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1 Introduction

1.1 Problem Statement

The primary purpose of RespiroVision is to revolutionize the early detection and diagnosis of lung cancer. This innovative software system harnesses the power of artificial intelligence (AI) and advanced medical imaging to fulfill several critical objectives:

• Early Detection: Through the design of RespiroVision, lung cancer- related markers like nodules are detected and positioned as far as possible at an early stage. Time is of the essence in the early detectiontreatment protocol; therefore, the patient's survival rate directly depends on the current diagnosis outcome.

• Accuracy: Using sophisticated deep learning algorithms and advancedimage examination methods, RespiroVision is expected to remarkably improve the quality of lung cancer diagnosis. This precision gravely reduces a situation where a person is wrong to be ruled as negative orpositive, being the most important thing in this process.

• Efficiency: RespiroVision simplifies the diagnostic process and makesit easier for healthcare professionals to view CT scan visualizations without the need for specific equipment. It can result in faster examination and addition of treatment methods which will be of a highquality.

• Minimized Subjectivity: The feature helps in reducing the machine-to-man discrepancy, which is the source of high variability for the manual interpretation of computerized tomography. This way, the consistency and reliability of the detection of lung cancer are increased.

• Real-time Analysis: Hence, RespiroVision can supply instantaneous detection of abnormalities, which in turn leads to their immediate alerting. This feature as such gives us an opportunity to be timely withthe intervention and shown a path to treatment.

• Empowering Healthcare Professionals: The software is not yielding itsplace to professionals but aiding to combat their tasks.It empowers radiologists and

specialists who provide rich and essential input in the healthassessments and decision-making processes.

• Accessibility: To ensure widespread uptake of RespiroVision, it shouldbe designed user-friendly and easily deployed even in the smallest ofhealthcare facilities as resourceless hospitals can also derive benefitsfrom the features of the platform.

1.2 Product Scope

RespiroVision, innovatively based amalgamation of AI and machine, is software system that can detect early stages of lung cancer by the wayof computed tomography (CT) scans. The purpose of this is to enable healthcare experts to use it in lung cancer diagnosis as a better alternative that increases accuracy and faster the process.

• Lung Cancer Detection: RespiroVision involves the analysis of CT scans for identification and demarcation of areas with suspicious cellsand nodules that could be indicative of a lung cancer presence.

• Real-time Analysis: The platform is available for the manualize access,the health care

specialists would have it during the real-time analyzing which wouldhelp speeding up the correctly diagnostic.

• Minimized Subjective Errors: One essential way planned to be achieved through Respirovision is the automated process of data analysis, which helps prevent mistakes and possible dehumanizationcompared to the process of manual interpretation.

- Enhanced Efficiency: Through its programming, the software will create as well as execute the lung cancer process.

1.3 Overview

In this health solution, resources have been shaped in to early diagnosisof lung cancer by artificial intelligence tool in order to improve the quality of life and the decrease of cancer-related problems.

Intelligence (AI). This cutting-edge technology employs the latest deeplearning algorithms and has a user-friendly interface where it properly analyses the CT lung images and in turn aids medical professionals in early stage lung cancer diagnosis.

Lung cancer is an important health issue globally that is dictated byearly detection to yield to good results for the patients. In the past it used to be a traditional approach for radiologists to present their readingof radiological images with visual analysis by scanning these images manually. However, this process involved a very subjective approach with the poor time management.

2 Literature Survey

The advent of AI-based air waves consisting of AI and sophisticated diagnostic technologies is causing a drastic change in the diagnosismode of lung cancer-related issues. Aimed at revolutionizing earlydetection and diagnosis, RespiroVision offers several critical advantages: Aimed at revolutionizing early detection and diagnosis,RespiroVision offers several critical advantages:

Early Detection and Accuracy:

RespiroVision uses the modern deep learning algorithms to discover lung cancer-originated markers including nodules and spot the initiallevel of disease. This put of getting the patient earlier is significant forexperiencing the up gradation of survival rates among the patients.
RespiroVision is a way to increase diagnostic precision. This leads to the elimination of a possibility of inaccurate diagnosis as well aiding timely and adequate treatment.

Efficiency and Minimized Subjectivity:

Among other benefits, RespiroVision digitizes the diagnostic process,making it simple and objective, thus allows other healthcare professionals to concentrate on important parts of patient care ratherthan wasting time on the diagnosis. Its automatic results cannot be influenced by the human bias as the indicator shows less variations characteristic for the human interpretation, which makes the finalresults more reliable and constant. Health is hence imitated in that many investigative procedures are accelerated, enabling swift examination and treatment planning that enhances patient care.

Real-time Analysis and Empowerment of Healthcare Professionals: His knowledge and understanding of these aspects will shape his actions, decisions, and the overall direction of his ministry.

RespiroVision is a tool for instantaneous detection of breathing aberrations which leads to immediate intervention in their cases. Thishelps them to obtain better diagnostic insights and increases their techniques for diagnosis, supporting specialists and radiologists to make the optimal decisions and contribute to the improvement of thepatients' health.

Accessibility and Product Scope:

It has a user-friendly interface, and it is easy to install so to increase deployment among healthcare centres this application is designed for. The coverage comprises CT scan analysis in the early stage using the CTscan for quick detection of weaknesses and mistakes, thus assuring abetter procedure to take decisions.

Lastly, RespiroVision is an innovation that is poised to be a critical discovery tool in the detection, as it provides a viable solution towardsbetter patient outcomes and lesser global burden of the disease.

3 Design (System Requirements and Specifications)

3.1 Product Scope

The lung cancer detection and segmentation approach, which we havejust developed and is highly customized to the needs of Pakistani patients, is a huge step ahead of the traditional idea of healthcare technology. Using the method of linearly applying CNNs technique, our innovation can radically change the early detection and treatment of lung cancer for Pakistani population. Not only a breakthrough for more precise diagnosis of lung cancer in this product but also here is a featureof the-segmentation-to- aid-in-treatment-planning –which is a greattool-for the doctors. Our model, based on the concept of the characteristics of Pakistani patients, is prepared to help both patients and the countries cure many illnesses, thus decreasing the cost of the treatment and saving lives. The product development is a proof of our strategy to respond to the immediate health problems of our communityand engage into local beneficial solutions aiming for cutting-edge technologies.

