FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7, 54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No.: ..... Filing Date: ..... Amount of Fee Paid: ..... CBR No.: ..... Signature: .....

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3. TITLE OF THE INVENTION: A Novel Health Care Risk Profiling Complications Learning Model for COVID-19

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5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY:

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6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION:

International Application Number	International Filing Date as Allotted by the Receiving Office
PCT//	

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) Application Number	Date of Filing of Original (first) Application

8. PARTICULARS FOR FILING PATENT OF ADDITION:

Main Application / Patent Number:	Date of Filing of Main Application

9. DECLARATIONS:

(i) Declaration by the inventor(s):

I/We, Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D., is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a)Date: ----- Dated this 31st day of May, 2021

(b)Signature(s) of the inventor(s): .....

(c)Name(s):
Prof. James Stephen Meka

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Prof. Prasad Reddy P.V.G.D.

(ii) Declaration by the applicant(s) in the convention country:

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a)Date: ----- Dated this 31st day of May, 2021

(b)Signature(s) of the inventor(s): .....

(c)Name(s):
Prof. James Stephen Meka

Mr.Amarendhar Reddy Modem

Prof. Prasad Reddy P.V.G.D.

(iii) Declaration by the Applicant(s):

- **The Complete specification relating to the invention is filed with this application.**
- **I am/ We are, in the possession of the above mentioned invention.**
- **There is no lawful ground of objection to the grant of the Patent to me/us.**

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

Sr.No	Document Description	File Name
1	Complete Specifications(Form-2)	CompletespecificationsForm2.pdf
2	Drawings	Drawings.pdf
3	Request For Early Publication(Form-9)	Form9.pdf
4	Statement of Undertaking (Form 3)	Form3.pdf
5	Declaration of Inventorship (Form 5)	Form5.pdf

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this (Final Payment Date): --------

Signature: .....

Name(s):

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To

The Controller of Patents

The Patent office at CHENNAI

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(57) Abstract :
The present disclosure relates to Health Care Risk Profiling Complications (HCRPC) learning model for covid19.The HCRPC model relates to healthcare systems and approaches that use a hybrid rules engine and a hybrid Deep Neuro-Fuzzy algorithm to optimize risk profiling complications. The HCRPC model can be used to improve health care quality and lower costs by using the defined methods. We proposed a novel learning approach Model where each task corresponds to risk modelling of complications. The present invention disclosed herein is a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 Comprising of main embodiment elements such as Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); used as for risk profiling complications of health care. According to the aspect of the present disclosure, a system for risk profiling complications of health care is provided with analyzing the dataset and building rules engine. The execution of the ruleset is made possible by a procedure that includes the steps of initiating the ruleset, constructing the decision trees for the ruleset and executing the rules; the output of this method is the initial risk profiling data, the same risk profiling data is then used by the model to apply on a novel Deep Neuro Fuzzy Classifier comprising of Fuzzification, deep learning, upgrade membership, and defuzzification. The machine can feed-forward the data to the same process for better results or output, once the novel Deep Neuro Fuzzy Classifier is applied. For evaluating the model, COVID19 patient™s data have been used and able to provide the Risks profiling complications based on the patient™s health and COVID19 symptoms. The proposed Model provides 95.1239% of Accuracy, 95.2267% Specificity and 95.0201% Sensitivity for COVID-19 dataset of 566603 patient™s data. Additionally, the proposed model can be used in healthcare applications since it identifies risk factors.

No. of Pages : 20 No. of Claims : 10

FORM 2

THE PATENTS ACT, 1970

(39 of 1970) &

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(See section 10, rule 13)

1. TITLE OF THE INVENTION:

A Novel Health Care Risk Profiling Complications Learning Model for COVID-19

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3. PREAMBLE TO THE DESCRIPTION:

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in which it is to be performed.

A NOVEL HEALTH CARE RISK PROFILING COMPLICATIONS LEARNING MODEL FOR COVID-19

FIELD OF INVENTION

The present invention relates to the technical field of Artificial Intelligence.

Particularly, the present invention is related to a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 of the broader field of Machine Learning of Artificial Intelligence.

More particularly, the present invention is related to a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 relates to healthcare systems and approaches that use a hybrid rules engine and a hybrid Deep Neuro-Fuzzy algorithm to optimize risk profiling complications.

BACKGROUND & PRIOR ART

Human health is being increasingly threatened by ever-evolving types of various diseases that are appearing on more fronts than ever before. To protect people from new types of pandemics, healthcare professionals must step-up with new ideas and model. Multiple diseases may be diagnosed in a patient, each with its own set of complications. COVID-19 risks include serious illnesses including acute liver injury and acute kidney injury, which necessitate costly medical procedures. Risk profiling of COVID-19 complications is critical for healthcare professionals to appropriately adapt customized treatment plans for patients in covid-19 care, to improve health care quality and reduce cost.

A knowledge base is a set of knowledge that has been encoded. The knowledge base of a rule-based expert system usually includes definitions of facts, laws and control material. In an expert system, an inference engine (also known as a rule interpreter or rule engine) offers a reasoning method. The inference engine in a rule-based expert system that executes on forward and backward chaining strategies.

Supervised learning, unsupervised learning, and reinforcement learning are the types of machine learning models. In supervised learning, the learner is given labeled training instances that provide both the right input and output. The unsupervised learning recognizes and explores dependencies in data by assigning no labels to data points. Supervised learning algorithms make predictions based on a defined data set. The input data that generates response values is used in the dataset training. Support vector machines, neural networks, and decision trees are examples of popular classification algorithms used in supervised learning.

The present invention, referring to Figure 1, illustrates a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 comprising of Start (101); Receive Data (102); Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); End (109); used as for risk profiling complications of health care.

