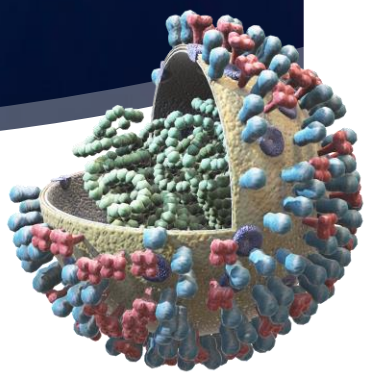
2023

Diagnoses System



Artificial Intelligence in Disease Diagnosis

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PROBLEM STATEMENT

During the time when Machine Learning and Deep Learning are booming so much, it is very important to understand that all this knowledge is not of any use if we can't apply it to different areas and impact the humanity.
This dataset will help you apply your existing knowledge to great use. Applying Knowledge to field of Medical Science and making the task of Physician easy is the main purpose of this dataset. This dataset has 132 parameters on which 42 different types of diseases can be predicted.

Due to big data progress in biomedical and healthcare communities, accurate study of medical data benefits early disease recognition, patient care and community services. When the quality of medical data is incomplete the exactness of study is reduced. Moreover, different regions exhibit unique appearances of certain regional diseases, which may result in weakening the prediction of disease outbreaks.

ABSTRACT

Artificial intelligence can assist providers in a variety of patient care and intelligent health systems. Artificial intelligence techniques ranging from machine learning to deep learning are prevalent in healthcare for disease diagnosis, drug discovery, and patient risk identification. Numerous medical data sources are required to perfectly diagnose diseases using artificial intelligence techniques, such as ultrasound, magnetic resonance imaging, mammography, genomics, computed tomography scan, etc. Furthermore, artificial intelligence primarily enhanced the infirmary experience and sped up preparing patients to continue their rehabilitation at home. This project covers the comprehensive survey based on artificial intelligence techniques to diagnose numerous diseases such as Alzheimer, cancer, diabetes, chronic heart disease, tuberculosis, stroke and cerebrovascular, hypertension, skin, and liver disease. We conducted an extensive survey including the used medical imaging dataset and their feature extraction and classification process for predictions.

INTRODUCTION

Healthcare is shaping up in front of our eyes with advances in digital healthcare technologies such as artificial intelligence (AI), 3D printing, robotics, nanotechnology, etc. Digitized healthcare presents numerous opportunities for reducing human errors, improving clinical outcomes, tracking data over time, etc. AI methods from machine learning to deep learning assume a crucial function in numerous well-being-related domains, including improving new clinical systems, patient information and records, and treating various illnesses. The AI techniques are also most efficient in identifying the diagnosis of different types of diseases. The presence of computerized reasoning (AI) as a method for improved medical services offers unprecedented occasions to recuperate patient and clinical group results, decrease costs, etc.

MARKET, CUSTOMER, BUSINESS NEED

Market Needs:

- Extensive progress in digital health has made it possible for healthcare providers to aid patients with novel treatment methods.
- AI technologies provide practitioners with tools that improve their ability to diagnose and successfully treat patients. However, doctors have been demonstrated to be resistant to adopting new technologies. For instance, medical professionals believe that AI would replace physicians in the coming years.
- Doctors and radiologists feel that talents, like empathy or persuasion, are uniquely human; hence, technologies cannot eliminate the requirement for a doctor entirely.

Customer Needs:

- A.I. Powered Smart Technologies And Applications Help In Disease Detection And Management

On the basis of End-User, the is segregated into Hospitals, Diagnostics Imaging Centers, Diagnostics Laboratories, and Others. In 2021, the diagnostic centers segment recorded a significant revenue share of the AI in the medical diagnosis market. In patients with infectious diseases and immunological disorders, laboratory tests are very helpful for verifying a diagnosis, estimating disease severity, and tracking disease progression. In disease management, timely diagnostic assessment and execution of trustworthy testing are crucial.