3.2 Product Functions

Integrating our cutting-edge Lung Cancer Detection and Segmentation algorithm with CT scans enables us to identify early-stage lung cancer.

The model, which demands very careful design with a distinctive capability in healthcare provision, will be employed as a strategy tool. Needs of Pakistani patients. Thanks to the groundbreaking use of this potent convolutional neural network the model, however, presents theresult of only 5 percent less carbon emissions over the years.(CNN) usesvast arrays of deep learning approaches based on cutting-edge
algorithmic models to precisely perform complex tasks as we humans do today. Discriminate and cut out lung cancer nodules and tumors indiagnostic medical images. Our strengths of the device relate to
accurate tumor indication, size and position. Approximation, enabling
early diagnosis in irrigation planning and treatment. Tailored not only will the case of our topic be highly discussed but also to the country-specific demographic and health infrastructure system of Pakistan. This
conception implies that lung's operation can hence be made morerelevant and productive. Cancer diagnostic, which would mean swiftinterventions in time and life-saving ultimately.

3.3 Running Environment

3.4 Functional Requirements

3.4.1 User should be able to Authenticate.

The system will facilitate physicians in accessing their patients' accounts through a sign-in process that requires them to provide their email and password credentials.

Users have the option to register their accounts by entering their personal

information. For those who are already registered, they can effortlessly sign in by providing their email and password. These user credentials will be securely stored inthe system's database and will serve as a means of authentication, ensuring authorized access for users.

3.4.2 User should be able to Input Images

CT scans need to uploaded for the software to perform its task.

3.4.3 Tumor Classfication

The system will then test the image provided and will classify the cancer into four types.

3.4.4 Diagnostic Report generation

After classifying a tumor (as mentioned in FR3), the system should generate detailed diagnosticreports for each patient, including images and classifications. Doctors should be able to review, edit, and finalize these reports before sharing them with patients.

3.4.5 System Security

The plan itself should build a full-proved data security system to deal with sensitive data of the patients with encryption, access controls and regular security audits. It should have the capabilities of capturing and control user movements for purposes of security and audit.

3.5 Non-Functional Requirements

3.5.1 Security

Description: All data within the system must be safeguarded against unauthorized access. API endpoints should implement robust authorization mechanisms. The system must consistently exhibit robustness and maintain predictable and correct behavior in terms of data security.

3.5.2 Availability

Description: The server hosting the system must maintain uninterrupted availability, operating 24/7. Users should have the capability to interact with the system at any time throughout the week. In the event of system downtime, it must be restored to full operational status within a maximum timeframe of 12 hours.

3.5.3 Accuracy

Description: The system is required to provide results with a 100% accuracy rate. Additionally, it should ensure the correctness of data by effectively managing concurrent tasks and processes.

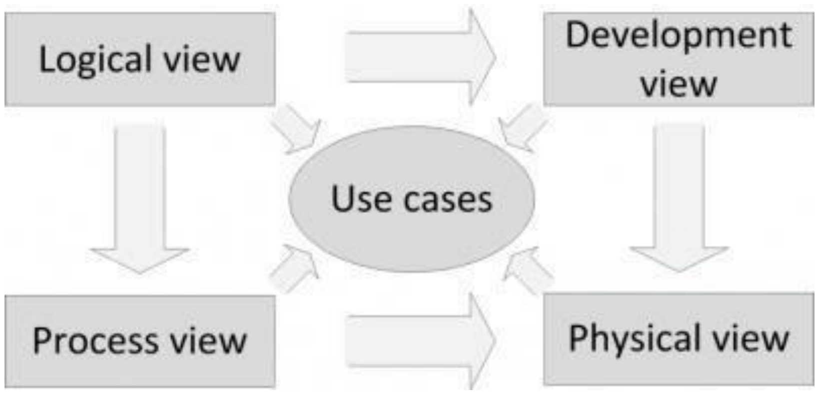
3.5.4 Usability and Maintainability

Description: The user interface should prioritize user-friendliness and ease of use. In scenarios where data becomes temporarily unavailable, the downtime should not exceed a period of 4 hours to ensure system maintainability and usability.

3.6 Architectural Design:

For our senior year group project titled "Early diagnosis of lung cancer Harnessing the capabilities of AI", we made use of the 4 + 1 software architecture models This guide gave us an organized approach to designing and laying out a software framework, maintaining cohesiveness in terms of modularity, scalability, and maintainability. The"4" refers to four architectural views: "Logic", "Des. Pro., 'Tech Task" and"physical" are the steps manipulated by the prototype's workflow where "+1" is the scenarios or use case pointing how the prototype would be applied in varied situations. Through the unanimous adoption of this approach we could therefore systematically engage in a number of otherareas, such as the product's basic architecture, development cycle,
deployment needs and user interaction scenarios. The use of the model approach allowed easily integration of AI technologies into our system for detecting and diagnosing lung cancer in the early stage, maintaining

the flexibility and ease of modification of the software architecture for future improvement.



3.6.1 Why We Chose the “4+1” Architecture Design:

- For our development we picked the 4 +1 software architecture model as a whole and robust approach to software engineering.

- This framework gave us a systematic development and design way to build the software system, implying simplicity and unity.

- Integrating logical, development, process and physical maps as well as milestones allowed us to compare operations, reduce the complexity of the given situation, and make comprehensive communication possible.

- The projection system of the architecture framework enabled cooperation of the group members by defining a well-grounded scaffoldfor development operations and deployment strategies.

