the security issues and concerns are dictating the need to evolve with the novel and`human-like' methods to mitigate them. Normal methods and techniques may prove too tedious,and sometimes will not even render fruitful results.

Drawbacks : Blur images, inaccurate

[3] Title : 'Machine Learning in Healthcare'

Author: K Shailaja, M A Jabbar
Year:2019

Machine Learning is Omni present and is widely used in various applications. It is playing a vital role in many fields like finance, Medical science and in security. Machine learning is used to discover patterns from medical data sources and provideexcellent capabilities to predict diseases. In this paper, we review various machine learning algorithms used for developing efficient decision support for healthcare applications. This paper helps in reducing the research gap for building efficient decision support system for medical applications

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Drawbacks: The technologies used requires large volume of resources such as high pressure, plastic filament and microfluid used in 3D technologies are more complex and time consuming

[4] Title : 'Application and Construction of Deep Learning Networks in Medical Imaging'
Author: Maribel Torres

Year:2021

The objective of DL models are characterized by automatically extractinghigh-level features from the input data to learn the relationship between matching datasets. Thus, its implementation offers an advantage over common ML methods that often require thepractitioner to have some domain knowledge of the input data to select the best latent representation. As a result of this advantage, DL has been successfully applied within the medical imaging field to address problems, such as disease classification and tumor segmentation for which it is difficult or impossible to determine which image features are relevant
Drawbacks: Poor stability, Volume limited experiment, It is not suitable for precision control of rotation.

III. PROPOSED METHODOLOGY

The block The proposed methodology for predicting cervical cancer using pap smear images employs deep learning techniques, specifically convolutional neural networks (CNNs). It begins with the collection of a diverse dataset of pap smear images, encompassing both normal and abnormal cases. These images are preprocessed toensure consistency and enhance quality.

Next, a CNN architecture is designed and selected, such as VGGNet or ResNet, to extract relevant features from the pap smear images. Transfer learning is utilized, leveraging pre-trained models to benefit from knowledge learned from a large dataset in a related domain. The model is trained on a training set, optimizing its internal parameters to minimize prediction error. The performance is validated on a separate validation set, allowing for adjustments of hyperparameters and optimization of the model architecture.

