AI-POWERED FRESHWATER FISH DISEASE DETECTION USING MOBILENETV2 AND GRAD-CAM

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Introduction:

Aquaculture plays a significant role in feeding the world's population and supporting economies, especially in areas where water resources are utilized for the cultivation of species such as Rohu and Catla. However, diseases in fish due to bacterial, fungal, and parasitic infections are affecting the survival rate of the population as well as the economy.

The conventional approach in detecting diseases in fish involves manual inspections as well as laboratory tests. However, this process is time-consuming and subjective in nature. With the development of new advances in the field of Artificial Intelligence (AI), it is now possible to automate the process of detecting diseases in fish by analyzing the images of the species.

The current project proposes the development of a system for detecting diseases in fish using MobileNetV2, which is a variant of the Convolutional Neural Network (CNN), along with Grad-CAM. The proposed system will provide real-time detection of diseases in fish using the web interface, which will allow the user to upload images as well as use the camera for the same purpose. With the addition of the explainable AI component, it will provide the areas of the images where the diseases are located, making it easier for the end-user to understand the output.

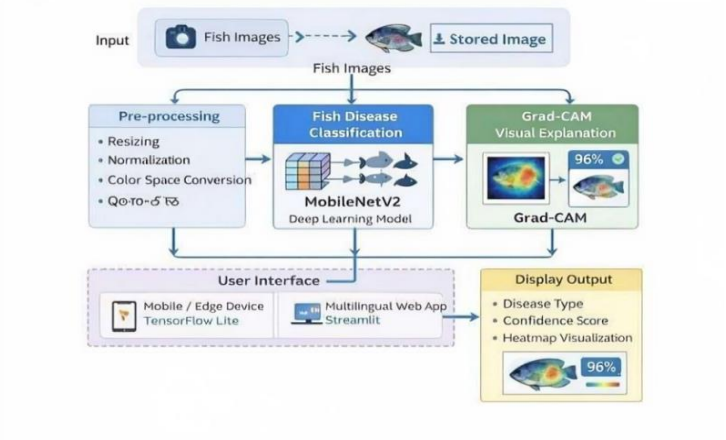

Figure 1: Proposed System Architecture for Fish Disease Detection

Objectives:

1. To develop an automated system for detecting diseases in freshwater fish using AI techniques.
2. To implement a lightweight deep learning model (MobileNetV2) for accurate multi-class classification.
3. To integrate Grad-CAM for visual explanation of disease-affected regions.
4. To design a real-time, user-friendly web application for disease detection.

Methodology:

The system has an effective step-by-step method for detecting fish diseases. First, it is necessary to gather images of various types of freshwater fish. These include both healthy and diseased fish. The images need to be preprocessed by resizing, normalizing, and denoising them. These steps ensure consistency in the images, thus enabling the model to operate effectively.
The preprocessed images are then passed through a deep learning model based on MobileNet-V2. The model is used for extracting essential features and identifying fish diseases from various categories. The model provides results in the form of prediction probability and disease labels.
To aid in understanding, Grad-CAM is also implemented in the system. It is used for identifying specific areas in the image that influence the decision. This makes it easier for humans to understand how decisions are being made.
The system is implemented using TensorFlow Lite. It is integrated into a web application using Streamlit. The application allows users to input an image or use a camera. The system provides results for fish diseases.

Result and Conclusion:

The system demonstrates a good performance in detecting fresh water fish diseases by using deep learning. The accuracy of the MobileNetV2 model was about 76.55%. This demonstrates that the model can perform the classification correctly in real-time conditions. Also, the Grad-CAM technique used in the system allows the identification of the parts of the fish that are infected by the disease, making it easy to understand the predictions of the model.
The system can also detect diseases in real time via a web interface.

conclusion,
This project demonstrates that AI technologies can effectively detect diseases in freshwater fish. By employing MobileNetV2, it is possible to maintain high accuracy and efficiency, and Grad-CAM ensures that the output is more interpretable, thus creating confidence in the user.

In conclusion, this system is useful, efficient, and easy to use in aquaculture. It is helpful in early detection of diseases in fish, thus reducing economic loss. It demonstrates how artificial intelligence can be integrated into real-life farming to improve productivity.

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Future Scope:

The future scope of this project includes

1. Development of a mobile application for on-field disease detection.
2. Integration with IoT sensors for real-time environmental monitoring.
3. Improvement of model accuracy using advanced deep learning architectures such as ResNet and EfficientNet**.**