- Hence, besides designing we compose an adaptable and extendable platform for AI app of lung wrestling cancer identification.

3.7 Module Identification:

For module identification, we employed a systematic approach to delineate distinct components within our software system:For module identification, we employed a systematic approach to delineate distinct components within our software system:

- Feature Decomposition: We divided the functions that make lung cancer detection possible into individual modules; each responsible fora separate task whether it is image's preprocessing, AI model compatibility or how events are visualised.

- Modular Design: It was planned to put together modules each was responsible for specific functionality. That made the application more modular and service oriented. It enabled us to modify only separate parts specific to a component not holding a wider impact.

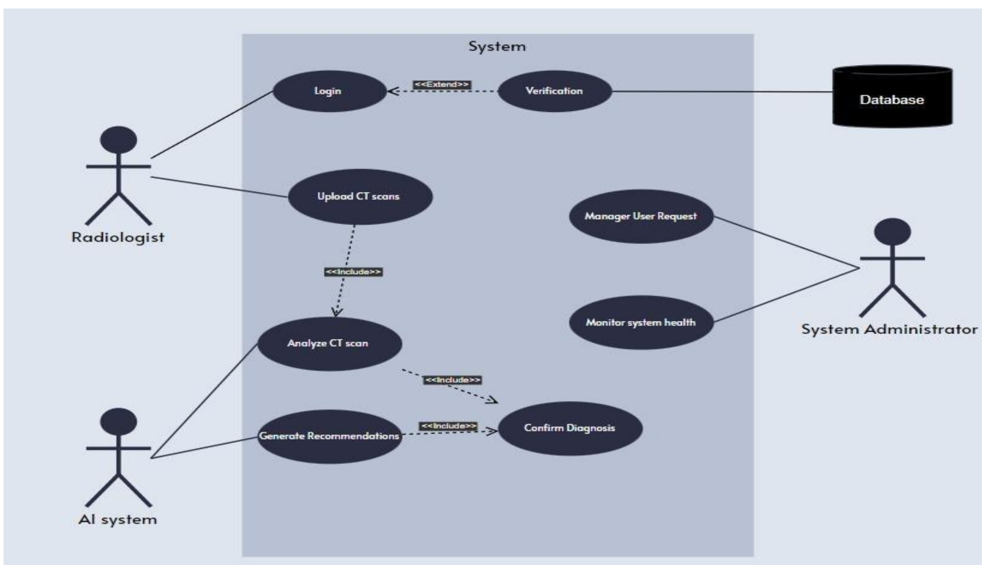
- Clear Interfaces: It was necessary to define the interface among modules well keeping in mind the benefit of communication and collaboration. This created open communication routes and the abilityto painlessly exchange information between the system's various components.

- Scalability and Reusability: Modular architecture was the order of the day for us as it provided high scalability. As we only had to add/modify modules which did not disrupt the existing application. Along with that,modules which are reusable were also found and developed so as toaccomplish the optimization of resource utilization and eliminate the riptide of redundancy.

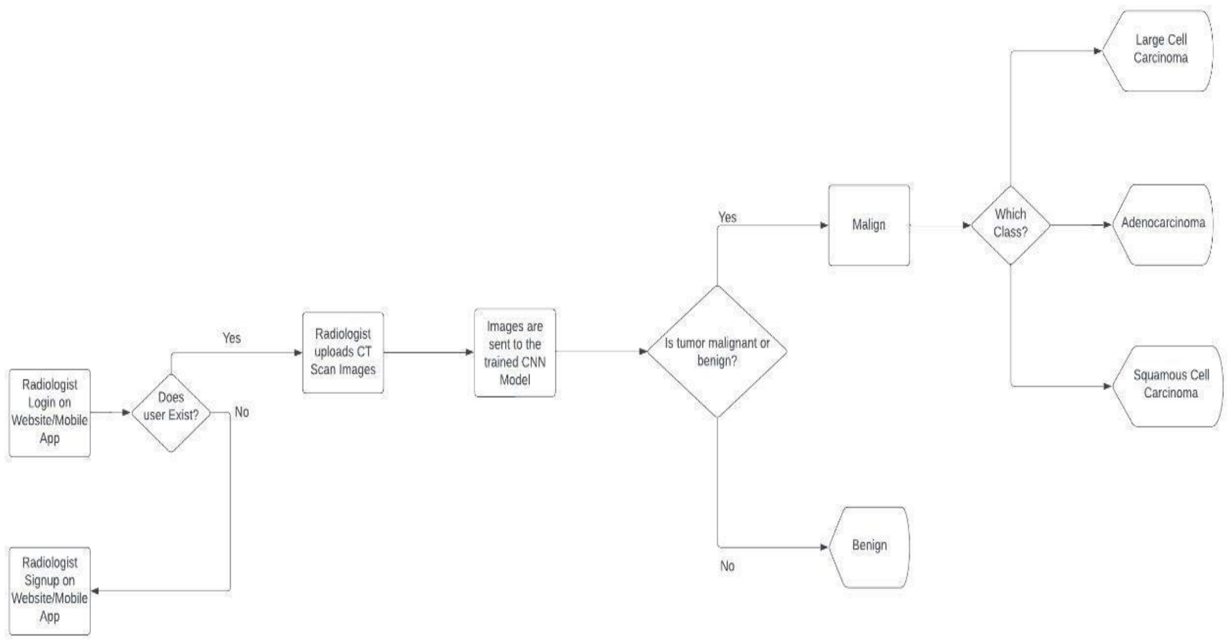
- Testing and Validation: The module modality underwent through specific testing and validation methods to guarantee reliability and accuracy under the scanner. Testing was performed at the unit level andthe integration level to ensure that the component parts worked correctly. This also meant that the entire system's performance wasassessed to determine if it was fit for its purpose.

- Documentation and Maintenance: Concise documentation was generated for each module containing a precise description of its operations, inputs, outputs and dependencies. This simplified the maintenance tasks which allowed the crew to easily deal with the possible problems and made the seamless operation of out hardwaresystem.