There are some learning models developed to Health Care Risk Profiling Complications. But the way of developing and the specifications consider are different than the invention disclosed herein. Some of the work listed in the prior art is as follows:

US20120173264 - *Facilitating Identification of Potential Health Complications,* presents "Methods, computer storage media, systems and user interfaces for facilitating avoidance of potential health complications are provided. In one embodiment, the method includes identifying risk data that indicates a potential health risk to a patient. The risk data is used to determine a potential health complication that may arise in association with the patient. A plan of care is generated for the patient based on the potential health complication that may arise in association with the patient. Such a plan of care may include an action(s) to perform in association with the patient in an effort to avoid the potential health complication."

US20150235001 - *System and Method for Scoring Health Related Risk,* states*"* Methods and systems are provided for assigning an individual to a stratum associated with a risk of generating a high level of health care-related costs. An electronic device receives information on the diagnosis of a medical condition for the individual. The device then identifies a gap in the individual's medical care for the diagnosed medical condition and associates the gap with an indexed value related to the severity of the gap in care. The device then assigns the individual to one of a plurality of strata based on a

health care profile of the individual, where the health care profile includes the indexed value related to the severity of the gap in care."

US10863927 - *Identifying fall risk using machine learning algorithms,* states "A person's fall risk may be determined based on machine learning algorithms. The fall risk information can be used to notify the person and/or a third party monitoring person (e.g. doctor, physical therapist, personal trainer, etc.) of the person's fall risk. This information may be used to monitor and track changes in fall risk that may be impacted by changes in health status, lifestyle behaviors or medical treatment. Furthermore, the fall risk classification may help individuals be more careful on the days they are more at risk for falling. The fall risk may be estimated using machine learning algorithms that process data from load sensors by computing basic and advanced punctuated equilibrium model (PEM) stability metrics."

US20170286622 - *Patient Risk Assessment Based on Machine Learning of Health Risks of Patient Population,* states "Mechanisms are provided for stratifying risk of a patient population. The mechanisms receive patient information for a plurality of patients in the patient population and perform a machine learning operation to train a risk scoring algorithm for scoring a risk of adverse conditions for the patient population using the patient information. The mechanisms determine, for each patient in the patient population, a risk score based on an application of the risk scoring algorithm to patient information for the patient. The mechanisms classify each patient into a risk classification category, in a plurality of risk classifications categories, based on a risk score generated by the application of the risk scoring algorithm to the patient information for the patient. The mechanisms generate an output indicating membership of patients in the plurality of risk classification categories."

Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed as limitations. Each group member can be referred to and claimed individually or in any combination with other members of the group or other elements found herein. One or more members of a group can be included in, or deleted from, a group for reasons of convenience and/or patentability. When any such inclusion or deletion occurs, the specification is herein deemed to contain the group as modified thus fulfilling the written description of all related groups used in the appended claims.

The above information disclosed in this background section is only for enhancement of understanding of the background of the invention and therefore it may contain

information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY OF INVENTION

The present invention, referring to Figure 1, illustrates a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 comprising of Start (101); Receive Data (102); Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update membership (107); Defuzzification (108); End (109); used as for risk profiling complications of health care.

The Rule's engine (104) maintains a list of the various risks and complications in this invention. Rules Engine contains a combination of risk and complication within a group of rules or a decision table in the Rule's engine. After the model receives and reads the data (102), the data clean-up (103) layer sequentially performs data lineage, data collection, custom metadata creation, and data preparation internally. The Data Clean (103) layer ensures that the Rules Engine (104) and subsequent layers do not receive any erroneous data. The Rules Engine (104), on the other hand, executes in two stages. The first stage entails determining the Complications associated with the Risks. The second stage entails gathering all risks, eliminating duplicates, prioritizing them, and publishing the identified risks to the Hybrid Deep Neuro-Fuzzy model.

The Novel Hybrid Deep Neuro-Fuzzy model is defined to calculate the final risk profile. The novel Hybrid Deep-Fuzzy model is composed of four layers: Fuzzification (105), deep learning (106), update membership (107), and Defuzzification (108). (108). The Fuzzification (105) receives data from the Rules Engine and then uses a hybrid membership algorithm to generate the membership degree. The Deep Learning model (106) multiplies the input elements by their weight connections to classify membership. The Update Membership (107) algorithm takes the classification identified in Deep Learning (106) and appropriately generates the final membership degree using a hybrid membership algorithm. Finally, based on the category, Defuzzification (108) generates the risk classification. For evaluating the model, COVID19 patient's data have been used and able to provide the Risks profiling complications based on the patient's health and COVID-19 symptoms. The proposed model provides 95.1239% of accuracy, 95.2267% Specificity, and 95.0201% sensitivity for the COVID-19 dataset of 566603 patient’s data. Additionally, the proposed model can be used in other healthcare diseases

by updating the risk and complications accordingly.

BRIEF DESCRIPTION OF SYSTEM

The Accompanying Drawings are included to provide further understanding of the invention disclosed here, and are incorporated in and constitute a part this specification. The drawing illustrates exemplary embodiments of the present disclosure and, together with the description, serves to explain the principles of the present disclosure. The Drawings are for illustration only, which thus not a limitation of the present disclosure.

The present invention, referring to Figure 1, illustrates a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 comprising of Start (101); Receive Data (102); Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); End (109); used as for risk profiling complications of health care.

Referring to Figure 2, illustrates Rules Engine Execution Process comprising of Rule Engine Data Input (201); Ruleset 1…Ruleset N (202); Rules/Table (203); Rule 1 comprising of Condition 1…Condition N and Action 1…Action N (204); Rule Engine Data Output (205); executes numerous Ruleset and each ruleset consist of multiple rules.

Referring to Figure 3, illustrates Hybrid Deep Neuro Fuzzy Model Execution Flow comprising of Start (301); Layer 1 (302); Layer 2 (303); Layer 3 (304); Layer 4 (305); Stop (306); is the feed-forward network for improving the result of the proposed model.

