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

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1 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.

CCS Concepts: • **Machine Learning**; • **Artificial Intelligence**; • **Image Recognition**;

Additional Key Words and Phrases: Magnetic Resonance Imaging, Artificial Intelligence,Machine Learning

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2 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.

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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.

3 REVIEW METHODOLOGY

Evidence-based Software Engineering is a method of answering engineering challenges by combining the best available evidence. Systematic Literature Review (SLR) is a suggested methodology for such investigations [9]. Performing an SLR entails a number of distinct tasks, which Kitchenham defines and describes in[10]. To limit the risk of researcher bias, SLR suggests pre-defining a review protocol as a starting point[10]. Along those lines and in accordance with them.

3.1 Research Question

Magnetic Resonance Imaging (MRI): An Automation Machine Learning Algorithm Used to Generate an Image Report by Using Machine Learning in Bangladesh Projects and its Evolution Strategies are the study subjects we've devised. We are creating a set total of eight questions, as shown in Table 1. These questions give a thorough examination of our chosen study topic. Details such as the research objective, methodology, case study projects, data sources, and validation methodologies are included.

3.2 Article Selection

This section explains the article selection method, (phase (b) in Figure 1) which includes specifying the article inclusion criteria, an automated keyword search to search digital libraries, a manual selection from the initial collection of articles, and reference checking of the listed articles.

Criteria for inclusion. In addition to the research objectives listed in Table I, we have established the following selection criteria that must be met by the reviewed publications in advance :

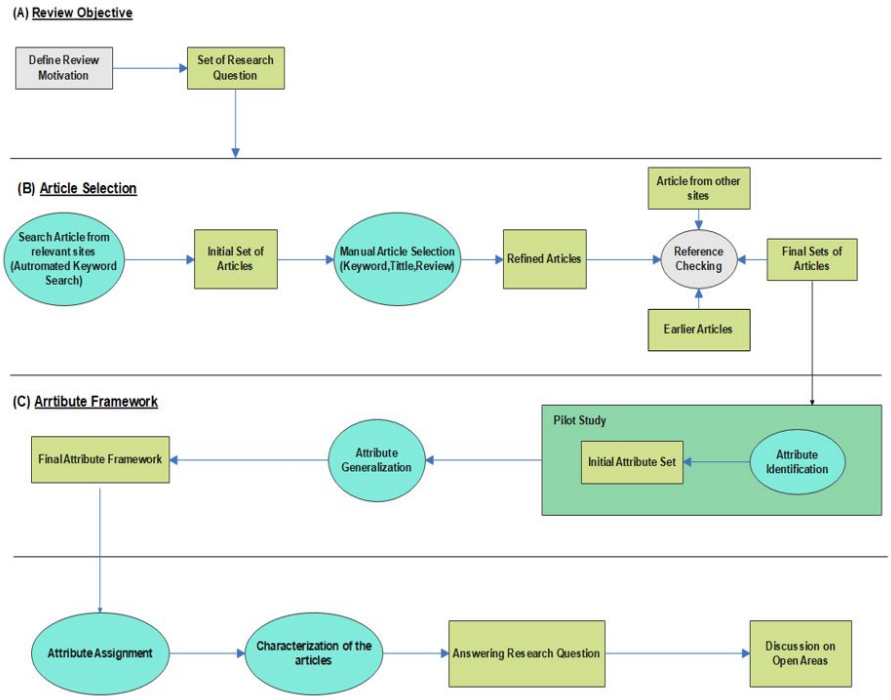

Fig. 1. Basic idea of systematic literature review

- The articles' subject areas must show a clear focus on the issue we've chosen. Authors of case study projects must define the study's goal openly and offer detailed evidence of research methods, data sets, and statistical detail.
- Articles must have a strong link to automated MRI testing and create pictures based on machine learning algorithm techniques in Bangladesh projects, as well as take into consideration certain elements that are specific to MRI testing and create automated results through image recognition. Only publications that employ machine learning as a case study and satisfy the aforementioned requirements are examined.
- The review includes articles from peer-reviewed journals and conferences. Books are not considered for review.

