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FISH IDENTIFICATION AND DETECTION USING ML

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Abstract -There is an increasing need for automated fish classification to help properly identify fish species and characteristics in a standardized, non-invasive, and cost effective manner. Machine learning is a promising method to do this. In this paper, we present the results of a convolutional neural network (CNN) used to identify fish species across datasets. Convolutional Neural Networks (CNNs) have been widely used in recent years for image recognition and classification tasks. In this context, CNNs have shown great potential in fish identification by analyzing the unique features of fish images. In this approach, a deep learning model is trained using a large dataset of fish images with known labels.

***Key Words*:**

Fish species identification, Deep learning, Fish Detection, Convolutional neural networks, Classification algorithms.

1.INTRODUCTION

Fish identification is a crucial task in many fields, including fisheries management, aquaculture, and biodiversity research. Traditional methods of fish identification often rely on morphological features, which can be time-consuming, laborious, and subject to human error. With the development of computer vision and deep learning techniques, Convolutional Neural Networks (CNNs) have emerged as a promising solution for automatic fish identification. CNNs are a type of deep learning model that can learn to recognize patterns and features in images, making them well-suited for image recognition and classification tasks. In fish identification, CNNs can analyze the unique features of fish images, such as color patterns, body shape, and fin shapes, to accurately classify the species of a given fish image. In this way, CNNs offer a fast and efficient way to identify fish species, which can contribute to the sustainable management of aquatic resources. In this article, we will explore the applications of CNNs in fish identification and the benefits of using this technology over traditional methods.

2. Literature Survey.

Fish species identification is a crucial task for fisheries management, biodiversity conservation, and fish trade regulation. Traditionally, fish species identification has relied on morphological characteristics, which can be time-consuming and prone to human error. In recent years, with the advancements in computer vision and machine learning, automated fish species identification has emerged as a promising alternative. In this literature survey, we review the state-of-the-art techniques and algorithms for fish species identification.

Fish species identification these approaches use deep neural networks, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), to learn discriminative features from fish images. Several studies have reported high accuracy rates using deep learning-based approaches. For example, Lu et al. (2020) proposed a deep learning-based framework for fish species identification, achieving an accuracy rate of 97.5%.

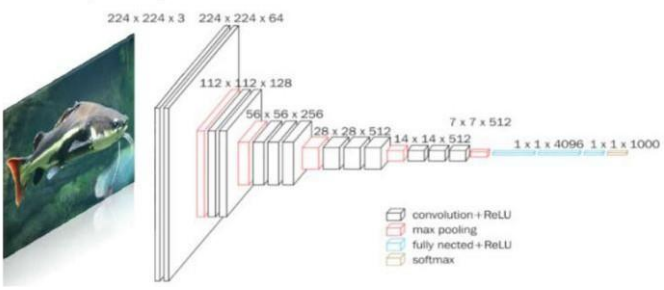
The system uses a combination of Convolutional Neural Network (CNN) and Support Vector Machine (SVM) for Fish species detection and recognition. The proposed system achieves an accuracy of 98 percent for fish species detection and 96 percent for fish recognition. The system uses CNN for feature extraction and Support Vector Machines (SVM) for classification. The proposed system achieves an accuracy of 95 percent for fish recognition. The proposed system uses the OpenCV library and CNN for face detection and recognition. The proposed

system achieves an accuracy of 98 percent for fish recognition. The above-reviewed papers demonstrate that real-time fish detection systems can be an effective solution for the identification and registration of Fishes. The use of CNN and SVM for Fish Species detection and recognition has been shown to be effective in achieving high accuracy rates. Further research can explore the use of deep learning techniques for improved performance in Fish Species detection systems. In conclusion, automated fish species identification is an active research area, with several promising techniques and algorithms. Deep learning-based approaches, feature-based approaches, hybrid approaches, transfer learning approaches, and smartphone-based approaches are among the most popular techniques used for fish species identification. Further research is needed to address challenges such as variations in fish appearance due to environmental factors and fish movement