- A difficult change to adapt to Serves rural communities better
- Improved customer Experience
- Cost and Time Saving

Business Needs:

- Accurate Diagnosis Report:
  Avid Radiopharmaceuticals is developing novel approaches to diagnosing Alzheimer's disease, other neurodegenerative diseases, and cancer
- Virtual Health Assistant:
  This is created by integrating systems with cognitive computing, augmented reality, and body and speech gestures. It is among the most useful AI applications in healthcare that offers a personalized experience to patients in terms of managing their health and getting rid of their queries. It reduces the frequency of visits to the hospitals, benefitting both patients and healthcare experts.

- Improving efficiency in operations:
  By examining data patterns, AI technologies can help healthcare organizations make the most of their data, assets and resources, increasing efficiency and improving performance of clinical and operational workflows, processes, and financial operations.

- Improved Quality , Cost and time Saving
  medical professionals can make more informed decisions based on more accurate information - saving time, reducing costs and improving medical records management overall.

DIRECTIONS FOR THE USE OF AI IN HEALTH CARE

The most promising applications of AI technology in healthcare are drug development and application; medical imaging and diagnostics; physician decision support; forecasting and risk analysis; lifestyle management and monitoring; information processing and analysis from wearable devices; monitoring of chronic conditions; virtual assistants; emergency care and surgery. Within the framework of this study, it is proposed to analyze in detail the following areas of using AI technology in medicine.
The authors examine the application of the following AI-based systems:

a cyborg-AI-doctor–a human individual with an intelligent AI chip implanted in their brain (a cybernetic organism);
an AI-robot–an autonomous cyber physical system (machine) that can independently navigate through the hospital or visit outpatients in their homes;
an AI-hospital, or an *AI-medical organization*–AI implemented within a perimeter of a given medical organization (on-site);
an AI-cloud-doctor–an AI-based software platform, whose information and communication infrastructure, data processing and decision-making tools are hosted in a cloud storage service (off-site).

As a result of the analysis, a palette of possible forms of AI in medical practice is revealed, taking into account territorial, technological, ethnic and other factors that affect the choice of the form of AI in the provision of medical services.

LIMITATIONS OF AI IN DISEASE DIAGNOSIS

Obviously, one cannot currently have an X-ray, MRI, or CAT scan at home (off-site). Physical contact with a patient is still required in many cases. The available portable equipment allows only limited medical testing to be done at a patient's home. Thus, cyborg-AI-doctors, AI-robots and AI-medical organizations will need to be deployed in healthcare facilities. An AI-cloud-doctor is not yet capable of providing a comprehensive patient examination remotely, but some promising results have already been achieved in this area; Every doctor, like any other specialist, is susceptible to doubt and fear of admitting an error. This leads to potential disagreements among physicians with regard to diagnosis, prediction of the disease progression and choice of treatment.

APPLICABLE PATENTS

PATENTING AI FOR MEDICAL DIAGNOSTICS

From The Perspective Of European Patent Law, The Application Of Ai To Healthcare Is Particularly Interesting Because On The Surface It Seems To Relate To Several Different Types Of Patent Exclusions. Mathematical Methods, Computer Programs And Methods Of Treatment And Diagnoses Performed On A Human Body Are All Excluded From Patent Protection In European Patent Law.

Specifically, Article 52(2) of the European Patent Convention (EPC) lists a number of subjects that are not regarded as inventions by the European Patent Office (EPO). Among them are programs for computers and mathematical methods. You may think that AI and ML models fall into both of these categories, being a mathematical model implemented on a computer. However, Article 52(3) of the EPC goes on to state that applications related to these subjects are only excluded "to the extent to which a European patent application or European patent relates to such subject-matter or activities as such".

Article 53 of the EPC thus states that patents shall not be granted for "diagnostic methods practiced on the human or animal body". However, it is important to note that this exception to patentability only applies to method claims and so does not exclude protection for a medical device or computer program which carries out a diagnostic method.
Even for method claims, in our experience if is still often possible to overcome the Article 53 EPC exclusion. The EPO Guidelines provide four phases which need to be performed for a method to fall within the Article 53 exclusion.

the Article 53 exclusion relates to diagnostic methods "practiced on the human or animal body". To determine this, it must be ascertained whether an interaction with the human or animal body takes place.

