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Implantation of Android for Better Health with Medication Management App

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Abstract:- The Android application has been developed with the aim of assisting patients in maintaining their health by reminding them of their medication schedules through an Alarm Ringing system. Targeting individuals prone to forgetting their dosage timings, this application provides a user-friendly interface for setting alarms with fields for date, time, and medicine description. Users have the flexibility to schedule alarms for multiple medications at various intervals according to their prescribed regimen. Additionally, a notification system is integrated to alert users after configuring the alarm settings. Furthermore, users retain control over the activation and deactivation of these notifications as per their preference. This study presents a system leveraging the Android Operating System to facilitate medication adherence through timely reminders and automatic alarm functionalities. In today's fast-paced and stress-laden lifestyle, individuals are increasingly susceptible to various illnesses, underscoring the importance of maintaining health and wellness. With the ubiquitous presence of smartphones in our tech-driven society, these devices serve as indispensable tools. Leveraging this technology, the proposed system aims to harness the potential of smartphones to enhance health management practices. By incorporating notifications and automated alarms, the system seeks to alleviate the challenges associated with medication adherence, thereby contributing to improved overall well-being.

Keywords:- *Android Operating System, Medication Adherence, Reminders, Automatic Alarms, Health Management, Smartphones, Technology, Wellness, Lifestyle, Stress, Diseases, Notifications, Adherence Challenges, Well-Being.*

I. INTRODUCTION

Everywhere in the world, the smartphone is gaining an incredible amount of popularity. Because it provides such a wide range of functionalities, it has evolved into more than just a means of communication; it has become the personal remote control of life. At the same time as it has become the standard voice communication facility, it has also become everyone's online bank, online shopping mall, and online tutor. The device is a go-to device for a variety of activities that are performed on a daily basis, including taking pictures, watching movies, shopping, making phone calls, talking, and a great deal more. Portable electronic gadgets are outfitted with sophisticated user interfaces, the capacity to do computations, and sufficient memory [1]. Some examples of the personal information that can be stored on mobile devices include a contact list, passwords for online banking, credit card information, and the location of the possessor, among other things. In a poll conducted by the Pew Research Centre, it was found that the percentage of people using smartphones around the globe has climbed from a median of 45% to 54% between the years 2013 and 2015 [2]. In the field of healthcare, medication adherence is a fundamental component that plays a crucial role in the efficient management of chronic illnesses, the prevention of complications, and the overall improvement of patient outcomes. On the other hand, in the midst of the chaos that is modern life, many people find it extremely difficult to stick to the drug schedules that they have been prescribed. In light of the widespread nature of this problem, several approaches have been developed to assist patients in maintaining their treatment regimens and avoiding any potential complications [3]. The creation of an Android application that is tailored to solve the complexity of medication administration is one example of a solution that might be implemented. Through the utilisation of the possibilities of contemporary technology, this Android application is an example of a proactive strategy to improving medication adherence. At its core, the programme is designed to enable patients to take charge of their own health by delivering timely reminders and alerts through the Alarm Ringing system. This is the primary goal of the application. This programme provides a user-friendly platform for persons who have difficulty remembering the amounts of their medications by utilising the widespread availability and accessibility of smartphones [4]. Users are able to effortlessly set alarms for their meds, which may be customised to their specific schedules and prescriptions, thanks to the user-friendly interface and capabilities that allow for customisation.

Digital Image Processing is the process of gathering and analysing visual information using a digital computer through the use of digital technology. The photos are maintained in a matrix format and are stored on a plane. Digital image processing systems are, in essence, computerised systems that take input in the form of images through the use of cameras or multispectral sensors. The system then applies effective algorithms to these images in order to produce the output that is wanted. Applications of digital image processing and analysis can be found in a wide variety of fields, including computer art, entertainment, education, visualisation, and

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many more. Images in their visual form are saved in the computer as an image array, which necessitates the use of secondary storage devices such as magnetic tapes, hard discs, and other removable storage discs as the storage media [5].Archival storage is accomplished through the utilisation of magnetic discs and optical discs, while digital storage can take the form of small frame buffers. Online storage is mostly comprised of optical storage and magnetic disc respectively. Kilobytes to Terabytes is the range of sizes that the digital photos often take up.