The suitability of the articles was assessed using the above-mentioned selection criteria and a manual analysis of the title, keywords, and abstract (described later in this section). Conclusions are double-checked if there is any question.

Automated keyword search.In literature surveys, automatic keyword search is a common method[11, 12]. To get the first set of articles, we ran a broad automated keyword search. The search method was the responsibility of the first author of this article. IEEE Computer Society Digital Library, ACM and Google Scholar were all searched. The title, keywords, and abstract were used in all searches. Knowing that search string composition differs amongst libraries, we first defined search terms based on our inclusion criteria. Then, following the requirements of the digital library searched, we merged these search terms to produce search strings. The following is a list of the search phrases that were used :

CATEGORY	RESEARCH QUESTION	MAIN MOTIVATION
TARGET	1.Which feature of our project were explored and what statical distribution the article has in those facets? 2.What are the dimensions of our project explored under each study facet?	1.To decompose the articles accordingly to their study, focus and intensity of studies in each focus area. 2.Top determined the specific aspects of our project explored in the studies within each facet.
APPROACH	3.What are the research approaches followed in the studies? 4.What are the datasets or data sources of our project mostly exploited in the studies? 5.What tools are used in our project?	3.To identify the general research approach followed in the studies . 4.To identify the data sources of our project that are used for the studies. 5.To determine the tools used in this project.
OUTCOME	6.Does the concern on "MRI testing by using Image recognition through Machine Learning" follow an increasing trend? 7.What contributions are made in literature to analyze the prediction of MRI testing based on Machine learning using Image recognition? 8.How are the research approaches and result of the articles typically validated?	6.To identify the beginning and growth of research interest in the field or our project. 7.To identify the approaches employed to the research approaches and study results. 8.Identifying the individual research approaches to evaluate the research by validating results.

Fig. 2. Table1- Research Question

Terms representing MRI testing report generation based on recognize the image pattern by using Image Recognition using machine learning in Bangladesh: " Here analyze the MRI image by Image Recognition and Generate the image report in a systematic way by Machine Learning .An automated keyword search yielded 10 items by using ACM.

Choosing by Hand. According to recent studies, our project does not support automated keyword search well due to a lack of a consistent set of keywords, and the topic's abstracts are weak in contrast to those of other disciplines. As a result, it's possible that some of the 10 items found by the automated search process are irrelevant, while others are pertinent.

Reference checking. The first author conducted a non-recursive search of the references of the 8 selected papers to assure the inclusion of other important but missing publications (as described above).

Final set of articles. The article selection procedure yielded a total of seven articles. Our review website has a complete list of these pieces, as well as distribution by year and location.

3.3 Attribute Framework

The subsequent step within side the assessment protocol changed into the development of an characteristic framework .This framework changed into used to represent the chosen articles and to reply the studies questions. Following is a quick description of this process. The characteristic set become derived primarily based totally on criteria: (a) The area of the review (i.e.Generating MRI test report by Image recognition and Machine learning algorithm) and (b) the studies questions.

