Implementation of Artificial Intelligence for creating a healthier and prosperous fishing ecosystem in Fish farming

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Abstract

In this report, I have proposed using artificial intelligence to improve the efficiency and sustainability of Indian aquaculture. Fish eating has been a part of the cultural tradition of many people and offers nutritional benefits, including protein, fatty acids, vitamins, minerals, and essential micronutrients. Fishing in India is a major industry employing 14.5 million people. India ranks second in aquaculture and third in fisheries production. Fisheries contributes to 1.07 % of the total GDP of India and over 5 % to agricultural GDP. According to the National Fisheries Development Board the Fisheries industry generates an export earnings of Rs 334.41 billion.

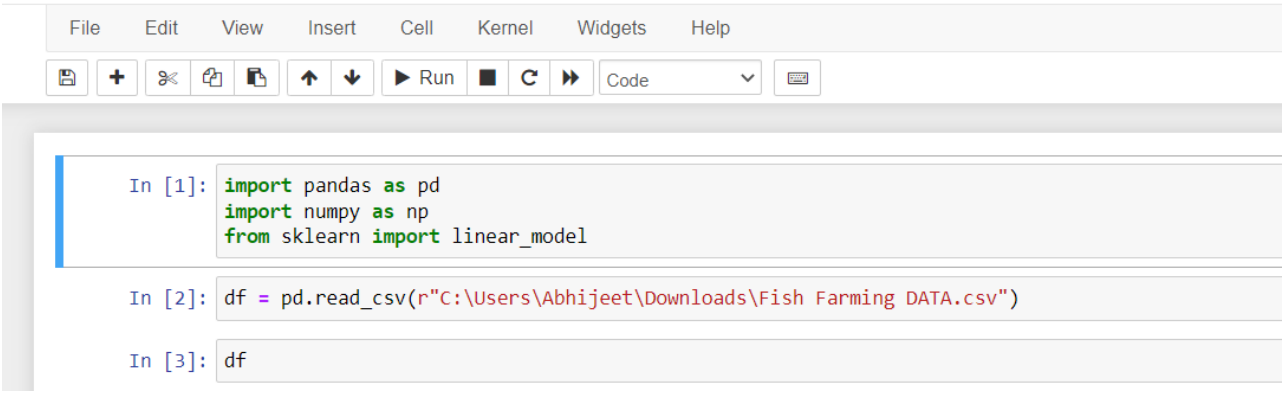
Fish eating has been a part of the cultural tradition of many people and offers nutritional benefits, including protein, fatty acids, vitamins, minerals, and essential micronutrients. In India the annual per capita consumption of fish for the entire population was estimated at 5-6 kg, whereas for fish eating population it was found to be 8-9 kg. India also produce the shellfish, crustaceans, and seaweeds that are important for human body nutrition and the pharmaceutical industry. This use of AI service will create a healthier and prosperous fishing ecosystem.

1. Problem Statement

The problem statement is to apply artificial intelligence to improve the efficiency of the fish farming industry. Despite India being the world's largest exporter of shrimp and second largest aquaculture producer globally, the industry is fraught with various challenges – ranging from unscientific farming practices to inefficiencies in the value chain. I hope to create a service that can solve the problem of the fishing industry and help to increase their revenue.

2. Market/Business needs Assessment

Indian aquaculture practices as unhygienic and unhealthy. Fish farmers face the problem of overproduction, poor managed production system, lack of proper cold chain and distribution system and lack of knowledge about feeding strategies. Therefore, by using AI technique, we aim to provide small business with useful insights from the available data and ways to generate more revenue.



(Total fish production in lakh tonnes)

Out[3]:

	year	Total_Fish_production
0	1981	24.42
1	1982	24.44
2	1983	23.67
3	1984	25.06
4	1985	28.01
5	1986	28.76
6	1987	29.42
7	1988	29.59
8	1989	31.52
9	1990	36.77
10	1991	38.36
11	1992	41.57
12	1993	43.65
13	1994	46.44
14	1995	47.89
15	1996	49.49
16	1997	53.48
17	1998	53.88
18	1999	52.98
19	2000	56.75
20	2001	56.56
21	2002	59.56

22	2003	62.00
23	2004	63.99
24	2005	63.05
25	2006	65.72
26	2007	68.69
27	2008	71.27
28	2009	76.16
29	2010	79.98
30	2011	82.31
31	2012	86.66
32	2013	90.40
33	2014	95.79
34	2015	102.60
35	2016	107.62
36	2017	114.31
37	2018	127.04
38	2019	135.73
39	2020	141.64

```
In [4]: model = linear_model.LinearRegression()
```

```
In [5]: model.fit(df[['year']],df.Total_Fish_production)
```

```
Out[5]: LinearRegression()
```

```
In [6]: model.predict([[2035]])
```