Persons who have difficulty promptly following to their prescription regimens are the major target audience for this programme, which focuses on providing assistance to those persons. By simplifying the process of medication management, it aims to reduce the amount of stress that is experienced by both patients and the medical professionals who look after them. Users are able to input crucial information that is pertinent to their treatment procedures thanks to the integration of aspects such as the date, the time, and descriptions of medications inside the interface for setting alarms [6]. In addition, the incorporation of a notification system provides an extra layer of assistance, ensuring that customers are provided with timely reminders even while they are occupied with their busy schedules. In essence, the purpose of this introduction is to lay the groundwork for a more in-depth exploration of the capabilities and advantages provided by the Android application in terms of improving medication adherence and encouraging optimal health outcomes. The purpose of this application is to empower individuals in their journey towards greater health and well-being by tackling the underlying hurdles to adherence through the implementation of creative technological solutions [7].

➢ *Problem Definition*

Medication adherence poses a significant challenge in healthcare, with many patients struggling to adhere to prescribed regimens. Physicians often face difficulty in ensuring that patients take their medications at the designated times. A prevalent issue arises from patients forgetting to take the correct medications in the prescribed dosage and at the appropriate times. This lack of adherence, commonly referred to as medication nonadherence, has garnered increasing attention due to its detrimental effects on patient health and associated rise in medical costs. Nonadherence to medication regimens has been identified as a complex and costly problem, contributing to suboptimal treatment outcomes and placing strain on healthcare resources. Consequently, addressing medication adherence has become paramount in improving patient care and mitigating the negative impacts of nonadherence on both individuals and healthcare systems.

II. PROPOSED APPROACH

The proposed system is based on the Android Operating system, which will remind users to take medicines on time through notifications and an automatic alarm ringing system. Today's life is full of responsibilities and stress. So people are prone to diseases of different types, and we must stay fit and healthy. We rely on gadgets, especially smartphones, in our developing and technology-dependent life. Today everyone has a smartphone. With this, we get an opportunity to use technology in a better way so that it is helpful to us, and it plays an integral part in our daily life and helps us stay fit in many ways.

