

IDS 560 – Analytics Strategy & Practice

Project - Automating Chest X-Ray Diagnosis using AI Team – Marvel

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Technology Innovation

1. Healthcare Issues

Chest X-ray exams are one of the most frequent medical imaging examinations available. However, the diagnosis of a chest X-ray can be extremely challenging when compared to diagnosis from other imaging examinations, i.e., CT Scan. Thus, in this project, we are aiming to automate the process of diagnosis in order to achieve clinically relevant computer-aided detection and diagnosis (CAD) with chest X-rays. From a business perspective, hospitals rely heavily on doctors for diagnostics through various imaging examinations. Therefore, this CAD project is targeted at hospitals, that want to maximize efficiency by automating diagnosis procedures & make better use of their doctors. Also, we are targeting rural areas where specialists are not available and this product can be a game changer.

2. Impacted Organization / Use

Here, we are planning to provide this solution to hospitals irrespective of their rural or urban location. This product will help people in rural areas more in comparison to people living in urban areas where it is hard to find a specialist. Furthermore, this project is a computer-aided diagnosis project that targets hospitals that want to maximize efficiency by automating diagnosis procedures, improving healthcare, and thus being cost-effective.

3. Existing Solution

The Breast, Cardiovascular, Lung, and Neurological Imaging Artificial Intelligence software recently come to the market and we guess other competitors currently are working on X-ray image processing too.

There are a few works that are very similar to our project –

1. **A Novel Method for COVID-19 Diagnosis Using Artificial Intelligence in Chest X-ray Images**

This paper proposes a novel method CoVIRNet (COVID Inception-ResNet model), which utilizes chest X-rays to diagnose COVID-19 patients automatically.

2. **XCOVNet: Chest X-ray Image Classification for COVID-19 Early Detection Using Convolutional Neural Networks**

This paper has a two-phase X-ray image classification called XCOVNet for early COVID-19 detection using a convolutional neural Networks model. XCOVNet detects COVID-19

infections in chest X-ray patient images in two phases. The first phase pre-processes a dataset of 392 chest X-ray images of which half are COVID-19 positive and half are negative. The second phase trains and tunes the neural network model to achieve good accuracy.

4. Proposed Solution

From the above section, it is clear that using CNN is the most accurate method for image data thus we have decided to develop an AI model which is using CNN algorithm.

Technical Objectives & Challenges

Healthcare providers are trying to quickly predict disease to diagnose patient risk, but can't because current diagnostic tools take a long time or are unavailable in rural areas. Our model is going to provide a faster solution to this problem.

Reading and diagnosing chest X-rays may seem like a relatively simple task for radiologists, but in practice, it often requires careful observation and knowledge of anatomical principles, physiology, and pathology. It requires complex thinking & thus, these factors make it difficult to develop a consistent and automated technique for reading chest X-rays while addressing all common chest diseases. Our aim is to automate the process of X-Ray image detection using deep-learning techniques.

Most of the literature available on Chest X-Ray Diagnosis revolves around the diagnosis of one disease label, for example, the presence of COVID-19 in patients. However, this project focuses on diagnosing the 14 most common types of chest diseases and thus, is capable of reducing the workload of doctors in hospitals. Here, our major challenge was to find a model which can handle all 14 diseases at one time. In machine learning, CNN is one of the best ways to handle image data.

Data handling was the biggest challenge we faced as our data is extremely heavy and this made our process extremely slow. As advised by the professor, AWS EC2 or any other deployment method can be used for our project.

Market Opportunity

For a hospital, it is extremely important to have good work assigned to their doctor. And due to the lack of doctors, it has become crucial to use their time smartly. Wasting a doctor's time reading an X-ray is a cost to the hospital in terms of their time. The solution to this problem is to automate X-ray diagnosis using AI. This product will help in maximizing efficiency and it will also decrease human error.

Here, the market for our product is rural areas where getting a specialist is difficult. In such scenarios, having an automated system can lead to faster results along with a smoother process.

Though our major focus is rural areas, this product will have a market wherever there are hospitals as it has great usage there as well. Hospitals can provide this to their labs where a patient can directly get their report result.

In a nutshell, the market opportunity for our product exists in both rural and urban areas. Though urban areas have good hospitals, the presence of our product will help them in saving their doctors' time. And the presence of this product in rural areas is going to be a game changer as the number of hospitals and specialists is comparatively less in rural areas, but having this facility will be convenient for people living there.

Company and Team

Team -Marvel

Charu Yadav

I am pursuing a master's in business analytics at the University of Illinois. I have almost 4 years of experience in the banking sector. After handling a commercial portfolio for 2 years, I joined HSBC as an assistant manager and there I was a part of the CCAR modeling team. After my 2 years of work experience, I started my MS in business analytics at UIC.

Deepak Singhal

I have work experience in software development of 4 years in India in Healthcare and Automobile where I worked on Java, Python, SQL, AWS, Spring and currently pursuing my Master's in Business Analytics from the University of Illinois at Chicago where I am learning analytical skills, and Big Data technology.

Medhavi Pokhriyal

A spontaneous and enthusiastic management sciences student pursuing a Master's degree in Business Analytics from UIC, with previous extensive involvement in the interdisciplinary field of computer science, statistics, and biology. A confident presenter with an innate ability to explain complex information to a varied audience at any level. Possess hands-on experience in Python, R, SQL, machine learning & data visualization software.

Reza Amini

After I got my bachelor's degree in industrial engineering, I started my career in the business analysis field. I have done analytical projects during my career, and I became more interested in solving business problems. So, I decided to extend my BA knowledge and I came to the U.S. and started the business analytics master program. It was a great experience for me.

Sunny Patel

Currently, about to complete my Master's Degree in Business Analytics at the University of Illinois Chicago. Prior to this, I completed my Bachelor's Degree in Business and simultaneously was pursuing Chartered Accountancy. I switched my field of studies to Analytics and decided to pursue this field for higher studies. I have a good amount of hands-on experience in coding and have in-depth knowledge of machine learning modeling and visualization.