# Applications of Machine Learning in The Field of Medical Care

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**Abstract These years, with ML and AI becoming the hotspot of research, several applications have come forth in each of these areas. It exists as a kind of academic frontier as well as something close to our life. In this trend, the combination of both medical field and machine learning become more emerging. This research paper proposes the idea which remarkably reduced the existing situation of unbalanced medical distribution and resources strain.This research paper summarizes about the application of ML and auxiliary tumor treatment in the process of medical resource allocation, and puts forward some new techniques of application to realize it closer to human life in the generation of AI and the explores a good situation of mutual combination between medical industry and computer industry, which is beneficial to both.**

**Keywords – Machine Learning, Medical.**

## I. INTRODUCTION

Machine learning a science which aims to make machine capable of learning. Machine learning returned to the public's vision after the famous competition between Alpha Go of Google and the Go player Li Sedol, ending with the score 4:1 in 2015. And this event made machine learning more well know among people even among those who were not familiar to computer science and it has caused intense debate in related field. Actually, although ML is a young branch of AI, it is not a new subject. ML is broadly defined as the application of certain computer algorithms to a set of data known to the event outcomes, and the capabililty to learn to training data and predict new data based on learning outcomes. Its core is induction and summary instead of deductive. Early in the medium of 1950s, Samuel, a computer scientist of United States, designed a chess program that could learn by itself through continuous play. This program shows people the ability of machine at the first time, meanwhile, the unpredictable potential of machine to learn came into people's sight. However, as the research continued, machine learning entered a period of cooling off. Until 1970s, it staged a comeback gradually. And during this period of continuous research and development, until today, ML has become an important subject including data mining, pattern recognition, natural language processing and so on. It has also become a core of AI. In today's society, medical care problems have become a popular topic and problems such as the unbalance and insufficient allocation of medical resources has become increasingly apparent. In this situation, applications of ML has become the unavoidable trend in the current development of medical care. As early as 1972, the scientists in University of Leeds in UK has been trying to use artificial intelligence (ANN) algorithms to judge abdominal pain. Now, more researchers are committed to the combination of ML and medical care. The methods of pathological diagnosis of tumors, lung cancer, etc. by ML has gradually entered the field of vision. Some companies such as Amazon, Alibaba and Baidu have established their own research team working for it. This introduction of ML in medical care has greatly saved medical resources and provided a new way for citizens to see a

## II. AIMS AND OBJECTIVE

### a) Aim

The main aim of the Applications of ML in the branch of Medical Care has greatly saved medical resources and provided a new way for citizens to see doctor and facilitate people's lives. At the same situation, the demand of people also provides a new inputs for the research and development of ML, with promoting its continuous improvement.

### b) Objective

ML applications can possibly increases the accuracy of treatment and health result through various ML algorithm. For eg: deep learning, is used to recoginize human brain tumor, is increasingly being used in medical imaging. Using unsupervised neural networks that can take in from

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dataset without any supervision, deep learning applications can detect, identifiy and analyze cancerous lesions from images. Future development in ML in medical care will continue to transform the industry Machine learning applications under progress include a diagnostic tool for the diabetic retinopathy and predictive analysis to determine breast cancer recurrence based on medical data.

## III. LITERATURE SURVEY

**Paper 1: Journal of Medical Imaging and Health Informatics ISSN:**

Journal of Medical Imaging and Health Informatics (JMIHI) is a standard to disject the novel experimental and the theoretical analysis impacts in the areas of clinical, doctor and facilitate people's lives. At same time, the demand of people also provides a new impetus for the research and development of ML, with promoting its continuous improvement.biomedicine, biology, reformation engineering, medical image cleaning, bio- computing, D2H2 and other health releted areas. As an example, Home Healthcare (D2H2) and the Distributed Diagnosis aims to advance the virtue of patient wellness and patient care by make over the delivery of healthcare from a central, hospital-based system to one that is more distributed and home-based. Different medical imaging techniques used for taking out information from CT, ultrasound, MRI, thermal, X-ray, fusion and molecular of its fashion is the main focus of this journal.

**Paper 2: Computer-aided diagnosis of malignant or benign thyroid nodes based on ultrasound images.**

The objective of this study is to evaluate the diagnostic value of combination of artificial neural networksANN and support vector machineSVM-based CAD systems in differentiating poisonous from benign thyroid nodes with grayscale ultrasound images. Both SVM and ANN had more value in distinguish thyroid nodes. In combination, the sensitivity increased but specificity decreased. This combination might provide an another opinion for radiologists dealing with difficult to diagnose thyroid node ultrasound images.

