Machine Learning in Medical Field: An Application of Auxiliary Tumor Treatment

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Abstract

These years, with artificial intelligence and machine learning becoming the hotspot of research, several applications have emerged in each of these areas. It exists not only as a kind of academic frontier but also something close to our life. In this trend, the combination of medical care and machine learning becomes more and more tighter. The proposal of its main idea also greatly alleviated the existing situation of unbalanced medical distribution and resources strain. This paper summarizes some application of machine learning and auxiliary tumor treatment in the process of medical resource allocation and puts forward some new methods of application to realize it closer to human life in the era of artificial intelligence and the explores a good situation of mutual combination of medical industry and computer industry, which is benefit both.

Keywords: machine learning, data mining, pathology, diagnostics.

1. Introduction

Machine learning (ML) is a science which aims to make machine capable of learning. ML 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 ML more well known 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 ability 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, ML 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.

Now, ML is mainly divided into supervised learning, semi-supervised learning and unsupervised learning. Some hot of them is Nearest neighbor classifier, Naïve Bayes classifier, ANN (Artificial Neural Network) and SVM (Support Vector Machine). Among them, ANN has become the hot algorithms that discussed by lots of scientists. ML is a cross-disciplinary field with many domains, and it can be studied in a wide range of fields, not only in computer science, but also in medicine,

finance and other disciplines, which can improve its own performance by getting new knowledge and skill, and at the same time, simulating human learning behavior.

In today's society, medical care problems have become a hot topic, and problems such as the unbalance and insufficient allocation of medical resources has become increasingly apparent. In this situation, the application of ML has become the unavoidable trend in the current development of medical care. As early as 1972, the scientists in the University of Leeds in the UK have been trying to use artificial intelligence algorithms to judge abdominal pain. Now, more and 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 Alibaba, Amazon, 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 doctor and facilitate people's lives. At the same time, the demand of people also provides a new impetus for the research and development of ML, with promoting its continuous improvement.

2. Existing system

In present systems there is hardly any medical service available in remote locations. Persons needing medical services often need to travel long distances. Even in urban areas the service is sometimes not available immediately. Patients and doctors are hardly to communicate with each other's,and patients had to wait for long time in order to communicate to the doctor.This main concern has to do with the confidentiality of the data. There is also concern about non-confidential data however such Systems that deal with these transfers are often referred to as Health Information Exchange.

Disadvantages

- Data Acquisition.
- MLrequires massive data sets to train on, and these should be inclusive/unbiased, and of good quality.
- Time and resources.
- Interpretation of results.
- High error-susceptibility.

3. Proposed system

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Decision-tree algorithm

The algorithm of decision tree is a method, which creates a decision tree by existing data and inputs the training set. According to the growth direction of decision tree, the test data can be classified. The main idea of decision tree is which feature is the best, how many branches can be generated and the time when to stop splitting. During this procession, it can be determined by the variable which is called impurity and some other mathematical method. However, due to the fact that it is a greedy approach, decision tree may disable to find the best tree sometimes.

Support vector machine

SVM is an important part of statistical learning theory, which by transforming input space into high-dimensional space. In the linear classification, the hyperplane and loss function are constructed to solve the minimum of the loss of agent; for the linear indivisible problem, the method can be applied, and the method is used to segment the hypersurface with feature space. SVM is often used in the analysis of medical conditions and the judgement of benign and malignant tumors, but it is difficult to implement in large-scale training samples because it may involve the calculation of high-order matrices.

Advantages

- Identifying Diseases and Diagnosis.
- Drug Discovery and Manufacturing.
- Medical Imaging Diagnosis.
- Personalized Medicine.
- ML-based Behavioral Modification.
- Smart Health Records.
- Clinical Trial and Research.
- Crowdsourced Data Collection.
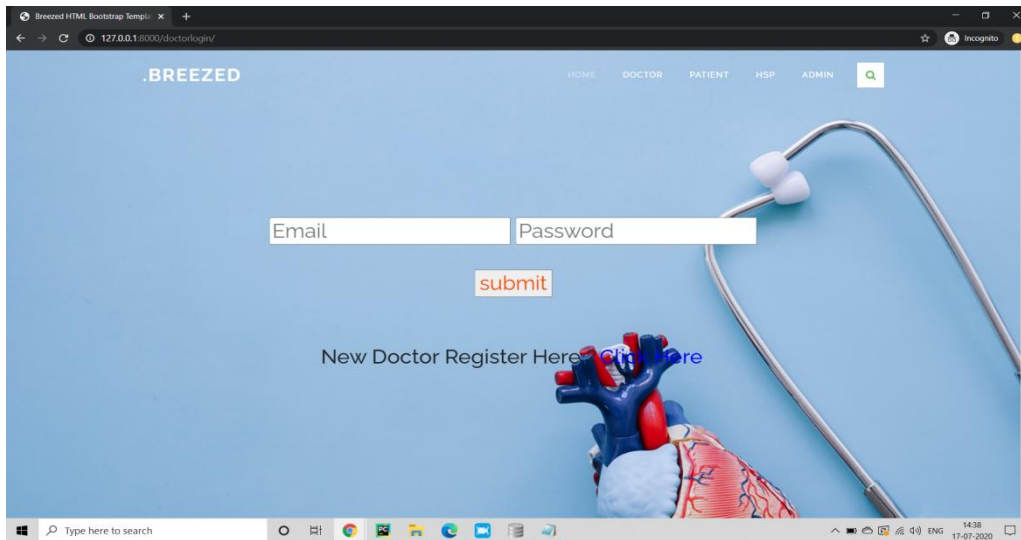
4. Modules