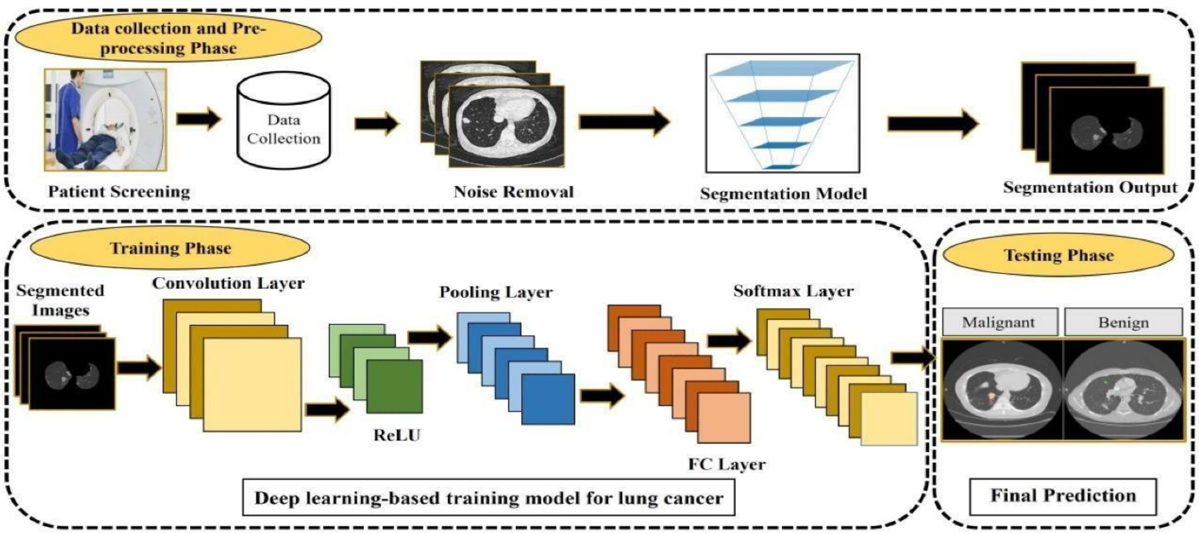
3.8.1 Use Case View



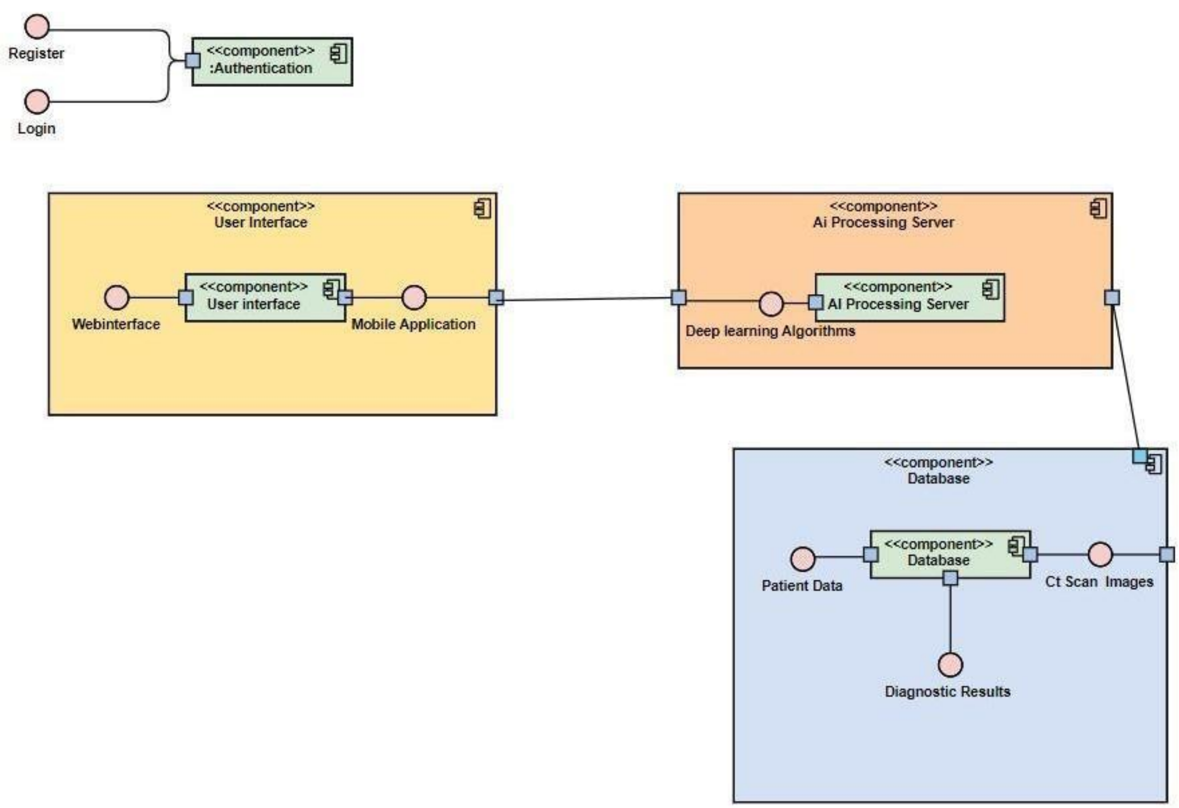
3.8.2 Logical View



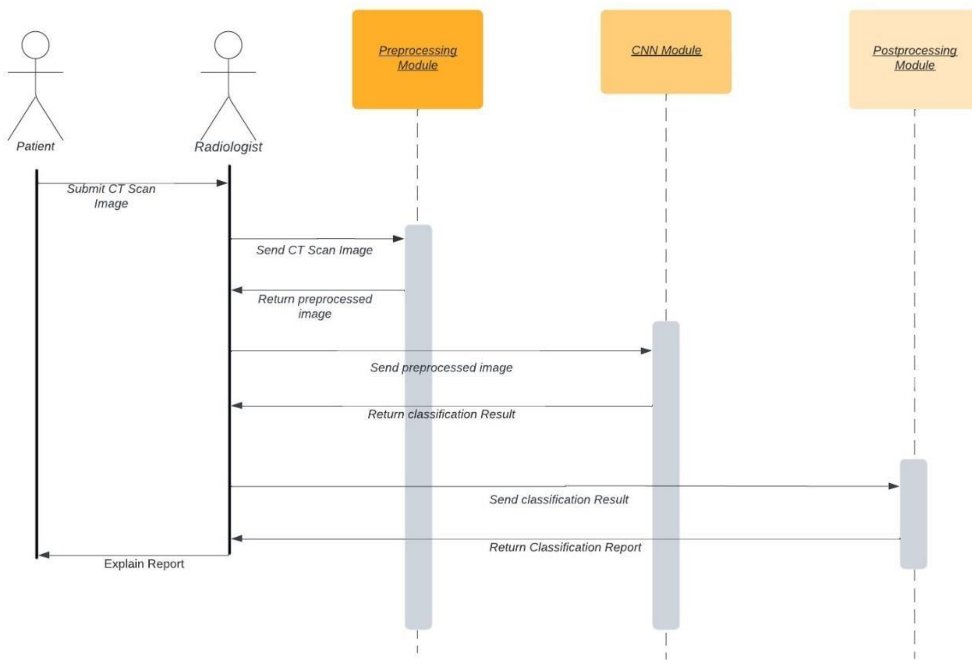
3.8.3 PHYSICAL VIEW



3.8.4 Development-View Component Diagram



3.8.5 Process View



4 Proposed Solution

4.1 Proposed Solution:

To address this issue, we propose a design of the AI system using the deep learning approaches. The system works by identifying nodules from the Computed Tomography scans through teaching deep learning model based on neighborhood collection of labeled photos. This model will exploit the acquisition of novel image analysis algorithms which can differentiate between lung nodules and other regions of interest related to the diagnosis of lung cancer.

AI gives multiple benefits when it become a part of the lung cancer detection process. It provides the high levels of diagnostic accuracy and reduces the time devoted to the analysis and assists radiologists in decision making. Altogether, this is the aim to help in the precision of lung cancer detection with an ultimate goal to improve the patients' results and ultimately to save lives.

RespiroVision is simply the Research and Development Sector.

4.2 Work Breakdown Structure:

Model Development:

Afeef: Model architecture design and implementation

Daniyal: Model training and evaluation

Shaheer: Model optimization and performance tuning

Web App Development:

Shaheer: Backend development and API integration

Afeef: Frontend UI/UX design and implementation

Daniyal: Deployment and testing

Mobile App Development:

Daniyal: Backend development and API integration

Shaheer: Frontend UI/UX design and implementation

Afeef: Deployment and testing

4.3 Design and Implementation Constraints:

Certainly, when embarking on our project to develop a lung cancer detection system using a Convolutional Neural Network (CNN) and receiving data from Shaukat Khanum Memorial Cancer Hospital, we need to be aware of several constraints and challenges :When we aim atcreating a machine learning system that allows lung cancer detection with a Convolutional Neural Network (CNN), we need to deal prominentissues of our target area (i.e., Shaukat Khanum Memorial Cancer Hospital)

• Data Privacy and Security: The tightly compartmentalized manner in which cancer patients' information is given in the region of medical data a highly delicate and sensitive issue that must be governed by regulation.

face a disciplined rules like HIPAA which are US privacy regulations. Thus, we have to guarantee that we comply with all applicable data privacy laws and obtain appropriate permission for data access and use.

• Data Quality: We, therefore, acknowledge that the quality of our created data set is the most important for making an accurate machine learning or AI (artificial intelligence) model. Hence, our response should be data of high quality with well described annotations and with minimalnoise.