ATTRIBUTE	SUB-ATTRIBUTE	BRIEF DESCRIPTION
GENERAL		• Publication Type,Year of Publication
STUDY TYPE	• Empirical • Case Study	
STUDY TARGET	• Image Recognition of MRI Testing • Helpfull For All Paitient • Less Time Consuming • Benificial For All Paitient	• Research on "Image Recognition of MRI Testing Using Machine Learning." • It will benefit all patients since it will generate the report image in a timely manner. • Patients may readily access both the image report and the written report document. • After providing the patient sample, it consumes the report delivery time.
CASE STUDY	• Image Recognition Processing through Machine Learning. • Analyzing Image Data to Generate MRI Test Reports • Programable Language. • Size of the project. • Domain of the Project	• Image Recognition Studies Using Machine Learning Produced a List of MRI Test Reports. • Image Data Analysis Using a Machine Learning Algorithm Studied. • Choose a programming language for this project. • Size measure of our project. • The project's application domain.
DATA SOUCE	• The Source Code • Contribution • Communication • Sources from Outside	• Code Base • Change Log, Bug Tracking, Project Management • Chat History • Github
METHODOLOGY	• Method • Tool Implementation • Tool Used	• Methods Applied in the Project • Tools Implemented for the Project • Tools and Algorithms Used for the Project
RESULT	• Growth Rate • Masure of Evaluation • Image Recognition, Machine Learning Result Classification • Summary	• Defines the growth rate of our project • Qualititive, Quantitive. • Other Findings
EVALUATION		• Validation Process for a study

Fig. 3. Table 2-Attribute Framework

Attribute generalization and framework final types.We also generalized the qualities and sub-attributes to increase their reusability. Sub-attributes papers such as "Image recognition" is employed to create the MRI test results, which are processed by analyzing the image data using a machine learning algorithm method are examples of sub-attributes paper. This final attribute list was then validated and approved by industry experts (2nd author). Through the second author of this survey, the venture method became one. During reviewing process, the authors claim the contribution is weighed against the outcomes provided in the research papers. For instance, to validate the declare at the objective of the observation (e.g., image recognition is employed to create the MRI test results), we analyzed what relevant facts re assets are investigated, what techniques are used, and the duration and process of facts gathering. If it was no longer cited in the article, we left the characteristic field to observe kind unfilled

Characterization of the reviewed articles papers. Since the characteristic venture manner is a problem to extraordinary interpretations, extraordinary reviewers might also additionally expect extraordinary characteristic subsets for the identical article. As the characteristic venture manner is completed through the second author, the best of the venture had to be verified to keep away from reviewer bias. This verification assignment became completed through the area professionals who assessed the records series desk towards the reviewed articles. Any disagreements have been resolved via discussion. Next, we speak about the consequences of this evaluation through answering the

studies.

4 REVIEW RESULT

We begin by discussing solutions to the study questions based primarily on reading the result. The "MRI testing report delivery system by analysis of image data via ML" task list is discussed in the review articles.

RQ1. Which feature of our project were explored and what statistical distribution the articles have in those facets?

- Articles under the facets determine what destructive role MRI Testing is playing in today's world.
- Articles under the facets investigate how seriously people take the MRI treatment.
- Articles related determines what percentage of MRI testing reports delivery within a time period.
- Articles related to this topic shows the sample models and their result and how affective are those results.
- Articles related to this topic focused on lack of updated MRI testing machines are available in the country.
- Articles related to this topic determines how beneficial the model will be for the society.

RQ2. What are the dimensions of our projects explored under each study facet?

This study query offers a fine-grained view on the scale of our tasks explored via the articles. The dimensions were primarily concerned with how the MRI testing report delivery system operates more quickly and the sample models.

RQ3. What are the research approaches followed in the studies? Research methodologies accompanied with inside the reviewed articles may be categorized into awesome approaches: empirical observation and case observation. Each reviewed research uses the mission information for both quantitative evaluation and qualitative evaluation. Figure 4 suggests, the rely on posted articles in step with this classification. As may be visible from Figure-4, 7.7% of the research (7 articles out of 18) accompanied the empirical method with both quantitative or qualitative information evaluation.

RQ4. What are the data-sets or data sources of our project mostly exploited in the studies?