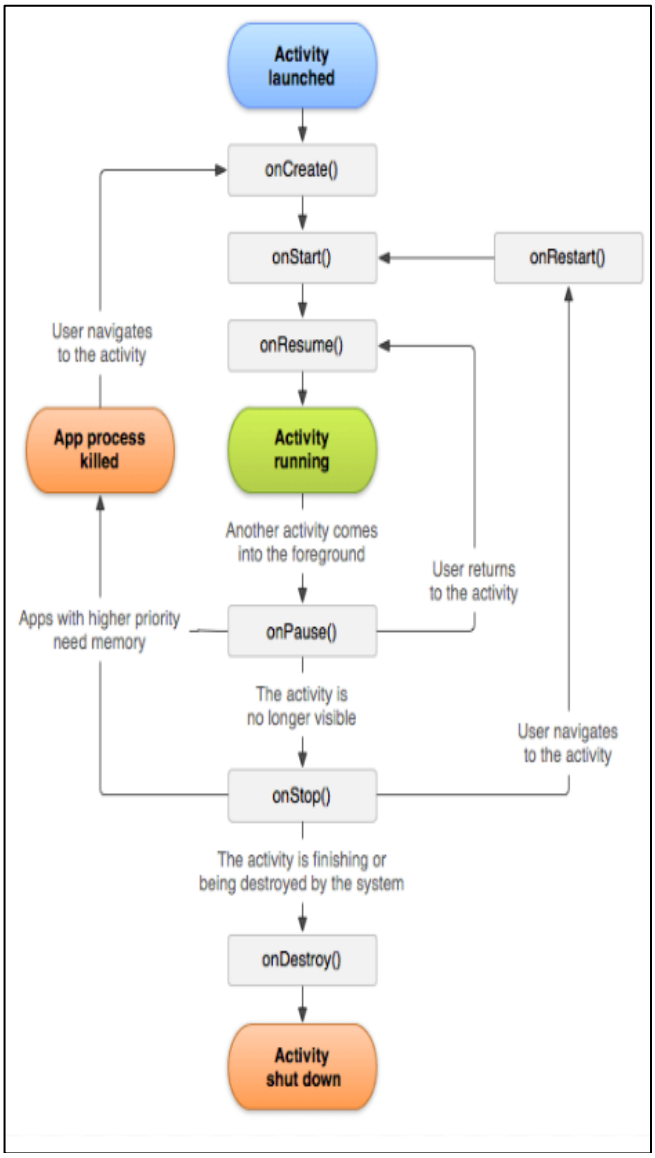

Fig 1 Activity Life Cycle

The proposed system is built upon the Android Operating System, leveraging its capabilities to address the challenge of medication adherence. Through a combination of notifications and an automatic alarm ringing system, the system aims to remind users to take their medications promptly, thereby promoting better health outcomes.

III. REVIEW OF LITERATURE

Developers can utilize this to include new features into their apps and learn from the features of other apps. It can be used to find the app's secret functions and system APIs, both of which lack adequate documentation [8]. Through reverse engineering, developers can examine the architecture and design of conventional apps across several categories, as well

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as reverse engineer system APIs. Reverse engineering an app's code analysis can be useful in learning from other apps, particularly in situations where developers are unsure of how to implement a feature. Reverse engineering is crucial in these situations because it allows for the acquisition of information about various approaches. Reverse engineering with an emphasis on security was utilized in our situation to examine iOS app behavior and identify fraudulent or privacy-invading apps.

Multi-touch gestures form the foundation of the iOS user interface (UI), which facilitates multitasking.

After its release, iOS saw multiple updates and bug patches [9]. The primary characteristic of the iOS platform is its closed-source nature. Apple deserves praise for including a number of accessibility features in iOS that make its products usable for people with vision or hearing impairments. In contrast to iOS-based phones, Android-based phones are also quite popular because of their affordability and versatility.

For training, machine learning classifiers need large amounts of labeled data sets. Large labeled training data sets are expensive to obtain and process and require security or field professionals. This limitation of conventional supervised procedures can be solved with the aid of active learning techniques.

Using a specific informative measure, active learning approaches select the optimal example or sample for training. The technique of active learning has been applied in many fields. Wang et al. have looked at the active learning approach to lower the labeling cost for audio annotation [10].

The authors presented their own approach, known as alternating confidence sampling, after evaluating three certainty-based active learning querying methodologies. They were able to show that their innovative approach reduced the cost of annotations. A qualitative examination of twenty thousand unlabeled recordings was conducted in order to evaluate the efficacy of the suggested methodology. Expert analysis conducted by humans revealed that the annotation results of their active learning were satisfactory. For effective audio annotation, the authors employed the least-confidence sampling strategy, the alternating confidence sampling technique, and a semi-supervised active learning approach. Their research therefore showed that an active learning technique can be helpful in situations when getting a labeled instance is expensive. They haven't, however, investigated every potential pairing of various active learning scenarios and querying techniques.

The foundation of stream-based selective sampling is the presumption that there is a large amount of unlabeled data available but no labeled data on hand. One unlabeled instance is selected from the data set at a time by the algorithm, which then determines whether to reject the instance or query it to get its label from an Oracle database or human annotator based on an informativeness metric. Sequential 107 learning is another name for it since each unlabeled instance is chosen one at a time from the data source. This methodology's basic premise is that unlabeled instances ought to be sampled first from their true distribution [12]. Previously, research has been done on using stream-based selective sampling to simulate real-world activities like part-speech identification and sensor scheduling. This method's benefit is that it speeds up the classification process by limiting the size of the dataset and reducing the amount of annotation work required.

