

# Artificial Intelligence based Algorithms used for Solving Personalized Medicine Problems in Personalized Medicine Application

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**Abstract:** *Artificial Intelligence consciousness has altogether acquired grounds in our everyday vocation in this time of data and innovation. Similarly as with any field of study, advancement happens as far as forward leap or formative exploration prompting headway and well-disposed ease of use of that particular innovation. Issues from various regions have been effectively tackled utilizing Artificial Intelligence algorithms. To involve AI algorithms in taking care of Personalized Medicine issues, for example, illness recognition or forecast, precise infection finding, and treatment improvement, the decision of the algorithm impacted by its capacity and pertinence matters. This paper surveys the application and capacity of counterfeit brain organization (ANN), support vector machines (SVM), Naïve Bayes, and fluffly rationale in taking care of customized medication issues and shows that the acquired outcomes live up to assumptions. Additionally, the accomplishment from the past investigations urges designers and analysts to involve these algorithms in tackling Medical and Personalized Medicine issues.*

**Keywords:** *Artificial Intelligence; Brain organization; Naïve Bayes; Personalized Medicine issues; Support Vector Machine*

## I. INTRODUCTION

It is generally an astonishing issue seeing a medication works for certain individuals and be less viable on others or causing aftereffects in another. One more issue is the topic of why certain individuals foster a few sicknesses for example diseases, while others don't. Hereditary make-up and other differential factors like age; way of life could be explanations behind these issues. In that capacity, accepts medication should move toward each patient's sickness as remarkable, with drug custom fitted to the person's history and science. This way to deal with clinical practice is known as Personalized or Precision Medicine.

Patients with same diagnostics result should not be dealt with the same way; they can get different treatment

to accomplish proficient treatment as represented in Fig. 1. Customized medication as a branch or expansion of Medical Sciences utilizes practice and clinical choices to convey altered medical services administration to patients. The significant job of customized medication as placed by is to foresee the chance of a singular fostering an illness, accomplish exact analysis, and upgrade the best treatment accessible.

This is achieved with the assistance of hereditary data, which is utilized as a feature of the benchmark information in fitting or modifying clinical treatment or organization. Yet, most of replicable discoveries don't pinpoint normal qualities fundamental weakness or assurance from sickness; all things considered, current arrangement focuses essentially on interesting hereditary variations, albeit various normal variations have facilitated understanding also.

The field of medication has fundamentally developed throughout the long term and accentuation is placed on thinking about forestalling infections by the utilization of current advancements to figure out the chance of individual having a sickness and giving the individual therapies (perhaps sedates) to control the event of the anticipated illness. Likewise with the utilization of innovation, clinical staff (for example specialists and drug specialist) can convey a particularly effective medical care administration rather than customary strategies.

The utilization of Artificial Intelligence strategies in setting up or building customized medication is significant as far as accuracy and precision of infection revelation, treatment, and medication organization. The control of antagonistic medication responses and compounds digestion which brings about certain individuals having issues dispensing with drugs from their bodies, thus prompting glut; while others wipe out the medication from the body before it finds the opportunity to work. The utilization of PCs in clinics and clinic to record clinical exercises or utilization of electronic wellbeing record (EHR) frameworks these days gives clinical information and information that can be utilized as a benchmark to improve clinical benefit conveyance.



Fig 1. Diagnosis and treatment of patients group

## II. AI ALGORITHM USED IN PERSONALIZED MEDICINE

There are number of algorithms from Machine Learning and Artificial Intelligence that are used in the Medical Field, and in specific Personalized Medicine. Some of these algorithms are discussed here.

### A. Naïve Bayesian

Naïve Bayesian (NB) algorithm named after Thomas Bayes (1702-1761) who proposed the algorithm depends on probabilistic model and permits the catch of vulnerability in a model in a principled manner through deciding the probabilities of various results. NB is broadly involved today in various frameworks that reaches from spam separating, recommender frameworks, and text order. It is likewise utilized in clinical applications, and weather conditions conjecture. This makes it a decent algorithm for order and expectation too.

A portion of the benefits of NB are - it is hearty for commotion in input information, requires a modest quantity of preparing information. A portion of the burdens of NB as referenced are - loss of exactness because of class restrictive autonomy cause by presumption. Furthermore, a few hindrances of Naïve Bayes, incorporates; where an indicator isn't accessible from the preparation information, NB accepts that the record with the new indicator class has zero likelihood.

### B. Artificial Neural Network(ANN)

The application of ANNs in medication incorporates, yet not restricted to the determination, imaging, back torment, dementia, pathology and visualization assessment of an infected appendix, myocardial localized necrosis, intense aspiratory embolism arrhythmias, or mental issues illnesses.

A portion of the benefits of ANN as expressed by are: Neural organizations can learn direct and non-straight models. Likewise, the exactness of models made by brain organization can be estimated genuinely. Fragmented information and commotion are mediocre by brain organization. Brain networks models are adaptable on the grounds that they can be refreshed, henceforth making it appropriate for dynamic climate like wellbeing area.