The content given with the Ministry of Health's aid contains barriers and biases. The MRI machine not only supplies the image in this project, but it also creates the report paper. where a patient can obtain both a report and an MRI video at the same time It has the ability to greatly increase both medical understanding and patient experience. By evaluating the MRI image file with image recognition, an MRI film ratio may be demonstrated. The MRI film report might be completed in a matter of minutes. According to a recent review of the literature, the number of MRI reports is normal, with a rate of around 80%. Unintentional abnormalities were discovered in 18% of the MRI scans, out of the 20% that had them. 15.1 percent of respondents did not request a delay; 1.8 percent were street checks, and 1.1 percent were emergency referrals[18]. This has demonstrated that the user experience for MRI testing is adequate but not exceptional (Fig. 2).

RQ5. What tools and softwares are used in our project?

In machine learning, certain algorithms are employed to follow a path to solve any image from data. Machine learning algorithms must first evaluate a plausible representation of the data in order to learn from predicted data findings. when the findings are as exact as possible as true outcomes However, at this stage, we must provide a high-resolution image source and follow a well-planned approach. The computer vision and architecture then convert the provided picture to computer language, do the required analysis, and offer an appropriate data set for the machine learning algorithm. To achieve proper image processing, we may employ the "TRansFlow" machine learning technique.

Fig. 4. Working of ML Image Processing

It is capable of working with both machine learning and deep learning. It performs more nimbly in terms of its application programming interface (API). It is a free and open-source (OSS) data representation library.Trans Flow is commonly used for speech recognition, object identification, data recommendation, and so forth.

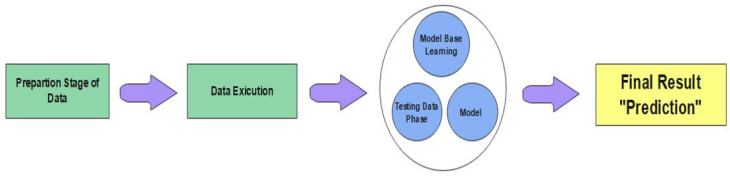

Fig. 5. Machine Learning Working Process for Prediction

RQ6. Does the concern on "MRI Testing" follow an increasing trend?

Yes, the use of "MRI testing" is becoming more common. People are becoming interested in MRI scanning in order to improve their treatments. Dedicated doctors recommend MRI examination to identify any abnormalities in the human body. As a consequence, the doctor may readily comprehend both the image report and the written record in order to comprehend any abnormalities in the human body. Image processing and machine learning can be utilized to produce a high-quality MRI image and result.

RQ7. What contributions are made in literature to analyze the Image Data and Generate of MRI Testing Report based on using ML?

The newest MRI machine, which is based on Ingenia's ambitious 1.5T MRI machine, can efficiently focus on bodily tissues and organs by taking use of the favorable resonance of radio waves and magnetic fields. In order to understand the picture of MRI scanning image data, a prediction model was created for this study. MRI examination can identify cancer, stroke, coronary heart disease, bone infections, malignancies, and other illnesses. The machine learning approach is a set of rigid artificial intelligence policies that build models only on sample statistics. In rural Bangladesh, there is a lack of high-quality diagnostic services and hospitals. A number of diagnostic centers in the metro area employ cutting-edge MRI scanning technology. However, in rural areas, access to this technology is restricted.

RQ8. How are the research approaches and results of the articles typically validated?

The three forms of threats to validity in experimental research are external, internal, and construct validity[13]. The concept of "external validity" relates to the extent to which the findings may be extended to a wider population (or outside of the research settings). Changes in the dependent variables can be reliably ascribed to changes in the independent variables, according to internal validity. For the model to be valid, the independent and dependent variables must accurately reflect the abstract assumptions.