In conclusion, armed with knowledge of the issues, the exclusions of Article 52(2) and 53 of the EPC can often be avoided by careful drafting. Of course, the usual criteria of novelty and non-obviousness will still need to be met – but for the right invention, it is certainly possible to gain patent protection for the use of artificial intelligence in healthcare applications.

APPLICABLE REGULATIONS / LAWS

Federal Food, Drug, and Cosmetic Act (FDCA): FDA enforces the FDCA, which regulates the safety and effectiveness of drugs and medical devices, including certain forms of medical software. The bulk of this chapter describes the application of the FDCA to health care clinical AI systems.

Health Insurance Portability and Accountability Act (HIPAA): In addition to the Privacy Rule (described in more detail below), HIPAA authorizes the U.S. Department of Health and Human Services to enforce the Security Rule (45 C.F.R. Parts 160 and 164). These rules create privacy and security requirements for certain health information

Common Rule: The Common Rule sets requirements for research on human subjects that either is federally funded or, in many instances, takes place at institutions that receive any federal research funding

Federal Trade Commission Act (FTCA): The FTCA prohibits deceptive and unfair trade practices affecting interstate commerce. These could include acts relating to false and misleading health claims, representations regarding a piece of software's performance, or claims affecting consumer privacy and data security

FTC Health Breach Notification Rule: This FTC rule, separate from HIPAA's Breach Notification Rule, requires certain businesses to notifications to consumers after a breach of personal health record information, including information that may be collected to train, validate, or use health care AI systems

State tort law: When one individual or entity injures another, tort law may allow the injured individual to recover damages. Injury could result from the use of health care AI systems, including when the behavior of developers, providers, hospitals, or other health care actors falls below the standard of care.

ROLE OF AI IN DISEASE DIAGNOSIS

- ACCURATE CANCER DIAGNOSIS

PathAI offers one of the best Machine Learning and Artificial Intelligence tool in healthcare that allows Pathologists to make accurate diagnoses. PathAI reduces errors during the process of cancer diagnosis and offers a range of new techniques for individual medical treatment. With increased accuracy in the diagnosis of cancer patients, most of them can be looked after or be cured at a stage where it does not turn fatal, saving numerous lives.

- CUSTOMER SERVICE CHATBOTS

Chatbots are developed using technologies like NLP, allowing patients to raise their queries regarding appointments, bill payments, and more. Chatbots also communicate with the patients with respect to their illness and symptoms, which in turn helps in reducing the load on medical professionals.

Further, the chatbots assist in offering the required solutions to the patients, allowing Healthcare experts to focus on other important tasks at hand. This healthcare solution not only engages patients but also gives advanced treatment to them and offers better outcomes.

- VIRTUAL HEALTH ASSISTANTS

Virtual health assistants are responsible for a number of things, including responding to the queries of routine patients via calls and emails, managing medical information of the patients and covering sensitive data, scheduling appointments with doctors, sending follow-ups and clinical appointment reminders to the patients, etc.

- TREATMENT OF RARE DISEASES

With the help of technologies such as Deep Learning and AI, BenevolentAI became capable of providing the correct treatment to the required patients at the right time, resulting in achieving better target selection of patients and offering insights. The company is working on getting its drugs licensed and creating portable medications for rare diseases.

- MANAGEMENT OF MEDICAL RECORDS

Healthcare is among the next Big Data frontiers that need to be tamed. Like a needle in a haystack, significant and valuable data may get lost in the huge pile of data, leading to the loss of billions of dollars a year for the industry. Moreover, without being able to connect significant data points, the development of proper diagnosis and new medicines and drugs slows down.

- REDUCTION OF DOSAGE ERRORS

Even a single extra dose of a medicine or a drug can have some dire consequences on a patient's body, which is why it is important that the patient takes the right amount of medicine as prescribed. Otherwise, there may be serious repercussions. With the help of Artificial Intelligence, the industry will be able to reduce the margin of probable errors in medication.

