Article Id
AL04126

ARTIFICIAL INTELLIGENCE AND ITS USE IN AQUACULTURE

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Aquaculture is the rearing and production of aquatic animals and plants, including finfish and shellfish, for food and non-food purposes. Aquaculture production is mostly under controlled or semi-controlled systems. Therefore, technological applications that allow population densities management and optimizing culture management are currently the one possible solution to ensure production efficiency.

Artificial intelligence and automation technology, it is a better feasible problem to use these modern techniques in conventional animal husbandry as well as the aquaculture business. This will substantially free up human resources, increase current manufacturing efficiency, and aid in increasing output, product quality, and other conveniences. Artificial intelligence can intelligently detect animals of various weights and stages, feed them differently, and increase the output rate of high-quality feeding animals using modern animal husbandry and aquaculture technologies (Yongqiang *et al*. 2019)

Aquaculturists recognize that physiological rates of cultured species and end process outputs (e.g. ammonia, pH, and growth) may be adjusted by controlling ambient conditions and system inputs such as water, oxygen, temperature, feed rate, and stocking density in the pond. These are the types of practical metrics that will allow commercial aquaculture plants to increase efficiency while lowering labor and utility expenses. Aquaculture process control and artificial intelligence systems are expected to provide the following benefits: (1) increased process efficiency; (2) decreased energy and water losses; (3) decreased labor costs; (4) decreased stress and disease; (5) enhanced accounting; and (6) enhanced process understanding (Lee, 2000).

The utilization of computer monitoring as well as automation in the aquaculture sector. The most well-known AI paradigm is issue solution through the interpretation of an automated intelligent task. The use of AI models such as modern data science methodologies is rapidly developing in other areas. Simultaneously, within the aquaculture sector, they have not been enough harnessed (Yang *et al*. 2020).

Challenges in Adopting Innovative Techniques

Proposing and inventing novel technology is one thing, but ensuring that it is adopted is another. When a new technology is immersed and confirmed by rigorous testing, it can be difficult to adopt. Adoption of new technology is defined as an innovation decision-making process in which an individual enters the decision-making process of adoption or rejection through this first knowledge of the innovation period and verifies the decision (Mwangi & Kariuki 2015; Miranda *et al*. 2016). With the prosperous adoption of technologies, three major problems should be recognized (Van Henten, 2020): firstly, understanding that the change in technology with great skill in CIA as well as robotics is initiating a modern discipline into the technological market. Second, being data-intensive, embedding modern technology in the future farm's data infrastructure is a challenge on its own. Third, recognizing and matching technology to the needs of farmers, as well as educating farmers to operate increasingly high-tech equipment, are essential success factors in the adoption of new technologies.

Monitoring

Monitoring the aquaculture environment is crucial due to great variability, particularly in the open sea, which can pose an enormous hazard to aquaculture. It has traditionally been difficult and time-consuming, and it has the potential to endanger cultivated species if water quality anomalies are not recognized promptly. Aquaculture managers need to be able to monitor the environment, water quality (dissolved oxygen, temperature, pH, ammonia chlorophyll, nitrogen, nitrite, etc.), and fish behavior in real-time to intervene rapidly as well as decrease risks (Devi *et al*. 2017).

Multi-parameter Water Quality Meter

Water quality parameters forecast a high-quality water environment, which is critical for ensuring aquaculture productivity and quality (Chen *et al*., 2017). The water quality index determines an environment's water quality. As a result, real-time monitoring of the water

quality indicators in the aquaculture environment is critical for detecting breeding biological irregularities, preventing infections, and mitigating associated hazards (Zounemat-Kermani*et al*., 2019). Water quality characteristics in aquaculture alter throughout time and space. As a result, the acquisition of water quality measures must be monitored regularly. Simultaneously, numerous parameters impact the characteristics of an environment's water quality, causing significant difficulty in predicting water quality parameters (Yeon*et al*., 2008; Liu *et al*., 2014a).

Biomass Detection of Fish

Regular fishing detection, which often causes stress and physical injury to fish, has an impact on fish health and welfare, and is based on the human determination, is the traditional technique of getting fish biomass information. This is insufficient for modern aquaculture requirements. Machine learning in fishery aquaculture opens up new possibilities for intelligent aquaculture. Meanwhile, combining machine vision and machine learning can more correctly assess the fish size, weight, numbers, and other biological data (Zhao *et al*. 2021).

Feeding

In aquaculture, feeding is a crucial factor in production costs as well as water quality (Li *et al*. 2020). Most large-scale farming uses mechanized feeding procedures to save money and time. Automatic feeding devices work on a timer, feeding only when it's time to feed, regardless of the state of the water. As a result, using an automatic feeding system can lead to overseeing and changing the quality of the water (Liu *et al*. 2014b).

Conclusion

The utilization of computer monitoring as well as automation in the aquaculture sector. Machinel earning in fishery aquaculture opens up new possibilities for intelligent aquaculture. Aquaculture managers need to be able to monitor the environment, water quality (dissolved oxygen, temperature, pH, ammonia chlorophyll, nitrogen, nitrite, etc.), and fish behavior. Most large-scale farming uses mechanized feeding procedures to save money and time. Monitoring the aquaculture environment is crucial due to great variability, particularly in the open sea.

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