

(54) Title of the invention : LIVER TUMOUR PREDICTION USING DEEP LEARNING

(51) International classification :G06F0018241100, G06N0020000000, G06F0017180000, G16H0050200000, G16B0040000000

(86) International Application No :NA
 Filing Date :NA

(87) International Publication No : NA
 Filing Date :NA

(61) Patent of Addition to Application Number :NA
 Filing Date :NA

(62) Divisional to Application Number :NA
 Filing Date :NA

(71)Name of Applicant :
 1)Ms.Dhanashree Kuthe
 Address of Applicant :Assistant Professor, Computer Science and Emerging Technology, Ramdeo Baba University, Nagpur- 440013, Maharashtra -----
 2)Mr. Parthasarathi M
 3)Mrs.A.Vaishnavi
 4)Dr. L.Sudha
 5)Dr.P.Nirmaladevi
 6)Mrs. P. Karthika
 7)Dr B Angelin
 8)Mrs.V.Deepa
 9)Mrs.S.Nithya
 10)Mrs.J.Saivijayalakshmi
 Name of Applicant : NA
 Address of Applicant : NA

(72)Name of Inventor :
 1)Ms.Dhanashree Kuthe
 Address of Applicant :Assistant Professor, Computer Science and Emerging Technology, Ramdeo Baba University, Nagpur- 440013, Maharashtra -----
 2)Mr. Parthasarathi M
 Address of Applicant :Assistant Professor, Computer Science and Applications Kristu Jayanti College, Bangalore- 560077, Karnataka -----
 3)Mrs.A.Vaishnavi
 Address of Applicant :Assistant Professor, Department of Computer Applications, Kongunadu Arts and Science College- 641029, Coimbatore, Tamilnadu -----
 4)Dr. L.Sudha
 Address of Applicant :Associate Professor, Department of Computer Science, VET Institute of Arts and Science(Co-Ed) College, Erode- 638012, Tamilnadu -----
 5)Dr.P.Nirmaladevi
 Address of Applicant :Assistant Professor, Department of Computer Applications, Nandha Arts and Science College (Autonomous), Erode, Pincode-638052, Tamilnadu -----
 6)Mrs. P. Karthika
 Address of Applicant :Head & Assistant Professor, Department of Computer Science, Tagore College of Arts and Science, Chromepet-44., Chengalpattu, Tamilnadu -----
 7)Dr B Angelin
 Address of Applicant :Assistant Professor, Department of Information Technology,Dr SNS Rajalakshmi College of Arts and Science (Autonomous), Coimbatore- 641049, Tamilnadu -----
 8)Mrs.V.Deepa
 Address of Applicant :Assistant Professor Department of Computer Science Sri Ramakrishna College of Arts & Science Coimbatore -641006, Tamilnadu -----
 9)Mrs.S.Nithya
 Address of Applicant :Assistant Professor, Dharmamurthi Rao Bahadur Calavala Cunnan Chetty's Hindu College Pattabiram - 600072, Tamilnadu -----
 10)Mrs.J.Saivijayalakshmi
 Address of Applicant :Assistant Professor SRMIST,Ramapuram,Chennai - 600 089, Tamilnadu -----

(57) Abstract :
 LIVER TUMOUR PREDICTION USING DEEP LEARNING Abstract Different types of methods used in the prior identification of liver tumour from civ dataset using machine learning techniques. we have created the prediction model for Hepatocellular carcinoma (HCC) liver tumour. we have proposed a straight-forward approach of predicting the HCC liver cancer using publicly available dataset. Different types of data pre-processing are done on the dataset for extracting the most optimal information, and also different types of classification models like Linear Regression, Support vector machine classifier, DecisionTree Regressor etc. are used to see the prediction results. We achieved good results in terms of accuracy and computational time. machine learning is a part of man-made consciousness that utilizes an assortment of measurable, probabilistic and enhancement methods that enables PCs to "learn" from past precedents and to identify hard-to-recognize designs from huge, boisterous or complex informational indexes. This capacity is especially appropriate to restorative applications, particularly those that rely upon complex proteomic and genomic estimations. Therefore, machine learning is every now and again utilized in disease conclusion and discovery. All the more as of late machine learning has been connected to disease guess and forecast. This last mentioned approach is especially intriguing as it is a piece of a developing pattern towards customized, prescient drug. In collecting this audit we led a wide overview of the distinctive sorts of machine learning techniques being utilized, the kinds of information being coordinated and the execution of these techniques in growth forecast and visualization. Various distributed examinations additionally appear to come up short on a fitting level of approval or testing. Among the better composed and approved investigations unmistakably machine learning techniques can be utilized to generously (15-25%) enhance the precision of foreseeing disease powerlessness, repeat what's more, mortality. At a more major level, it is additionally apparent that machine learning is likewise enhancing our fundamental comprehension of disease improvement and movement.