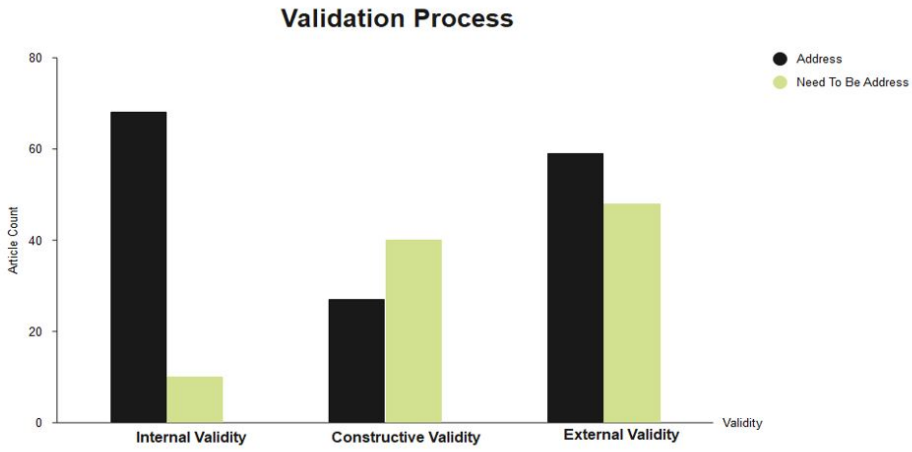

Fig. 6. Validation Process of the research approaches

5 AVENUE TO FUTURE RESEARCH

The next phase in the survey (Figure 1) is to formalize the tacit understanding gained from reading the overview articles on how to distill comparable study directions. To carry out this step, we assessed the impacts seen in phase 4 to identify gaps, similarities, and inconsistencies, as well as the most and least often employed research methods in each component. In the future, we may be able to apply it to various diseases prediction models.

6 THREATS TO VALIDITY

Carrying out a survey is usually a guide task. Thus maximum threats to validity related to the opportunity of researcher bias. To decrease this, we followed tips on carrying out SLR counseled with the aid of using the Kitchenham approach. In particular, we documented and reviewed all steps we made in advance, inclusive of choice standards and characteristic definitions. In what follows, the outline associated with validity threats relating to the thing choice, the characteristic framework, and the thing characterization is discussed.

7 CONCLUSION

In this study, we provide the results of a systematic literature review (SLR) on MRI testing by analyzing image recognition through a machine learning algorithm approach. For the review, a total of 18 papers were chosen as references. We created an attribute framework from a careful reading of a subset of the selected articles, which was then utilized to characterize the articles in a systematic manner. In addition, we are proposing a set of eight research questions that would be researched and addressed during the project. The attribute structure was detailed enough to characterize the articles in response to the study questions. Our review website has a collection of articles and data collected under this attribute structure. An in-depth explanation of the review process's legitimacy is provided.

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8 CONTRIBUTION RECORD

Detail of Each group member contribution according to the following tables.

Student id & name	Paper No from Ref	Paper Title
Rifat Al Mamun Rudro (19-39909-1)	[1][2][11][4] [5][6][8][9][10]	• MRI Simulation-Based Evaluation of Image-Processing and Classification Methods. • Imaging in evaluation of response to neoadjuvant breast cancer treatment benefits of MRI. • Procedures for performing systematic reviews • Machine Learning for Medical Imaging. • Qualitative and descriptive research: Data type versus data analysis. • Ultra fast dynamic contrast-enhanced breast MRI. • Application of breast cancer diagnosis based on a combination of convolutions. • Systematic literature reviews in software engineering- a tertiary study.
Kaniz Fatema Kanta (19-40788-2)	[3][7][12][13] [14][15]	• https://medlineplus.gov/mriscans.html • Machine learning for internet of things data analysis. • Motivation in software engineering: A systematic literature review. • Empirical studies of agile software development • Empirical studies of software engineering. • http://reviewossevolution.weebly.com/.

Table 1. Paper collected and read by the group member

Student id & name	Section No	Section Title
Rifat Al Mamun Rudro (19-39909-1)	[3][4][6][7]	Review Methodology, Review Result, Threats of Validity, Discussion
Kaniz Fatema Kanta (19-40788-2)	[1][2][5]	Abstract, Introduction, Avenue of Future Research.

Table 2. Section(s) Written in the paper by the group member