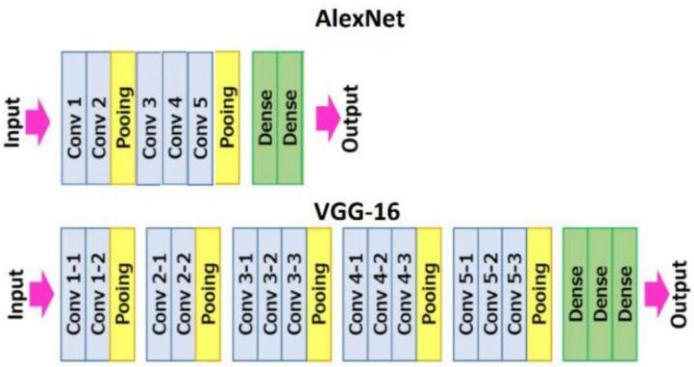
3. Proposed Work

Fishermen and researchers commonly use fish tagging to monitor the growth of different fish populations. For decades, a variety of marine and freshwater animals have been tagged externally with electronic tags. For smaller fish species, surgical implantation of tags is required. However, tagging some species of fish may be impossible, illegal, or prohibitively expensive. Endangered fish, for example, cannot be legally tagged because they are protected from human harm. As a result, this complicates and restricts scientific research of endangered fish species, as well as regulatory monitoring of endangered fish species

CNNs are a type of deep learning model that can learn to recognize patterns and features in images, making them well-suited for image recognition and classification tasks. In fish identification, CNNs can analyze the unique features of fish images, such as color patterns, body shape, and fin shapes, to accurately classify the species of a given fish image. In this way, CNNs offer a fast and efficient way to identify fish species, which can contribute to the sustainable management of aquatic resources. The Convolutional Neural Network (CNN) is a multi- layered/deep neural network designed to detect visual patterns using minimal pre-processing image's pixel. CNN is a unique neural network architecture and consist of two major components, namely convolutional and pooling layers. It can be used to capture the image vision in near-infinite ways. There are number of CNN architectures, which are the key to build algorithms to control and power AI as a whole in the near future. Some of them are LeNet, VGGNet, AlexNet, ZFNet, ResNet and GoogLeNet.The VGG16 also known as Oxford Net presented in Fig. 2, is the architecture of CNN is named after the Oxford Visual Geometry Group, which created it.



The VGG16 is a CNN model developed by Karen Simonyan and Andrew Zisserman from the Oxford University . This model has reached the accuracy at 92.7% and is ranked in the top 5 in ImageNet's, which is a data set that has more than 14 million images from 1000 classes. It was one of the popular models submitted to ILSVRC-2014. The improvisation was made by replacing the large size of kernel filters for the first and second convection layer, respectively with 3 x 3 filters to improve the AlexNet model.

