



# Showcasing the Impact of Machine Learning in Healthcare

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## Abstract

Machine learning makes the machines learn from provided data and with the help of its algorithms it predicts and analyzes the data. This makes the machines artificially intelligent. These techniques spread its wings in all the areas of healthcare whether it is the diagnosis, treatment etc. Here a brief overview of all the areas where machine learning / artificial intelligence techniques can be applied.

**Keywords:** Machine Learning; Data; Healthcare; Artificial Intelligence

**Abbreviations:** RPA: Robotic Process Automation; ML: Machine Learning; NLP: Natural Language Processing.

## Introduction

Healthcare industry is a big dealing with patients, medicines, research, diseases, biomedical scientists, academia, government officials, laboratories, pharma etc. One big aim of this industry is disease free country. To achieve this goal all parts are working very hard day-night. Still many of the diseases are in scene. And many are treating in a proper way to cure. Making clinical trials more successful, machine learning techniques are used. These methods are robust, time consuming and help in roadmap of every experiment a success. Because of these methods our system becomes intelligent and efficient enough to work. Here are some of the areas where machine learning and artificial intelligence come into existence and play a wonderful role to overcome the problems specified.

## Disease Diagnosis and Treatment

Many pharma companies using AI in research and develop diagnostics and therapeutics for diseases including cancer. Currently the burning topic of research is prevention from disease. According to the available data of disease symptoms machine learning model is developed which will help our medical practitioners to understand the disease in a fast and patient oriented pace. If diagnosis of a disease

is correct in a given time, the doctors will treat that patient comfortably. These ML/AI based approaches help doctors to see the affected areas, degree of severity of disease etc. So, doctors can focus more on treatment. These approaches improve the human errors that may occur during diagnosis. This will help a step ahead for curing a patient [1].

## Precision Medicine

Academia and pharma industry have been focused on how to improve disease diagnostics and prognosis in spite of drug response and adverse effects to improve the safety and efficacy of drugs, toxicity of certain drugs are also increasing high. The concept of personalized medicine is come into existence because every individual has difference in genome. Genomic information from patients can contribute to biomarker based guided personalized drug/or treatment. Moreover pharmacogenomics come over pharmacokinetics which involves the mechanism of the action of drugs on cells as gene-expression pattern is different in different individuals. Not only genotyping, the study of metabolite and their contribution to personalizing drug treatment are very next step.

AI/ML techniques help to study the gene expression patterns and identify the disease development. Metagenomics can be carried out by DNA qPCR/microarray. And these results help to design individual treatment. Over the last few years, Genome wide association studies have been developed

to identify the wealth of genomic variations associated with diseases. These will provide clinical applications [2].

### Genome Diversity

Genomic revolution in medicine has opened the avenues to understand the disease at micro level. Technology, personalized medicine, policies, public-private partnerships are improving the way of medicines day by day. Now this is needed to study genotype to phenotype, and their interaction with environment. Because human and disease variability are very important to understand the complexity of gene environment interactions [3]. It is a big challenge to understand gene-gene, protein-protein, and gene /protein interaction with environment interactions at certain point. These discoveries help to understand disease-risk prediction. The role of AI/ML methods used in data to understand the gene association patterns which will help to understand the disease better and genetics of particular human being, it will help to understand the medicine. If anything is found rare then it is a matter of study.

### Drug Manufacturing

The use of machine learning in the early stages of drug discovery /designing has the potential for initial screening of drug compounds to predict the success rate based on biological factors monitored. This will lead to the existence of technology like next generation sequencing. This will involve unsupervised learning of machine learning. This will involve identifying patterns in data without predictions. If there are known patterns in the data then it is supervised learning in AI. One example is decision tree that make decisions on the basis of predictions. These innovative methods of machine learning will also be beneficial in vaccine designing of crucial diseases [4].

### Clinical Trial Research

Machine learning has the potential in helping clinical trials. For ex, genetic information to target specific populations. ML can also use for remote monitoring and real time data access for increased safety. For example, monitoring biological signs for disease, drug response etc. These ML techniques help to increase clinical trials efficiently and these techniques help to reduce data errors in electronically saved medical records [5].

### Radiology

Radiology and radiotherapy are the one that can diagnose diseases better. Radiologists are the cyborgs of today that will read the algorithms for available thousands of data in a minute. In near future, hospitals are ready to develop machine learning algorithm based devices that can

detect differences in cancerous and healthy tissues/cells. This will improve radiation treatments [6].

