Diagnosis System For Fish Diseases Trichodina and Gyrodactylus Under Microscope Based on Decision Tree and LDA.

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Objectives

- Detection Trichodina and Gyrodactylus disease in fish, using the system.
- Aim to rapid disease diagnosis.
- Allowing for earlier treatment of infected fish to prevent the spread of disease.
- Achieve an efficient result of identification.

Fish Diseases

- **Trichodina:** is one of the parasites that you can't see without a microscope. This parasite is usually found on the gills, skin or fins of the fish.
- **Gyrodactylus:** is an interesting little parasite; species of which can be found infesting many different types of freshwater. It generally infests the skin and fins of the fish.
- **Both diseases Spread in tilapia fish.**

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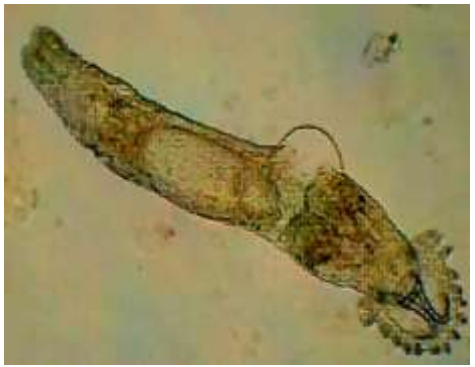
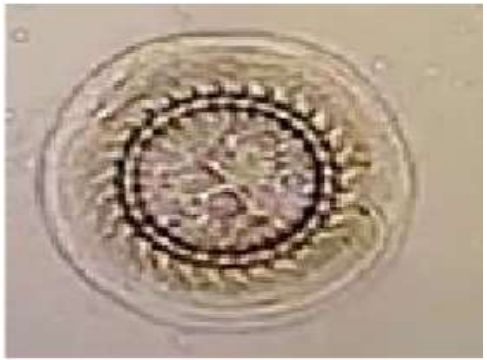
Trichodina and Gyrodactylus

		
Fish	**Gyrodactylus**	**Trichodina**

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Disease Diagnosis

- **Traditional:** Based on fish-farmer or fish-veterinarian using their experiences and skill during their career.

- **Modern:** IT technology provide the web-based guide for diagnosing fish diseases.

- **On this paper:** An image processing-based fish disease diagnosis system was developed.

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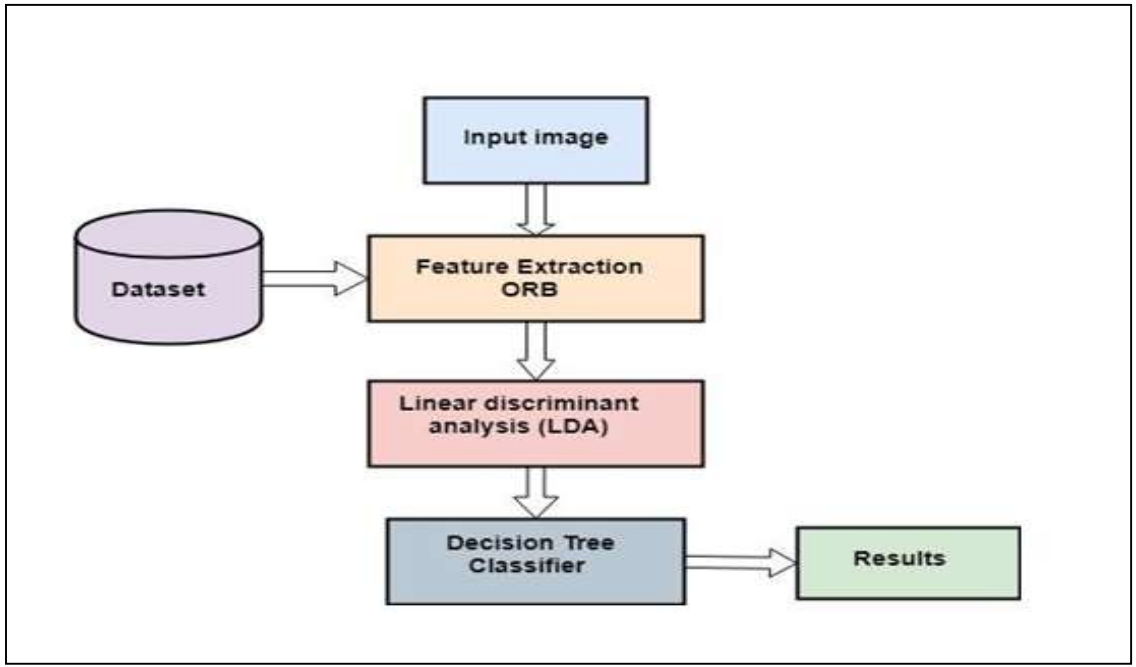
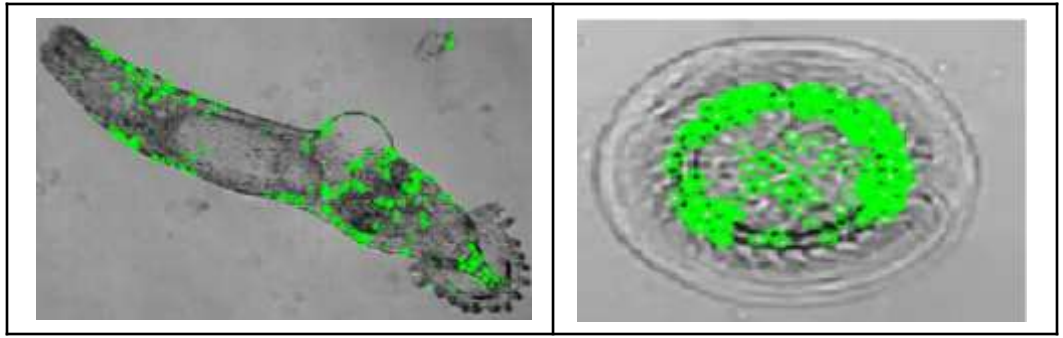
Methodology