ANNs are black box algorithms, henceforth powerless in giving understanding into its design. Additionally, despite the fact that it can sum up from a bunch of

models, assuming it sees just instances of a specific reach; it expectations outside these reach could be totally invalid.

### C. Support Vector Machines (SVM):

SVM enjoys benefits, and as referenced, they are: SVM produces precise outcome grouping result on hypothetical premise, in any event, when input information are non-straightly distinguishable. Additionally, the exactness result doesn't depend on the nature of human mastery judgment for decision of the linearization work for non-straight information. A detriment of SVM as a non-parametric strategy referenced by its need for straightforwardness for results. The greatest impediment as referenced what lies in the decision of the piece. It must be set accurately to accomplish a precise outcome for some random errand or issue. Bit decision that produces precise outcomes for task "A" might deliver unfortunate outcomes for task "B".

## III. PROBLEMS IN PERSONALIZED MEDICINE

The issues in customized medication fluctuate and can be reliant upon a sickness type or nature. Generally, issues from a greater picture can be taken a gander at according to alternate points of view as revealed are; government regulations and guidelines on open clinical information and hereditary exploration, medical care laborers perspectives, mindfulness and training, IT execution, and monetary issues. In any case, the focal point of this paper is on IT execution issues, and the issues considered as displayed in Fig. 2 are illness identification or forecast, accomplishment of precise conclusion, and ideal treatment.

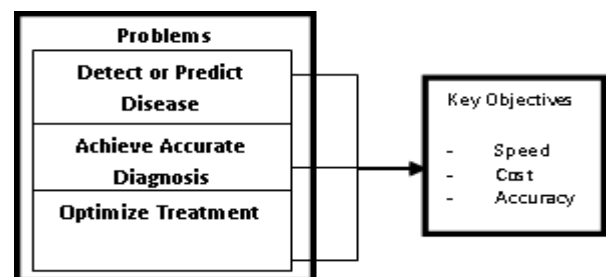


Fig 2. Problems in personalized medicine.

## IV. APPLICATION OF AI TECHNIQUES TO SOLVE THE PROBLEMS

The problems mentioned in Fig. 2 are sequentially discussed in the subsequent sections with regards to how AI algorithms are employed by researchers to solve the problems:

### A. Detection/Prediction

The answer for identification or forecast of illness is significant for the tackling of the following two (for example finding and treatment) issues. In this segment Artificial Intelligence algorithms from AI are audited as for how the issue of infection identification or expectation is addressed.

#### a) *Support Vector Machine*

In a study by SVM was used to classify and detect fall types. The study was relevant because, falling as accident especially in the elderly aged members of the society has to be prevented; but before it can be prevented; it has to be detected and classified. Five different classifiers were used in the research, but SVM was one of two that achieved 99% accuracy. Also, used SVM to detect the accuracy of cardiac monitoring devices. The generic systems for monitoring cardiac arrests lacks the ability to differentiate between artifacts and true events across a range of individuals because they are trained just on a general population level. So, they used SVM to refine and achieve a more accurate patient specific result by making use of population level prior knowledge for initial model creation, then refining further by selectively interacting with human experts to get examples from a new patient until a stopping condition is met. The result from their study shows that patient specificity improves the Atrial Fibrillation (AF) of detection and the poor specificity of the generic detector.

#### b) *Fuzzy Logic*

Case Based Fuzzy Cognitive Map (CBFCM) is an expansion of fluffy mental guides that is utilized for grouping and forecast. CBFCM works by addressing the causal connection between various ideas and afterward investigating induction designs. This is applied in customized medication by investigating the connection between various nature of illnesses and patient explicit data for example quality, pulse, and blood classification to derive an example match in the way to deal with illness location in a patient. An examination on Genomic and Personalized Medicine for grouping for of infection recognition in the Decision Support System they created. For every tolerant, they utilized three boundaries (C1, C2, and C3) as information values which could be Clinical signs, hereditary data, age or organic outcomes. Fluffy guidelines were then applied on the ideas. In the event that there is a decent similitude between known cases and patient an end is drawn, else a FCM is utilized for finding and remedial choice. In a connected work by, Fuzzy rationale was utilized to recognize coronary illness utilizing 6 info fields (chest torment, pulse, cholesterol, glucose, most extreme pulse, old pinnacle) and 2 result fields (result, and safety measures) with decide base that comprise 22 principles. The result recognizes the presence of coronary illness and safety measures appropriately. What's more, the noticed outcome was 92% precise.

#### c) *Artificial Neural Network:*

In a review brain organizations and choice tree were utilized to foster patient explicit continuous alert algorithms. They saw that cautions are fabricated reflectively by dataset that include large number of patients to identify unfriendly clinical and ailments. Yet, minus any additional improvement, investigations discovered that a model worked from one patient populace has more awful execution on information from other two populaces. In this way, their exploration

investigates building patient-explicit disturbing models from particular individual models' information. Of the two algorithms utilized in the exploration (Decision Tree and Neural Network), Neural Network was suggested in light of the fact that it has a higher precision rate (96%,99%, 79%, and close to 100%). Notwithstanding, the outcome from Decision Tree (84%, 98%, 72%, and 98%) was not all that terrible, simply that it was not sufficient contrasted with the ones from brain organizations. Information from 11 unique patients of different ages was gathered from 196 hours. What's more, brain organization of single result layer with one secret layer was utilized with two different preparation times for example 2 and 8 hours. Albeit the presentation of the 2 hours prepared network was poor, the 8 hours prepared network was viewed as very well since it beats the nonexclusive alert algorithms in gadgets.