IV. CREATING ANDROID APPILCATION

The first step is to create a simple Android Application using Eclipse IDE. Follow the option **File -> New -> Project** and finally select **Android New Application** wizard from the wizard list. Now name your application as **Hello World** using the wizard window, and the following screenshots are:

A. Experimental Setup

Android is a versatile software stack designed for a wide array of mobile devices, not just limited to smartphones. It serves as the operating system, middleware, and host for critical applications, offering a comprehensive solution for developers. With its robust architecture and support, Android simplifies mobile development, providing tools and APIs through the Android SDK for creating applications using Java programming language. Whether it's for building a DVR, a handheld GPS, an MP3 player, or any other device, Android offers a flexible platform for software development. Its full phone software stack encompasses everything needed for seamless operation, making it an ideal choice for developers seeking to create diverse and innovative mobile solutions.

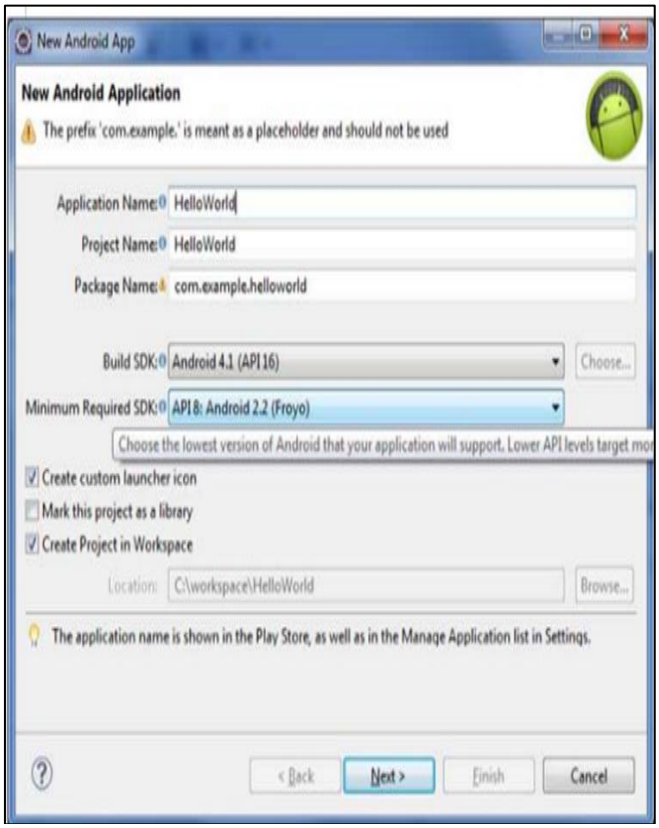

Fig 2 Experimental Setup

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➢ *Analysis of Projected Model*

Each class's rainfall is categorised as follows: normal in class 0, low in period 1, regular in class 2, high in class 3, 4, very low in class 5, then almost nonexistent in class 6.

Table 1 Classify the Planned Perfect for Many Lessons

Classes	Precision	Sensitivity	Specificity	F-score	Accuracy
0	0.591	0.619	0.969	0.605	0.947
1	1.000	0.826	1.000	0.905	0.975
2	0.837	1.000	0.971	0.911	0.975
3	1.000	0.809	1.000	0.894	0.959
4	0.878	1.000	0.974	0.936	0.978
5	0.754	0.852	0.943	0.800	0.928
6	0.914	0.865	0.980	0.889	0.975
Average	0.854	0.853	0.978	0.849	0.962
Testing stage	Precision	Sensitivity	Specificity	F-score	Accuracy
0	0.619	0.619	0.973	0.936	0.950
1	1.000	0.783	1.000	0.878	0.969
2	0.714	0.854	0.950	0.778	0.937
3	1.000	0.853	1.000	0.921	0.969
4	0.818	0.882	0.963	0.849	0.950
5	0.683	0.796	0.924	0.735	0.903
6	0.806	0.784	0.975	0.795	0.953
Average	0.806	0.796	0.969	0.796	0.947