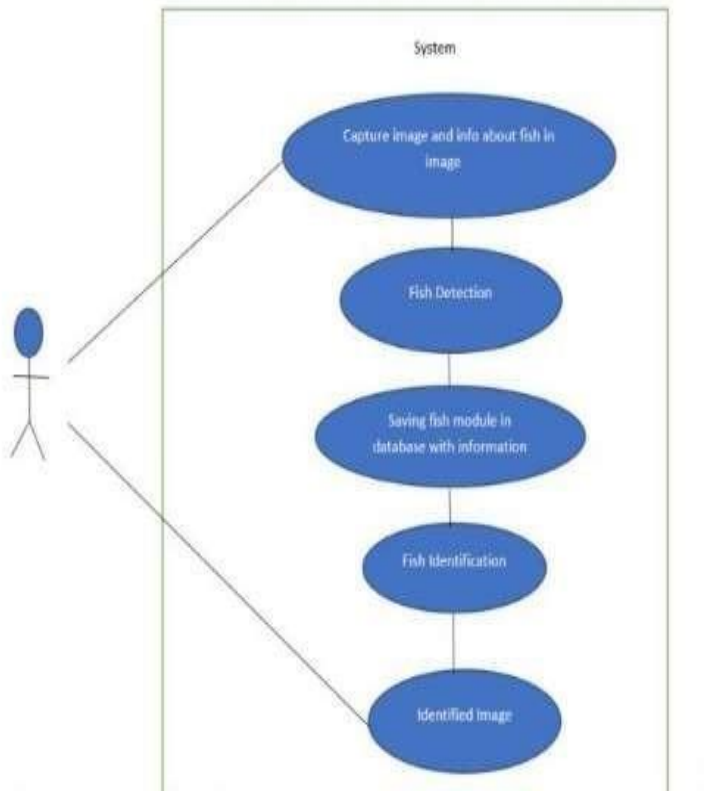


They proposed a method to remove the noise in the dataset before the training step taken into action through the image processing implementation. This can eliminate the underwater obstacles, dirt, and non-fish bodies from the images. They use the DL approach by implementing the CNN model for the fish species classification. Fish web-App is a Web application

for fish species recognition. It consists of a Website designed for the mobile And Computer systems that allows the user to take or upload photograph of a whole fish for inspection and a computing system that incorporates a sophisticated image processing pipeline and a DL neural network to interpret images and identify them into predefined fish classes. The Data set contains of more than 9 numbers of species of fish with 9000 different images of fishes. Including Black Sea Sprat, Red Mullet ,Horse Mackerel and many other common aquarium fish. Based on our study, a specific Web application developed for recognizing freshwater fish in World. Motivated by this factor, this study presents the development of Fish Detection, utilizing the Convolutional Neural Network (CNN) for the model development in identifying Malaysia freshwater fish.

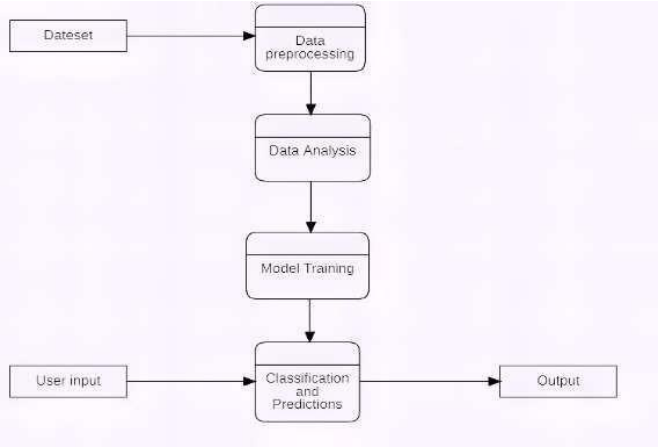
4. Use Case Diagrams

A use case diagram is a dynamic or behavior diagram in UML. Use case diagrams model the functionality of a system using actors and use cases. Use cases are a set of actions, services, and functions that the system needs to perform. In this context, a "system" is something being developed or operated, such as a web site. The "actors" are people or entities operating under defined roles within the system.