#### B. *Achievement of Accurate Diagnosis*

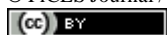
The significance of exact conclusion need not be overemphasized in the clinical field, on the grounds that ill-advised or wrong finding brings about genuine ramifications for wellbeing result. This issue fluctuates from over-determination to under-analysis bringing about the following issue to be examined later in this paper for example treatment improvement. Be that as it may, the AI algorithms used to resolve this issue for example accomplishing precise finding, are examined in this segment.

#### a) *Artificial neural network (ANN)*

A A few examinations show the capacity of ANN to precisely analyze a few infections for example threatening melanoma, eye issues, and various types of malignant growth by dissecting demonstrative standards and otherworldly data. The use of ANN in clinical diagnostics differs; one of the manners in which the ANN is applied as expressed by is displayed in Fig. 3. In an examination by, ANN was applied to analyze kidney stones. The examination was conducted on a dataset that comprise 1000 patients' records, and 7 ascribes that were the genuine indications of kidney stones. The examination thought about three brain network algorithms for example Outspread Basis Function (RBF), Learning Vector Quantization (LVQ), and Multilayer Perceptron (MLP) with back proliferation. Likewise, WEKA was utilized as a device, with 70% preparation, 15% testing, and 15% approval. The outcome shows MLP beats different algorithms with a precision of 92% and accurately grouped occasions of 922, and inaccurately ordered cases of 23.

#### b) *Expert System*

A A standard based Expert System was created by that produces applicable information and data for discussions, results, and conceivable finding. Their exploration was checked to Malaria, chicken pox, and looseness of the bowels, diabetics, cholera, asthma, jaundice, hepatitis, typhoid, thyroid, headache, sciatica, bronchitis, and Alzheimer's infection. Additionally, fostered a standard based master framework that causes derivation with images that to require the interpretation of



a particular information in standard emblematic structure. Information was gathered that partner patients with sign/indications and illnesses. The indications are coordinated in gatherings and the result is arranged into an idea, doubt, or suspension of demonstrative plans to the client (specialist).

### c) Support Vector Machine

In a connected examination, executed and clever framework based help vector machine and Radial Basis Function (RBF) kind of Artificial Neural Network (ANN) to analyze coronary illness. Be that as it may, SVM was proposed in light of the fact that it delivered a superior outcome (86.42%) contrasted with RBF (80.81%). An absolute clinical record of 214 cases comprising 19 credits and 4 class dispersion were utilized. Double grouping was utilized in which 78 examples have a place with the class „0“ for example Myalgia meaning typical, while 139 are viewed as patients with heart issues.

### C. Treatment Optimization

(SVM) with polynomial bit, and a classifier that generally predicts the greater part class in the preparation information (utilized as a gauge). The best outcomes got are: 98% F-measure for the class Cure, 100% F-measure for the class Prevent, and 75 percent F-measure for the Side Effect class.

## V. FUTURE TRENDS

Customized Medicine is a functioning exploration region with a ton of imagined items and accomplishments. A portion of these future patterns include Preventive Medicine. Preventive Medicine is a future pattern connected with customized medication. It is imagined that, sometime, every lifeless thing will actually want to perceive your hereditary code-including that provoking candy machine in your office, which could conceivably encourage you to skirt the chocolate bar today, so you can skip diabetes tomorrow. Automated Surgery: Researchers are as of now working on creating robots that could impeccably do a medical procedure on people. Mechanical medical procedure, for example, da Vinci® help empowers specialists work with upgraded vision, accuracy, skill, and control. Likewise, the utilization of mechanical medical procedure remotely is imagined in the new future; particularly to do a medical procedure on Astronauts. A clench hand measured robot is planned for its initial zero-gravity test in the following a while one little advance toward empowering robotic clinical consideration for people stuck on profound space missions going on for a really long time. Additionally, the utilization infused computer chips to perform careful or organ remedial activities are imagined as opposed to removing the human body.

## VI. CONCLUSION

The execution of Personalized Medicine intensely depends on AI algorithms as talked about in this audit. Nonetheless, it is as yet in its beginning phase and levels and faces a few difficulties; some of which have an immediate connection to AI were examined in this report.

While different issues, for example, exploration and execution expenses, and unofficial laws are additionally difficulties which are basic to the fruitful execution of customized medication, however not tended to by the algorithms examined in this report. In any case, Personalized Medicine doesn't just face difficulties; it represents a few difficulties also, for example, changing the clinical calling and practice to the degree that a few futurist figure algorithms and machines could supplant the vast majority of the positions specialists do today. At last, a fruitful execution of customized medication would save many lives and amazing the clinical calling.

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