

Applications of Artificial Intelligence in Aquaculture

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Currently, Aquaculture plays a critical role in meeting the budding global demand for Aquaculture and fisheries products; however, it faces immense challenges in fish growth, seed production, feed utilization, health status and remote monitoring. With technological advancements, the artificial intelligence (AI) technique offers inspiring resolutions for enhancing fish farming practices and certifying sustainable aquaculture development. With this new sophisticated and dynamic artificial intelligence (AI) technique, we aim to convert aquaculture from art into more of a science. The utilization of modern AI technology significantly frees up human resources, upsurge current manufacturing efficiency, and aids in increasing output, product quality, and other conveniences. There are numerous applications of AI systems in aquaculture, and the important ones are listed:

Remote automated monitoring

With AI in aquaculture, the aquaculturist can remotely monitor and maintain the farming site. AI systems control cloud infrastructures to give remote site-level examination and glitch detection to levels never grasped before. AI systems will give alarming signals to farmers about water levels, any blockages, low oxygen levels or any other concern that might be important to resolve instantly. It helps the farmers to roam freely by remote monitoring and maintenance while being capable of monitoring their aquaculture sites with accuracy. The necessity to continuously remain present in the field is no longer possible due to AI only (Yongqiang *et al.*, 2019).

Ai-based automated feeding

As feeding represents the biggest cost to farmers, which involves more than 50% of input cost, optimization in this area always means better profitability. The use of AI-based Automated Feeding systems has revolutionized the feeding process in fish as the farmers have to feed fish manually, and feeding

is a tiresome process. Remaining constantly available, farmers can occasionally forget, or they may even remain inaccessible for certain purposes. This is where AI can be extremely important and step into the fish farmer's shoes using automated feeding systems. This AI-based Automated Feeding system has AI-empowered tools that release a registered amount of feed at a particular time for fish to intake, minimize feed wastage and improve feed consumption among the fishes. The proximate composition of feed, its nutrient profile and energy content will be displayed all the time to improve the nutritional content and shelf life of fresh and processed fish products. It can also help fish products retain their natural flavours and aromas.

Examine growth and biomass

The calculation of manual biomass in aquaculture gives significant challenges as it's time-consuming and tedious with no considerable enhancements. The correctness of these dimensions relies heavily on the worker's skills and knowledge, making them vulnerable to human error. Furthermore, physical measurements are characteristically restricted to small samples, which may provide an inaccurate representation of the entire fish population in ponds. This restriction results in errors when approximating the total biomass. In addition, frequent labour-intensive measurements cause stress, disrupt their feeding patterns and condition their health. By utilizing the power of AI, farmers not only identify the dodges in their cultivation practice but are aware of the upcoming steps and loss control to ensure that their fish stock turns out to be fruitful. It will contribute to the collection of big data and analytics to help others analyse the correct practices and steps for the same. Meanwhile, combining machine vision and machine learning can better assess fish size, weight, numbers, and other biological data (Zhao *et al.*, 2021).

Water quality management

Another important advantage of using AI in aquaculture is that it can easily detect water quality and regulate it. As we know, water quality is the main and important factor that determines the growth, health and survivability of fishes throughout the process of culture. Any contamination with water tends to infect the pond/water body. AI-empowered sensors can simply inform the farmer and lead to supervisory measures. This particular application of AI makes the aquaculture industry very advanced yet progressive.

Regulating temperature

Temperature is one of the critical factors regulating the growth and development of fishes, and its regulation is important for the growth and experimental analysis of fishes. Temperature optimization can be done through artificial intelligence and machine learning algorithms that allow farmers to customary their preferences and extract modified models for their fish culture site. For example, AI can help farmers to increase it at night.

Human-less filtration

In earlier times the filtration of aquaculture farmers manually to maintain the water quality, the contemporary era has become much more advanced. As Motorized by AI, human-less water filtration can be easily done with the help of pre-installed machinery. Hence, the practice of AI in aquaculture denies the need for farmers to manually perform tiresome activities and spend long hours in the same. At the same time, performing and monitoring all the functions to cope with the demands of culturing practices and lead to better outcomes for the practice altogether.

Data analytics

One of the important applications of AI in aquaculture is that it can utilize big data analytics to collect information records and help others take the right steps. With the benefit of data analytics, farmers can very well recognize the risks and encounters that they might face in the process and take appropriate steps to ensure that they are on the right path. So, data analytics not only provides you with a summary of the practice but also capitulates the dos and don'ts to help farmers.

One of the chief applications of artificial intelligence, predictive analytics paves the way for aquaculture practitioners not only to strategize their upcoming actions but also work along the lines of the forecasted notions so that they can do the best for their cultural practices. Artificial intelligence is improving aquaculture by making farmers understand the analytics of how their inputs affect fish growth under various conditions.

References

- Yongqiang, C. H. E. N., Shaofang, L. I., Hongmei, L., Pin, T., and Yilin, C. H. E. N. (2019). Application of intelligent technology in animal husbandry and aquaculture industry. In 2019 14th International Conference on Computer Science & Education (ICCSE) (pp. 335-339). IEEE.
- Zhao, S., Zhang, S., Liu, J., Wang, H., Zhu, J., Li, D., and Zhao, R. (2021). Application of machine learning in intelligent fish aquaculture: A review. *Aquaculture*, 540, 736724.

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