Referring to Figure 4, illustrates Plot of Error Rate, the error rate is calculated Versus Epoch.

Referring to Figure 5, illustrates Plot of Accuracy showing trained and original Data.

Referring to Figure 6, illustrates Output for Patient Complications Prediction of HCRPC Model.

Referring to Figure 1, illustrates a Novel Health Care Risk Profiling Complications Learning Model for COVID-19, in accordance with an exemplary embodiment of the present disclosure.

Referring to Figure 2, illustrates Rules Engine Execution Process, in accordance with another exemplary embodiment of the present disclosure.

Referring to Figure 3, illustrates Hybrid Deep Neuro Fuzzy Model Execution Flow, in accordance with another exemplary embodiment of the present disclosure.

Referring to Figure 4, illustrates Plot of Error Rate, in accordance with another exemplary embodiment of the present disclosure.

Referring to Figure 5, illustrates Plot of Accuracy, in accordance with another exemplary embodiment of the present disclosure.

Referring to Figure 6, illustrates Output for Patient Complications Prediction of HCRPC Model, in accordance with another exemplary embodiment of the present disclosure.

DETAIL DESCRIPTION OF THE PRESENT INVENTION

The present invention herein is a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 is explored, a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 is provided in the following layout that explains the entire view of the implementation of the invention that used as for risk profiling complications of health care.

The present invention, referring to Figure 1, illustrates a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 comprising of Start (101); Receive Data (102); Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); End (109); used as for risk profiling complications of health care. The present disclosure relates to Health Care Risk Profiling Complications (HCRPC) learning model for covid-19. The HCRPC model uses rules engines and a hybrid Deep Neuro-Fuzzy algorithm to optimize risk profiling complications. Referring to Figure 1, shows an example of the processing model. The processing model is an example of a system in which the system components and techniques listed below can be implemented as computer programs that can run on one or more computers and in one or more locations. The HCRPC model is implemented by receiving data, characterizing an input comma separated file. The processing system can receive input of COVID-19 related data. The processing system then use rules engine, a novel deep fuzzy neural network model (an output layer) to

process the received data and produce an output of Risk profiling complications from the input COVID-19 patient's data.

The HCRPC model can be set up (start (101)) to accept input data (102) set and produce any type of risk classification output based on that data set, allowing it to perform any type of risk profiling in health care. The prediction or classification output generated by the system depends on the task that the processing system has been configured to confirm. The output produced by the processing system for a given data for a COVID-19 patient could predict the patient's risk of complications. Additionally, in the COVID-19 recognition task of the model, the output produced by the processing system for a given data could predict whether or not the patient is affected by the disease based on the symptoms. The patient's real-world data is inconsistent; feeding the same data to the model may result in the error output. As a result, preprocessing of the data is required to ensure maximum accuracy. Preprocessing step defined as Data Cleanup (103) step in this model. Data cleanup entails the following steps in sequence: data lineage, data collection, custom metadata creation, and data preparation. The model uses 25 features of the COVID-19 patient's data and the data cleanup step ensures the data passed to the model is clean.

The rules can be set up during the design phase and tailored to the Specific disease, or they can be tweaked depending on the diseases, complications, and risks. Based on the input data, the rules engine is instantiated to determine one or more rules (Rule 1…Rule N) that are executed on the input data. The rule engine (104) is configured to define the attributes. The attribute values associated with the selected attributes are determined by the rule's engine. The rules engine selects at least one rule to be executed based on the determined attribute values. At least one rule is executed on the actual input data including the attributes and the associated attribute values for establishing a relation between diseases, risks, complications and the attribute values. The defined relationship enriches the attribute values, resulting in enriched real-world data.

The Rule's engine (104) may be configured with rules to perform defined processes. Rules may be a sequence of procedural statements configured to regulate the process or data. The rules in the rule's engine may be configured at design time. The rules may be configured to enforce specific constraints on the processes. The system uses below Rules Algorithm as shown in Table 1, as the first step.

TABLE 1

Rules Algorithm

a. Begin / Start	
b. For each patient:	1. Group all the known symptoms accordingly 2. Retrieve all the distinct illness values and their risks and create a list β 3. Analyze the list to create a final risk α 4. Initialize all rules processes 5. For each rule process ã in β a. If the risks are unique, copy each risk into the final list α b. If the risks are not unique: i. Calculate the most risks across complications ii. Remove the redundant risks across complications iii. Prioritize the risks and create final list α

Referring to Figure 2, illustrates Rules Engine Execution Process comprising of Rule Engine Data Input (201); Ruleset 1…Ruleset N (202); Rules/Table (203); Rule 1 comprising of Condition 1…Condition N and Action 1…Action N (204); Rule Engine Data Output (205); executes numerous Ruleset and each ruleset consist of multiple rules. Figure 2 shows an example of the rule engine execution. A rule engine (104) executes numerous Ruleset and each ruleset consist of multiple rules. Every rule has multiple condition and actions. For example: every rule can have a risk and its complication for a disease.

Rule Engine Data Input (201) is the N-Number of Rule Sets from Rule Set 1….Rule Set N (202). The Rules/Table (203) contains Rule 1 to Rule N (203), each Rule has set of conditions such as Condition 1 to Condition N and set of actions such as Action 1 to Action N (204). The Rule Engine Data Output (205) is enriched real-world data, configured to define the attributes.

