

Unit 4 Innovate

Intelligent Aquaculture

Traditionally, fishers went out to sea with fishing nets or long lines on boats to catch fish. They took advantage of their experience gained through trial and error, through observation, and through knowledge passed down from previous generations. With wild fish stocks gradually declining due to overfishing and the changing climate, more fishers are turning to farming instead of casting nets or lines. In fact, according to a UN report, about 49% of the fish consumed worldwide in 2020 came from fish farms, not from the wild. This figure is expected to continue to grow, increasing to 62% by 2030. With the arrival of smart fish farming technology driven by artificial intelligence (AI), fish farmers are able to provide healthy, affordable seafood to families everywhere.

Traditionally, fishers went out to sea with fishing nets or long lines on boats to catch fish. They took advantage of their experience gained through trial and error, through observation, and through knowledge passed down from previous generations. With wild fish stocks gradually declining due to overfishing and the changing climate, more fishers are turning to farming instead of casting nets or lines. In fact, according to a UN report, about 49% of the fish consumed worldwide in 2020 came from fish farms, not from the wild. This figure is expected to continue to grow, increasing to 62% by 2030. With the arrival of smart fish farming technology driven by artificial intelligence (AI), fish farmers are able to provide healthy, affordable seafood to families everywhere.

A computer system with deep learning capabilities is able to track and record fish behavior better than humans can, especially when the system is trained with enough relevant data. It can distinguish and identify one fish from another and diagnose whether a small speck is dirt or sea lice, and this information is entered into the fish's health record. In a sense, the fish farm is monitored by an AI doctor on duty 24/7. Farmers can then determine when they should take action, such as when to separate an abnormal group from the rest or spread out the fish population to reduce density, without resorting to harsh chemical treatments, which can harm the fish, the environment, and even the consumer. In addition, all this data from cameras and sensors can be utilized for various applications and purposes.

One of the most noticeable and effective applications is real-time monitoring of fish behavior and other environmental changes, which serves multiple purposes, including diagnosing diseases in individual fish. By processing large sets of data, an AI system can detect and recognize unusual group behaviors of an entire school of fish, possibly caused by changes in water quality, temperature, or oxygen levels surrounding the cage. It can also ensure the quality of cage nets to prevent fish from escaping or predators from invading and protect the surrounding habitat.

The system can also tell farmers exactly when to feed the fish by identifying patterns of behavior that an individual fish or the school exhibits when they are hungry. This is how farmers can accurately determine optimal feeding times and amounts. The right amount of food at the right time minimizes cost, reduces waste and pollution, and maximizes fish growth rates. Given the fact that feeding constitutes more than 50% of a fish farm's operational budget, this precise feeding approach will ultimately contribute to a more affordable supply of fish for consumers as well as efficient and sustainable aquaculture operations in general.

AI continues to advance in aquaculture to extend beyond caged fish. In particular, smart fish farming technologies can be applied to seaweed farming. Seaweed is as valuable a source of food as fish. It's also a source of fuel and an important ingredient for cosmetics, fertilizers, and other medicinal and industrial products. As such, ongoing research is exploring various ways AI can help in the seaweed industry, including the use of autonomous underwater vehicles (AUVs) and swarm robotics. Using cameras and sensors, AUVs can do many of the analytical and diagnostic tasks on seaweed farms. Swarm robots, or many small robots working together, can swim in and around seaweed farms to collect data and then make decisions on how to deal with problems that arise. Single larger robots or even humans may be available to take care of the physical labor from removing harmful weeds to harvesting; however, swarm robots may be more efficient and cost-effective.

The potential of AI in aquaculture is vast, and it brings a more sustainable and technologically driven future for fish and seaweed farming. Families that gather together, eagerly anticipating a healthy seafood dinner, may not be aware of the carefully monitored fish and seaweed farms or the cutting-edge AI technology involved in getting food to their table. However, the process of doing so is evidence of the considerable amount of investment in sustainable, high-quality aquaculture with AI. With AI as an ally, the future of the oceans and the nourishment of humanity is just a little bit more secure.

Unit 4 Go Beyond

From Gazing to Engaging The Future of Personalized Museum Visits

Museums are said to be places where time is transformed into space. Maybe that's why people visit them, to learn and be inspired in new ways.

Accordingly, museums are adopting new techniques and technologies to meet the diverse demands of visitors.

To help visitors interact with artworks and artists in a novel, engaging way, many museums are adopting technology to enhance the experience of museum-goers. The Van Gogh Museum in Amsterdam allows visitors to virtually touch objects and interact with the characters inside, immersing themselves in the artworks.

Some museums are even personalizing services, as natural language processing techniques can be implemented into chatbots. The chatbot of the British Museum of London explains details not only about the exhibits but also about the facilities and venues, in a dozen different languages.

Personalized services will continue to be an important part of a museum visitor's experience. Based on an analysis of a visitors' background and past behavior, including the artworks, websites, or social media sites they've viewed or given a "like" to online, deep learning systems can predict and recommend artworks they would most likely be interested in. The National Museum of Singapore conducted a study in 2017 on developing a deep learning engine that can track a visitor's gaze, identify what interests them, recommend personalized tours, and show them virtual objects on top of real-world exhibits, often giving interactive quizzes and games that suit their interests.

To some, visiting museums and galleries may be a way of escaping from everyday dullness. To others, it may be a serious attempt to enter a world of beauty, wonder, imagination, and inspiration.

Whatever their reasons are, more visitors will seek a unique way of appreciating the exhibits, and more innovative services will emerge.