Using Table 1, please describe the projected classical for each of the listed classes. A 0.947 sensitivity, 0.619 precision, 0.970 specificity, 0.591 f-score, and 0.605 accuracy were recorded in the investigation of the 0th class. The first class has an f-score of 0.905, a specificity of 1.000, an accuracy of 0.826, and a sensitivity of 0.975. The second group has an f-score of 0.837, an accuracy of 0.911, a sensitivity of 0.975, besides a specificity of 1.000. As for the third group, the relevant metrics are sensitivity (0.959), precision (0.809), specificity (1.000), and accuracy (0.894). Class 4 metrics include an f-score of 0.879, an accuracy of 0.936, a specificity of 0.974, a precision of 1.000, and a sensitivity of 0.978. A stivity of 0.928, specificity of 0.852, f-score of 0.754, and accuracy of 0.800 characterise the fifth class. A sensitivity of 0.975, an accuracy of 0.865, a specificity of 0.989, a specificity of 0.914, besides an f-score of 0.889 are all recorded in class 6. Sensitivity is 0.962, precision is 0.853, specificity is 0.978, f-score is 0.854, and accuracy is 0.849 in the average class. Next, we have the following metrics for the 0 class: sensitivity: 0.950, precision: 0.619, specificity: 0.973, f-score: 0.619, and accuracy: 0.619. The sensitivity, precision, specificity, and accuracy for class 1 are 0.969, 0.783, 1.000, and 0.878, respectively. In class 2, the scores are as follows: 0.778 for accuracy, 0.937 for sensitivity, 0.854 for precision, and 0.950 for specificity. We find an f-score of 1.000, specificity of 1.000, accuracy of 0.921, exactness of 0.853, sensitivity of 0.969, and class 3 findings. A sensitivity of 0.950, precision of 0.882, f-score of 0.963, and accuracy of 0.818 (0.849) are all recorded for class 4. The following values are shown on a 5-point scale: sensitivity=0.903, precision=0.796, specificity=0.924, accuracy=0.735. The sensitivity, accuracy, and specificity values for class 6 are 0.953, 0.784, and 0.795, respectively. A 0.947 precision, 0.969 specificity, 0.806 f-score, and 0.796 accuracy are all inside the typical class.

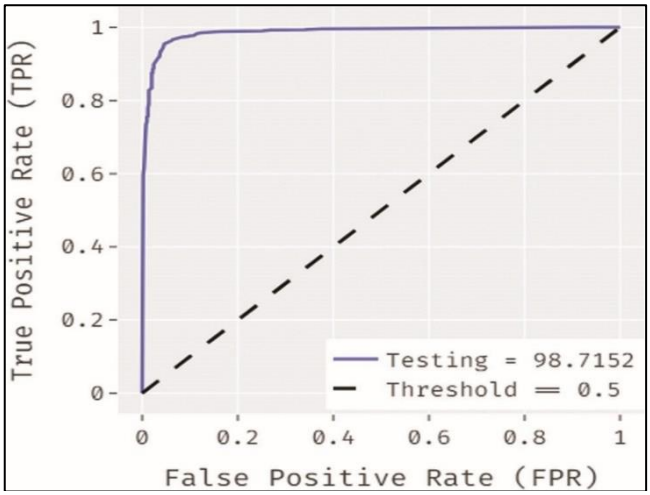

Fig 3 ROC Examination of Projected Perfect Under ROC-Testing Stage

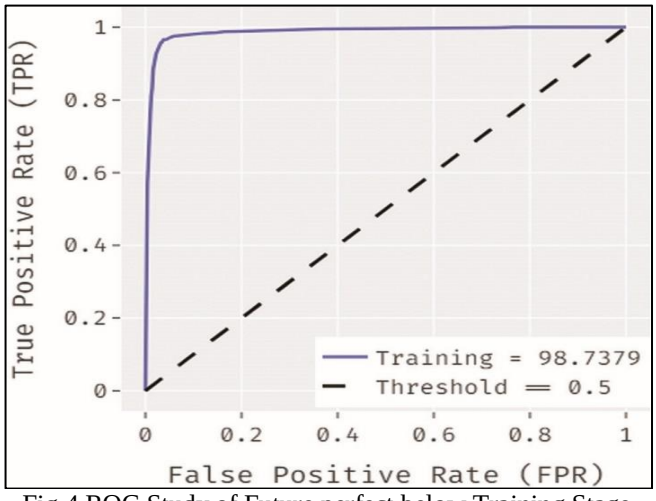

Fig 4 ROC Study of Future perfect below Training Stage

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B. Analysis of Projected Perfect with Existing Procedures