- ROBOT-ASSISTED SURGERY

Robot-assisted surgery has gained a lot of popularity recently. Several hospitals are implementing robotics that assists them in completing tasks that require precision, control, and flexibility. It is used in tasks, including open-heart surgery, exceeding human capabilities. Robots integrated with mechanical arms, cameras, and required surgical instruments augment the knowledge, skills, and experience of the doctors, creating a new form of surgery.

- AUTOMATED IMAGE DIAGNOSIS

AI applications make it easy to decipher images to conduct analysis. Using Deep Learning technologies and programs, these AI systems equip themselves with algorithms that offer a quicker reading of complex images, including those from CT scans and MRIs. The automated image diagnosis system offers improved performance to doctors, providing better diagnoses of diseases.

- FRAUD DETECTION

While there are several patients searching for effective medical services that save cost, there is also an exponential rise in the rate of fraud cases. This has made most medical organizations and patients suffer huge damage. With the help of AI-based solutions, these fraud attempts have reduced massively as these tools allow elaborate navigation through the processes and detect fraud.

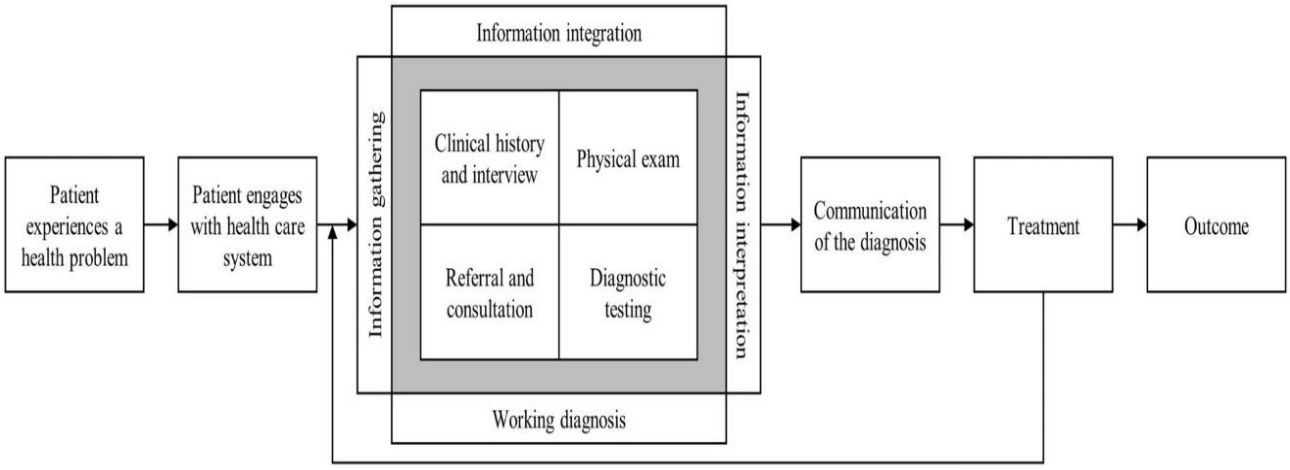
- DEVELOPMENT OF NEW MEDICINES

Coming up with new drugs for clinical trials takes a lot of time and money. The unique benefit of Artificial Intelligence technology allows healthcare professionals to scan pre-existing medicines and use them to redesign medication in a way that allows them to fight against specific diseases. This makes it cheaper to develop new drugs.

- IMPROVED HEALTHCARE ACCESS

Artificial Intelligence has led to the development of several medical software that offers interactive and customized healthcare services like anytime appointments with doctors. The patients have better and improved access to the hospitals when required, and the AI chatbots help them further. If the issues are minor, then the patients are automatically recommended the respective medication, and if a doctor visit is necessary, then the same is suggested to the patients.