### Big Data of Electronic Health Records

The big data of electronic health records lead to the understand the machine learning methods. Because these methods are very useful to analyze different types of data. Classification is a machine learning method for document classification like patient's queries or optical character recognition. They help in collection and digitization of health information. Here artificial neural network using MATLAB will develop intelligent machines to help in diagnostics, clinical decisions and moreover provide suggestions for personalized treatments [1,7].

### Prediction of Disease Epidemic

At present there are data available for epidemic outbreak around the world. These data can be collected from satellites information on web, real time updates on social media and other sources. Support vector machines and artificial neural network are the ML/ AI techniques that can predict malaria outbreaks on account of available data, i.e. temperature, average monthly rainfall, total number of positive cases and other biological reasons [8].

It is observed that artificial intelligence based magazine [9] involves web application and mobile apps connected by unified database including databases for epidemiology, weather and geographical data. Using machine learning algorithms provide the system to predict and geolocate the disease outbreaks. This system can monitor multiple outbreaks in a time. This will also focus on the prediction of antibiotic resistance. AI based devices use data not blood for diagnostics as a rapid test kit.

### IOT Devices

Internet of things is AI driven analytics across many databases which will communicate through 5G networking. This will enable clinicians /physicians to contribute data from the field, from emergency sites routine in-home visits and receive real time advice from doctors. This will enable the accuracy faster. These platforms give data security to many administrations whether public or government. This security is achieved by Cloud platforms like AWS, Google, and Azure etc. These devices will make medical treatment online in case of emergency [10].

### RPA Technology

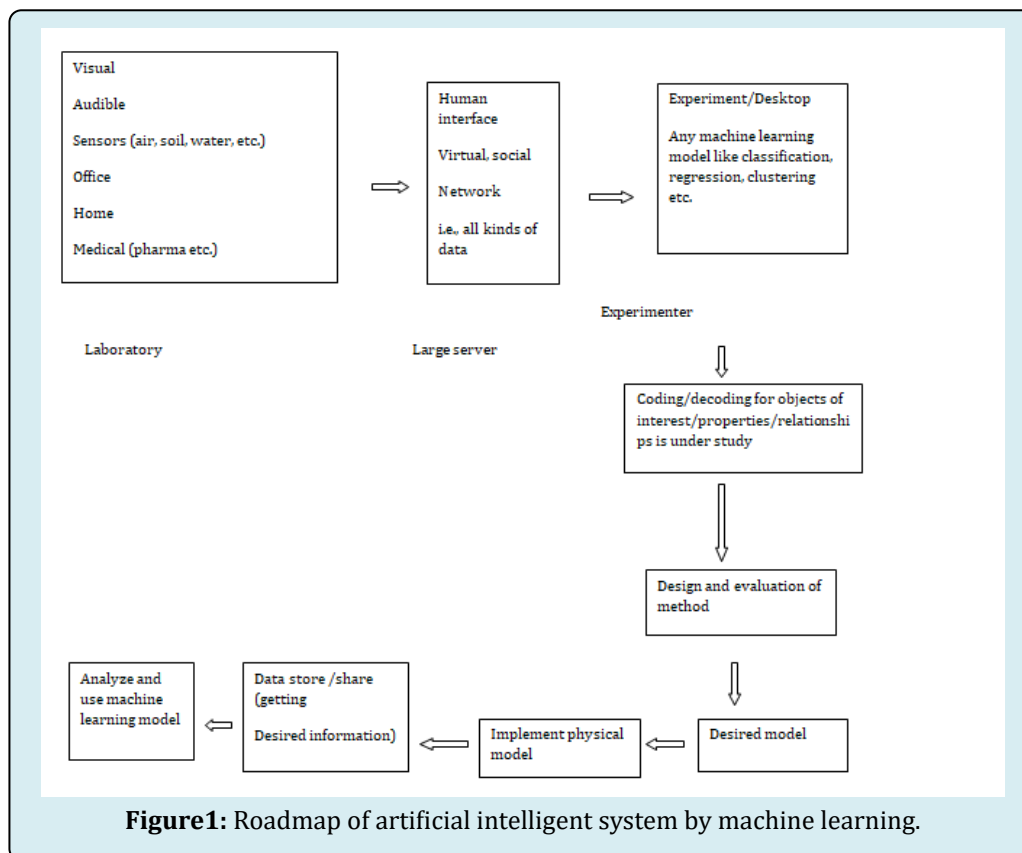
As the name suggests robotic process automation (RPA) allows any of organizations to automate all the tasks as like human beings is doing. Robotic automations interact

with the existing IT architecture of the organizations. This software program also runs on an end user's PC, laptop or mobile device. The sequences of commands are executed by Bots under some defined set of organization rules. This will remove the repetitive and clerical tasks. It requires direct access to the code [11].