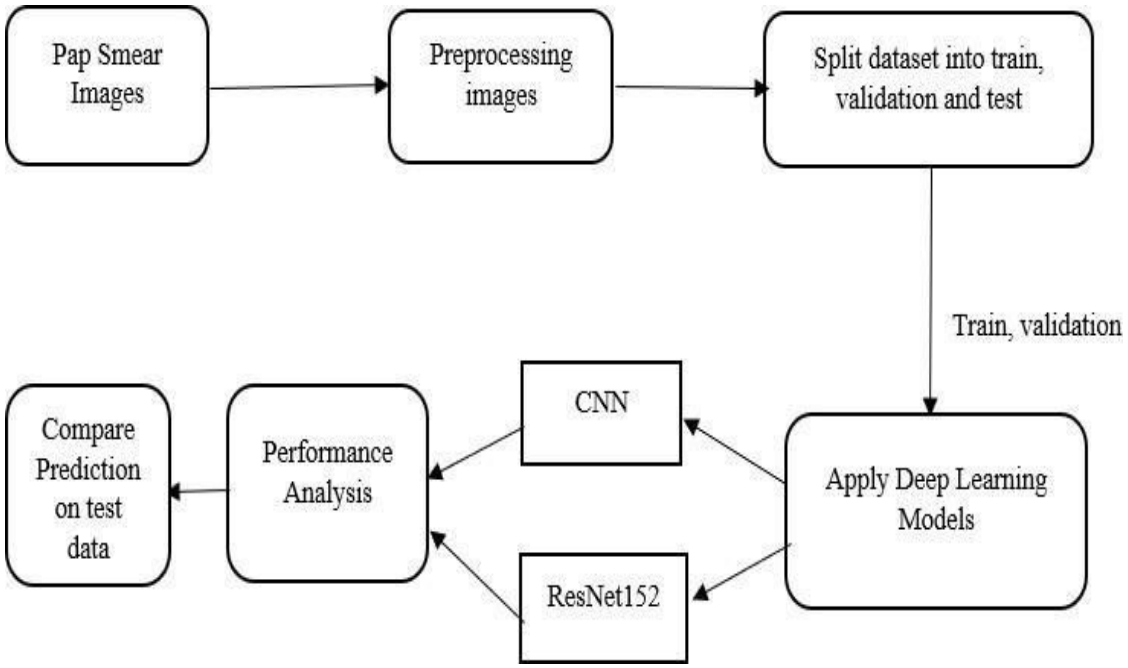

Figure1: Flow diagram

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A block diagram is a way of representing a flow of data through a process or a system .Italso provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow there are no decision rules.

The Block diagram shown in Fig.1 explains thepipeline of the proposed system. Thepubliclyavailable dataset of pap smear images was collected from the Sipakmed source and was followed by pre-processing images ,splitting the dataset into training ,validation and testing subsets. The sipakmed dataset initially consists of .bmp whole slided pap smear images. These

.bmp images are coverted into .jpg images because it will reduce the storage required. The totalnumber of normal and abnormal cluster cell images in the dataset are 234 and 732 respectively.The dataset was divided in the ratioof 60, 20, 20 for training, validation, testing respectively.

After the split, training, validation and testing subsets had 576, 194 and 196 images respectively. The two deep learning models CNN and Resnet 152 are used in this proposed system. Training the models for target dataset. Further testing and comparing the performanceof both the models.