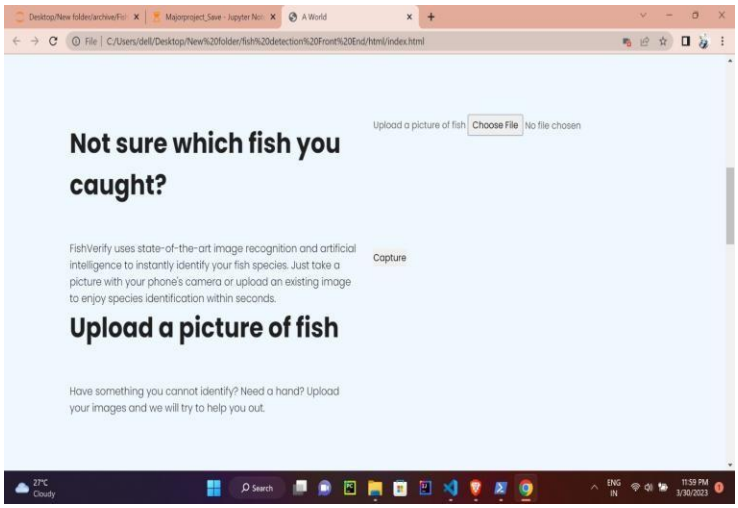


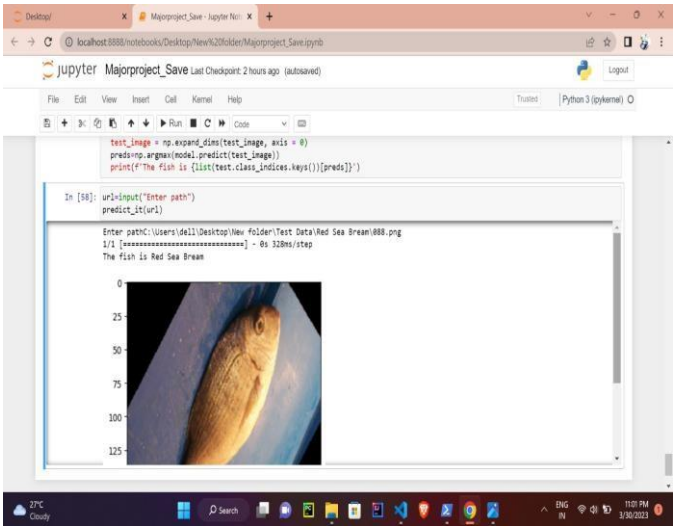
5. Architecture

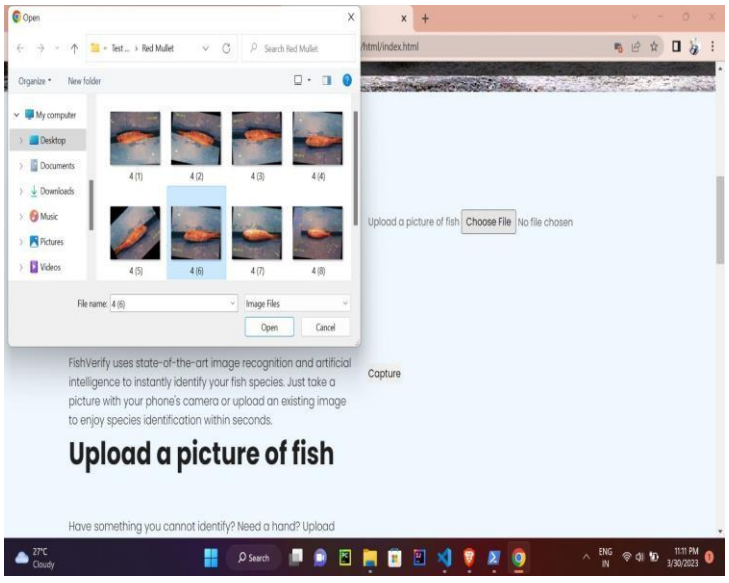
Project design is the general approach given to develop the software to solve the problem of particular organization. Project design is stage at which description of project development is given and how the project is designed. The purpose of design is to determine how to build the system and to obtain information needed to drive the actual implementation of the system. The focus is particularly on the solution domain rather than on the problem domain. Object oriented design consists of transforming the analysis model into the design model. It describes the system in terms of its architecture. An architectural diagram is a diagram of a system that is used to abstract the overall outline of the software system and the relationships, constraints, and boundaries between components. It is an important tool as it provides an overall view of the physical deployment of the software system and its evolution road map.