No. of Pages : 14 No. of Claims : 5

Note: Mrs. S. Nithya, Asst. Prof, Dept of Computer Science, publication of patent. Patent title: Liver Tumour prediction using deep learning. Patent application no: 2025/011860. It's very useful for NRIAC/NAAC. ramu.



G. ualunnaaraj
PRINCIPAL
 DHARMAMURTHI RAO BHADUR CALAVALA
 CUNNAN CHETTY'S HINDU COLLEGE
 DHARMAMURTHI NAGAR, PATTABIKAM,
 CHENNAI - 600 072.

28/2/25
DR A GOPINATH
CO-ORDINATOR
 DHARMAMURTHI RAO BHADUR
 CALAVALA CUNNAN CHETTY'S HINDU COLLEGE
 Dharmamurthi Nagar, Pattabiram, Chennai-600072.



Office of the Controller General of Patents, Designs & Trademarks
Department for Promotion of Industry and Innovation
Ministry of Commerce & Industry,
Government of India

Application Details

APPLICATION NUMBER	202521011860
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	12/02/2025
APPLICANT NAME	1 . Ms.Dhanasri 2 . Mr. Parthasarathy 3 . Mrs.A.Valsh 4 . Dr. L.Sudha 5 . Dr.P.Nirmala 6 . Mrs. P. Kartikeyan 7 . Dr B Angelli 8 . Mrs.V.Deepa 9 . Mrs.S.Nithya 10 . Mrs.J.Salvi
TITLE OF INVENTION	LIVER TUMOUR PREDICTION USING MACHINE LEARNING
FIELD OF INVENTION	COMPUTER SCIENCE
E-MAIL (As Per Record)	senanipindia@ipindia.gov.in
ADDITIONAL-EMAIL (As Per Record)	editorsipoffice@ipindia.gov.in

additionally apparent that machine learning is likewise enhancing our fundamental comprehension of disease improvement and movement.

Objective

Data Mining technologies have been widely used in the process of medical diagnosis and prognosis, extensively. These data mining techniques have been used to analyze a colossal amount of medical data. The steep increase in the rate of obesity and an unhealthy lifestyle eventually reflects the likelihood and the frequent occurrence of liver-related diseases in the mass. In this project, the patient data sets are analyzed for the predictability of the subject to have a liver disease based purely on a widely analyzed classification model. Since there are pre-existing processes to analyze the patient data and the classifier data, the more important facet here is to predict the same the conclusive result with a higher rate of accuracy. There are 5 distinct phases in this process. First, the min-max algorithm is applied to the original liver patient data set that could be collected from the UCI repository. In the second phase, significant attributes are demarcated by the use of PSO feature selection. This helps to bring out the subset of critical data, from the whole normalized datasets of liver patients. After this step, the third phase involves the usage of classification algorithms for comparative analysis and categorization. Accuracy Calculation is the fourth phase. It involves the usage of Root Mean Square value and a Root Error value. The fifth phase is the evaluation phase. Depending on the studies, a simple evaluation process is executed to preserve the integrity of a precise result reflection. J48 algorithm is considered to be a better performing algorithm when it comes to feature selection with an accuracy rate of 95.04%

The objective of this paper is to be able to predict the occurrence of liver tumour in a sample dataset/ training data set, in order to be able to calculate the predictability to the greater magnitude of accuracy using the appropriate machine learning algorithm. Machine learning is understandably one of the most extensively utilized paradigms of big data management where a significantly high set of distinct raw data can be collated effectively to make appropriate inferences and eventually to come up with a usual collection of contextually useful collection of integrative information. With the onset of the exponential technological explosion in the field of medicine, there is a felt need to handle a colossal set of data, thereby managing and utilizing the same to make effective and informative inferences for the doctors and patients