Referring to Figure 3, illustrates Hybrid Deep Neuro Fuzzy Model Execution Flow comprising of Start (301); Layer 1 (302); Layer 2 (303); Layer 3 (304); Layer 4 (305); Stop (306); is the feed-forward network for improving the result of the proposed model. The Hybrid Deep Neuro Fuzzy classifier comprises of four main components:

Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108). Each component needs to be executed in sequence to provide the output. The components are not configured to change the sequence of the execution. Figure 3 depicts the overall process of the hybrid deep Neuro fuzzy algorithm. The Fuzzification (105) step, fine tunes the data after pre-processing has been applied into the classifier. Every input in this layer generates the membership degree. The Fuzzification step contains multiple layers, where in each layer can consist of hybrid membership algorithm. The hybrid membership determines full, partial or none membership degree. The membership works on Gaussian combination applied with Sigmoidal functions. This component generates an output generated by each membership functions of neural network layer's and concatenates the received outputs to generate an output that is provided as the output of the component to the next module.

The Deep Learning (106) network component processes the data with a huge number of input variables. The deep learning network component is initialized upon receiving data from Fuzzification component. The deep learning network transmits information using backpropagation and feed-forward algorithms to the hidden layer. A hidden layer transforms a single-layer into a multi-layer perceptron. The nodes in the neural network's layers are interconnected to each other. The information flows after the data are processed by backpropagation and feed-forward algorithm. A hidden layer transforms a single-layer into a multi-layer perceptron.

In Deep Learning (106) network component, the input elements are multiplied with their weight connections. Every neuron output is associated with input via linear or nonlinear transformation. Every neuron will be activated using the linear or Sigmoid. If the activation function is linear, then the final output is a linear combination of the original input data. If the activation is nonlinear, then every neuron uses weighted sum for a set of inputs and then nonlinear activation function is used to generate the output value. The classifier sends data to next component.

Update Membership (107) is initiated by receiving the data from classifier. The membership updates the data using the hybrid learning algorithm. The hybrid learning algorithm consists of least-squares method and back propagation. This step is used for fine tuning the data and send data to the defuzzification component.

The system further processes the data to a Defuzzification (108) component. The

defuzzifer generates output depending on the fuzzy rules in the network. The fuzzy rules are configured and setup automatically by the deep Neuro fuzzy classifier. The parameters to the rules are identified in the training phase of the model. After the process of defuzzification, the output of the whole network is calculated.

The system sums up the outputs of all the rules from the four components and converts the fuzzy values into output. The system updates the parameters, weights and parameters until the desired accuracy is achieved. The Hybrid Deep Neuro Fuzzy Model Execution Flow comprising of Started (301) with Layer 1 (302), it receives the data from the Rule Engine (104) and executes Hybrid Membership Algorithm. The Layer 2 (303) receives the data from the layer 1 and transforms into a multilayer perceptron and generates output. The layer 3 (304) updates the membership function for the better accuracy. The layer 4 (305) is to apply Fuzzy rules and generates response. The layers forms, executes until the desired accuracy is met and once desired accuracy achieved process will end (306).

The experiments were performed on the HCRPC model using COVID 19 patient's data set. The model is evaluated with Rule Engine, ANFIS, and Random Forest. According to the results presented in Table 2, it can be concluded that the performance of the model is better than the other algorithms.

TABLE 2

Performance comparison of the HCRPC model with other models

Comparison Models	HCRPC Model	ANFIS	Rules Engine	Random Forest
Dataset1 (5000 Records)	**98.2% Accuracy**	92.4% Accuracy	98% Accuracy	91.2% Accuracy
Dataset2(566603 Records)	**95.1% Accuracy**	89.1% Accuracy	90% Accuracy	87.9% Accuracy

Referring to Figure 4, illustrates Plot of Error Rate, the error rate is calculated Versus Epoch. Error Rate refers to misclassified cases. Figure 4 represents the error rate has been decreased as the number of epochs increased. The model is fine tuned to achieve maximum accuracy and minimum error rate

Referring to Figure 5, illustrates Plot of Accuracy showing trained and original Data. Figure 5 represents the model accuracy of the both training and testing data. Form the

Figure 5 it can be concluded that the model is trained well, so that the Training data and testing data are near equal.

Referring to Figure 6, illustrates the application of the HCRPC model. A physician enters various complications of a COVID-19 patient and the model predicts and publishes the Risk factors of that patient. This model can be utilized for a better healthcare quality with reduced costs. The HCRPC model can be helpful in healthcare professional's identification of risks as per complication. The HCRPC accepts different complications and provide the risks factor for a COVID-19 patient.

CLAIMS

We claim:

1. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 Comprising of main embodiment elements such as Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); used as for risk profiling complications of health care.

2. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein A Health Care Risk Profiling Complications (HCRPC) learning Model implemented method to generate a Risk profiling complication for a patient report comprising below data set rules:

    a. Determining at least one attribute value associated with at least one selected attribute, based on the determined attribute value, execute at least one rule from a plurality of business rules stored in the data store.

    b. Novel neuro fuzzy network classifier to predict the patient's risk profiling based on complications.

    c. Determine one or more target layers of the system based on the desired accuracy

3. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the model's system code further causes the computer system to: transform the first component output to the second component; the second component feed-forward the output node to the other hidden layers; the second component determines the accuracy and prediction.

4. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the first component can be ruling filter and the second component can be convolution filter or merge filter.

5. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the model's rule component consists of generating a dependency graph for the rule set and a Sequence of processing logic for optimal fact processing.

6. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the model's rule component provides interface for Rules models and can be updated as per the user.

7. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the model's second component - Hybrid Deep Neuro Fuzzy classifier consists of four components Fuzzification, deep learning, update membership, and defuzzification.

8. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the Hybrid Deep Neuro Fuzzy classifier's components needs to be executed in sequence to provide the output. The components are not configured to change the sequence of the execution.

9. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the update membership component is applied using both Gaussian and Sigmoidal functions.

10. A Novel Health Care Risk Profiling Complications Learning Model for COVID-19 as claimed in claim 1, wherein the proposed Model provides 95.1239% of accuracy, 95.2267% Specificity and 95.0201% sensitivity for COVID 19 dataset of 566603 patients.