• Data Imbalance: The recognition of the fact that the medical data including datasets for cancer detection often possess class imbalance, where there are more samples below the normal class than those of the higher class category is important.

a significantly larger run of uncorrelated (non-cancer) cases comparedto the cases confirmed to be positive (cancer). This unbalance couldlead to some problems whilst fallowing our model, and as the consequence we could apply some tricks like oversampling,undersampling, or blacklisting.

weighted loss functions.

• Limited Data: It meant that creating a powerful CNN model is most ofthe time really reliant on the availability of a really big data set. If our population does not have a big size, it may result to a small amount.

The problem is the difficulty in training an extremely precise model and itcould be possible to come with answers by transfer learning or data augmentation.

• Hardware Constraints: As it is known that CNNs can be computational intensive in terms of complex running of large images, we are going to optimize our Convolutional Neural Networks to get the best possibleefficiency.

architectures. Therefore, due to higher model resource demands, our efficiency may be getting affected by being deprived of powerful GPUs orcloud computing resources.

• Regulatory Approval: In order to yield the same result this model will have to be submitted to regulation, a process which will likely require itsapproval.

a measure that may in more time-consuming and precise reality dependon our current location and employment system.

• Clinical Validation: However, we understand that the experimentalmodel design will not be achievable until it is smoothly transitional.

as a technology used in a clinical location, it must undertake a clinical validation procedure for ensuring that it has no harmful effects and works timely too. It is common to have experts in this validation, medicalprofessionals being part of the collaboration.

• Resource Constraints: We do realize that time as well as resources do determine the efficiency and the results of research projects. Properly communicating with interdependent team members, ensuring no one isbusy while also being able to cover for those who are missing and adjusting to unforeseen schedule changes is a must.

challenges will be essential.

• Performance Metrics: We recognize the need for the model evaluationto be values-laden, to ensure that the health care context is taken into consideration. However, it is not vital that accuracy is the ultimate criteria. Here sensitivity, specificity and AUC-ROC values are frequentlyin medical applications.

