Magnetic Resonance Imaging (MRI): An Automation Machine Learning Algorithm Used to Generate an Image Report.

A research proposal submitted by

Rifat Al Mamun Rudro
19-39909-1
Dept. Of CSE Group: 1
rifat.rudro138964@gmail.com

Kaniz Fatema Kanta
19-40788-2
Dept. Of CSE Group: 1
kanizkanta47@gmail.com

Course Supervisor:

Dr M.M. Mahbubul Syeed.

American International University-Bangladesh

Department of Computer Science

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Abstract:

MRI scanning is a relatively new scientific diagnostic procedure. It assists us in detecting any problems in our bodies. In recent years, these tests have been done entirely digitally using cutting-edge technology, however, there is an issue with sending the MRI result in a timely manner. Obtaining the report takes a long time. So, our primary goal is to transform traditional MRI report creation into digital and automated report distribution platforms. As a result, you won't have to wait long to receive the report from the diagnosis center. Within a minute, the patient may obtain their report and know about their condition. To address this challenge, we may utilize machine learning techniques and data analysis, image recognition, and pattern recognition approaches to find the minimal approach.

The report may be created automatically while the patient is being sampled in the sample room using Artificial Intelligence. We can break down the typical report delivery timing by applying machine learning techniques. This medical sector was picked since there are several possibilities for developing scientific standards, and it is a prominent field. Everyone is entitled to medical care. MRI (Magnetic Resonance Imaging) equipment may scan bodily sections and generate images, but no textual description is produced. That is why we have decided to use a machine learning approach to solve the problem.

Introduction:

Lately, MRI scans have been mainly used to see if the bones and tissue cells are damaged or not, without any intervention from the doctor. MRI scans are usually done as part of the pre-trial diagnosis of any surgery. It takes internal body images. It also shows the bones, tissue cells, location and condition of organs. After performing the MRI scans, doctors can analyze the copy of the report and make other decisions about whether or not additional diagnosis or surgery is needed. Recently, some diagnostic centers and hospitals in Bangladesh have modernized with technologies such as MRI scanners. Ingenia's ambitious 1.5T MRI machine is the latest MRI machine [2].

MRI is a technique that is used to generate focused photographs of the organs and tissues in the body with the useful resource of radio waves, magnetic fields, and magnetic field gradients. MRI is especially applied in hospitals and diagnostic centers for detecting diseases. MRI generates better picture of organs just like the thoughts than each different anatomy scanning technique. MRI can help in coming across cancer, stroke, coronary heart disease, bone infections, tumors, etc. [1][2][3]. The device getting to know method is a hard and fast of policies which are a part of artificial intelligence and that create models based totally mostly on sample statistics. Machine getting to know units of policies are applied in locations in which it's miles more difficult or now no longer feasible to boom the problem or ordinary algorithms to perform any desired tasks. After getting the MRI test report, the statistics evaluation is any other method this is analyzed with the aid of using the device [4][5][6]. Data assessment is a device of supervising, remodeling and modeling statistics for inventing useful statistics, suggesting conclusions, and helping decision-making. Machine research use a first-rate set of policies to research an in-depth number of statistics. These algorithms characteristic without human preference or time constants. They compute every statistics mixture to apprehend the statistics historically [7].

Image reputation is a way to use images to search for images and recognize hidden illustrations of features behind them, then look at that discovered illustration for the desired activities. The reputation of the image is based mainly on the deep mastery which is part of the mastery of the system. Deep mastering refers to

automatic studying techniques. Image reputation can be used in computer applications, clinical image optimization, etc. Model reputation is a way to observe and distinguish any style [8]. Style recognition is the primarily version-based information classification system. This is created via the model information, which then meets the models and style traits. Model reputation is used in the evaluation of virtual photos to take a mechanical look at the images in order to derive meaningful statistics. It is particularly useful for discovering similarities.

