





Computational Science and Engineering
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Master’s Thesis

Evaluation of Machine Learning Algorithms
for Object Detection in Technical Drawings
like P&IDs and Circuit Diagrams

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Machine Learning Algorithms based Skin
Disease Detection

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Abstract—Skin disease recognition and observing is a major challenge looked by the medical industry. Because of expanding contamination and utilization of lousy nourishment, the tally of patients experiencing skin related issues is expanding at a quicker rate. Well-being isn’t the main concern, however unfortunate skin hurts our certainty. Customary and appropriate skin checking is a significant advance towards early discovery of any destructive or starting changes in skin that may bring about skin disease. Machine learning methods can add to the improvement of capable frameworks which can order various classes of skin illnesses. To identify skin maladies, first, it is required to separate the skin and non-skin. In this paper, five diverse machine learning algorithms have been chosen and executed on skin infection data set to anticipate the exact class of skin disease. Out of a few machine learning algorithms, we have worked on Random forest, naive bayes, logistic regression, kernel SVM and CNN. A similar examination dependent on confusion matrix parameters and training accuracy has been performed and delineated utilizing graphs. It is discovered that CNN is giving best training precision for the right expectation of skin diseases among all selected.

Keywords: Machine learning, Random forest, naive Bayes, logistic regression, kernel SVM and CNN

I. INTRODUCTION

Skin is the biggest organ of the human body. It is made out of epidermis, dermis, and subcutaneous tissues. Skin perceives the outside condition and shields our inside organs and tissues from unsafe microscopic organisms, contamination and sun presentation. Skin can be influenced by various external and internal factors. Artificial skin harm, chemical harm, adventitious viruses, individual’s immune system, and genetic disorders are some factors that influence skin disorders. Skin diseases seriously affect once life and well-being. Ones in a while, individuals attempt to fix their skin issues by utilizing their home cures. These strategies if are not proper for that kind of skin illness would bring about hurtful impacts. Skin diseases can easily transfer from one person to another, thus required to be controlled in an early stage. In maximum cases,

the conclusions on the patient’s symptoms are tracked from doctor’s experiences and subjective judgments. If the judgment is wrong or delayed, it may harm human health. Therefore, it becomes necessary and significant to develop efficient approaches to detect and diagnose the symptoms of skin diseases at early stages. With the advancement of technology, the skin observing framework can be structured and executed for early detection of skin infections. Various innovations are accessible for image and pattern-based discovery of different skin diseases. Machine learning is one of the areas which can play a massive role in operative and exact identification of different classes of skin diseases. Through image classification using machine learning, diseases may be classified. Image classification is a supervised learning issue in which a lot of objective classes is characterized and a model is trained to perceive the class. There exist many machine learning and deep learning algorithms which can distinguish and predict different categories of skin diseases based upon their classifications. This paper presents a comparative analysis of 5 different machine learning algorithms random forest, naive Bayes, logistic regression, kernel SVM and CNN. All these algorithms are implemented on three different types of skin diseases (acne, lichen planus and sjs ten) and perform classification based detection. Almost 3000 skin samples have been compiled for developing and validating the proposed framework. The training accuracy of these algorithms is compared and analyzed. The organization of our work is as follows. Section II explains a brief literature survey of skin problem and melanoma detection. Section III denotes overview of skin diseases and machine learning algorithms. Section IV describes the result from the investigation. Finally, section V gives a conclusion and future scope.

II. LITERATURE SURVEY

The amalgamation of technology with health care results in rapid development in image processing techniques to aid the medical field. Application of digital image-based equipment such as Computed Tomography (CT), Digital Subtraction Angiography (DSA), and Magnetic Resonance Imaging (MRI) help in accurate diagnosis. Many researchers have worked for detection of skin diseases so far. A brief literature survey is given below. Ercal et al. [1] used an adaptive color metric from the RGB planes. It helps in discriminating the tumor and the background. Image segmentation is performed using a suitable coordinate transformation. Borders are drawn by extracting the tumor portion from the segmented image. This was an effective method to find tumors diagnosis. Demyanov et al.

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Adult Cardiac Arrest Circular Algorithm—2015 Update

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graph TD
    Start([Start CPR  
• Give oxygen  
• Attach monitor/defibrillator]) --> 2min[2 minutes]
    2min --> CheckRhythm{Check Rhythm}
    CheckRhythm -- "If VF/pVT Shock" --> PostCPR[Post-Cardiac Arrest Care]
    CheckRhythm -- "If not VF/pVT" --> ContinuousCPR((Continuous CPR))
    ContinuousCPR --> ROSC[Return of Spontaneous Circulation (ROSC)]
    ContinuousCPR --> ContinuousCPR
    
```

Start CPR

- Give oxygen
- Attach monitor/defibrillator

2 minutes

Check Rhythm

- If VF/pVT Shock

Post-Cardiac Arrest Care

Continuous CPR

- Drug Therapy
 - N/A access
 - Epinephrine every 3-5 minutes
 - Amiodarone for refractory VF/pVT
- Consider Advanced Airway
 - Quantitative waveform capnography
- Treat Reversible Causes
- Monitor CPR Quality

Return of Spontaneous Circulation (ROSC)

CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If P_{ETCO₂} <10 mm Hg, attempt to improve CPR quality
 - Intra-arterial pressure
 - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J; if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine N/A dose:** 1 mg every 3-5 minutes
- **Amiodarone N/A dose:** First dose: 300 mg bolus. Second dose: 150 mg

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

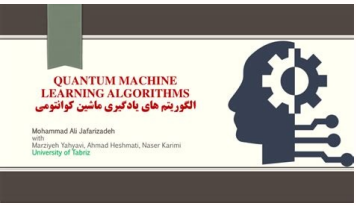
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO₂} (typically >40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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