

## Detection of Counterfeit Medicines Using Machine Learning Techniques

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Counterfeit medicine, also known as fake medicine, is a medication or pharmaceutical product that is produced and sold with the intent to deceive. It may look like a legitimate brand-name product. However, it contains incorrect, insufficient, or harmful ingredients. Counterfeit medicines pose a serious threat to public health. It can be ineffective, cause adverse side effects, or even lead to death. Traditional methods for detecting fake medicines involve visual inspection of packaging for inconsistencies like misspellings, poor print quality, checking the pill's appearance, color, and size for anomalies, and verifying the expiration date. That means more or less traditional methods were subjective and prone to human error. One separate technique could be analyzing the chemical composition of medicines. It was time-consuming and expensive. Therefore, it never became a viable solution. Furthermore, counterfeiters are becoming increasingly sophisticated with the advent of the internet that makes it difficult to distinguish fake medicines from genuine ones using conventional techniques. Reinforcement learning can be a powerful tool in detecting counterfeit medicines. Reinforcement learning is a type of machine learning where an agent learns to make decisions by interacting with an environment and receiving rewards or penalties for its actions. By training an AI agent to analyze various features like packaging, labeling, and chemical composition, it can learn to distinguish between genuine and fake products. Through iterative learning and reward-based feedback, the AI agent can continuously improve its accuracy in identifying counterfeit medicines. This technology can help automate the detection process, making it more efficient and reliable than traditional methods. Additionally, it can be used to develop real-time detection systems that can alert authorities and consumers about counterfeit products in circulation. Reinforcement learning's adaptability and ability to learn from continuous feedback makes it well-suited for detecting counterfeit medicines, as it can adapt to evolving counterfeit techniques and improve its accuracy over time.

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