**Paper 3: Liver segmentation from CT images using a sparse priori statistical shape model (SP-SSM):**

This study proposes new liver segmentation method based on a sparse priori statistical shape model (SP-SSM). First, mark points are selected in the liver a priori model and the original image. Then, a priori shape and its mark points are recognizable to obtain a dictionary for the liver boundary info. Second, the sparse coefficient is calculated based on resemblance between mark points in the original image and those in priori model, and then the sparse statistical model is well-established by combining sparse coefficients and dictionary. Then, the sparse matching constraint model is well- established based on the sparse coding theory. These models jointly derive the constant mis-proportion of the sparse statistical model to proximate and accurately extracts the liver boundaries.

## IV. EXISTING SYSTEM

Computer technology perhaps used to reduce number of mortality as well as waiting time to examine the specialist. Computer programs or software developed by reflecting human intelligence could be used to assist the doctors in making decisions without consulting specialists directly. Software was not intended to replace specialist or doctor, as yet it was developed to aid general practitioners and specialists take immediate action to produce as many doctors as possible. However, while waiting for students to become doctors and doctors to become specialists, many patients may already die. Current practice for medical treatment required patients to consult specialists for further treatment. Artificial intelligence provides students with more opportunities to participate in a digital and dynamic way.

## V. COMPARATIVE STUDY

| Sr. No. | Author | Project Title | Publication | Technology | Purpose |
|---|---|---|---|---|---|
| 1. | Dr. Eddie Yin-Kwee NG , Singapore | Journal of Medical Imaging and Health Informatics | IEEE, 2019 | Distributed Diagnosis and Home Healthcare | disseminate novel experimental & theoretical research results in the field of |

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| | | | | | |
|---|---|---|---|---|---|
| **2.** | in Yu, Tao Jiang, Aiyun Zhou, Lili Zhang, Cheng ; & Pan Xu | Computer-aided diagnosis of malignant or benign thyroid nodes based on ultrasound images. | IEEE, 2019 | ANN | differentiating poisonous from benign thyroid odes with grayscale ultrasound images. |
| **3.** | Xuehu Wang ,Yongchang Zheng, Lan Gan,Xuan Sang,Xiangf eng Kong,Jie Zhao | Liver segmentation from CT mages using a sparse priori statistical shape model (SP-SSM | CSPI, 2019 | SP-SSM | This study proposes a new liver segmentation method based on a sparse a priori statistical shape model |

## VI. PROBLEM STATEMENT

In the medical image analysis, although the error caused by the subjective condition of the doctor is avoided, it is also limited by the objective conditions, such as noises, and other errors are still easy to occur; Although machine learning has already invested in many researchers and applications in assisting tumor treatment, it still requires more financial and personnel requirementsto make relevant research and development to put into large-scale use. At present, it still cannot meet this requirement This is accompanied by certain security problems.

## VII. PROPOSED SYSTEM

In this paper, Focusing on research about ML in medical care currently, its focus is basically on the judgement of the symptoms and the improvement of related medical measures. Certainly, relevant researchers are capable to reduce the investment of medical resources and avoid subjective error caused by human's judgement themselves. With the development of medical technology, ML has been studied for the prediction of tumor follow-up treatment and so on. At present, relevant study has made a significance in lung cancer, skin cancer, breast cancer.

Researchers are still advancing research on other cancers.

## VIII. ALGORITHM

**Step 1:** Start

**Step 2:** Collect the Dataset

**Step 3:** Split the Dataset intotrain & test using model selection in scikit-learn library **Step 4:** Pre-processing of Data

storecsvdata =csv.DictReader(csvfile) for row1 in storecsvdata:

Pregnancies = row1["Pregnancies"] Glucose = row1["Glucose"] BloodPressure = row1["BloodPressure"] SkinThickness = row1["SkinThickness"] Insulin = row1["Insulin"] DiabetesPedigreeFunction = row1["DiabetesPedigreeFunction"]

Age = row1["Age"] BMI = row1["BMI"]

Outcome = row1["Outcome"] storedatamodel.objects.create(Pregnancies= Pregnancies, Glucose=Glucose, BloodPressure=BloodPressure, SkinThickness=SkinThickness, Insulin=Insulin,BMI=BMI,DiabetesPedigree Function=DiabetesPedigreeFunction, Age=Age,Outcome=Outcome)