Table 2 details the metrics used to compare the proposed model to current models in this section..

Table 2 Contrast Scrutiny of Different Classical

Methods	Prec.	Testing acc.	Spec.	Training acc.	Sens.	F-score
Xception classical	0.906	0.875	0.870	0.905	0.832	0.867
R.NET-50	0.931	0.879	0.880	0.907	0.812	0.868
D.NET-201	0.926	0.885	0.880	0.911	0.833	0.877
Inception-V3	0.906	0.881	0.880	0.913	0.849	0.874
Projected classical	0.950	0.947	0.974	0.962	0.894	0.9522
VGG-16	0.887	0.849	0.850	0.886	0.792	0.8357
proposed	0.921	0.897	0.900	0.924	0.864	0.892

The comparison analysis of several models is shown in Table 2, which is located above. The following values were achieved in the study of in that order. Following VGG-19's faultless training, the testing, specificity, and f-score values were 0.871, 0.904, and 0.863, singly. The MN-v attained a training accuracy of 0.893 and a testing accuracy of 0.840 after achieving perfection. Following the MN-v2 0.924, specificity 0.897, and f-score 0.892, R.NET-50 achieved a faultless set of results: a training accuracy of 0.907, a testing accuracy of 0.879, a sensitivity of 0.812, a specificity of 0.880, and a exactness of 0.868. The following values were obtained once the D.NET-201 achieved perfection: training accuracy (0.911), testing accuracy (0.885), precision (0.833), sensitivity (0.880 0.926), and f-score (0.877). Following the Inception-V3, the f-score was 0.913, the specificity was 0.881, the precision was 0.849, the specificity was 0.880, the precision was 0.906, and the precision was 0.874, in that order. Following the Xception model's perfection, the following metrics were achieved: training accuracy of 0.905, of 0.875, exactness of 0.832, compassion of 0.870, specificity of 0.906, and f-score of 0.867, in that order. Following its successful implementation, the projected model accomplished the following metrics: training of 0.962, of 0.947, sensitivity of 0.947, besides f-score of 0.894; exactness of 0.974, besides sensitivity of 0.950, besides f-score of 0.922, respectively.