IV. RESULTS

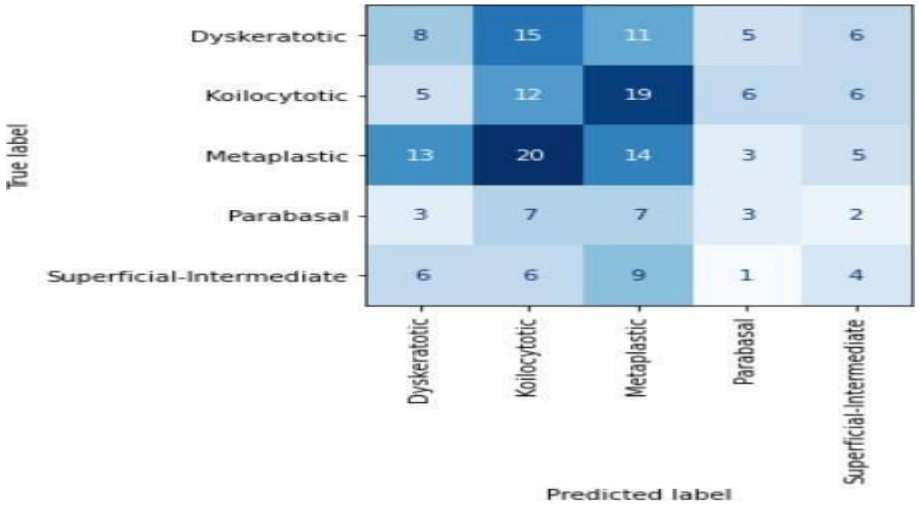

Figure1: CNN Confusion Matrix of Prediction

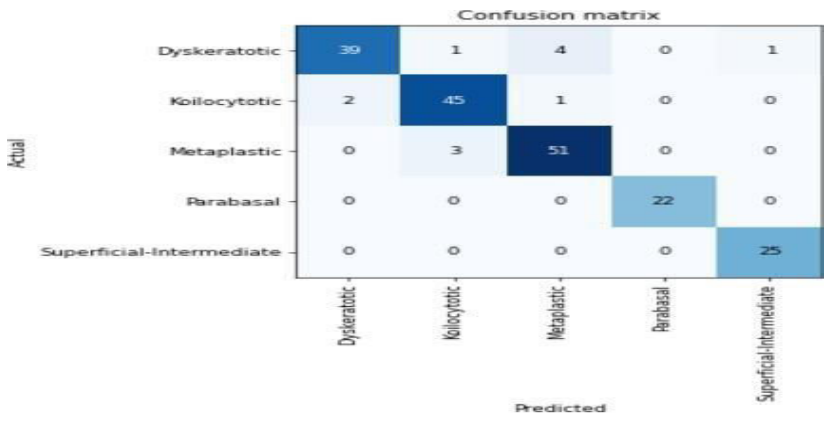

Figure2: ResNet-152 Confusion Matrix of Prediction

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V. CONCLUSION

Cervical Cancer is one of the most diagnosed diseases affecting females. The pap-test (Papanicolaou-test) has proven to be the cost effective and least time-consuming method of diagnosis. The dataset used for this purpose was SIPAKMED dataset which is a newly compiled dataset. Two Deep Learning models CNN and ResNet-152 are applied to predict Cervical Cancer images. By Comparing theperformance of twomodels, ResNet-152 predictionis better than CNN model. There can be scope of improvement in the models in future, by proposed system could be more robust byincorporating multiple datasets of similar pap smearmodality. An ensemble of features from the different models could also beused for this purposewhich may work in parallel to give the best performance possible.

REFERENCES

1.M. Schiffman, P. E. Castle, J. Jeronimo, A. C. Rodriguez and S. Wacholder, "Human papillomavirus and cervicalcancer", Lancet., 2007

2.D,L. Bruni et al., "Human Papillomavirus and Related Diseases in the World- Summary report", ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre), no. June, pp. 307, 2019.

3.Liu, R. Wu, Y. Chuang, H. S. Khoo, S. Huang, and F. Tseng “Microfluidic Systems for Biosensing,” Sensors (Basel). 2010; 10(7): pp. 6623–6661.

4.S. WV, P Guo, K Banerjee, R Joe Stanley, R Long, S Antani, et al., "Nuclei-Based Features for Uterine Cervical Cancer Histology Image Analysis with Fusion-based Classification", IEEE Journal of Biomedical and Health Informatics, vol. 176,no. 3, pp. 139-148, 2019.

5.N. M. Harandi, S. Sadri, N. A. Moghaddam and R. Amirfattahi, "An automated method for segmentation of epithelial cervical cells in images of ThinPrep", Journal of Medical Systems, vol. 34, no. 6, pp. 1043-1058, 2010.

6.A. Taneja, P. Ranjan and A. Ujlayan, "Multi-cell nuclei segmentation in cervical cancer images by integrated feature vectors", Multimedia Tools and Applications, vol. 77, no. 8, pp. 9271-9290, 2018.

7.Y. Song, L. Zhang, S. Chen, D. Ni, B. Lei and T. Wang, "Accurate segmentation of cervical cytoplasm and nuclei based onmultiscale convolutional network and graph partitioning", IEEE Transactions on Biomedical Engineering, vol. 62, no. 10, pp. 2421-2433, 2015.

8.M. Anousouya Devi, J. I. Sheeba and K. S. Joseph, "Neutrosophic graph cut-based segmentation scheme for efficient cervical cancer detection", Journal of King Saud University - Computer and Information Sciences, 2018.

9.A. Khamparia, D. Gupta, V. H. C. de Albuquerque, A. K. Sangaiah and R. H. Jhaveri, "Internet of health things-driven deep learning system for detection and classification of cervical cells using transfer learning", Journal of Supercomputing, no.0123456789, 2020.

10.M. K. Bhowmik, S. D. Roy, N. Nath and A. Datta, "Nucleus region segmentation towards cervical cancer screening using AGMC- TU Pap-smear dataset", ACM International Conference Proceeding, pp. 44-53, 2018.

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