Dated this 31st day of May, 2021

Meka James Stephen

Digitally signed by Meka James Stephen
Date: 2021.05.31 19:06:05 +05'30'

A Novel Health Care Risk Profiling Complications Learning Model for COVID-19

ABSTRACT

The present disclosure relates to Health Care Risk Profiling Complications (HCRPC) learning model for covid19.The HCRPC model relates to healthcare systems and approaches that use a hybrid rules engine and a hybrid Deep Neuro-Fuzzy algorithm to optimize risk profiling complications. The HCRPC model can be used to improve health care quality and lower costs by using the defined methods. We proposed a novel learning approach Model where each task corresponds to risk modelling of complications. The present invention disclosed herein is a Novel Health Care Risk Profiling Complications Learning Model for COVID-19 Comprising of main embodiment elements such as Data Cleanup (103); Rules Engine (104); Fuzzification (105); Deep Learning (106); Update Membership (107); Defuzzification (108); used as for risk profiling complications of health care. According to the aspect of the present disclosure, a system for risk profiling complications of health care is provided with analyzing the dataset and building rules engine. The execution of the ruleset is made possible by a procedure that includes the steps of initiating the ruleset, constructing the decision trees for the ruleset and executing the rules; the output of this method is the initial risk profiling data, the same risk profiling data is then used by the model to apply on a novel Deep Neuro Fuzzy Classifier comprising of Fuzzification, deep learning, upgrade membership, and defuzzification. The machine can feed-forward the data to the same process for better results or output, once the novel Deep Neuro Fuzzy Classifier is applied. For evaluating the model, COVID19 patient's data have been used and able to provide the Risks profiling complications based on the patient's health and COVID19 symptoms. The proposed Model provides 95.1239% of Accuracy, 95.2267% Specificity and 95.0201% Sensitivity for COVID-19 dataset of 566603 patient's data. Additionally, the proposed model can be used in healthcare applications since it identifies risk factors.

Dated this 31st day of May, 2021

Meka James Stephen

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DRAWINGS

Total No of Sheets: 04

Sheet No.1

Applicants: Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D.

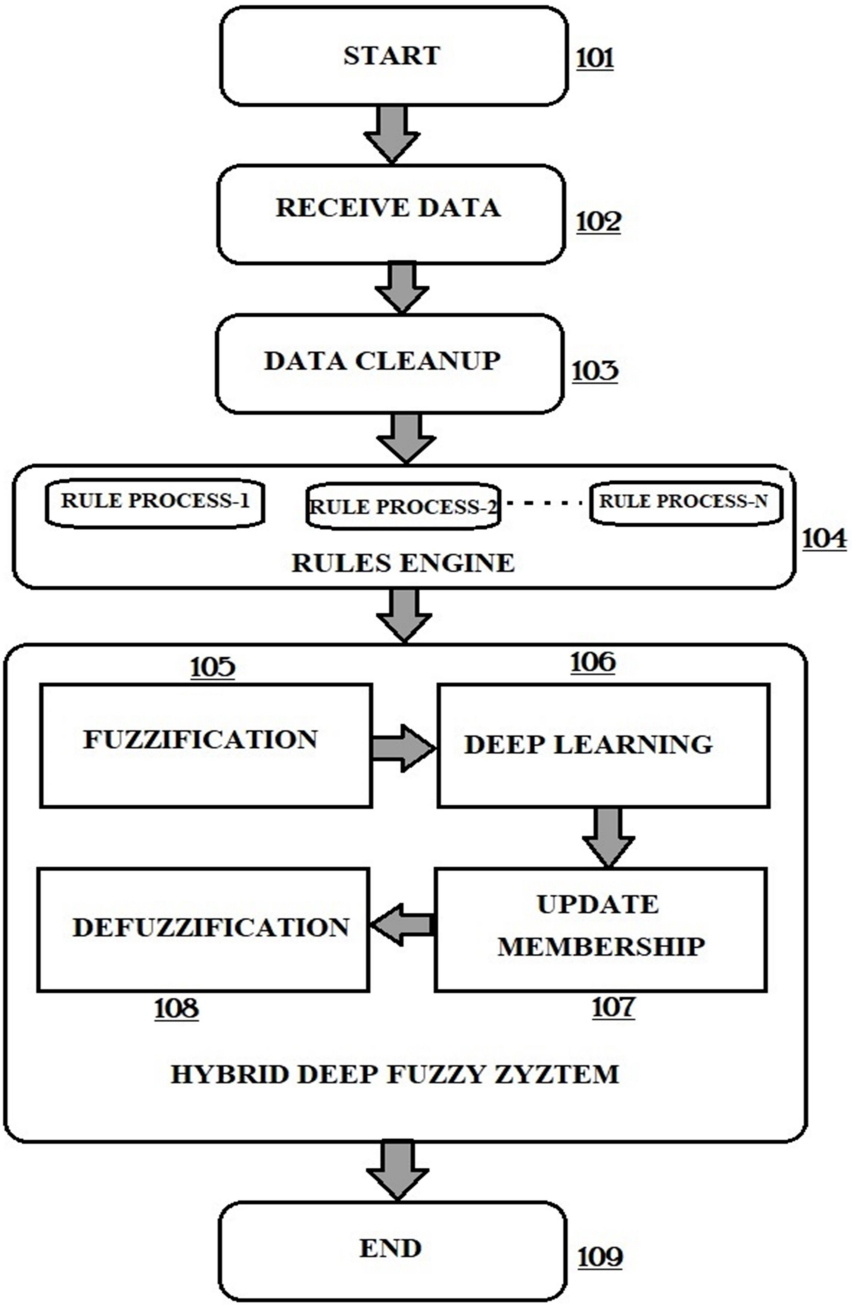

FIGURE 1: A Novel Health Care Risk Profiling Complications Learning Model for COVID-19.