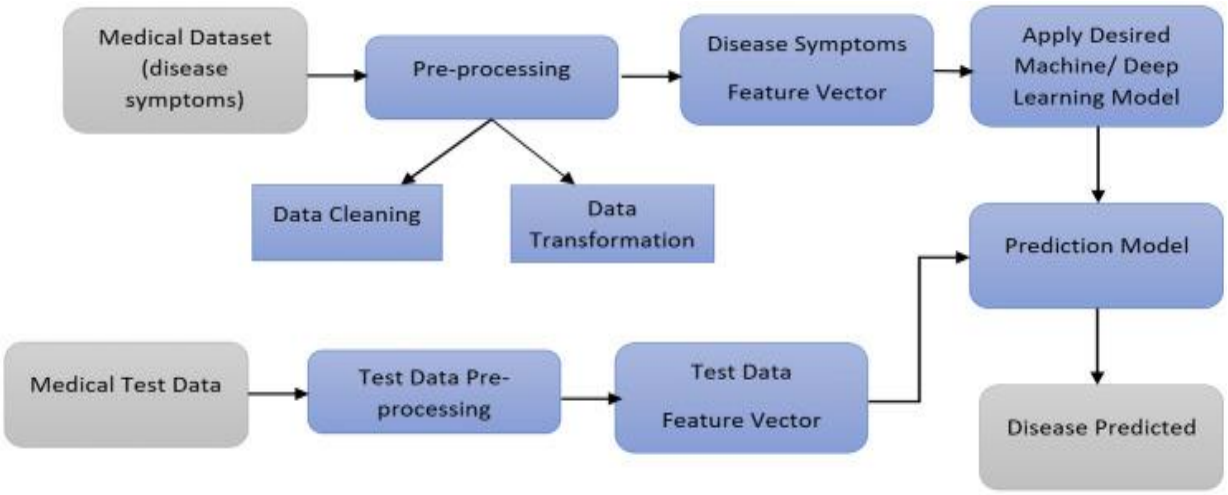
PRODUCT PROTOTYPE



Initially, the patient experiences a health problem associated with the individual's symptoms, which causes the person to contact the healthcare system, where sufficient information is collected via reviewing the patient's clinical history and conducting an interview, performing a physical exam and diagnostic testing, and referral and consultation that involves other medical experts.

Information gathering, integration, and interpretation, as well as providing a working diagnosis—for example, a single or differential diagnosis—together represent a continuous process that can be repeated several times. The working diagnosis and an explanation of it are shared with the patient, and appropriate treatment is planned. Finally, this process results in an outcome for patients and the healthcare system, such as learning from error or a timely diagnosis.

FRAMEWORK FOR DISEASE DETECTION SYSTEM



DATA SOURCE

Numerous medical data sources are required to perfectly diagnose diseases using artificial intelligence techniques, such as ultrasound, magnetic resonance imaging, mammography, genomics, computed tomography scan, etc. Preferred reporting items for systematic reviews and Meta-Analysis guidelines are used to select the articles published on the Web of Science, Kaggle, Scopus, Google Scholar, PubMed, Excerpta Medical Database, and Psychology Information for early prediction of distinct kinds of diseases using artificial intelligence-based techniques.

- **Algorithms that can be Used:**

1. Random Forest

   Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. This algorithm to improve accuracy and reduce overfitting. It can be predicting correct accuracy of disease diagnosis

2. Decision Tree Classifier

Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems.

3. Neural Network

   A neural network is a method in artificial intelligence that teaches computers to process data in a way that is inspired by the human brain. It can be predict Diagnosis the disease by learning Datasets

- ## Software Needed

1. Python: It is one of the best language used by data scientist for various data science projects/application. Python provide great functionality to deal with mathematics, statistics and scientific function

2. Excel: Excel is a spreadsheet program from Microsoft and a component of its Office product group for business applications. Microsoft Excel enables users to format, organize and calculate data in a spreadsheet.

3. Jupyter: The Jupyter Notebook is an open source web application that you can use to create and share documents that contain live code, equations, visualizations, and text.

4.Tableau: Tableau Desktop delivers everything you need to access, visualize, and analyze your data. With an intuitive drag and drop interface, you can uncover the hidden insights you need to make impactful business decisions faster, even when you are offline.