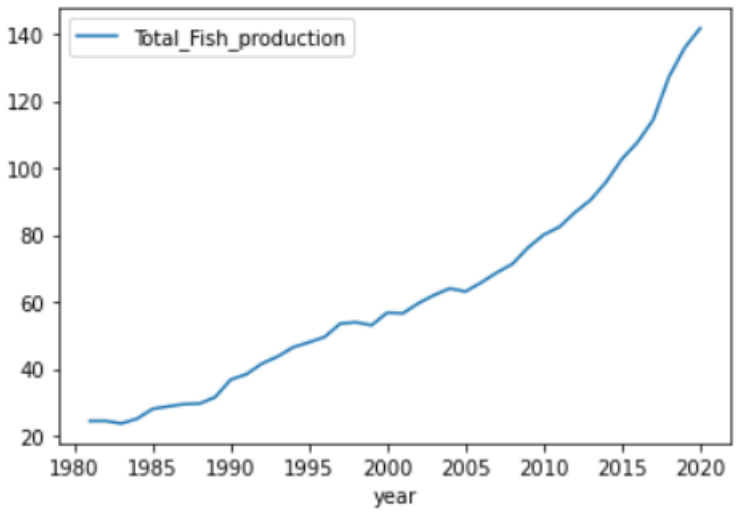
```
Out[6]: array([153.33249812])
```

In [7]:
```
import matplotlib.pyplot as plt
```

In [8]:
```
%matplotlib inline
```

In [9]:
```
df.plot(x = 'year', y = 'Total_Fish_production')
```

Out[9]: <AxesSubplot:xlabel='year'>



Target Specification

The proposed service will provide the fish farmers with some techniques so that their quality of fish will get improve and they can earn more profit. AI will help to improve aquaculture by making farmers understand the analytics of how their inputs affect fish growth under various conditions. This makes fisheries understand various feeding strategies. This involvement of AI can significantly reduce overfishing through data collection systems using AI to bring in accountability in harvesting practices.

3. External search

The sources I have used as a reference for analyzing the need for such a system for the fish farming industry are mentioned below:

- How AI can help Indian fish farmers
- Importance of Artificial Insemination in fish Farming
- Fish farming and partnering with AI systems
- Application of AI to aquaculture aims for improving efficiency, healthier fish

4.1 Benchmarking

Many companies like Aquaconnect, Observe Technologies, eFishery, Umitron Cell, XpertSea are using these AI techniques to make fish farming smart and to improve efficiency. This will help to boost the economy of India.

4.2 Applicable patents

- **Patent 1 – Management of sea lice by using AI**
- **Patent 2 – Providing information about the feeding by using AI**

There are a lot of patents that can be looked upon, but since these two are related to most of the applications of modern fish farming hence I have mentioned them.
The first patent focused on sea lice management, using AI to aid in the monitoring of infestations' development and spread within the environment. The platform gathers data from salmon farms across Norway and uses sophisticated machine learning techniques to help predict and prevent sea lice outbreaks. This led to effective breeding, area management, and control of pathogens.
The second patent offers to track measurable patterns when stocks are feeding. Their goal is to provide farmers empirical and objective guidance on how much to feed. The system aggregates data from sources including sensors, cameras, and acoustics, then extracts relevant information for its algorithms, and sends alerts to farmers for when to increase or decrease feeding. The software learns as it goes, getting smarter over time, and can be operated remotely.

4.3 Applicable constrains

- Data collection from fish farm.
- Lack of technical knowledge to the farmers or farm owners
- Convincing the farm owners to implement the system in their farm
- Skilled labour is required

4.4 Applicable regulations

- Gov regulation for fish farming
- Antitrust Regulation
- Employment Laws
- Regulation against false technologies

5. Business opportunities

Since the above techniques have been used by large corporate fish farms they can also be used by small scale fish farmers. Therefore this service is a great chance for business opportunities. Fish farmers can opt for this service as it will increase their revenue and also Fish production. Hence this inclination of farmers toward the technology is thus a fairly great business opportunity for service providers like us.

6. Final Product prototype

The final product is a service that provides Fish farmers to increase efficiency of fish farming industry, collecting knowledge about feeding, detecting the pollution underwater by using AI techniques. This overall will increase the revenue of fish farmers and also the quality of fish in the market.

This service implements Artificial Intelligence techniques on datasets collected from the various fish farms.

- Use of camera and feeding systems, and are incorporating AI based system learning into their technology to gain a competitive advantage and meet rising customer expectations and market demand.
- Use of AI or swarm intelligence (SI), to detect pollution underwater.
- Use of Sensors, cameras, and fuel-monitoring systems can also be placed onboard or next to underwater nets for real-time tracking
- We can use sensors, cameras, and acoustics for extracting the relevant information and send it to the algorithm, which will guide farmers on how much to feed.
- All this will improve the revenue of fish farmers and increase in production of fish.

7. Conclusion

This is true that fully automated aquaculture is still not a reality, as the farmer's intuition, approaches, and experience are still critical in the process. There is a huge possibility that we will witness an intense wave of automated fisheries with AI at the core producing more seafood to feed the growing world population while reducing the cost and environmental footprint of aquaculture operations. In this world we live, technology is no longer an option but a necessity.