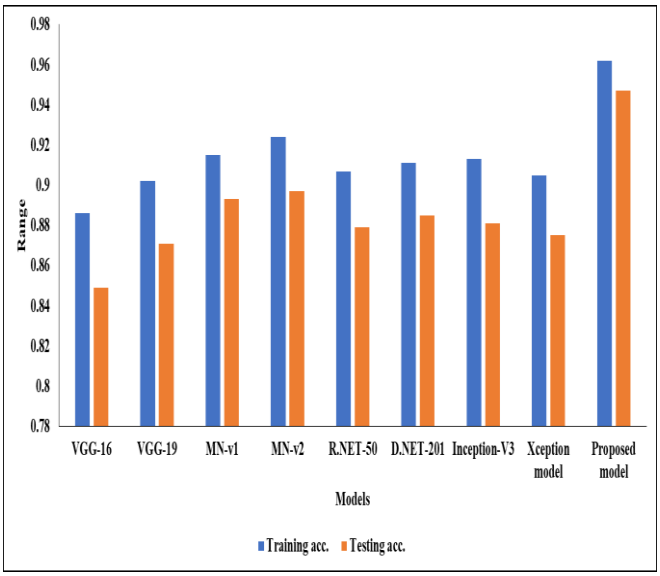

Fig 5 Accuracy Investigation

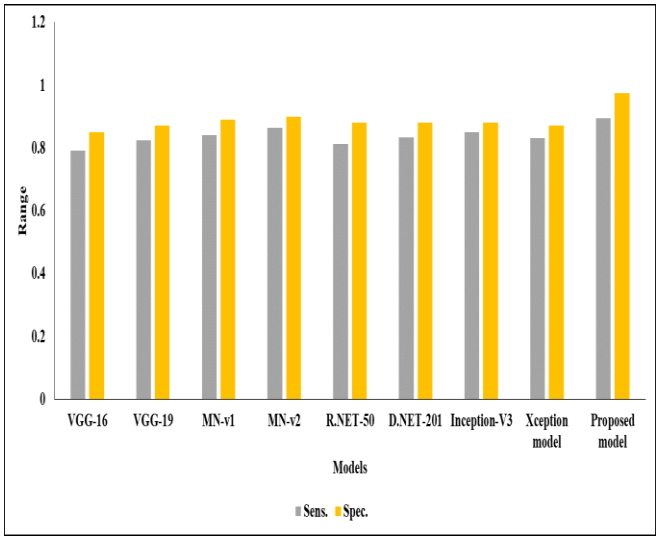

Fig 6 Graphic Inspection of Predictable Archetypal

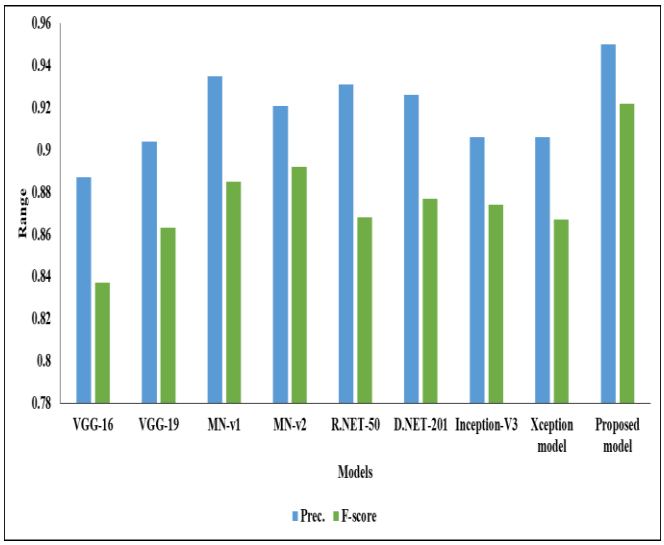

Fig 7 Graphic Scrutiny of Likely Perfect by Existing Practices

V. CONCLUSION

The application provides dependable reminders, an outstanding user interface, and an outstanding user experience. Additionally, it supports a large number of new features that assist medicine alarms. A survey was carried out with one hundred individuals, which included persons of varying ages. The following graph illustrates the relative levels of interest that people of varying ages have in the

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various features that are offered by the system. The results demonstrated that combining all of the features that are offered is beneficial to individuals of all ages. Searching for doctors who specialise in diseases was shown to be advantageous to individuals aged approximately 40 years old, who were included in the entire group that was surveyed. The physician was an excellent option for the group that was 58 years old. Individuals who were less than 55 years old discovered the feature of arranging appointments. Adults are more likely to forget the timings of their medications and to forget their positions. This is especially true for older people. The function that automatically rang the alarm was advantageous to each and every single member of the complete population. The younger generation is particularly worried about the new healthcare consciousness and is interested in learning about the new medical procedures that are being produced on a daily basis with great curiosity.

It is also possible for patients to search for doctors based on the disease they are suffering from, which takes into account the doctor's area of expertise. This provides a convenient and time-saving service for users to look for doctors.

Physicians have the ability to view all of the appointments that they have scheduled, along with the date and time that they have scheduled; this allows them to create new appointment schedules.

There are plans that can be implemented to enhance the overall functionality of the system through the utilisation of video calling. Additionally, specific prescriptions will be prioritised.

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