CODE IMPLEMENTATION

Import Libraries

```
import numpy as np
import pandas as pd
import seaborn as sb
from matplotlib import pyplot as plt
import seaborn as sns
import plotly.express as px
from sklearn.model_selection import train_test_split
from sklearn import metrics
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
from sklearn.ensemble import RandomForestClassifier as RFC
from sklearn.model_selection import cross_val_score
from sklearn.tree import DecisionTreeClassifier
```

```
train.head()
```

	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_tongue	...	scurring	skin_peeli
0	1	1	1	0	0	0	0	0	0	0	...	0	
1	0	1	1	0	0	0	0	0	0	0	...	0	
2	1	0	1	0	0	0	0	0	0	0	...	0	
3	1	1	0	0	0	0	0	0	0	0	...	0	
4	1	1	1	0	0	0	0	0	0	0	...	0	

5 rows × 134 columns

```
test.head()
```

	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_tongue	...	blackheads	scurrin
0	1	1	1	0	0	0	0	0	0	0	...	0	
1	0	0	0	1	1	1	0	0	0	0	...	0	
2	0	0	0	0	0	0	0	1	1	1	...	0	
3	1	0	0	0	0	0	0	0	0	0	...	0	
4	1	1	0	0	0	0	0	1	0	0	...	0	

Data Cleaning

```
train.isnull().sum()
```

```
itching                    0
skin_rash                  0
nodal_skin_eruptions       0
continuous_sneezing        0
shivering                  0
                        ...
blister                    0
red_sore_around_nose       0
yellow_crust_ooze          0
prognosis                  0
Unnamed: 133            4920
Length: 134, dtype: int64
```

```
train = train.drop('Unnamed: 133', axis=1)
```

```
train.isnull().sum()
```

```
itching                 0
skin_rash               0
nodal_skin_eruptions    0
continuous_sneezing     0
shivering               0
                       ..
inflammatory_nails      0
blister                 0
red_sore_around_nose    0
yellow_crust_ooze       0
prognosis               0
Length: 133, dtype: int64
```

```
train.shape
```

```
(4920, 133)
```

```
test.shape
```

```
(42, 133)
```

```
train.isnull().any()
```

```
itching                 False
skin_rash               False
nodal_skin_eruptions    False
continuous_sneezing     False
shivering               False
                        ...
inflammatory_nails      False
blister                 False
red_sore_around_nose    False
yellow_crust_ooze       False
prognosis               False
Length: 133, dtype: bool
```

```
train.corr()
```

	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_
itching	1.000000	0.318158	0.326439	-0.086906	-0.059893	-0.175905	-0.160650	0.202850	-0.086906	-0
skin_rash	0.318158	1.000000	0.298143	-0.094786	-0.065324	-0.029324	0.171134	0.161784	-0.094786	-0
nodal_skin_eruptions	0.326439	0.298143	1.000000	-0.032566	-0.022444	-0.065917	-0.060200	-0.032566	-0.032566	-0
continuous_sneezing	-0.086906	-0.094786	-0.032566	1.000000	0.608981	0.446238	-0.087351	-0.047254	-0.047254	-0
shivering	-0.059893	-0.065324	-0.022444	0.608981	1.000000	0.295332	-0.060200	-0.032566	-0.032566	-0
...	...	...	...	...	...	...	...	...	...	

```
train.duplicated()
```

```
0       False
1       False
2       False
3       False
4       False
        ...
4915     True
4916     True
4917     True
4918     True
4919     True
Length: 4920, dtype: bool
```

```
# check if balanced
train['prognosis'].value_counts()
```

```
Fungal infection                          120
Hepatitis C                               120
Hepatitis E                               120
Alcoholic hepatitis                       120
Tuberculosis                              120
Common Cold                               120
Pneumonia                                 120
Dimorphic hemmorhoids(piles)              120
Heart attack                              120
Varicose veins                            120
Hypothyroidism                            120
Hyperthyroidism                           120
Hypoglycemia                              120
Osteoarthristis                           120
Arthritis                                 120
(vertigo) Paroymsal  Positional Vertigo   120
Acne                                      120
Urinary tract infection                   120
```

Train Test Split

```
A = train[["prognosis"]] # diseases
B = train.drop(["prognosis"],axis=1) # symptoms
C = test.drop(["prognosis"],axis=1) # symptoms - testing
trainx, testx,trainy, testy = train_test_split(B,A,test_size=0.2)
```