Research Background:

Bangladesh is currently categorized as a growing country. Every sector in Bangladesh has grown tremendously. Medical research is one of the fastest growing industries, with new mechanisms being developed on a daily basis. Many new technologies have been introduced in Bangladesh in recent years. As a consequence, patients receive the most suitable and high-quality care here. MRI (Magnetic Resonance Imaging) is presently the most often used medical test. Doctors can quickly diagnose any health issues in our bodies via MRI scanning. Every day, a number of patients in Bangladesh request MRI examination. In Bangladesh, there are several types of MRI testing accessible. Functional MRI tests, breast MRI scans, heart MRI scans, brain MRI scans, and so on are examples. According to another examination of the literature, throughout the summer season, an average of 5000-7000 persons seeks medical care in government hospitals and diagnostic institutes in Bangladesh. However, according to data, physicians' rates are relatively low in comparison to the number of patients [8].

There is a scarcity of high-quality diagnostic facilities and hospitals in Bangladesh's rural districts. There are a lot of diagnostic centers in the metro region that offer modern MRI scanning equipment. However, in rural regions, access to this technology is restricted. An MRI machine, according to my approach to machine learning and image recognition, can offer a better resolution image of the MRI scan film as well as a written report at the same time. Where patients may simply access both the picture report and the written report document. As a result, it saves time. A patient is constantly looking for exceptional care and a stress-free working environment. The major goal of the strategy is to shorten the time it takes to provide the report. The old way of transmitting MRI reports is time-consuming owing to the pathological doctor's signature and the written report creation procedure. It takes roughly 5-6 hours after MRI scanning to give the written report of the MRI scanning. In such instance, Patient must visit twice: once to provide the sample and again to collect the report. As a result, patients may encounter difficulties. To address the issue, we introduce a hassle-free MRI Scanning in which a patient may benefit from current technology.

Research Question:

The number one goal of this studies is to locate the appropriateness of the machine’s method. Under the hood of this goal, the test examines a set of study questions.

The principal query is: What is the main reason why these studies take a look at the "automated MRI report"

- ✓ Is this method being user friendly?
- ✓ Is this method working properly?
- ✓ Is this method giving clear film of MRI scanning?
- ✓ Is this method really well worth the usage?
- ✓ Is it secure to believe?
- ✓ Have you ever confronted any problems after the usage of MRI reports?

- ✓ Is it helpful? What do you think?
- ✓ Give this machine a rating out of ten.

Research Methodology:

For these studies, we are able to use the case observe technique. This phase offers an in-depth dialogue of the connection among the choice of this studies technique and the particular protocol for wearing out the case studies.

Case studies are the descriptive evaluation of people, groups, events, and disagreements on particular subjects which are studied holistically through one or greater methods [9][10][11]. The case study method is widely used in intuitional purpose for further research. Case studies have been widely discussed in the literature and a brief summary has been written on the specific steps that can be used to conduct a case study.

The case study methodology will keep the thesis project centered and manageable, once we don't have the time barrage or resources to the research.

In the case study methodology, it has a large number of client observations and reusability of the data. Where an observer can contribute their opinion. Case study methodologies are very accessible to all types of readers. It has a great advantage in cost. Whereas the costs associated with the case study method involve accessing the data, which is done for free. For the recent COVID-19 pandemic situation, researchers couldn't obtain the proper data from a specific location. That's why the case study method can solve the problem. Research data can be obtained by creating a Google form or third-party former response. Where an observer can share their opinion for further research. In the diagnostic center, when a patient provides the sample for an MRI test, the MRI machine takes a sample from an image of the body part. Through the image recognition process, the machine can follow the machine learning algorithm approach to analyze the image and generate an automated report through the MRI machine. This will save the report preparation time so that patients can benefit from it. We must be confident in the availability of MRI machines with the desired machine learning algorithm approach. We need to make sure we provide them with the proper training to use the machine properly. Otherwise, the MRI report will be modified due to lack of system information.

Significance of Result:

In recent times, medical science has developed in a very significant way. Medical tools are updated daily. New technologies are added in the medical field. This is why medical science has a lot of research to improve medical care.