Feature Extraction

- **Image Feature Extraction Then Create Dataset.**



	mean	median	stander	var	target
count	262.000000	262.000000	262.000000	262.000000	262.000000
mean	133.799604	135.874046	74.407862	5538.005335	1.629771
std	6.516057	8.652142	1.216991	184.682151	0.483790
min	98.045608	96.000000	70.938491	5032.269528	1.000000
25%	129.818424	130.250000	73.837406	5451.962499	1.000000
50%	134.074875	136.000000	74.266483	5515.510532	2.000000
75%	138.583188	142.750000	74.731698	5584.826612	2.000000
max	148.722055	158.000000	82.123353	6744.245132	2.000000

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Fisher's Linear discriminant analysis (LDA)

- Linear discriminant analysis (LDA) is one of the most popular supervised dimensionality reduction methods for the dataset.

```
# Applying Fisher's Linear Discriminant Analysis
from sklearn.discriminant_analysis import LinearDiscriminantAnalysis
lda = LinearDiscriminantAnalysis(n_components = 2)
X_train = lda.fit_transform(X_train, y_train)
X_test = lda.transform(X_test)
```

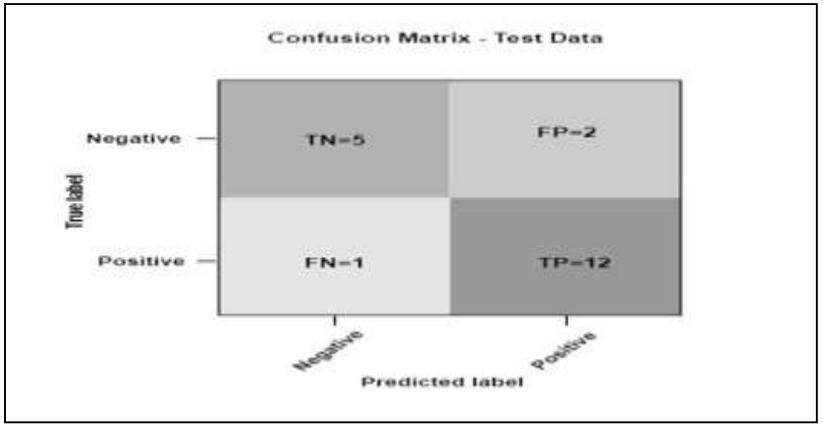
System Classification

- the comparison between the classification accuracy of SURF-LDA-DT and proposed combination which is ORB-LDA-DT.

Algorithm	Accuracy
ORB-LDA-DT	87.5%
SURF-LDA-DT	85%

Results

Accuracy: The algorithm recorded a final score of **87.5%** As the next confusing matrix will explain.



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Classification Report Equations

- Precision = true_positive / (true_positive + false_positive)
- Recall = true_positive / (true_positive + false_negative)
- F-score = 2 * Precision * Recall / (Precision + Recall)
- The support is the number of samples of the true response that lies in that class.

Classification Report

- The precision and recall or F-score of the minor class might be the most suitable measurement.

	precision	recall	f1-score	Support
Trichodina	0.83	0.71	0.77	7
Gyrodactylus	0.86	0.92	0.89	12
avg / total	0.85	0.85	0.85	20

Discussion

•Using (Decision Tree) classifier in detection of the Trichodina and Gyrodactylus diseases on fish.

•The final score of the total algorithm is **87.5%.**

•The algorithm answered 5 imaged from class one true and 2 image false and also answered 1 images from class two false and 12 images true.

•The dataset constructed and built from about 260 images from the two classes of diseases, and saved into a CSV excel file**.**

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Conclusion

- The proposed combination of ORB-LDA-DT gives better classification accuracy than the existing combined technique which is SURF-LDA-DT.
- It is fast and efficient method to recognize and detect the Trichodina and Gyrodactylus diseases as compared to the Traditional Method.
- The Decision Tree results based on the real images of infected Fish disease dataset. The proposed combination (ORB-LDA-DT) gives 87.5% accuracy.

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Future Recommendations

- Update machine learning algorithms to deep learning techniques to increase the accuracy of the system by up to 99%.
- We plan to detect the disease based on the kinds of pathogens such as parasites, bacteria, fungal, and the virus for more convenient and useful aid to the diagnosis system.
- We will make machine learning algorithms can apply to different feature Descriptors.
- We aim to identify other diseases in fish rather than only one disease.
- We aim to increase our dataset with more samples.

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Thanks!

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