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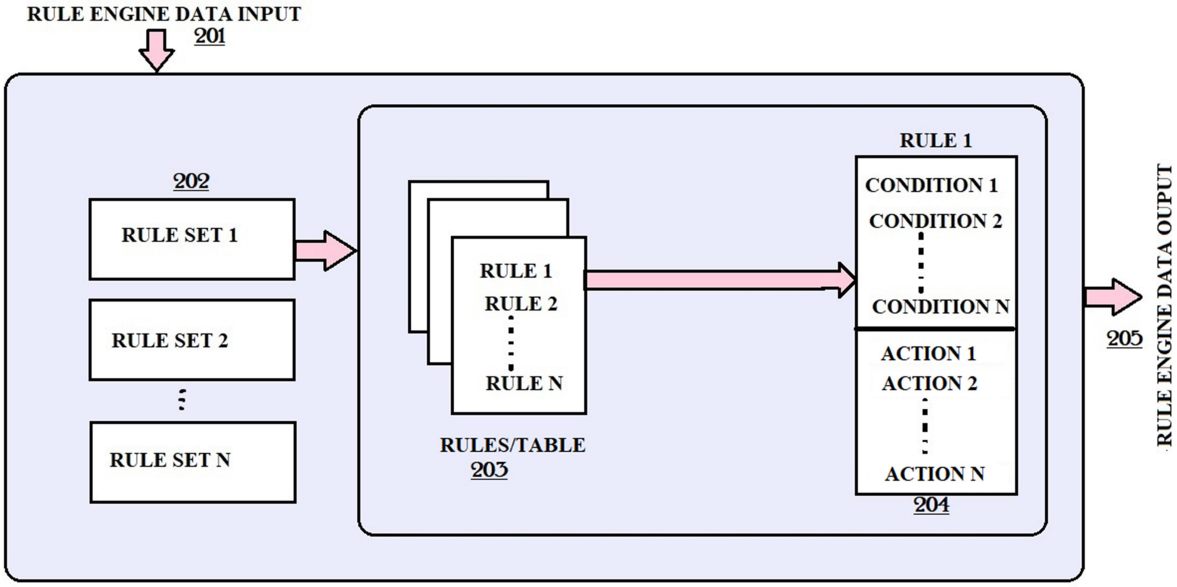

FIGURE 2: Rules Engine Execution Process.

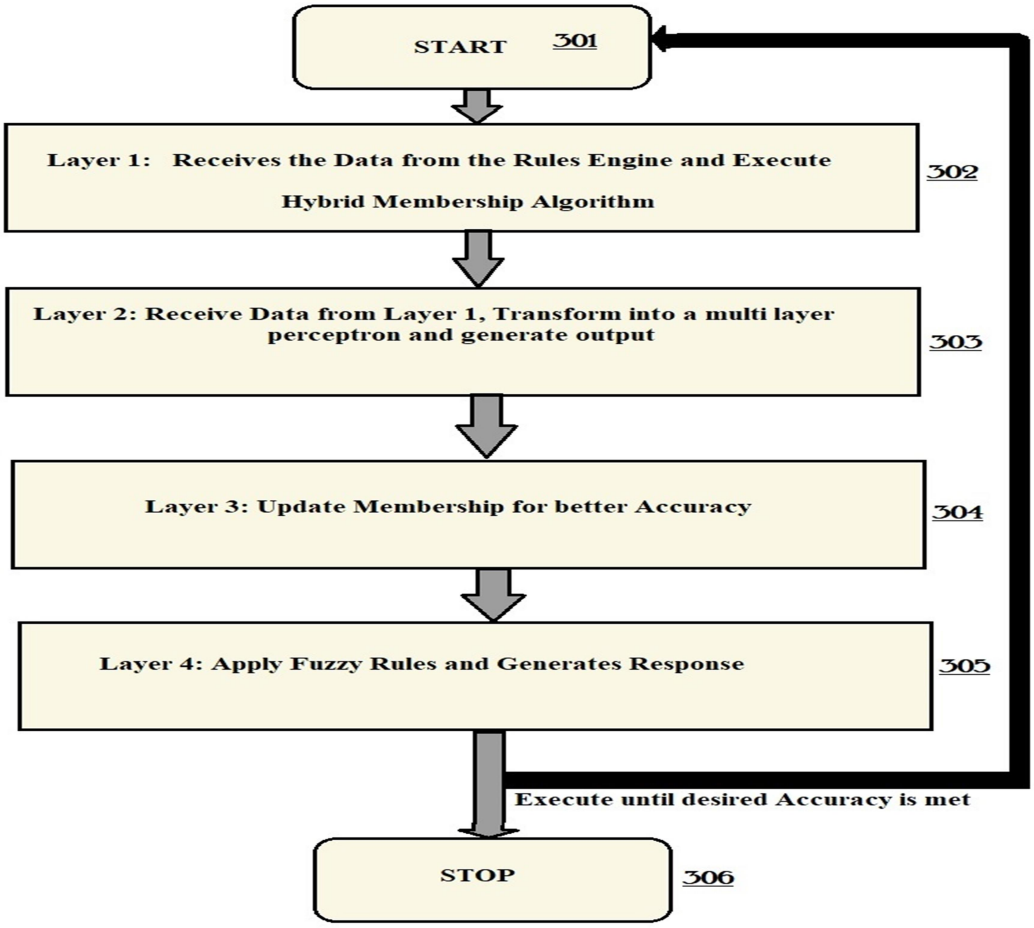

FIGURE 3: Hybrid Deep Neuro Fuzzy Model Execution Flow.