Description:

DATA GATHERING

Information Gathering is the initial step of the AI life cycle. The objective of this progression is to distinguish and acquire all information related issues. In this progression, we need to distinguish the distinctive information sources, as information can be gathered from different sources such as files internet. It is perhaps the main strides of the existence cycle. The amount and nature of the gathered information will decide the proficiency of the yield. The more will be the information, the more exact will be the expectation. The initial step is gathering the informational index. Datasets can be collected from UCI store where some benchmark datasets are accessible the imperative highlights in the dataset are identified by utilizing some least complex strategies, for example, previously or from specialists given data. The datasets contains boisterous information and highlight esteems, in this manner pre processing methods are basic.

DATA PREPARATION:

Subsequent to gathering the information, we need to set it up for additional means. Information readiness is a stage where we put our information into an appropriate place and set it up to use in our AI preparing. In this progression, first, we set up all information, and afterward randomize the requesting of information. This progression can be additionally partitioned into two cycles:

Data exploration

It is utilized to comprehend the idea of information that we need to work with. We need to comprehend the attributes, organization, and nature of data. A better comprehension of information prompts a powerful result. In this, we discover Correlations, general patterns, and anomalies

Data Pre-Processing:

Presently the subsequent stage is pre-handling of information for its investigation

DATA WRANGLING:

It is utilized to comprehend the idea of information that we need to work with. We need to comprehend the attributes, organization, and nature of data. A better comprehension of information prompts a powerful result. In this, we discover Correlations, general patterns, and anomalies.

1. Missing Values

2. Duplicate data

3. Invalid data

4. Noise

So, we use various filtering techniques to clean the data. It is mandatory to detect and remove the above issues because it can negatively affect the quality of the outcome

1. Missing Values

DATA ANALYSIS:

Presently the cleaned and arranged information is given to the examination step.

This progression includes: Selection of analytical techniques:

1. Building models

2. Review the result

The point of this progression is to assemble an AI model to break down the information utilizing different insightful methods and survey the result. It begins with the assurance of the sort of the issues, where we select the AI strategies, for example, Classification i.e., calculated relapse, choice tree, arbitrary timberland and so on, at that point fabricate the model utilizing arranged information, and assess the model. Consequently, in this progression, we take the information and use AI calculations to construct the model.

TRAIN MODEL:

Now the next step in the testing is to train the model, in this step we train our model to improve its performance for better outcome of the problem. We use datasets to train the model using various machine learning algorithms. Training a model is required so that it can understand the various patterns, rules, and, features.

TEST MODEL:

Presently the subsequent stage is to prepare the model, in this progression we train our model to improve its exhibition for better result of the issue. We use datasets to prepare the model utilizing different AI calculations. Preparing a model is required so it can comprehend the different examples, rules, and, highlights.

TRAIN MODEL

TRAIN MODEL

TEST MODEL:

INPUT DESIGN

Input design is the process of converting the user-oriented. Input to a computer based format. The goal of the input design is to make the data entry easier, logical and free error. Errors in the input data are controlled by the input design. The quality of the input determines the quality of the system output.

All the data entry screen are interactive in nature, so that the user can directly enter into data according to the prompted messages. The user are also can directly enter into data according to the prompted messages. The users are also provided with option of selecting an appropriate input from a list of values. This will reduce the number of error, which are otherwise likely to arise if they were to be entered by the user itself.

Input design is one of the most important phase of the system design. Input design is the process where the input received in the system are planned and designed, so as to get necessary information from the user, eliminating the information that is not required. The aim of the input design is to ensure the maximum possible levels of accuracy and also ensures that the input is accessible that understood by the user. The input design is the part of overall system design, which requires very careful attention. If the data going into the system is incorrect then the processing and output will magnify the errors.

The objectives considered during input design are:

- Nature of input processing.
- Flexibility and thoroughness of validation rules.
- Handling of properties within the input documents.
- Screen design to ensure accuracy and efficiency of the input relationship with files.
- Careful design of the input also involves attention to error handling, controls, batching and validation procedures.

Input design features can ensure the reliability of the system and produce result from accurate data or they can result in the production of erroneous information.

