A Minor Project Report

on

**TITLE OF PROJECT REPORT**

Submitted in partial fulfillment of requirements for the award of the

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**Under the guidance of**

**Dr. Pankaj Lathar**

**(H.O.D IT)**

**Submitted By**

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**CANDIDATE’S DECLARATION**

I hereby declare that the work presented in this report entitled “IRONA - The AI diagnostician”, in fulfillment of the requirement for the award of the degree Bachelor of Technology in Information Technology, submitted in IT Department,CBPGEC affiliated to Guru Gobind Singh Indraprastha University, New Delhi, is an authentic record of my own work carried out during my degree under the guidance of H.o.D(IT) Dr. Pankaj Lathar

The work reported in this has not been submitted by me for the award of any other degree or diploma.

Date :

<Student’s Name>

Place :

<Roll No>

**CERTIFICATE**

This is to certify that the Project work entitled “IRONA - The AI diagnostician” submitted by <Avinash, Rajnish and S.R Aman> in fulfillment for the requirements of the award of Bachelor of Technology Degree in Information Technology at CBPGEC, New Delhi is an authentic work carried out by his/her under my supervision and guidance. To the best of my knowledge, the matter embodied in the project has not been submitted to any other University / Institute for the award of any Degree .

Dat Dr. Pankaj Shyam Lathar

(HOD.,IT)

**ACKNOWLEDGEMENT**

I express my sincere gratitude to Dr. Pankaj Lathaer(HOD,IT) for his valuable guidance and timely suggestions during the entire duration of my dissertation work, without which this work would not have been possible. I would also like to convey my deep regards to all other faculty members of the school of IT, who have bestowed their great effort and guidance at appropriate times without which it would have been very difficult on my part to finish this work. Finally, I would also like to thank my friends for their advice and pointing out my mistakes.

**ABSTRACT**

There has been an unsaid shortage of doctors and nurses in the country, a report by the Center for Disease Dynamics, Economics & Policy, released in April 2019, found that India is facing a shortage of 600,000 doctors and 2 million nurses. The figures stand way behind when compared with the global recommended standards by the World Health Organisation(WHO). The Doctor to Patient ratio stands at a 1:10,198 (recommended 1:1000) and Nurse to Patient being 1:483, a deficit of 2 million nurses. The shortage of Doctors and Nurses not only brings down the Health Index of a country but also causes untimely deaths, pregnancy failures, severe undernourishment, high infant mortality rate and the spread of communicable diseases. Initial diagnosis becomes a forthcoming factor when dealing with the shortage of doctors. Initial diagnosis if not done in time, then in some cases the treatment and the medication can never be reversible. Using Machine Learning as a methodology, a machine can be trained to diagnose the diseases at an early stage. The machines can then act as an assistant to the Doctors and help them treat more patients on an everyday basis.Also, the Machines can also be used as an alternative to Doctors, at rural places where the patients have to move huge distances just to get their scans checked. Using this approach “IRONA- The AI Diagnostician” project tries to diagnose the diseases of patient just by uploading a copy on IRONA. IRONA, right now at an initial stage can predict the diseases like Pneumonia with an accuracy of “99%” , just by looking at a copy of scans uploaded on it. IRONA can be trained to work on other diseases as well and studying and predicting the diseases, This can act as an assistant to doctors, and look help in diagnosing diseases at an initial phase, and help in improving and developing the health index and putting a break onto untimely deaths of the human resource which have the potential of changing the world.

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**CHAPTER-1**

**1.1 INTRODUCTION**

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Artificial Intelligence(AI) a term coined by John MacCarthy at a workshop in the Dartmouth College of Computer Sciences refers to the machines exhibiting comprehensive intelligence understanding and cognitive thinking abilities as apprehended by the human mind.

Founded as an academic discipline in 1956, Artificial Intelligence has grown exponentially over the years, from solving traditional problems like reasoning, knowledge representation, planning to now being able to do complex tasks like Natural Language Processing, Image Recognition and making “General Intelligence” a long term goal. Increasing number of approaches and tools has filled the giant lacunae that existed in the earlier times. The tools like artificial neural networks and search methods and other methods based on other subjects of natural science have helped Artificial Intelligence expand its horizons to the next level and take on and help in solving real-world problems and not just remaining a technology.

The leap of technology that have happened in the millenials century, have made computers with high computation power the size of a palm, which people like MacCarthy would have never thought of.

Even though the discipline found a place as an academic research subject by the end of 1960s’ but it wasn’t until 2015 that AI got its major breaththrough. The advent of cloud computing infrastructure along with the increased research tools and datasets in the 2010s complemented in cutting through the rates of the expensive neural network in the previous decade. In the coming year, the world’s big economies like China started experimenting and investing in Artificial Intelligence as a discipline, which had lead to major breakthroughs in the discipline.

Artificial Intelligence is often considered to be a broader discipline with several sub-disciplines being subsets of Artificial Intelligence. The intersection of these subset disciplines is sometimes low, which often raises questions to whether they are subfields or just different disciplines.  
Fields like Robotics, Machine Learning, Artificial Neural Networks are considered to be some subfields of AI.