Due to the shortage of updated MRI testing machines, some diagnostic centers use older machines to collect samples for MRI testing. As a result, patients cannot get the exact report. Patients had to travel abroad to check their physical condition. Some diagnostic centers and hospitals have recently upgraded MRI machines. In recent times, Ingenia's ambitious 1.5T MRI machine is the latest MRI machine. This machine can provide high quality and comfortable patient experience and high-quality images. In my approach, the machine can not only provide the image but also generate the document written for the report. Where a patient can get a report and an MRI film at the same time. It can easily improve the field of medical science and the patient experience. By analyzing the MRI image film by image recognition, it can demonstrate an MRI film ratio. Using this approach, minimal time may be required to generate the MRI film report.

A recent review of the literature showed that the number of MRI reports is normal and the rate is 80%. Of the 20% that showed MRI tests, 18% of the tests found accidental abnormal things. 15.1% did not request any postponement; 1.8% were street checks; and 1.1% were urgent referrals [12]. This has proven that the user experience for MRI testing is quite good, but not up to the mark.

In this research, we propose a new approach to perform MRI testing. where an operator can take the sample from the patient for an MRI test. By taking the sample, the operator can ensure that the sample is taken very carefully. Therefore, the result will not be accurate due to sampling. This approach will be of great benefit to both the patient and the physician as they can save time in receiving the report. In this case, the patient does not need to come back for the report after a certain period of time. The patient can get the report every time they deliver the sample. Therefore, patients can view the report with the dedicated doctor after receiving the report.

Conclusion:

In recent times, machine learning technology has become more popular and efficient for people. People can easily take advantage of this technology. By using a machine learning approach, an ordinary patient can save valuable time and get proper treatment from the doctor on time. After providing their sample for MRI testing, patients will get both the filmed image and the written result using machine learning. In this way, patients do not have to wait to receive reports for a long time.

Reference:

1. "MRI Simulation-Based Evaluation of Image-Processing and Classification Methods" Remi K.-S. Kwan, Alan C. Evans, and G. Bruce Pike, * *Member*, *IEEE*
2. "Imaging in evaluation of response to neoadjuvant breast cancer treatment benefits of MRI" C. Balu-Maestro, C. Chapellier, A. Bleuse, I. Chanalet, C. Chauvel, and R. Largillier Centre Antoine-Lacassagne, Department of Imaging, Nice, France
3. https://medlineplus.gov/mriscans.html
4. "Machine Learning for Medical Imaging" Bradley J. Erickson, MD, PhD Panagiotis Korfiatis, PhD Zeynettin Akkus, PhD Timothy L. Kline, PhD
5. "Qualitative and descriptive research: Data type versus data analysis" Hossein Nassaji https://doi.org/10.1177/1362168815572747
6. "Machine learning for internet of things data analysis: a survey" Mohammad SaeidMahdavinejad, MohammadrezaRezvan.
7. "Ultrafast dynamic contrast-enhanced breast MRI may generate prognostic imaging markers of breast cancer" Natsuko Onishi1, Meredith Sadinski1, Mary C. Hughes1, Eun Sook Ko1, Peter Gibbs1,2, Katherine M. Gallagher1, Maggie M. Fung3, Theodore J. Hunt1, Danny F. Martinez1, Amita Shukla-Dave1,2, Elizabeth A. Morris1 andElizabeth J. Sutton
8. "MEDICAL EQUIPMENTS AND ITS USES IN VARIOUS HOSPITALS AND CLINICS IN DHAKA BANGLADESH" Munima Haque, Department of EEE, Southeast University, Tejgaon Industrial Area, Tejgaon, Dhaka-1213, Bangladesh
9. Guidelines for conducting and reporting case study research in software engineering Per Runeson, Martin Höst Department of Computer ScienceSoftware Engineering

10. The Case Research Strategy in Studies of Information SystemsAuthor(s): Izak Benbasat, David K. Goldstein and Melissa Mead
11. “Case study research: design and methods”Author: Robert K Yin\
12. “Incidental Brain MRI imaging from 1000 asymptomatic volunteers”Azar.P.Daghar, Gregory.L.Katzaman.