• Model Maintenance: Upon the deployment of our model, the need for constant updating and maintenance will be evident because it shall require the substitution and addition of new guidelines as well asavailability of other data.

• Costs: We take into consideration the costs that go into the development and deployment phase of AI models, which includeschunks like hardware, software, data collection and personnel.
Budgetary capacities may have a significant influence on the feasibilityof our project.

• Collaboration: We are grateful that efficient partnership between software developers, Big data specialists, and medical practitioners iswhat makes a difference in the quality of service provided to patients.

The two disciplines will need to connect significantly that could be adifficult task but important for success of the project.

• Legal and Liability Issues: To foster the success of AI in healthcare settings, we will have to identify the problems related to the legal consequences that can be applied to the use of AI in a medical setting,ensuring compliance with all the relevant laws and regulations.

4.4 Assumptions and Dependencies:

Assumptions:

• Data Availability: We anticipate that we shall obtain proper and proficient labeled dataset from Shaukat Khanum Memorial Hospital thatwill be employed in training and testing of the CNN model. The dataset must be decided concerning lung images also attributed the labels (cancer or non-cancer).

• Data Quality: We expect that the dataset has all the necessary characteristics, such as the values in the dataset to be correct, annotations of higher quality and lower noise. High-datum data is thecrux for the sharp model.

• Model Architecture Choice: Our task is to apply a CNN and therefore we believe this will work well for the said purpose. CNNs, are used quitefrequently for image classification, however their performances may also be affected by the factors such as the relevance and the quantity ofdata.

• Ethical and Legal Compliance: We understand that all medical information is confidential and hence we ensure that we follow all the ethical and legal procedures related with handling such data. There willbe legal requirements that need to be followed, people have to be informed about the project and protecting privacy and compliance with regulations.

• Hardware and Software Resources: We presuppose the availability oftricky computational resources such as GPUs or cloud computing to both train and test our CNN model for mitigating its complications.

• Expert Collaboration: We do not have any doubts about the availabilityof specialists and medical professionals who will confirm our findings and will assist in interpretation.

provide information that is not general but rather specific, the modelshould be standardized in line with the medical community.

Dependencies:

• Data Access Agreement: The matter is very important for our projectsas far as we are connected with Shaukat Khanum Memorial Cancer Hospital to get their information and data. The MOU have to have a rulewith the definition of data utilization processes, limits and restrictions.

• Data Preprocessing: Our project success is measured by the quality of work we deliver on time.

preprocess steps such as data cleaning, resizing, and normalization are applied to enable data to be represented in a form that is appropriate fortraining. Suitable preprocessing is the KEY factor for model
performance.

• Labeling and Annotation: Humanizing: Teaching machine learning algorithm to understand visual concepts. If there is no pre-defined labelin the dataset, the data will need to be annotated, which is often very labor-intensive and potentially full of errors. We can't be satisfied with
just the specific labels-their correctness is vital.

• Model Training: Study time for our neural network is restricted by the availability of hardware resources and the quality of the training data. Training is likely to take the considerable quantity of time and resources; therefore, adequate allocation of the resources should be demanded.

• Evaluation and Validation: Reliability of our model validation and evaluation strongly depends on ensuring that we have a dependable test dataset and identification of suitable evaluation metrics. The assistance of medical professionals can rear the care of the prophecies.

• Ethical Compliance: The project success we're pursuing involves adherence to ethical and legal principles that guide the way we deal withpatients' confidential information. Lack of these regulations'
compliance may cause project delays or run into the risk of legal
actions.

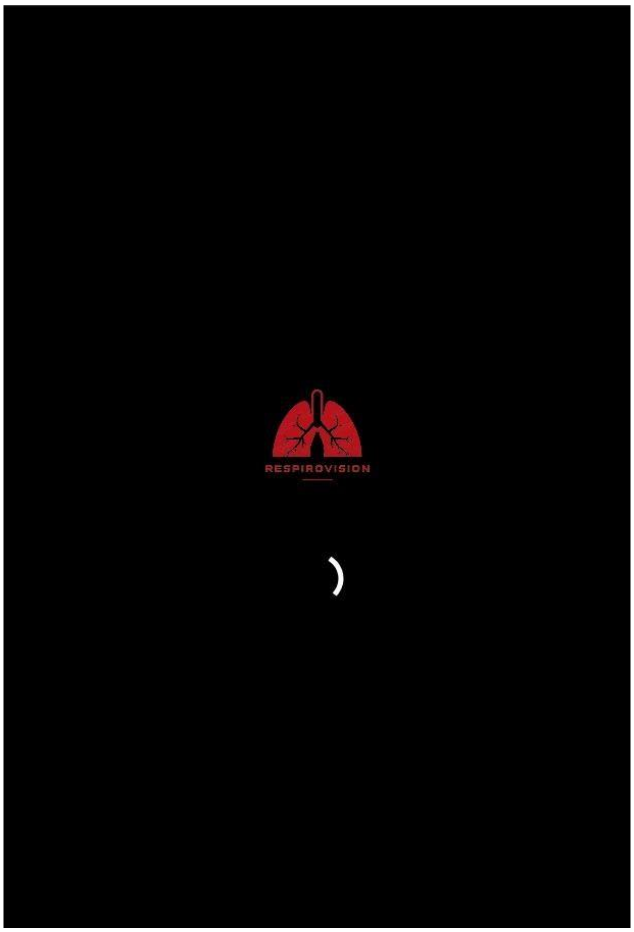
• Deployment Considerations: In the case of that the project is aimed at implementation of the model into clinical use success depends on
getting the approval from the regulatory authority the regulatory bodies.

in making arrangements, it can be complicated and one may also taketime to complete it.