Doctor: The Doctor can register the first. While registering he required a valid doctor email and mobile for further communications. Once the doctor registers, then the admin can activate the customer. Once the admin activates the customer then the customer can login into our system. After login he can see the view-patient data. based on patient symptoms, the doctor will give the precautions and he will give thedoctor treatment.

Patient: The Doctor can register the first. While registering he required a valid patient email and mobile for further communications. Once the patient registers, then the admin can activate the patient. Once the admin activates the patient then the patient can login into our system. After login he can provide symptoms. based on patient symptoms, the doctor will give the precautions and he will give thedoctor treatment.
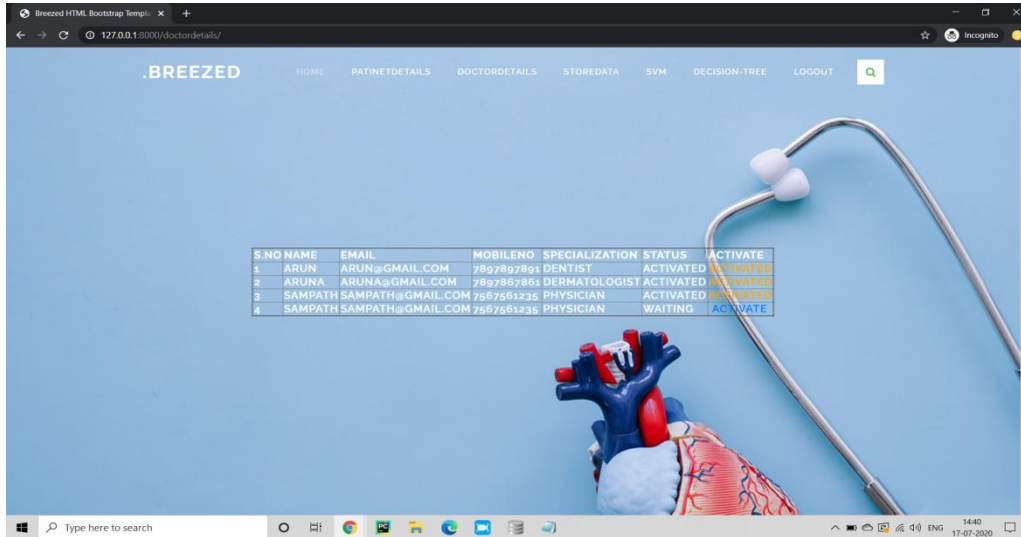
Admin: Admin can login with his credentials. Once he logs in, he can activate the doctors. The activated user only login in our applications. Once he logs in, he can activate the patients. The admin can add new data to the dataset. So, this data user can perform the testing process.Admin can get predictions SVM algorithm and also get the prediction from the decision tree.
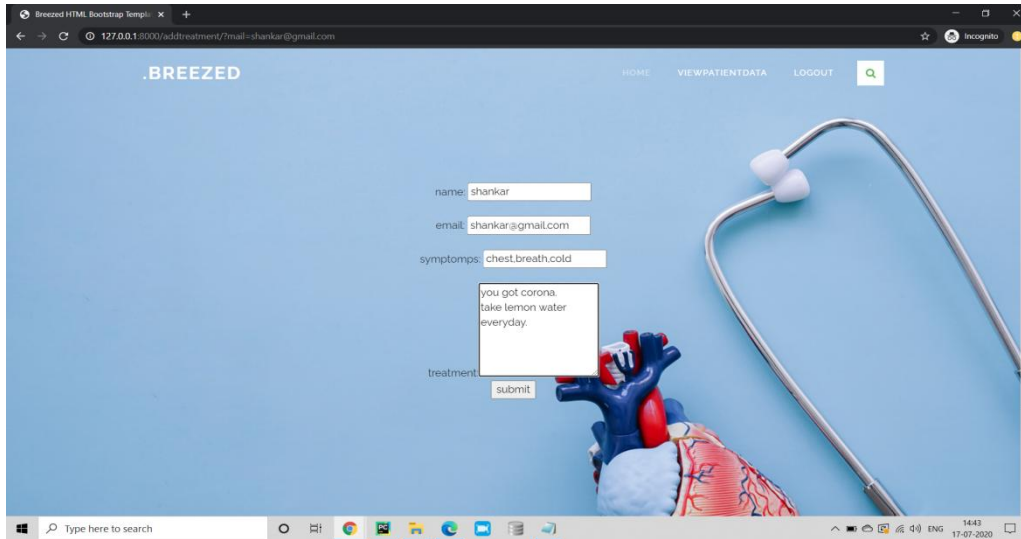
Machine learning:ML refers to the computer's acquisition of a kind of ability to make predictive judgments and make the best decisions by analyzing and learning many existing data. The