**Step 5:** Train the model using SVM cls ← SVC()

cls.fit(self.X_train, self.y_train) y_pred ← cls.predict(self.X_test)

svm_acc ← accuracy_score(self.y_test, y_pred)

svm_prec ← precision_score(self.y_test, y_pred)

svm_recall ← recall_score(self.y_test, y_pred)

svm_f1Scr ← f1_score(self.y_test, y_pred) cm ← confusion_matrix(self.y_test, y_pred) **Step 6:** Train the model using Decision Tree dt ← DecisionTreeClassifier() dt.fit(self.X_train, self.y_train)

y_pred ← dt.predict(self.X_test) dt_acc ← accuracy_score(self.y_test, y_pred)

dt_prec ← precision_score(self.y_test, y_pred)

dt_recall ← recall_score(self.y_test, y_pred) dt_f1Scr qq ←

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f1_score(self.y_test, y_pred) cm ← confusion_matrix(self.y_test, y_pred) **Step 7:** Transformation of Data

**Step 8:** Test and Run the Model

**Step 9:** Stop

## IX. MATHEMATICAL MODEL

When medical resources are limited, the efficiency of medical imaging examination and relevant results don't satisfy most of people. It means that, if ML is used in the medical imaging, it will greatly save manpower and improve efficiency. In recent years, Machine Learning has been favoured by medical practitioners in CT segmentation, MRI analysis, and other aspect of medical images. In terms of ultrasound detection, Zhu[4] proposed in his article that the ANN algorithm can be used to determine benign and the malignant nodules in the thyroid. In this experiment, 618 patients and a total of 689 thyroid nodules, of whom no history of the thyroid disease, no history of radiotherapy in the neck, and ultrasound examination. After extracting the morphology, margin, echo, calcification, internal combination, halo sign and color Doppler vascular characteristics of each nodule, they constructed a neural network, where 0 and 1 are used to indicate benign and malignant respectively. To avoid overtraining, a total of 561 nodules participated in the study and constrained the above six eigenvalues and related characteristics respectively. By calculating the error between the output value and the expected value, the weight between neurons was changed. Finally, the result reached 84.3%. In MRI images segmentation, HUANG[5] proposes to use gray forecast model to reduce the error. He created original sequence $X_t$ by collected data and established G(1,1) model by formula as following:

$$dX_1(i)dt+\alpha X_1(i)=\beta \quad (2)$$

The above equation can be solved by least squares method, where ˣ is the control coefficient, ˙ is the expansion factor, and (1) is the initial predicted value:

$$X_1(i) = \left[X_0(1) - \frac{\beta}{\alpha}\right] e^{-\alpha(i-1)} + \frac{\beta}{\alpha} \quad (3)$$

Through this method, the randomness of the original data can be reduced, and the experiment showed it can identify the region of tumor roughly, reduce false positives efficiently, and improves the accurateness of segmentation of tumor. Sarraf[6] classified results of MRI with Alzheimer's disease and normal brain by CNN and structure of LeNet- 5, and studied 62335 images, of which 52507 belonged to Alzheimer's disease with the high accuracy reaching 98.85%. Dou[7] detected brain microbleeds (CBMs) by establishing a three-dimensional full convolutional network (FCN). This result can reduce the large number of unwanted calculations, and greatly speeds up the detection speed with the sensitivity is up to 93.16%. Theoretically, this method can likewise be applied to other medical tests. Besides the applications indicated above, ML has many researches on liver fiber CT and MRI of cancer. Among them, ANN, SVM and clustering algorithms are the more common methods. Which are derived from the main ML algorithms also gradually open up the horizons of researchers. In the pre- processing of information, the past symptoms and cases are first entered into the database. Because there may be some defects in the cases, decision tree algorithm that is not sensitive to the missing data is used for pre- processing. Use impurity to measure which node to separate, using the form of the entropy formula:

$$E(t) = -\sum_j p(j|t)\log_2 p(j|t) \quad (4)$$

$$G_{split} = E(p) - \sum_{i=1}^{k} \frac{n_t}{n} E(i) \quad (5)$$

In all nodes, the largest G value of all node is the current separation node. From this traversal, the most suitable node can be found and it can be classified according to relevant attributes. During the examination and referral process, it can classify patients into diffrent types, based on similarity and a high- dimensional data space which can be used to measure similarity. Here we introduce coefficient of Jaccard as the standard of measurement. For the initial classification, an initial threshold is set. The formula is as follows