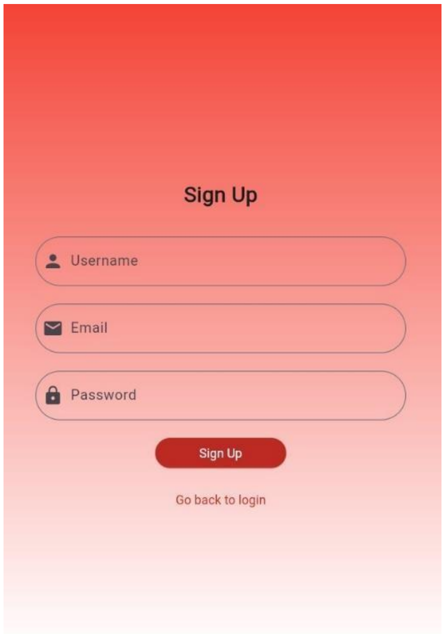
- Budget and Resources: The sufficient budget and resources to be available can determine both the scale of the project and the time inwhich it will be accomplished. We are ordering for the hardware, education software, personnel and miscellaneous cost.

4.5 Proposed User Interfaces:

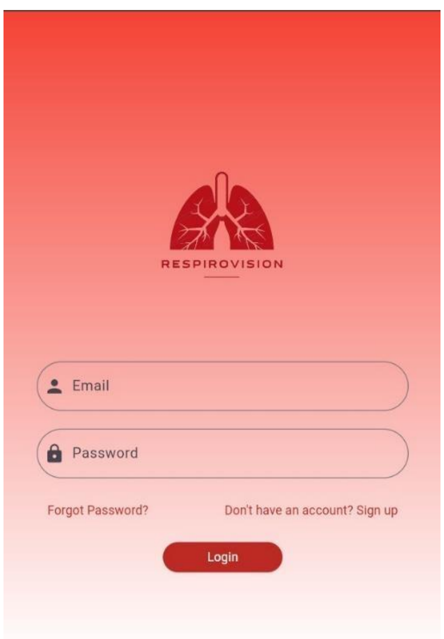
4.5.1 Mobile App:



Loading Screen

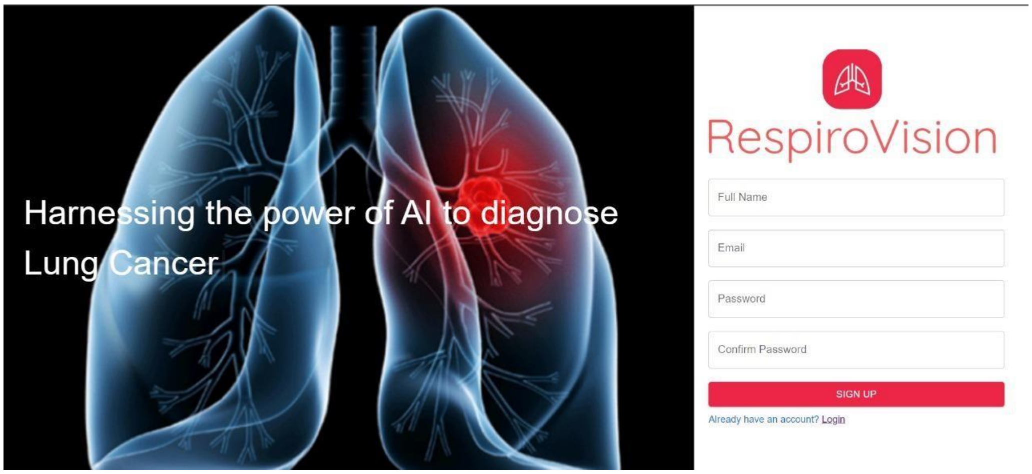


User Sign Up Page

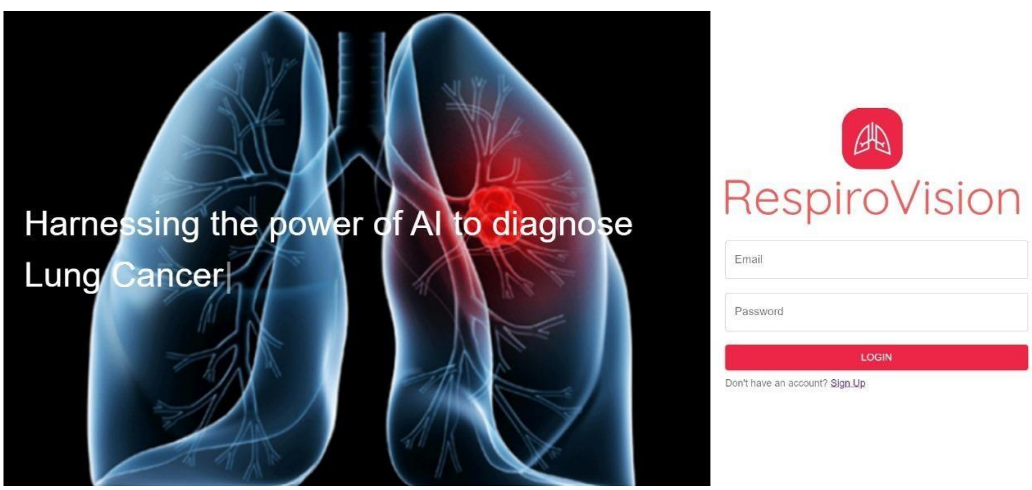


User Login Page

4.5.2 Website

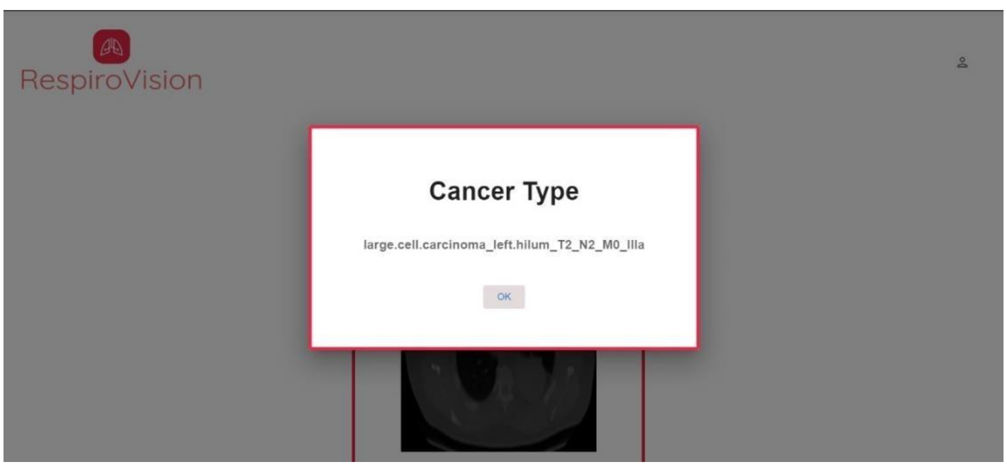


User Signup



User Login

CT Scan upload Portal



Result!

5 Results and Discussions

Our project aimed to develop a comprehensive Lung Cancer Classification system is capable of precisely classifying chest X-ray images into four distinct classes: Advanced (large cell carcinoma), Squamous cell carcinoma, Adenocarcinoma and Normal. In which aim we took under consideration three brilliant system architectures – ResNet, VGG16, and EfficientNet whose level of performance was calibrated for us to decide upon the most effective model. The fact that our research found the EfficientNetB3 model to be the most precise, with up to 97% accuracy, is a significant outcome.

EfficientNet B3 turned out to be a more productive and acceptable plan comparing the other arrangements, just for classifying the chest X-ray images into the chosen groups. This superior performance has come about through its ability to not only recognize, but also to reliably categorize finer details in the frames, hence boosting accuracy. A model's scaling preferably coupled with appropriate optimal parameter designation was key to the high accuracy attained in our lung cancer classification exercise.

Implications for Healthcare: This advantageous precision of the EfficientNet B3 model in detecting the effects of lung cancer on clinical practice should not be overlooked, and it holds promising promise for both diagnosis and treatment planning. Healthcare professionals can make rapid specific interventions following accurate categorization of chest X-ray images into exact cancer types. This approach enhances the likelihood of a patient's recovery and the availability of a more personalized approach.

In addition, provision of user-centered websites and applications with friendly web and mobile platforms increases the functionality and in turn enhance the work flowall and easy accessibility. The running APP will be built with Flutter and Dart for the mobile application, and React.js for the website part, as well as Flask to smoothly deploy the model. This solution helps to cover more platforms like mobile devices, websites and others to meet the needs of the providers and patients.

Hence, we hope that in the future our lung cancer classification system will be able to transform lung cancer diagnosis because it will give medical practitioners the needed resources to provide accurate and easy to use diagnosis tools. Even though the system has been thoroughly validated and is applicable in clinical settings, the integration process needs to be a continuity to ensure smooth change to support personalized medicine and the betterment of patient care.

6 Conclusion and Future Work:

Conclusion:

Our Final-Year Project has so far ended with the Engineering of world-class Lung Cancer Classification Systems rooted with the modern advanced algorithms and the unique frameworks for app development.

Through meticulous experimentation and evaluation, we have successfully identified the EfficientNet B3 architecture as the optimal model for accurately classifying chest X-ray images into four distinct categories: Large Cell Carcinoma, the Squamous Cell Carcinoma, Adenocarcinoma, and the Normal Cell are the choices available.

We embody accessibility and usability in all the software solutions that we use including Flutter, Dart, React.js, and Flask for model deployment.

Such an approach ensures that doctors and patients can easily access and utilise the tools that improve the healthcare system to the satisfaction of all parties.

The project is a step in the direction for the application of AI and medical imaging in the field of oncology as it displays the efficiency of AI-based framework to reshape lung cancer diagnosis and therapy.Through helping health care providers with a rapid and effective tool for timely detection and classification of lung tumor, our system not only promises to drastically reduce mortality rate but also contributes as one of the viable tools for healthcare delivery improvement.

Future Work:

While our project has achieved notable success in its current form, there are several avenues for future exploration and enhancement: Our initiative has come to profound success so far as this moment and by pursuing this path, there are ways to use and furthering the campaign.

Integration of 3D Datasets: We plan at doing 3 dimensional images sets such as CT scans into our classification system to increase its accuracy and diagnostic potential. By applying volumetric imaging, we can visualize deeper into the lung tissue and therefore more details about the abnormalities can be used to refine the diagnosis and plan the treatment.

Expansion to Mobile Platforms: The rollout of our Lung Cancer Classification System on the Google Play Store and Apple's App Store presents a big chance to extend the reach of this tool among healthcare experts and patients. Next step is improving the UX, mobile-optimizing, and algorithmizing and monetization for customer retention and support of development and maintenance.

Continuous Model Improvement: It is imperative to emphasize that this model is a continuously improving and progressive step forward, with recognition of the evolving clinical needs as well as the innovations of future imaging technologies. Future efforts of research will go into the process of achieving a good architecture, establishment of transfer learning techniques, and integrating feedback from healthcare professionals in order to reinforce the precision and benefits of the system.

Clinical Validation and Regulatory Compliance: During the shift of the system from researching phase to the developing clinical applications along with practical cases, examinations and checking all the regulations must be done properly. The future work will involve working with health care institutions to conduct clinical trials, get regulatory approval, and to be medications and treatment compliant with the medical standards and guidelines.

Collaboration and Partnerships: We consider the reverent of getting together and cooperations with industry groups, healthcare staff, and administrative bodies is the prerequisite of the fact that "Lung Cancer Classification System" will be implemented into everyday healthcare practice. Therefore, going forward, brewing on our strengths, such as partnerships and collaboration, will be at the forefront to ensure funding and sustainable ecosystem to scale our innovation worldwide.

7 References

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