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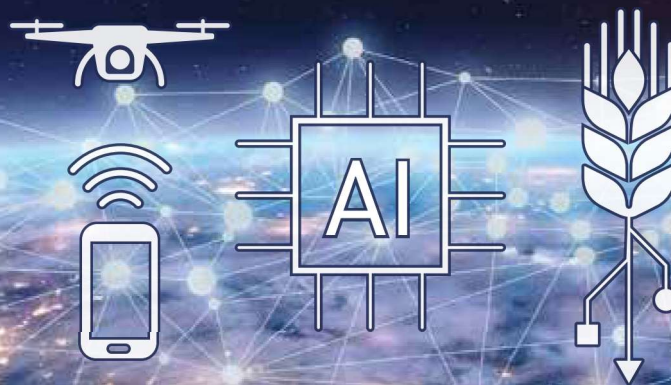projects in agriculture*

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Monitoring livestock vitals with machine learning technology

AI-enabled chip and sensor technology, mobile application mapping veterinary services, and drones fitted with thermal sensing, are transforming the way livestock farmers monitor and protect their animals.

Bob Koigi

In Uganda, a new technology is embracing AI and machine learning to detect livestock diseases 2 days before they manifest, connect farmers to veterinary officers and monitor animal movement to avert theft. The innovation, dubbed Jaguza Luganda, constitutes a chip with a sensor that is connected to a radio-frequency identification (RFID) reader, and to users' mobile phones or computers. Since 2016, 18,000 Jaguza chips have been installed.

The chip and sensor technology is attached to an animal's ear, and an RFID reader is able to detect the sensor in the chip from up to 300 m away, or even further if an antenna or radar is installed to bolster the frequency. The chip monitors vital information about the animal, including temperature variations, feeding patterns and reproductive stages through the smart sensor, and is able to detect diseases 48 hours before they manifest, allowing for timely medical attention. "We use Jaguza to predict problems earlier, detecting cases like lameness or digestive disorders and provide recommendations to farmers on how to keep their cows healthy and improve the efficiency of their farms. Using these insights, we're already seeing a 35% increase in livestock production on our customers' farms," says Jaguza's founder, Ronald Katamba.

The technology can also track livestock movement and alert farmers, through mobile messages, in the event that animals wander beyond farm boundaries. "Jaguza learns patterns about a cow's movements from the sensor. We use this data to develop machine learning models and Tensor Flow algorithms," explains Katamba. The technology has also been effective in reducing cases of theft that

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are rampant in Uganda's livestock rearing regions. Charles Walugembe, who keeps 180 cows began to trial Jaguza in 2018. He chipped 50 of his exotic cows that were bringing him the highest returns for their meat and milk. "For the longest time, we have been hiring armed guards to watch our cows. We have been spending almost half of what we earn from our livestock to pay these guards and other protection methods like fencing, but somehow we still manage to lose them. Since using Jaguza, I am able to track movement no matter where I am and we haven't had any cases of missing livestock," he says.

Mobile management

The Jaguza Livestock mobile application, which has 85 veterinarians signed up and on standby to respond to farmers' inquiries, compliments the sensor device. Using GPS, the app maps out the farmers' proximity to a veterinary officer, and provides information on the vet's specialisation and availability. Information on good livestock management practices, including feeding and disease detection is also provided on the app, which is available on both Android and iOS mobile devices. In order to reach farmers who are not connected to the internet, the technology is accessible offline through a USSD code. Over 1,250 users have downloaded the app to access livestock information, and both the sensor devices and the app have attracted farmers beyond Uganda – in Fiji, Mozambique and Namibia.

In a bid to streamline livestock keeping, the app also has a provision for record keeping, allowing farmers to record expenses and earnings. Dan Kisitu has been rearing cattle in Uganda for the last 15 years and signed up with Jaguza in 2017 to monitor his 40 cows. Besides managing to tackle common diseases like foot and mouth disease, rinderpest and East Coast fever, he has used the Jaguza app for record keeping, which has seen him reduce expenses. "I used to spend a lot of money on veterinary services and medicines, especially due to frequent disease outbreaks from which I lost a number of cows. Beyond getting alerts on any health issues of my cows before they escalate, I have managed to bring down expenses like feed and supplements by up to 50% using the electronic record keeping that allows me to identify where I am over-spending," says Kisitu. "I have also been able to access information on good farm management practices for feeding, vacci-nation and reproduction, in a place where extension services are no longer readily available due to the scarcity of government officers," he adds.

Large-scale livestock farmers are monitoring the health of individual cows using drones fitted with high definition cameras and thermal sensing technology

Scaling out with drone sensors

To cater to large-scale farmers, Katamba is using drones fitted with high definition cameras and thermal sensing technology. The drones, which are connected to the farmers' phones through a cloud-based system, track the animals' body temperatures and alert the farmers in the case of sickness. Where it might usually take up to a whole day to count each cow reared by large-scale farmers, the drones take on average 15 minutes to do a headcount. "Our drone tech uses 'smart cameras' that are powered by AI and facial recognition to identify individual animals in real-time. The cameras monitor the animals' presence on the farm and send real-time information to the farmers' mobile and computer. There are two signs, a red one which indicates that the cow is sick or unavailable and a green one indi-cating the cow is fine," he explains.

Despite the success of the technology, which has seen Katamba invited to Texas to promote Jaguza to livestock farmers in the area, he notes that regula-tions for flying drones in Uganda are not yet in place and poor internet connectivity has stood in the way of project implementation. "Drones are still banned in Uganda despite the numerous benefits they deliver to ordinary people. We are in constant com-munication with the government to have a policy shift in recognising these emerging technologies while investing in increasing internet connectivity to allow easier adoption of the innovations," says Katamba, who obtained a license to operate only after receiving a letter from the Chief of Defense Forces and the Uganda Civil Aviation Authority.

Jaguza is a member of the CTA AgriHack network, which supports young digital agripreneurs with capacity building opportunities, and was among the 2016 finalists of the Pitch AgriHack compe-tition. The company won first prize as a mature start-up in the 2019 competition at the African Green Revolution Forum in Accra, Ghana. ◼

Jaguza's chip and sensor technology is attached to an animal's ear to read vital information about the animal, including temperature variations