## Discussions

Artificial intelligent system: For developing these cutting

edge technologies artificial intelligence system is developed which will make algorithms to learn from data and make machine efficient to use the data for desired output. These ML algorithms may be neural net, classification, deep learning etc. The data can be obtained from any of the sources (laboratory), collected in large server for reuse in future and then experimenter (our system) where machine learning methods are performed. And we will get the desired output as information which will be shared or reuse for anytime when needed (Figure 1).



**Figure 1:** Roadmap of artificial intelligent system by machine learning.

## Examples of AI Based Methods for Healthcare

Nowadays the big IT giants are come closer to pharma industries to work with public -partner relationship to develop AI based models which will improve and well affect the medical field. As per need many types of software are developed and programming languages are modified day by day to get the desired results. Programming languages like Python and Rare popular for application of ML. Julia is another programming language that best offers support for modern ML framework like tensor flow and MXN et. Julia works better in the diagnosing of diabetic retinopathy. Deep learning in Julia helps to diagnose the diabetic retinopathy. The role of radiologist is really remarkable in diagnosing diseases. To make them fully utilizable machine learning

(ML) techniques, content flow image search engine in collaboration with Julia solve the diagnosing problem in seconds. Content flow is a 3D image -based search engine that again uses deep learning to put the recorded knowledge of medical images. Due to shortage of radiologists this could be the best solution.

Companies like Google joins hands with these ML techniques to develop more tools for medical industry. One of them is Deep mind which predicts the kidney diseases before it occurs. Hence it is said that this AI based deep learning continuously predict the risk of future patient deterioration. The working of these AI methods is possible due to large datasets of electronic medical records covering various clinical records like adult patients, inpatients, and outpatients

settings. Patient's treatment policies, their different medical tests outcome etc. Augmented reality microscope is one such microscope that evaluates tissue samples for diagnosis of cancer. As there is a need of trained pathologists this ARM is ready to use for detecting metastatic breast cancer and identifying prostate cancer with latency compatible with real time use. These AI designed microscopes improve the accuracy and efficiency of a cancer diagnosis.

Another breakthrough AI application in healthcare is protein net neural network which has the capacity to predict the structure of a protein in milliseconds. Convolution neural network show promising results in this regard. This AI based model predicts local and global structure of the protein through geometric units that optimize global geometry. Co evolution and experimental pattern is studied. It will improve the path from drug discovery to protein construction. Similarly these AI based techniques help in drug discovery and delivery processes and soon vaccine development of infectious diseases like HIV, malaria, tuberculosis etc are possible.

The researchers working on computer model designed to pick out potential antibiotics that kill bacteria using different mechanisms than those of existing drugs and it can screen available drugs. It is believed that it will also identify other promising antibiotic candidates which they plan to test further and able to design new drugs.

Blue dot a Canada based firm was the first to predict the outbreak of corona virus on December 31, 2019 using an artificial intelligence proved system. Epidemiologist and physicians manually classify the data and developed taxonomy for corona virus. Later they applied natural language processing NLP and machine learning techniques to train the system. Using classification as priority the system algorithm predicts the cases in Wuhan. As Air travelling is significant in disease dispersal. Blue dot uses geo informatics system data and flight tickets sales to create dispersion graph for each disease based on the airport counted to city and where passengers are likely to fly. The locations receiving highest volume of travelers are identified and evaluated for what the impact of the diseases could be in that area.

## Conclusion

This is a technology driven era. And it is very important to have right data for achieving particular goal. Right framework for regulation with right approach of data analysis is big task. It is very much sure that our future technologies

will predict cholera and other diseases outbreak well in time. This will enhance the proper care. These at present technologies machine learning, artificial intelligence will also improve the way of drug or vaccine development. Moreover it will provide disease diagnosis and treatment well in time. These cutting edge technologies save time, money and serve patients more efficiently. Still these techniques are in infancy and developing as per the need. Which needs collaboration between artificial intelligence powered system and medical practisenors, lab workers, radiologists, and so on.

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