

Internet of Animal Health Things (IoAHT) Framework for Clinical Mastitis Detection in Dairy Cows

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Abstract— The Earth serves as a shared habitat not just for humans but also for an array of animal species and organisms. Throughout history, animals have played a crucial role in preserving the natural ecosystem balance and meeting diverse human needs. They contribute significantly to various sectors, such as Agriculture, Dairy, Poultry, and animal husbandry, thus bolstering a country's economy. Human responsibility lies in ensuring the well-being of these animals, which is overseen by Veterinary Science. In India, a major milk and milk product producer, the dairy industry actively contributes to the nation's economy. Among the primary milk sources—cows, buffaloes, goats, and sheep—cows hold a revered place in different faiths. Particularly in the dairy industry, cows are vital for milk production. However, monitoring cow health poses challenges. Clinical Mastitis, an inflammation affecting cows' mammary glands, hampers milk production. Automatic milking machines are commonly used, but identifying and segregating mastitis-infected cows from healthy ones remains difficult. The contagious nature of the disease increases the risk of widespread infection among cows. To combat this issue, we propose a solution called the Internet of Animal Health Things (IoAHT), based on the Internet of Things (IoT). IoAHT employs IoT technology for animal health, aiming to accurately identify cases of clinical mastitis in cows. The implementation of IoAHT has the potential to revolutionize health monitoring in the dairy industry, safeguarding cow well-being and ensuring sustainable milk production.

Keywords— Artificial Intelligence, Clinical Mastitis, IoT, IoAHT, Machine Learning.

I. INTRODUCTION

The rapid development of the internet has shrunk our world and ushered in a smarter era. Countless new technologies have become integral to our daily lives, with the internet permeating various sectors, making it indispensable for businesses. Beyond commerce, the Internet has firmly established its presence in critical domains like healthcare and defense. However, there remain numerous living and non-living entities yet to be connected to the internet, holding untapped potential for remote monitoring and control [20]. To bridge this gap, the Internet of Things (IoT) has emerged,

capturing significant attention across social, academic, and industrial spheres. The primary goal of IoT is to "connect the unconnected," bringing diverse entities onto the internet through a robust framework comprising hardware, software, communication platforms, and cloud applications.

IoT has found diverse applications, including in sectors such as robotics, transportation, and defense. One domain where IoT has considerable potential is healthcare, encompassing both human and animal healthcare. While IoT has made remarkable strides in advancing human health care, its impact on animal health care has been less pronounced [21]. To address this, the concept of the Internet of Animal Health Care Things (IoAHT) aims to connect animals to the IoT framework [22].

Animals have made profound contributions across sectors such as agriculture, dairy industries, and poultry. In India, the dairy industry stands as a major economic contributor, with cows playing a crucial role in milk production. Revered and cherished by people of diverse faiths, cows are considered important domestic animals. Nevertheless, the dairy industry faces numerous challenges, particularly in meeting the growing demands both nationally and internationally. Among these challenges is maintaining cattle health, as cows are susceptible to various diseases, including Clinical Mastitis.

Clinical Mastitis, an inflammation of the mammary glands caused by microorganisms entering the udder via the teats, significantly impacts dairy industry output and the country's economy [1]. If not addressed promptly, the disease can spread from one teat to infect the entire udder, exhibiting visible symptoms like udder swelling and changes in milk texture. Given that dairy farms house a large number of cows of different breeds and employ automatic milking machines, controlling the highly contagious clinical mastitis and preventing its transmission to other healthy cows presents a major challenge.

To address this issue effectively and efficiently, advanced mountable devices and gadgets equipped with modern technologies are necessary. The work focuses on providing a monitoring mechanism to aid farmers and dairy