representation algorithms include deep learning, artificial neural networks, decision trees, enhancement algorithms and so on. The keyway for computers to acquire artificial intelligence is machine learning. Nowadays, machine learning plays an important role in various fields of artificial intelligence. Whether in aspects of internet search, biometric identification, auto driving, Mars robot, or in American presidential election, military decision assistants and so on, basically, if there is a need for data analysis, machine learning can be used to play a role.
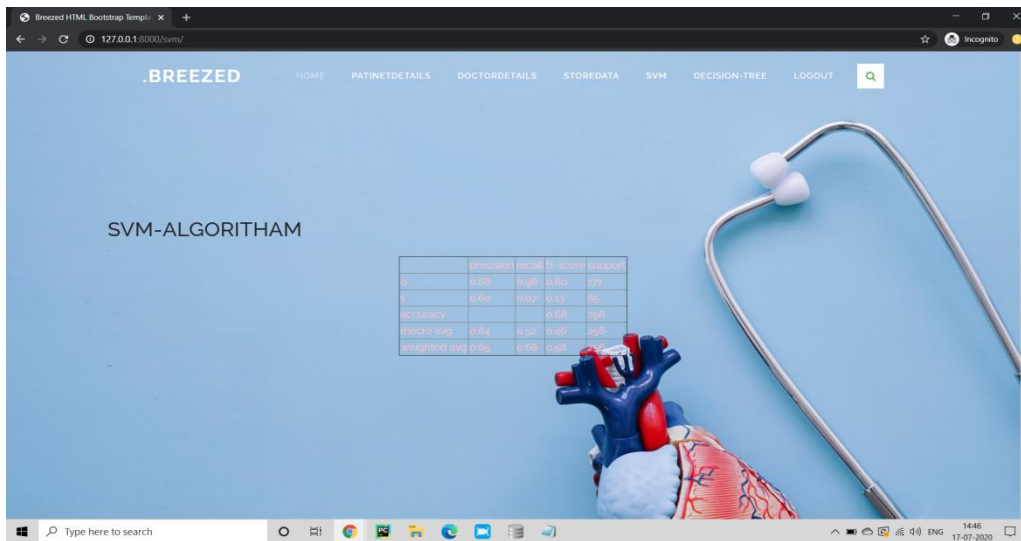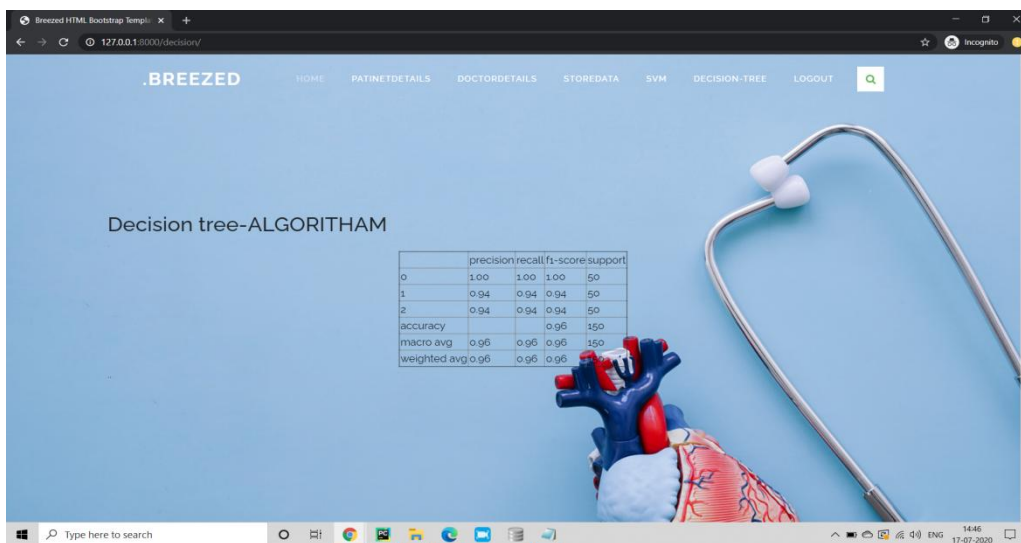