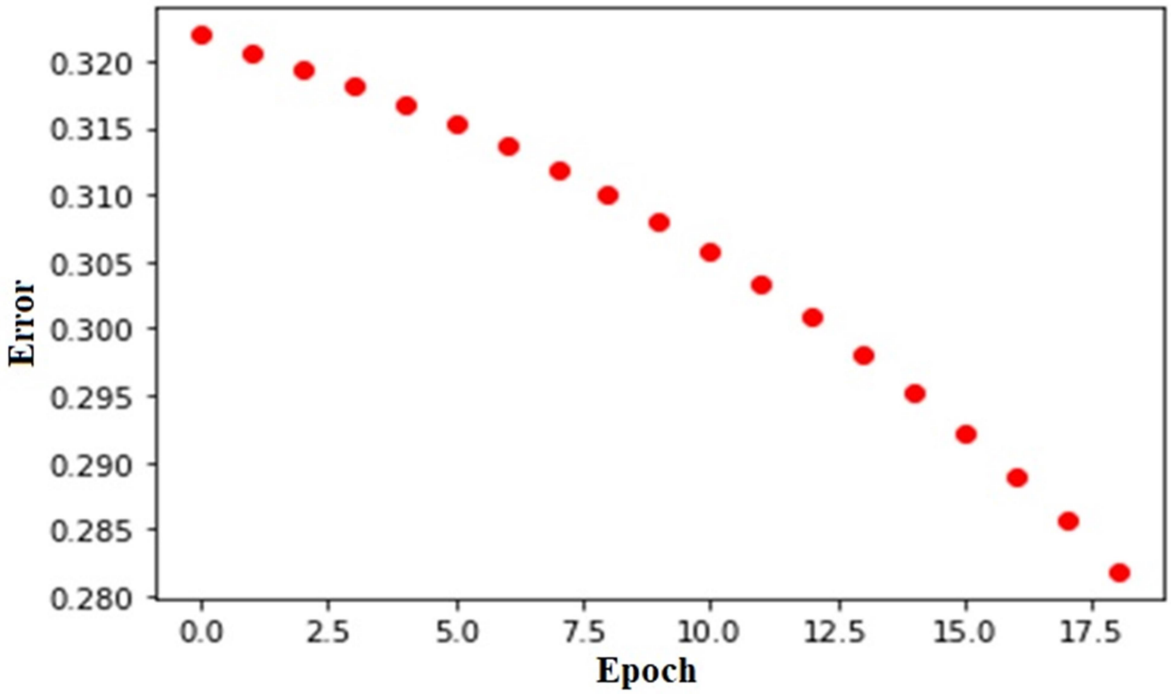

FIGURE 4: Plot of Error Rate.

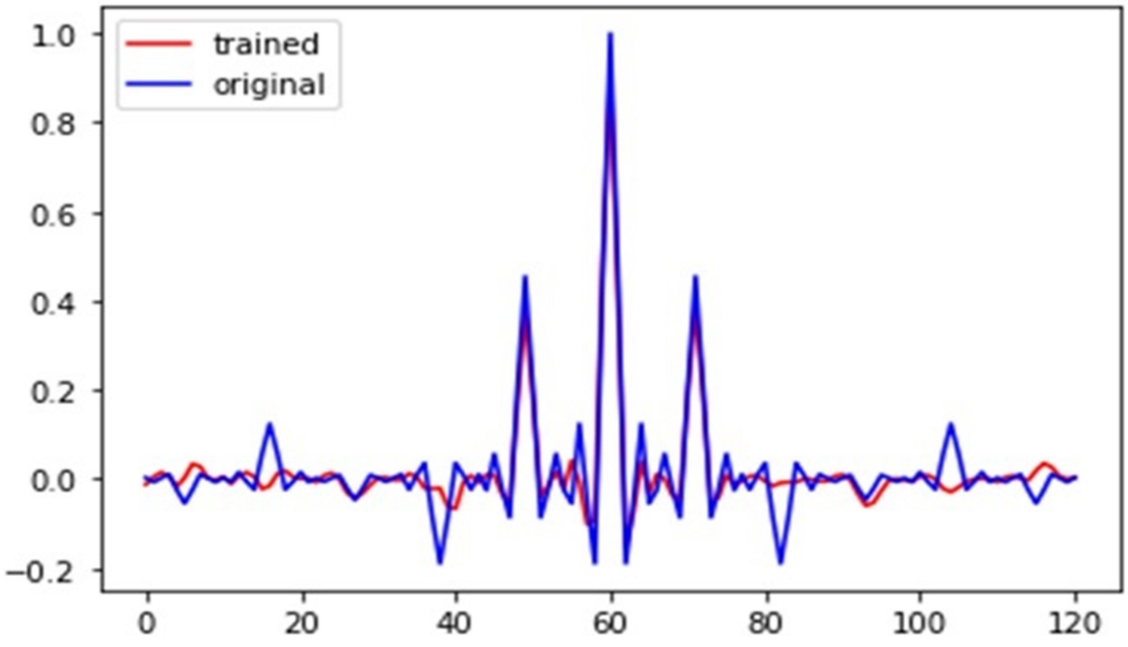

FIGURE 5: Plot of Accuracy.

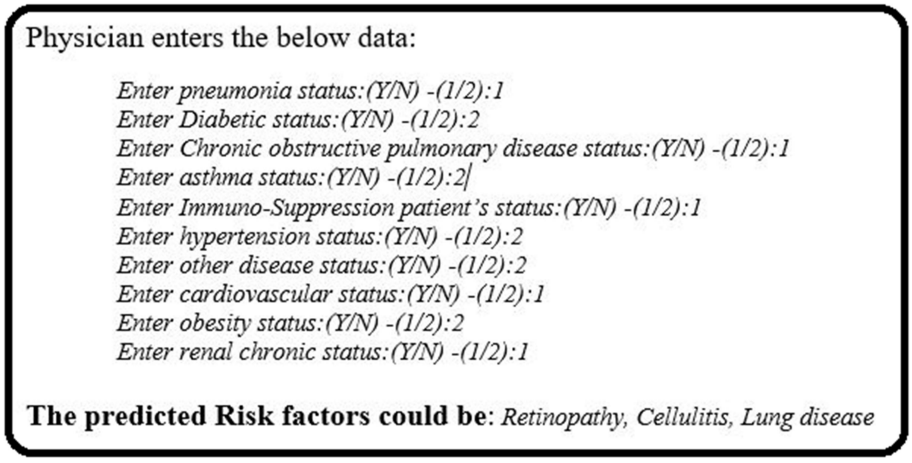

FIGURE 6: Output for Patient Complications Prediction of HCRPC Model.