Apply Machine Learning Algorithms

Random Forest

```
mod = RandomForestClassifier(n_estimators = 100,n_jobs = 5, criterion= 'entropy',random_state = 42)
mod = mod.fit(trainx,trainy.values.ravel())
pred = mod.predict(testx)
```

```
metrics.accuracy_score(testy, pred)
```

```
1.0
```

```
report = classification_report(testy, pred, output_dict=True)
pd.DataFrame(report).transpose()
```

	precision	recall	f1-score	support
(vertigo) Paroymsal Positional Vertigo	1.0	1.0	1.0	28.0
AIDS	1.0	1.0	1.0	30.0
Acne	1.0	1.0	1.0	23.0
Alcoholic hepatitis	1.0	1.0	1.0	13.0
Allergy	1.0	1.0	1.0	15.0
Arthritis	1.0	1.0	1.0	25.0

```
test = test.join(pd.DataFrame(mod.predict(C),columns=["predicted"]))[["prognosis","predicted"]]

test['result']= ' '
for i in range(len(test)):
    if test["prognosis"][i] == test["predicted"][i]:
        test['result'].iloc[i] = 'Correct'
    else:
        test['result'].iloc[i] = 'Incorrect'
test
```

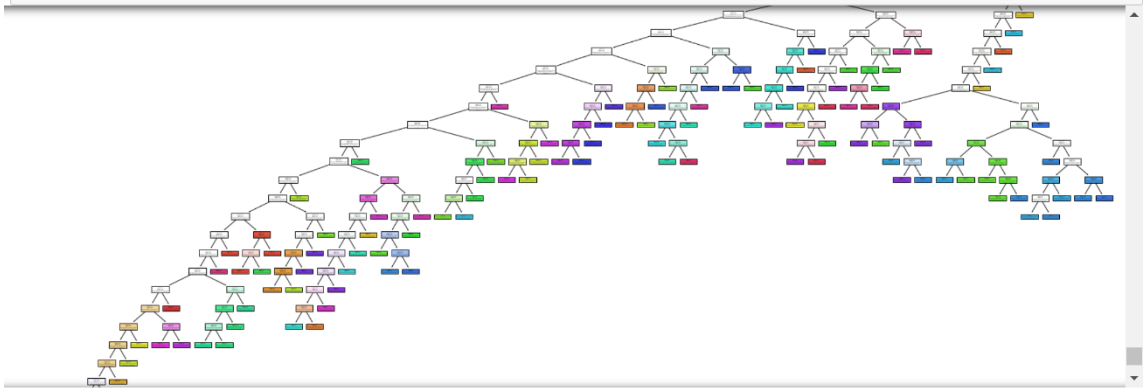
	prognosis	predicted	result
0	Fungal infection	Fungal infection	Correct
1	Allergy	Allergy	Correct
2	GERD	GERD	Correct
3	Chronic cholestasis	Chronic cholestasis	Correct
4	Drug Reaction	Drug Reaction	Correct
5	Peptic ulcer diseae	Peptic ulcer diseae	Correct
6	AIDS	AIDS	Correct
7	Diabetes	Diabetes	Correct
8	Gastroenteritis	Gastroenteritis	Correct
9	Bronchial Asthma	Bronchial Asthma	Correct
10	Hypertension	Hypertension	Correct
11	Migraine	Migraine	Correct
12	Cervical spondylosis	Cervical spondylosis	Correct
13	Paralysis (brain hemorrhage)	Paralysis (brain hemorrhage)	Correct
14	Jaundice	Jaundice	Correct
15	Malaria	Malaria	Correct

```
cm = confusion_matrix(y_test, pred)
pd.DataFrame(cm)
```