Doctor details:

SVM:

	precision	recall	f1-score	support
0	0.68	0.96	0.80	171
1	0.80	0.07	0.13	95
accuracy			0.68	258
macro avg	0.64	0.52	0.40	258
weighted avg	0.65	0.68	0.58	258

Decision-tree:

	precision	recall	f1-score	support
0	1.00	1.00	1.00	50
1	0.94	0.94	0.94	50
2	0.94	0.94	0.94	50
accuracy			0.96	150
macro avg	0.96	0.96	0.96	150
weighted avg	0.96	0.96	0.96	
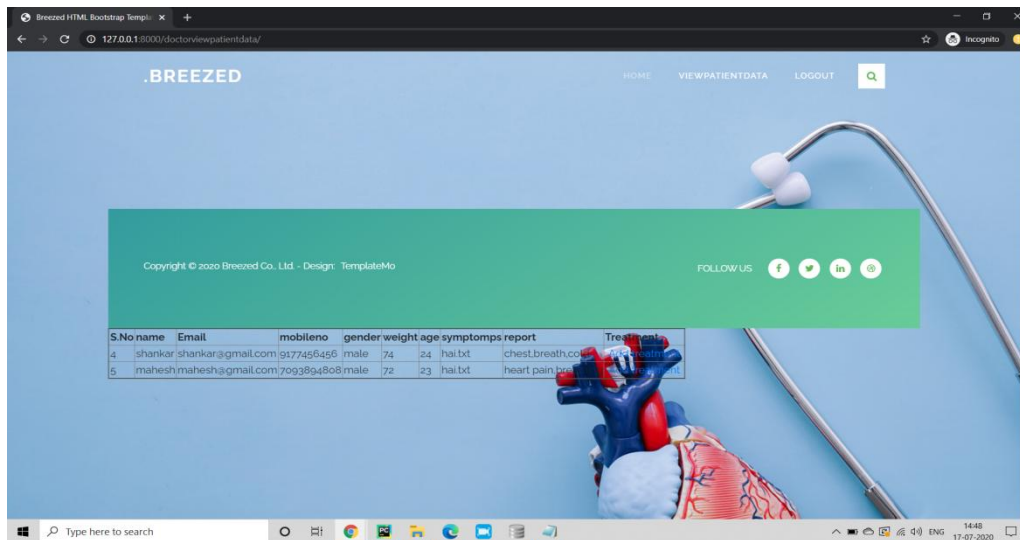
5. Sample test cases

S. No.	Test Case	Excepted Result	Result	Remarks (If fails)
1.	Doctor Register	If Doctor registration successfully.	Pass	If already Doctor mail exists, then it fails.
2.	Doctor Login	If the Doctor name and password is correct, then it will be a valid page.	Pass	Un-registered doctors will not be logged in.
3.	Patient Register	If patient registration successfully.	Pass	If already patient mail exists, then it fails.
4	patient login	If the patient's name and password is correct, then it will be a valid page	Pass	Un-registered patients will not be logged in..
5.	hsp login	based on body id doctor will give body report to forensic	Pass	can't provide the body report to forensic.
6.	after doctor login	display the patient data	Pass	can't get the patient data.
7.	doctor add treatment	doctor add the treatment based on the patient symptoms	Pass	won't add treatment to patient.
8.	Admin login	Admin can login with his login credential. If success he get his home page	pass	Invalid login details will not allow here
9.	Admin can activate the register patients	Admin can activate the register patient id	Pass	If the patient did not find it then it wouldn't login
10.	Admin can activate the register doctors	Admin can activate the register user id	Pass	If the doctor did not find it then it wouldn't login.

6. Conclusion

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 the 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 a balance between manpower and machine is also a problem that everyone of us must face.

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