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FORM 9

THE PATENT ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

REQUEST FOR PUBLICATION

[See section 11A (2); rule 24A]

I/We **Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D.** hereby request for early publication of my/our application for patent, titled "**A Novel Health Care Risk Profiling Complications Learning Model for COVID-19**" dated 31-05-2021, under section 11A(2) of the act.

Dated this 31st day of May 2021 **20:00:00** under section 11A (2) of the Act.

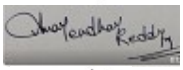
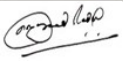
1. Name, Nationality and address of Applicants:

Sr.No	Name	Nationality	Address	Country	State
1	Prof. James Stephen Meka	India	Professor, Department of CSE, WISTM Engineering College, Pinagadi (V), Pendurthi (M), Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173	India	Andhra Pradesh
2	Mr.Amarendhar Reddy Modem	India	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh
3	Prof. Prasad Reddy P.V.G.D.	India	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh

~~**2. To be signed by the applicant or authorized registered patent**~~

Dated this…31st day of May 2021

3. Name of Applicant(s)/ Inventor(s) Signature(s):

Name of the natural person who has signed.	Signature:-
Prof. James Stephen Meka	
Mr.Amarendhar Reddy Modem	
Prof. Prasad Reddy P.V.G.D.	

To

The Controller of Patents

The Patent office at CHENNAI

FORM 3

THE PATENTS ACT, 1970
(39 of 1970)
and
THE PATENTS RULES, 2003

STATEMENT AND UNDERTAKING
UNDER SECTION 8

(See section 8; Rule 12)

1. Name of Applicant(s):
Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D.

2. Name, Address and Nationality of the Applicant(s):

Sr.No	Name	Nationality	Address	Country	State
1	Prof. James Stephen Meka	India	Professor, Department of CSE, WISTM Engineering College, Pinagadi (V), Pendurthi (M), Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173	India	Andhra Pradesh
2	Mr.Amarendhar Reddy Modem	India	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh
3	Prof. Prasad Reddy P.V.G.D.	India	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh

I/We, Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D., is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(i) that I/We have not made any application for the same/substantially the same invention outside India.

OR

~~(ii) that I/We who have made this application No…….dated ……..alone/jointly with……., made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:~~

Name of the country	Date of application	Application No.	Status of the application	Date of publication	Date of grant

~~**3.Name and address of the assignee**~~	(iii)that the rights in the application(s) has/have been assigned to…….. that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application. Dated this: 31st May, 2021
4. To be signed by the applicant or ~~his authorized registered patent agent.~~	Signature:…… Prof. James Stephen Meka Mr.Amarendhar Reddy Modem Prof. Prasad Reddy P.V.G.D.
5. Name of the natural person who has Signed.	Prof. James Stephen Meka Mr.Amarendhar Reddy Modem Prof. Prasad Reddy P.V.G.D.

To

The Controller of Patents

The Patent office at CHENNAI

FORM 5

THE PATENT ACT, 1970

(39 OF 1970) &
The Patent Rules, 2003

DECLARATION AS TO INVENTORSHIP

[See sections 10(6) and Rule 13(6)]

1. NAME OF APPLICANT(S):

Sr.No	Name	Nationality	Address	Country	State
1	Prof. James Stephen Meka	India	Professor, Department of CSE, WISTM Engineering College, Pinagadi (V), Pendurthi (M), Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173	India	Andhra Pradesh
2	Mr.Amarendhar Reddy Modem	India	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh
3	Prof. Prasad Reddy P.V.G.D.	India	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh

I/We Prof. James Stephen Meka, Mr.Amarendhar Reddy Modem, Prof. Prasad Reddy P.V.G.D., hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered…….dated is/are:

2. INVENTOR(s):

Sr.No	Name	Nationality	Address	Country	State
1	Prof. James Stephen Meka	India	Professor, Department of CSE, WISTM Engineering College, Pinagadi (V), Pendurthi (M), Visakhapatnam, Andhra Pradesh, India. Pin Code: 531173	India	Andhra Pradesh
2	Mr.Amarendhar Reddy Modem	India	Research Scholar, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh
3	Prof. Prasad Reddy P.V.G.D.	India	Senior Professor, Department of CS & SE, A.U. College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	India	Andhra Pradesh

Dated this…31st day of May 2021

Name of the Signatory Signature:-

Prof. James Stephen Meka

Mr.Amarendhar Reddy Modem

Prof. Prasad Reddy P.V.G.D.

3. DECLARATION TO BE GIVEN WHEN THE APPLICATION IN INDIA IS FILED BY THE APPLICANT (S) IN THE CONVENTION COUNTRY:-

~~We the applicant(s) in the convention country hereby declare that our right to apply for a patent in India is by way of assignment from the true and first inventor(s).~~

~~Dated this ……day of 2020~~

~~Signature:-~~

~~Name of Signatory:-~~

4. STATEMENT ~~(to be signed by the additional inventor(s) not mentioned in the application form)~~

~~I/we assent to invention referred to in the above declaration, being included in the complete specification filed in pursuance of the stated application.~~

~~Dated this ……day of 2020~~

~~Signature of the additional inventor (s)~~

~~Name :~~

To

The Controller of Patents

The Patent office at CHENNAI