	0	1	2	3	4	5	6	7	8	9	...	31	32	33	34	35	36	37	38	39	40
0	0	1	0	0	0	0	1	0	1	0	...	1	2	0	0	1	1	2	0	2	2
1	0	0	0	0	0	0	1	0	1	0	...	0	1	0	1	1	0	2	1	0	1
2	0	2	0	0	0	2	0	2	0	0	...	0	0	0	0	1	1	0	0	0	1
3	1	0	0	0	0	0	1	1	0	1	...	0	0	0	1	0	0	0	0	0	2
4	0	1	0	0	0	0	3	0	1	0	...	0	2	0	1	0	0	0	1	0	0
5	0	1	1	0	0	0	0	0	2	0	...	1	0	0	0	0	1	0	0	1	1
6	3	2	1	0	0	0	0	0	0	0	...	0	0	0	1	1	1	2	2	1	0
7	0	0	0	1	1	0	0	1	0	0	...	1	0	2	1	1	0	0	1	0	1
8	2	0	0	0	0	1	0	0	0	0	...	2	0	2	0	0	4	0	0	1	1
9	0	0	2	0	2	1	1	1	1	1	...	0	0	0	0	1	0	0	0	1	0
10	2	0	1	0	0	1	0	0	1	1	...	1	0	1	0	1	0	2	1	1	1
11	2	0	0	0	1	3	2	0	0	1	...	0	0	1	1	1	0	1	1	0	0
12	1	0	0	0	1	0	0	0	0	0	...	0	1	0	1	1	1	1	1	0	2
13	0	0	0	0	0	1	0	2	0	0	...	0	1	2	0	2	1	0	0	0	2
14	0	0	1	1	0	1	0	1	1	1	...	0	0	0	1	0	1	0	0	2	0
15	1	1	0	0	0	1	1	1	0	0	...	2	0	1	0	0	1	1	0	0	2
16	1	2	2	0	1	0	0	0	0	1	...	0	0	0	0	2	0	0	0	0	2
17	1	0	3	0	1	0	1	0	1	0	...	2	0	0	1	0	1	0	0	0	0
18	0	1	1	0	0	0	0	1	1	0	...	1	0	0	0	2	1	0	0	0	0
19	0	1	0	0	1	1	0	0	0	3	...	2	0	0	0	2	0	2	4	0	0
20	1	0	1	1	1	0	0	1	1	1	...	0	0	1	1	1	0	0	0	1	1

35	Arthritis	Arthritis	Correct
36	(vertigo) Paroymsal Positional Vertigo	(vertigo) Paroymsal Positional Vertigo	Correct
37	Acne	Acne	Correct
38	Urinary tract infection	Urinary tract infection	Correct
39	Psoriasis	Psoriasis	Correct
40	Impetigo	Impetigo	Correct
41	Fungal infection	Fungal infection	Correct

```
from sklearn import tree
plt.figure(figsize=(30,15))
tree.plot_tree(mod.estimators_[8],filled = True)
```



Decision Tree

```
dt = DecisionTreeClassifier()
clf = dt.fit(trainx,trainy)
pred = clf.predict(testx)
scores = cross_val_score(clf, testx,testy, cv=5)
print("for Decision Tree: ")
print(scores.mean())
```

```
for Decision Tree:
0.9695224282606445
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CONCLUSION AND FUTURE SCOPE

When it comes to disease diagnosis, accuracy is critical for planning, effective treatment and ensuring the well-being of patients. AI is a vast and diverse realm of data, algorithms, analytics, deep learning, neural networks, and insights that is constantly expanding and adapting to the needs of the healthcare industry and its patients. According to the findings of this study, AI approaches in the healthcare system, particularly for illness detection, are essential. Aiming at illuminating how machine and deep learning techniques work in various disease diagnosis areas, the current study has been divided into several sections that cover the diagnosis of Alzheimer's, cancer, diabetes, chronic diseases, heart disease, stroke and cerebrovascular disease, hypertension, skin disease, and liver disease. The introduction and contribution were covered in the first section, followed by an evaluation of the quality of the work and an examination of AI approaches and applications. Later, various illness symptoms and diagnostic difficulties, a paradigm for AI in disease detection models, and various AI applications in healthcare were discussed. Finally, the work that assisted researchers in determining the most effective method for detecting illnesses is finished, as in future scope. In a nutshell, medical experts better understand how AI may be used for illness diagnosis, leading to more appropriate proposals for the future development of AI based techniques.

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