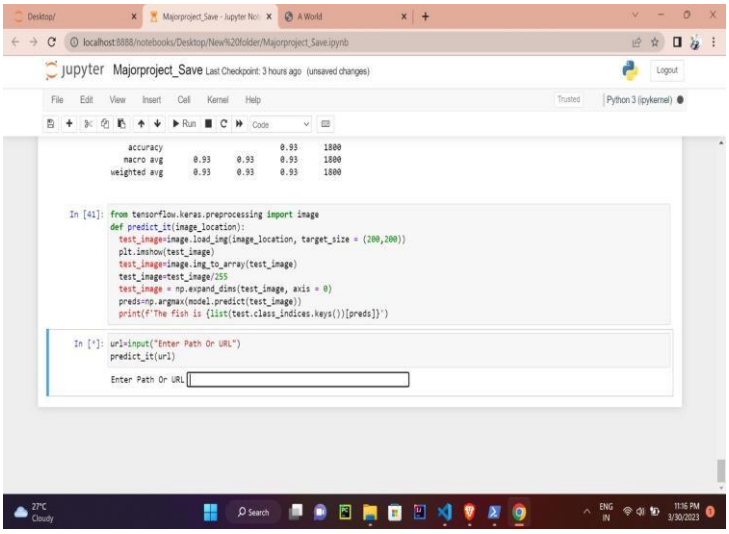


6. Results and Discussion









7. Conclusion

This work is a first step toward developing a fully implemented system which can accurately detect, classify and generate insights about fish in a wide variety of fish passage environments and conditions with data collected from multiple types of sensors. In this paper, we have presented the development of Fish detection, a Web application for identifying freshwater fish. The model for detecting the fish species is developed using the VGG16, a Convolution Neural Network model introduced by K.Simonyan. The TL in VGG16 is used to identify the freshwater fish species. We executed our proposed model using dataset consist of eight different types of freshwater species available in Ocean, River And in pounds with images. To minimize the risk of overfitting in various image variations, we have conducted an augmentation procedure. The foundation of the augmentation techniques used in this research was image transformations such as zoom, rotation, and flipping. The model achieved it's accuracy at 80-90 percent, when tested in the four different types of species freshwater fish. To compare with the existing works, more works need to be done, especially on the validation accuracy. The validation loss needto be reduced. The experimental results show that the pre- trained modeled yielded the moderate performance. For future work, to resolve and reduce the error rate of the result as well as the limited number of images in the data set, pre-training models on the combination of Image Net and image enhancement

could be used to solve the problem. To increase the model validation, more species with a greater number of images for each species are required.

Bibliography

[1] W. A. Wurts, "Why can some fish live in freshwater, some in salt water, and some in both," World Aquaculture, vol. 29, p. 65, 1998.

[2] D. A. Konovalov, A. Saleh, M. Bradley, M. Sankupellay, S.Marini, and M.Sheaves, "Underwater fish detection with weak multi-domain supervision," 2019 International Joint Conference on Neural Networks (IJCNN), 2019, pp. 1-8.

[3] K. M. Knausgård, A. Wiklund, T. K. Sørdalen, K. Halvorsen, A. R. Kleiven, L. Jiao, et al., "Temperate Fish Detection and Classification: a Deep Learning based Approach," arXiv preprint arXiv:2005.07518, 2020.

[4] N. E. M. Khalifa, M. H. N. Taha, and A. E. Hassanien, "Aquarium family fish species identification system using deep neural networks," International Conference on Advanced Intelligent Systems and Informatics, 2018, pp. 347- 356.

[5] X. Bai, X. Yang, and L. J. Latecki, "Detection and recognition of contour parts based on shape similarity," Pattern Recognition, vol. 41, pp. 2189-2199, 2008.

[6] J.-S. Kim and K.-S. Hong, "Color–texture segmentation using unsupervised graph cuts," Pattern Recognition, vol. 42, pp. 735-750, 2009.

[7] Y. LeCun, B. Boser, J. S. Denker, D. Henderson, R. E. Howard, W. Hubbard, et al., "Backpropagation applied to handwritten zip code recognition," Neural computation, vol. 1, pp. 541-551, 1989.

[8] K. Simonyan and A. Zisserman, "Very deep convolutional networks for large- scale image recognition," arXiv preprint arXiv:1409.1556, 2014.

[9] A. Krizhevsky, I. Sutskever, and G. E. Hinton, "Imagenet classification with deep convolutional neural networks," Advances in neural information processing systems, vol. 25, pp. 1097-1105, 2012.

[10] M. D. Zeiler and R. Fergus, "Visualizing and understanding convolutional networks," European conference on computer vision, 2014, pp. 818-833.

[11] K. He, X. Zhang, S. Ren, and J. Sun, "Deep residual learning for image recognition," Proceedings of the IEEE conference on computer vision and pattern recognition, 2016, pp. 770-778.

[12] C. Szegedy, W. Liu, Y. Jia, P. Sermanet, S. Reed, D. Anguelov, et al., "Going deeper with convolutions," Proceedings of the IEEE conference on computer vision and pattern recognition, 2015, pp. 1-9.