

# PROJECT PROPOSAL

## The Commercial Opportunity

We know that AI is the simulation of human processes by machines (computers) and that this simulation involves learning, reasoning, and self-correction. The number of tasks is increasing day by day, so we need AI. It therefore makes sense to automate routine processes. Increase production while preserving the company's workforce. In addition, it improves the lives of patients, physicians, and healthcare workers by performing tasks that humans would often perform, but at a much lower cost and in time. Additionally, using artificial intelligence to diagnose and treat patient conditions helps improve and speed up decision-making. The best thing about using AI in healthcare is that it improves a variety of areas like disease detection, optimal treatments, etc., which can save many lives.

In terms of the healthcare industry, AI in health refers to a set of diverse technologies that enable robots to detect, comprehend, act, and learn to execute administrative and clinical healthcare activities. AI has the potential to transform healthcare by addressing some of the industry's most important issues. For instance, AI can result in improved patient outcomes and increased productivity and efficiency in care delivery. It can also enhance healthcare practitioners' daily lives by spending time saved from the AI, which could be used to treat other patients. Add to that the high volume of images a radiologist is tasked to review, the fact that some medical centers may not have a radiologist on-call around the clock, and pneumothorax diagnosis can be delayed for many hours. By looking at these situations, AI can play a pivotal role which can ease off lots of workloads where labor work is not needed. Therefore, increasing staff morale and retention.

Doctors use technologies such as computed tomography scans or magnetic resonance imaging to produce a detailed 3D map of the area that needs to be diagnosed. Later, AI technology analyses takes the image as an input and can predict within seconds. Suppose doctors use old traditional methods. In that case, it will cause a delay in treating the patients as it is tough to interpret the scanned image manually and human errors which can have a huge impact on the patient health as for that period none of the medicine are working because of human prone errors, and it also takes a considerable amount of time manual diagnosis. But, on the other hand, it shows that an AI technique helps the patients and helps the doctors save the patient's life by treating them as early as possible.

## Our product:

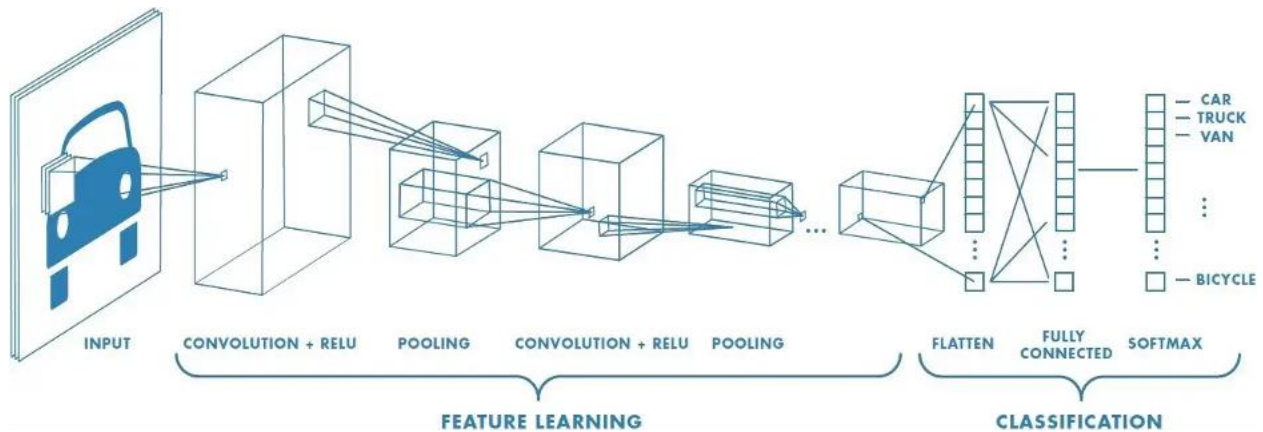
Our final product automates X-Ray diagnosis using AI, which will address all the issues we discussed earlier. Furthermore, this is a computer aided diagnosis product which targets hospitals that want to maximize efficiency by automating diagnosis procedures. The integration of this product into the clinical system could help health institutions and doctors advance patient care by reducing the time it takes to diagnose. Efficient Automated X-Ray Diagnosis procedures by using AI prediction models, which will interpret chest X-ray images quickly and more accurately by reducing human prone errors, with more accurate treatment, and lower medical costs. The final product of this project would be a high-accuracy model that diagnoses different types of chest diseases when an X-ray image is provided as input. The emergence of this product also helps solve rural areas problems, as we all know these areas have scarcity in terms of specialist doctors. Hence, the advances in AI allow for rapid processing and analysis of such massive and complex data. It recommends the correct decision for 13 different chest diseases with high accuracy.

## Revenue Opportunity:

From a business view, we can generate revenue by selling Artificial Intelligence packages on contract basis to healthcare institutions, licensed practitioners who have the authority to legally conduct this diagnosis, Selling future customer services, etc. I think of this as an additional safety check that can improve efficiency-of-care to deliver diagnoses and patient care sooner and to reduce the risk of chest diseases being overlooked. From this product, both the parties can be beneficial i.e., patients and the service providers (Healthcare Institutions).

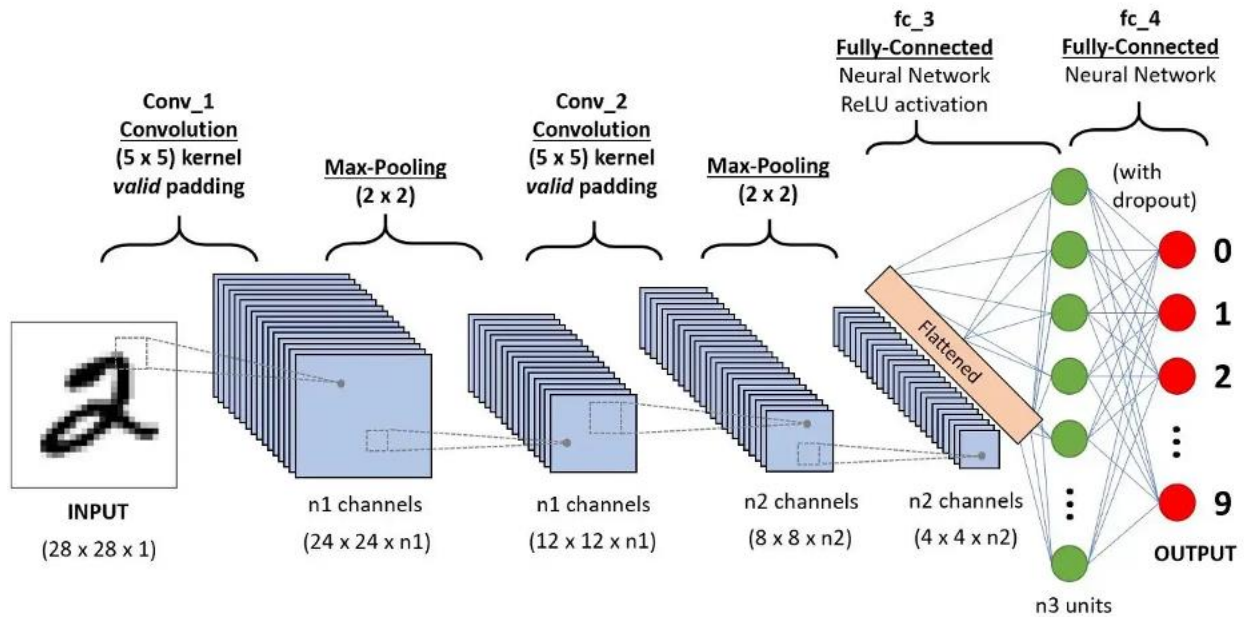
## The Innovation:

Our model's prime goal is to reach rural parts of the country and make people aware of any chances of chest diseases that may lead to life threatening causes. If we can reach in the rural parts where specialist doctors are not that readily available, and any of the 13 chest diseases could be caught at an early stage where it can get cured, then the motive of the project is successful. We are using CNN (Convolutional Neural Network). It's a deep learning model which can read Chest X-ray and gives us the probability of having these 13 chest related diseases.



About Convolutional Neural Networks: Artificial Intelligence has been witnessing monumental growth in bridging the gap between the capabilities of humans and machines. Researchers and enthusiasts alike, work on numerous aspects of the field to make amazing things happen. One of many such areas is the domain of Computer Vision.

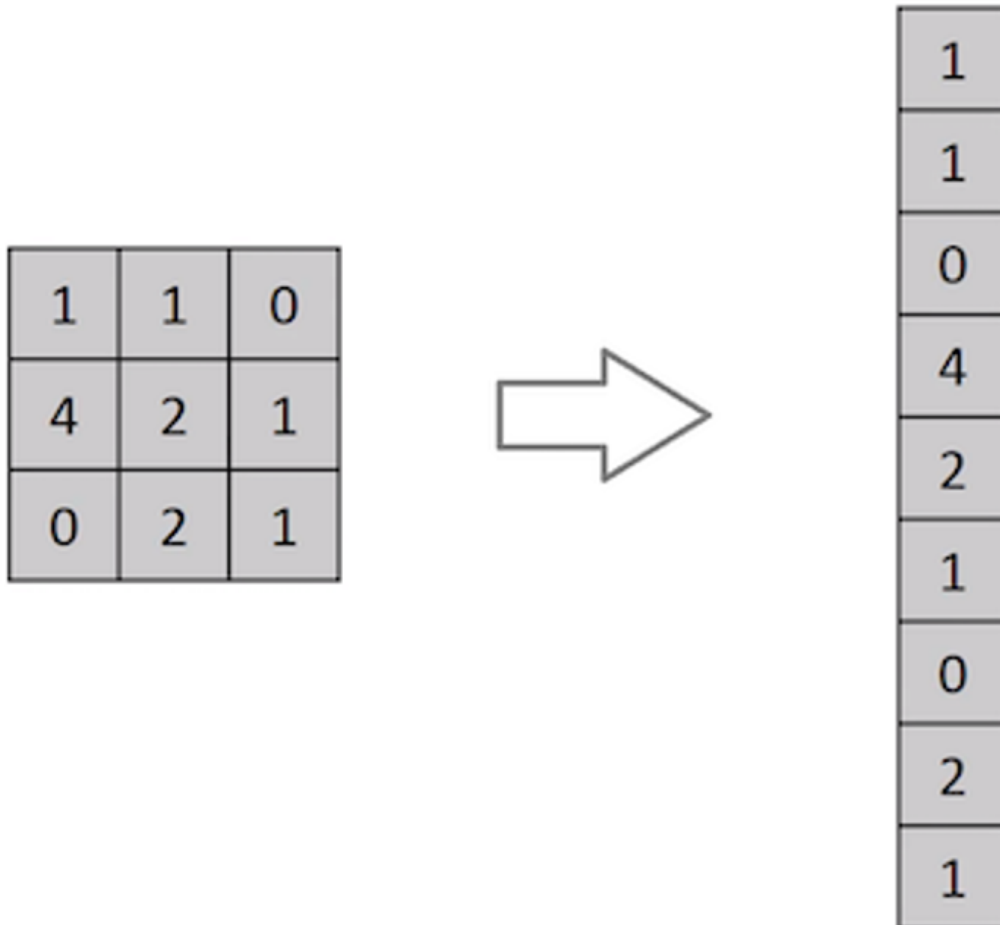
The agenda for this field is to enable machines to view the world as humans do, perceive it in a similar manner, and even use the knowledge for a multitude of tasks such as Image & Video recognition, Image Analysis & Classification, Media Recreation, Recommendation Systems, Natural Language Processing, etc. The advancements in Computer Vision with Deep Learning have been constructed and perfected with time, primarily over one algorithm — a **Convolutional Neural Network**.



A **Convolutional Neural Network (CNN)** is a Deep Learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image, and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, **CNN** can learn these filters/characteristics.

The architecture of a **CNN** is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlaps to cover the entire visual area.

Why **CNN** over Feed-Forward Neural Nets?



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Flattening of a 3x3 image matrix into a 9x1 vector

An image is nothing but a matrix of pixel values, right? So just flatten the image (e.g., 3x3 image matrix into a 9x1 vector) and feed it to a Multi-Level Perceptron for classification purposes.

In cases of extremely basic binary images, the method might show an average precision score while performing prediction of classes but would have little to no accuracy when it comes to complex images having pixel dependencies throughout.

A CNN can **successfully capture the Spatial and Temporal dependencies** in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of parameters involved and the reusability of weights. In other words, the network can be trained to understand the sophistication of the image better.

## Budget

We have created a prototype as of now, which can take multiple images at a time and gives out the result. If we can aim to have this model installed at x-ray labs and hospitals, that will take some capital. We must create one application which can be installed on Windows or Linux systems and internally it runs our deep learning model when it's provided with the x-ray images (png or jpeg or jpg formats). We assume almost 25K USD will be the cost to create the application and 2 months of time of our team (5 members) will be the budget of this project. Further there will be some maintenance cost as well to check the correct functioning of the model.

## The team & Team members & their Biographical Sketches

Team Name: **Team Marvel's**

**Team Members:**

**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. I worked as an analytical consultant at Wells Fargo where I was handling a commercial portfolio, a \$13.1B service associated with processing over 295k applications annually. I was the key developer of a non-segmented credit-scoring model which went into production in January 2020. After handling a commercial portfolio for 2 years, I joined HSBC as an assistant manager and there I was a part of the CCAR (The Comprehensive Capital Analysis and Review) modeling team where I developed the Initial Loss Given Default (ILGD) model for the 2021 CCAR (The Comprehensive Capital Analysis and Review) process. Overall, I have a good understanding of statistical modeling, but to learn this more in depth I choose to do MS. My degree is helping me not only with subject knowledge but also with management skills.

**Deepak Singhal:**

I completed my undergraduate from India, Thapar University in Engineering in 2017. During the under graduation, I decided to switch to software development roles. SpectraMedix (a Healthcare company) gave me a great opportunity where I worked as an ETL Developer for 2.5 years. I worked on Java, SQL, Spring batch, and Talend tools there. Then I decided to broaden my horizon, so I joined the Volkswagen group where I got to work as a Full stack developer. There I worked on AWS and React. After spending 1.5 years in Volkswagen, I came to pursue my master's in business Analytics from the University of Illinois, Chicago. I chose Business Analytics because I have already got good hands-on coding skills and data structures from my past work experience. Now I want to explore my analytical skills. UIC provided me with an excellent platform where I learned machine learning, Big Data, Operations management, and advanced database management. During my



master's, I worked as a data science graduate assistant where I worked on community detection algorithms to find out anomalies in medication procedures. Recently in summer, 22. I was offered to work with SpectraMedix again. This time I worked there as a Data Engineer intern where I worked on Python and SQL primarily. In this project, I have not only worked as a Data Scientist who can develop deep learning models like CNN but also work as a team leader at times, who can manage the workload among the team members as per their strengths.

### **Medhavi Pokhriyal:**

A spontaneous and enthusiastic management sciences student, pursuing a Master's degree in Business Analytics from the University of Illinois at Chicago. Prior to this, I was working as a Sales Engineer at an Ed-Tech Learning firm wherein my role was to analyze & report sales performance data to provide insights into marketing strategies. Furthermore, I also possess experience working as an Associate Business Analyst at a Cybersecurity start-up, which involved analyzing complex data in order to improve efficiency in business processes. With significant exposure to programming during my undergraduate engineering program in Bioinformatics, I developed a strong passion for the field of analytics & hence, I decided to pursue higher studies in Data Analysis.

### **Reza Amini:**

After I got my bachelor's degree in industrial engineering, I started my career in the business analysis field. Firstly, I started with the market research and gradually I became more quantitative-oriented, and I got promoted to become a business data analyst. as I had both business and analytical background, it made me successful in Translating the business problems into the analytical models for example, the company's warehousing cost was so high and they kept more stocks than their actual

demands, so I solved this problem with Implementing Machine Learning algorithms on their sales data to predict future demands for each group of products which resulted in a significant warehousing cost decrease. I have done such analytical projects during my career, and I became more interested in solving business problems with business intelligence tools day by day. 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. For example, I learned how to work with amazon web services, doing sql queries on the cloud and did data analysis projects on AWS. And I also had the opportunity to be a teaching assistant in the programming for data science course and worked with many international students with different backgrounds and helped them for their coding projects. I also recently have done an analytical project in a healthcare company (IYKA) in Chicago, and I got really interested in the healthcare industry and I think I can use my business intelligence skills in this field.

**Sunny Patel:**

Detail-oriented Data Analyst Enthusiast with excellent problem-solving skills and a keen interest in building solutions with emphasis on solving problems. I am currently a Graduate Student at the University of Illinois Chicago. About to complete my Master's Degree in Business Analytics. Prior to this, I completed my Bachelor Degree in Business and simultaneously was pursuing Chartered Accountancy. Moreover, you could say life had different plans for me. I took an online Beginner Level Data Analytics course for fun, but from there I developed a strong passion for it and switched my field of studies to Analytics. I decided to pursue higher studies in Analytics. Honestly, this degree helped me a lot to have an in-depth technical understanding in Machine Learning modeling.

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