$$J(A,B) = \frac{|A \cap B|}{|A \cup B|} \quad (6)$$

The Jaccard is calculated as follows, and then, the similarity coefficient will be formed into a similarity coefficient matrix. Sum of the each row of similarity matrix coefficient is calculated, the largest sum recorded as a variable called max, and then the element on the line and the element larger than İ are searched. The column in which the element is located and record the row number and separate it as the row and column of the new matrix. Repeat the steps of calculating the row and again, construct a new matrix again, and judge the latest matrix. If all elements are greater than İ, then go back to initial starts to work again, otherwise it starts from sum of the second search matrix rows.

$$sim(i,j) = \frac{|A \cap B|}{|A \cap B| + |A \cap \bar{B}| + |\bar{A} \cap B|} \quad (7)$$

$$\begin{pmatrix} sim_{11} & \cdots & sim_{1n} \\ \vdots & \ddots & \vdots \\ sim_{n1} & \cdots & sim_{nn} \end{pmatrix} \quad (8)$$

The similarity matrix analysis method is used to classify the patient's illness, and the relevant data is transmitted back to the patient and the medical staff, which can effectively help

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them to conduct intermediate referrals, which greatly saves the investment of the manpower.

## X. SYSTEM ARCHITECTURE

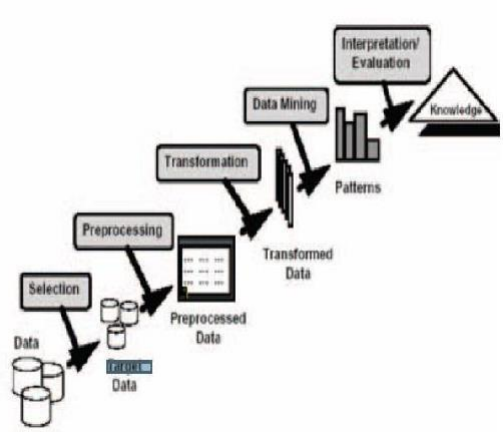


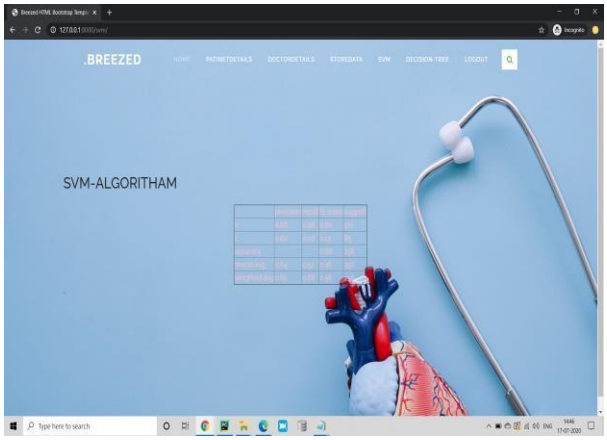

*Fig. Architecture*

Fig.1: System Architecture

## XI. ADVANATGES

1. One of the clinical advantage of ML in medical care lies in the early stage drug discovery process. This also covers Research & Development technologies such as next-generation sequencing and precision medicine, which can even help in finding alternative paths for therapy of multifactorial diseases.
2. This has found one of the best acceptance in the Inner Eye initiative developed by Microsoft, which works on the image diagnostic tools for analysis of the picture.
3. One of the clinical advantage of ML in medical care is identification, diagnosis of the disease and ailments are otherwise considered to be as hard to diagnose. This include anything from the cancers which are hard to catch at the time of initial stage to other genetic diseases.

## XII. DESIGN DETAILS




## XIII. CONCLUSION

Thus, we have tried to implement the paper “Hanyue Dou”, “Applications of Machine Learning in the Field of Medical Care”, IEEE 2019 34rd Youth Academic Annual Conference of Chinese Association of Automation (YAC) and according to the implementation the conclusion is for identifying the accuracy of the diseases. This article reviews the main methods of ML and summarizes several representative applications after understanding the history of machine learning in the medical field and its current application. The typical ideas and algorithms are summarized. At same time, the improvement method based on machine learning in the process of visiting is proposed. However, this does not mean that ML is perfect. Whether in terms of technology, ethic or law, it has certain problems. The solution of these problems requires technicians and legal personnel. Working together, and how to strike balance between manpower and machine is also a problem that everyone of us must face.

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