**1.2 MACHINE LEARNING**

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1.2.1 Introduction

“Machine learning is a field of study that gives computers the capability to learn without being explicitly programmed”, Arthur Samuel a pioneer in the field of Artificial Intelligence and computer gaming, who is also known to have coined the term “Machine Learning” defines machines learning with this simple definition. Sometimes also referred to as an application of Artificial Intelligence that provides the ability to automatically learn and improve form experience without explicitly programmed. Machine learning more than just accessing and using data by itself, then focuses on the development of computer Programs that can access the data and use it themselves.

The whole process gets started with the observations and data, and then making looking for patterns and repeated observation in the data and to use it to make decisions and necessary predictions about other data in the future data.

Let’s consider the example, in the field of data analytics, machine learning helps in finding complex algorithms that can be used for prediction. The model allows scientists to produce reliable, repeatable, decisions and results and get the hidden insights through the trends in the data set.

1.2.2 Mathematical Definition

In the year 1997, first time somebody tried to define Machine Learning in terms of a mathematical expression. Tom Mitchell gave a definition like this,

***“A computer program is said to learn from experience E with***

***respect to some task T and some performance measure P, if***

***its performance on T, as measured by P, improves with***

***experience E"***

The definition meant to mean that with increasing experience ‘E’ if any machine improved its performance ‘P”, then the whole process is a process of machine learning.

Let's have a look at another example, for better understanding,

Suppose you wish to recommend a book to a person Mr. X (the task becomes recommending the book to the personT), to recommend a book you need to know and have a basic knowledge of the previous book/books that Mr. X liked, (so this becomes the experience E) and by finding out more and more about the books that Mr. X has found interesting you can predict much better about what books Mr. X would find to be better than others (this becomes the Performance P).

Using this mathematical expression helps in simplifying any problem for which a model needs to be prepared but not always the real world problems are this simple, sometimes highly complex and interdependent real world problems need a more or less pragmatic approach rather than just looking at the Performance, Experiences and Task part of the problem.

**1.2**.3 Classification in Machine Learning

As mentioned in the previous section, the primary aim of Machine Learning is “learning”. Based on these different types of learning methods and the nature of learning signal or response available to the machines they can be classified into various types.



\*In this Section we will only look at the Learning Problems

**1.2.3.**1 Supervised Learning

An approach which is a bit similar to a human being learning under a supervisor/teacher. The algorithm learns from the example data and the target responses. The responses play a vital role in supervised learning as they take affect the performance of the algorithm and help in imporving the experience of the algorithm

**1.2.3.**2 Unsupervised Learning

When the algorithm is only considered with the plain examples without associated response, leaving algorithm to determine the data patterns on it own. Mostly used to provide insights to the supervised machine learning algorithms and providing insights and meaning of the data.

When a human recognizes an object and classifies it as something on the basis of similarities it has with other objects is kind of what unsupervised learning is about in layman’s terms.

**1.2.3.**3 Reinforcement Learning

When an algorithm is presented with examples that lacks labels as in unsupervised learning but the examples are accompanied with either positive or negative or neutral feedback according to the solution then the algorithm is said to be of reinforcement learning, which actually means the algorithm takes takes the decisions and bears the consequences. It's like the trial and error methods in the human world for a layman language.

**1.2.3.**4 Semi-Supervised Learning

Sometimes because of the existence of an incomplete training, the target outputs of training set are missing, this is just a special case and is known as transduction, when the entire set of problem instances are known at learning time, except the part of the targets are missing.The major goal here is to make effective use of all of the available data.

**1.3 HOW MACHINE LEARNING WORKS?**

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There have been some systematic steps which should be followed to work on the date sets and train them with machine learning algorithms. These are not hard and bound rules, but just recommended steps and should be followed so as to work in proper direction.

1. Gathering the Data is the first ann the foremost step which can be processed, the better the quality of the data, the better it will be for modelling.
2. Data Processing needs to be done in certain cases when totally raw data is gathered. Missing values can cause problems while working on the algorithm and can lean to much bigger problem which can become hard to troubleshoot later. So, data processing should be done so as to avoid the error in the future
3. Dividing the data into training, cross-validation and test sets. The recommended ratio for the respective sets is said to be a 6 : 2 : 2 for training set, cross-validations set and test set respectively
4. Model building with suitable modifications and operations on the training set, using the most effective and optimal algorithms and techniques.
5. The least step is for testing the conceptualised model with the data, with the test sets and evaluation of its performance using the desired and required metrics.

All these steps are just a recommendation purpose, there is not binding to create models using these steps only, the models can be created by any which way the person wants to.

**1.4 APPLICATIONS OF MACHINE LEARNING**

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Ever since the advent of machines with high computational power while consuming lesser resources has helped machines learning as an academic subject to expand its horizons and be used in solving real life and real-worlds problems and not just being restricted to only being a theoretical concept.

With some many different concepts being derived from Machine Learning, the concepts of machine learning finds application in approximately every domain of life. Be it education, healthcare, bureaucracy, economics, statistics and what not.

**1.4.1**