Data Flow Diagram (DFD)

The objectives consid

The first step is to draw a data flow diagram (DFD). The DFD was first developed by Larry Constantine as a way of expressing system requirements in graphical form.

A DFD also known as a "bubble chart" has the purpose of clarifying system requirements and identifying major transformations that will become programs in system design. So, it is the starting point of the design phase that functionally decomposes the requirements specifications down to the lowest level of detail. A DFD consists of series of bubbles join by the data flows in the system.

The purpose of data flow diagrams is to provide a semantic bridge between users and systems developers. The diagrams are:

- Graphical, eliminating thousands of words;
- Logical representations, modeling WHAT a system does, rather than physical models showing HOW it does it;
- Hierarchical, showing systems at any level of detail; and
- jargon less, allowing user understanding and reviewing.

The goal of data flow diagramming is to have a commonly understood model of a system. The diagrams are the basis of structured systems analysis. Data flow diagrams are supported by other techniques of structured systems analysis such as data structure diagrams, data dictionaries, and procedure-representing techniques such as decision tables, decision trees, and structured English.

External Entity

An external entity is a source or destination of a data flow, which is outside the area of study. Only those entities, which originate or receive data, are represented on a business process diagram. The symbol used is an oval containing a meaningful and unique identifier.

Process

A process shows a transformation or manipulation of data flows within the system. The symbol used is a rectangular box, which contains 3 descriptive elements: Firstly an identification number appears in the upper left hand corner. This is allocated arbitrarily at the top level and serves as a unique reference. Secondly, a location appears to the right of the identifier and describes where in the system the process takes place.

Data Flow

A data flow shows the flow of information from its source to its destination. A data flow is represented by a line, with arrowheads showing the direction of flow. Information always flows to or from a process and may be written, verbal or electronic. Each data flow may be referenced by the processes or data stores at its head and tail, or by a description of its contents.

Data Store

A data store is a holding place for information within the system: It is represented by an open ended narrow rectangle. Data stores may be long-term files such as sales ledgers, or may be short-term accumulations: for example batches of documents that are waiting to be processed. Each data store should be given a reference followed by an arbitrary number.

Resource Flow

A resource flow shows the flow of any physical material from its source to its destination. For this reason they are sometimes referred to as physical flows. The physical material in question should be given a meaningful name. Resource flows are usually restricted to early, high-level diagrams and are used when a description of the physical flow of materials is considered to be important to help the analysis.

OUTPUT DESIGN

The output form of the system is either by screen or by hard copies. Output design aims at communicating the results of the processing of the users. The reports are generated to suit the needs of the users. The reports have to be generated with appropriate levels. In our project outputs are generated by asp as html pages. As its web application output is designed in a very user-friendly this will be through screen most of the time.

CODE DESIGN

The main purpose of code design is to simplify the coding and to achieve better performance and quality with free of errors. The coding is prepared in such a way that the internal procedures are more meaningful validation manager is displayed for each column. The coding of the

variables is done in such a way that one other than person who developed the packages can understand its purpose.

To reduce the server load, the project is designed in a way that most of the Validation of fields is done as client side validation, which will be more effective.

IMPLEMENTATION PROCEDURES

The implementation phase is less creative than system design. A system design may be dropped at any time prior to implementation, although it becomes more difficult when it goes to the design phase. The final report of the implementation phase includes procedural flowcharts, record layouts, and a workable plan for implementing the candidate system design into a operational design.

USER TRAINING

It is designed to prepare the users for testing & converting the system. There is several ways to trail the users they are:

- 1) User manual
- 2) Help screens
- 3) Training demonstrations.

1) User manual:

The summary of important functions about the system & software can be provided as a document to the user. User training is designed to prepare the user for testing and convening a system

The summary of important functions about the system and the software can be provided as a document to the user

1. Open http page
2. Type the file name with URL index .php in the address bar
3. Index. php is opened existing user the type the username and password
4. Click the submit button

2) Help screens:

This features now available in every software package, especially when it is used with a menu. The user selects the "Help" option from the menu. The System success the necessary description or information for user reference.

3) Training demonstration:

Another user training element is a training demonstration. Live demonstration with personal contact is extremely effective for training users.

Diagram:



