

# Drugsafe: Detect & Track Counterfeit Medicines Real Time

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**Abstract** - Today almost 40% of the drugs sold worldwide are counterfeit. This is a critical problem and is harming the lives of many individuals. Counterfeit drugs are very difficult to detect as they look similar and have very minute differences which can't be spotted by the naked eye. Drugsafe is an AI powered solution that will help the user detect if the drug is counterfeit or not by just going forward and taking a picture. This picture will be sent for further validation which will be validated by the Microsoft Azure server based on several different metrics. Drugsafe also provides real time tracking of medicines and investigates real time metrics and alerts the user if the certain parameters are not right and they need to be worked on. All of this happens in real time and are done using the power of Microsoft Azure cloud services which will ensure this is highly scalable and offers low latency ensuring quick results and low turnaround time

**Key Words:** Microsoft Azure, Cloud, AI, Bot, C#, Healthcare, Counterfeit Medicine, Real Time.

## 1. INTRODUCTION

Today the drug industry is a leading industry which helps manufacture drugs for various diseases including terminal diseases. The drug industry is one of the largest revenues making sector and is rapidly evolving to ensure that it can save more lives of people by improving the combination of medicines to ensure that lives can be saved. But there exists a problem which is that with so many drug companies manufacturing drugs there is potentially no way to identify which drug is original or not. If we go to a medical store today its very hard to identify the original drug since there are no real time mechanisms for the same. Drugs can be manufactured from various plants and drug houses several of them don't put markers to help identify the consumer if it's an original product since its expensive. Today the supply chain is also broken, and the middleman might hoard and supply the end consumer with counterfeit medicine since it's a money-making business for a lot of customers[1]. This is primarily prevalent in villages and places where consumers can't buy drugs at a high price. Many people are fooled by the seller by selling them the same drug at a cheaper price but just to realize that the drugs sold are counterfeit. Also, there is no method to determine the supply chain methodology. Today drugs that are exported from point A to point B have no assurance that they were transported at the right temperature and pressure making them more vulnerable to counterfeiting. Consumers lack awareness regarding the

same and don't have any technical solutions that can help them with the same.

## 2. BACKGROUND STUDIES

Background studies were conducted on various medical stores and various existing medical solutions. Studies were also conducted on the supply chain management and how these companies were transferring medicines and under what conditions. It was found out that various medical stores did not have a right mechanism to detect if the medicine they were receiving was original or not. In fact, they had no mechanism for the same they were just going forward and trusting the vendor management company that was going forward and supplying them the medicine. The pharmaceuticals company responded on the basis that medicines were always sold to the big vendors and then went to small medical stores they possibly cant go forward to track and trace every medicine that would be sold. Also, currently the medicines are cheaply available if one does go forward and add markers to the medicine to checks its authenticity it would be expensive. There were certain places in India where drugs were sold at a cheaper price than usual and these were counterfeit medicines. With the evolution of online supply of medicines counterfeit rates might go down but that is not yet confirmed. The supply chain management system was also not very positive as there were several improvements that could be made[2]. Primarily there was no real time tracking of temperature, pressure and important parameters which is extremely crucial for medicines like insulin as it needs to be transported at a certain temperature and pressure otherwise consuming it can be very harmful for the patient since it may be spoilt. There was no real time system that could detect the same and provide an alert since there was no use of sensors that were sending alerts[3]. This causes serious issues on the integrity of the location from where the medicine is coming from and what conditions its being transported in. Certain medical drug houses prefer to sell the medicines directly to consumers to avoid this issue. Also, there are certain medical houses who have adopted SMS techniques to ensure one can send the batch number to a registered number to ensure that they can verify the authenticity of the drug that has been sold the consumer and whether the consumer is consuming an original medicine or not. But there is still a long way to go to ensure that the users can detect if the medicine is original or not.

### 3. RELATED WORK

Currently there is no system that directly helps detects a counterfeit medicine real time. There are services which can verify your batch number when you send a SMS to their services, but this also has a flaw since the batch number can be copied. Supply chain management systems try to use mechanisms like temperature regulations and checks but they there is currently no real time solution that can help detect issues and track it at the location real time. The consumer today is not able to also identify if the medicine is original or not since the shopkeeper might not have enough information as it might not know what temperature and where it originated from. The power should be given to the consumer where one can go forward and track and trace the drug from where it originated from and detect if its original or not.

### 4. IMPLEMENTATION

Drugsafe was implemented based on giving the consumer the power to go forward and detect counterfeit medicines. Drugsafe is implemented in two parts the first being the consumer application and the second being the merchant application where one can go forward to track and trace the drug. The consumer application has various features which can help the consumer know several different aspects of the drug. When the consumer uses the application for the first time they will be greeted with a welcome message and will have to go forward and scan their first medicine. They can go forward and click the scan tool where the picture of the back of the medicine needs to be taken. Once the picture is taken it is gone forward and analyzed for crucial details like Batch number which is usually unique to the pharmaceutical house and medicines are made in batches so its usually one of the key markers. The second metric which is taken into consideration is the expiry date usually the batch number and expiry date are a combination this gives us crucial information regarding the drug. Third, the ingredients and their composition is taken into consideration this is crucial as usually most counterfeit medicines can change the composition and the consumers might not know the same since most of them are unaware about the composition of the drugs. To get all these metrics the machine uses Microsoft Azure computer vision which helps in quick image processing. It goes forward and highlights the important text in blue section markers this ensures that the consumer knows what data is being sent and validated. Once the consumer goes forward and hits validate the medicine the next this it does is the details are sent to a secured server where the data is validated across an Azure Cosmos Database table. This table has all the details of all the medicines which is sourced from Dava.org which is a open source site which gives us information about the drugs manufactured in India. The details of the medicines are therefore validated across these details. The validation is done with all of the metrics above and then a confidence

score is released. This confidence score is crucial in determining if the drug is counterfeit or not. Once this has been validated and established the results are given. Another metric which is also taken into consideration is the color confidence of the medicine. Usually counterfeit medicine can't go forward and use commercially available printers which are very expensive and are used by pharmaceutical houses. They usually go forward and print it in much cheaper printers this gives a very different color combination than the original medicine which can be easily picked up by the medicine. Taking the confidence score and color metric score the application finally goes forward and gives the result on whether the medicine is counterfeit or not.



Fig -1: Key Metrics of Durgsafe

Since we go forward and need to compare the image real time we store this in a content delivery network to ensure we reduce the latency. This is indeed much faster compared to normally loading the picture. All this data is securely loaded with HTTPS and TLS v1.2 security which makes it highly secured. The data is highly encrypted and can only be accessed by the Microsoft Azure cloud. There is also a bot which can help the consumer answer any amount of questions about the medicine. The bot is designed using the Azure bot framework. Its again based on C#. The bot uses cognitive services like LUIS.ai to understand the keywords. How LUIS works is, basically it picks up the word the results a score <1 according to that the bot is coded to give results. LUIS returns in. json and the data must be parsed accordingly to give appropriate results. The bot runs on fast storage so it's fast when it comes to response time. The bot can be integrated into various social channels so that the user doesn't even need to install the application [4].

The bot is already linked to messenger and skype. It also has a direct communication channel where one can interact with the bot. The bot can process images and videos also. The bot is programmed in such a way that it can return answers with YouTube video's which are integrated into it. In addition to this the bot is light weight and barely takes up data and can also run on low speed internets. The application also has friendly reminder of medicines if they have expired and can alert the user on the same. It simply goes forward and creates a reminder to ensure that the user is not consuming counterfeit medicines[5]. The application also has another section where one can go forward and see the heatmap of

the medical stores that are reported with the highest amount of counterfeit medicines. This will ensure that the consumer can go forward and avoid the stores which are known to be selling the counterfeit medicines. The second aspect to this application is the drugsafe merchant application where one can go forward to track and trace the drug to ensure the drug is exported in the right conditions[6]. To simulate the conditions an Azure MX IoT Chip was used. This board can track various real time metrics including temperature and pressure. This is then sent to the Microsoft IoT Azure Hub where one can go forward and track real time metrics like the above. This will be placed above the medicine boxes to ensure that one can easily track and trace the drug[7]. This can help us also track location real time and one can easily know from where this was transported origin and destination point with all the real time metrics. The data sent is highly encrypted and ensures only users who are a part of Azure Active Directory can only access the same. This uses application insights to also simulate the data real time. The data is stored in the azure cosmos Database which has real time caching to ensure there is very low latency when the user is being sent. There is also a scheduled backup to ensure that data is not lost in cases of disasters[8].

## 5. APPLICATION AREAS

The application areas for these are vast. One can primarily go forward and use these in two places. The consumer can go forward and use this to detect if the medicine is counterfeit. This will increase the confidence of the user while buying medicines. This will also go forward and reduce the number of legal cases on the pharmaceutical houses as all the medicines will be validated. The consumer will also know the implications of consuming a counterfeit medicine since there is a bot that can make the user aware about the same. The various medical stores can also go forward and use the same to detect if the medicines they are receiving are original or not. This will help them claim to the consumers that they are only selling medicines which are original. The merchant application can be used by the transportation facilities and by the medical companies. This will help the user to ensure that there is authenticity in the supply chain. This will also help monitor real time parameters of the medicine and will also ensure the medicines are not spoilt during transportation.

## 6. CONCLUSION AND FUTURE WORK

The application has a lot of potential to ensure that it brings down the percentage of counterfeit medicine across the world. Drugsafe gives the power in the hand of the consumer where one can go forward and easily detect if medicines sold to them are counterfeit or not in real time. The drugsafe merchant application also is very useful in cases where the pharmaceutical company can track and trace the medicine which is sold to the consumers. This application currently needs to be worked upon to reach consumer in the broader

perspective. Since this application uses cloud it can easily scale for high demands and usage. Also, there would be a requirement to get more drug houses on board to ensure that more medicines can be scanned and detected if they are counterfeit or not. This case can also be extended across other sectors than medicine like fast move consumer goods where the users can easily detect if products are counterfeit or not and then raise the required requests. Since there will be a bot there would be very little need of human intervention and users can raise request very quickly.

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