Introduction

- Importance of aquaculture , economic importance , facts etc
- Mention Types of Behaviors
- Reason to why research needed in Behavior Analysis
- Reason on why the below work is done

Related work

- Present all works and point their region of interest

Methodology

- Mention and Discuss about each paper and its speciality / extra work done
- add figures

Results

- Point out **GAPS**
- Have a table
    - Gap Analysis.png
- Few more gaps common to all work mentioned

Discussion

- Disucss about Drawbacks
- How the gaps can be solved

Conclusion

- suggest improvements for future work , current work is less practical , given GAPS
- Mention Challenges , irrespective of gaps
- Tell about How

Sudeep

Paper 4 - Behaviour

RESULT

- Object tracking in dynamic scenarios often faces challenges related to object identity changes.
- Risk of Overfitting.

CONCLUSION

- To handle object identity changes during tracking, add a Location-Related Convolutional Neural Network (LRCNN) to the LSTM model. LRCNN boosts spatial understanding, ensuring accurate tracking in dynamic scenarios. Customize LRCNN to your dataset by adjusting settings. This combo of LSTM and LRCNN is a unique solution for better tracking without plagiarism concerns.
- The risk of Overfitting can be overcome by monitoring and learning curves which keep track of the model performances on ml training and validation sets.

Paper 16 - Mortality

RESULT

- Difficulty in accurately distinguishing between live and deceased fishes.
- Inability of real-time processing of image recognition algorithms on edge devices, such as onboard cameras or sensors, without relying heavily on external datasets or cloud computing.
- Lack of adaptability of MortCam to diverse aquaculture conditions and species.
- Challenges related to visibility.

CONCLUSION

- Enhancing image recognition algorithms: Improving the system's capacity for accurate differentiation between live and deceased fishes by deep learning architecture, transfer learning, and enhancing the feedback mechanism.
- Optimizing algorithms for deployment on edge devices, allowing for real-time processing without relying on available datasets.
- Undertake thorough research and development to render MortCam adaptable to diverse aquaculture conditions and species. Optimising the adaptability and versatility can be achieved by changing the modular design, and parameter customization, by adopting the environmental sensors so that they captures real-time data on water quality, lighting conditions, and other relevant parameters
- To overcome challenges related to visibility, it is essential to integrate technologies like infrared or sonar sensors alongside visual data. Using multiple sensors together greatly improves accuracy and reliability, helping the system overcome challenges in murky water or bad weather.

Sunil

Paper 10 - Feeding status

RESULT

- Limited Diversity in Fish Samples .The paper uses a single fish species, oplegnathus punctatus, for the experiments. This may limit the generalisation of the model to other fish species with feeding behaviours.
- Simplified Feeding Conditions. The feeding conditions, such as feeding schedule and amount, are somewhat simplified in the experimental setup. Real-world aquaculture systems may involve more complex feeding systems.

CONCLUSION

- Including multiple fish species in the dataset could enhance the model's adaptability. Samecthing can be done with sample size(50) used the experiment.
- Introducing variations in feeding schedules, pellet sizes, and frequencies which are closer to real-world aquaculture practices can enhance the model's adaptability and effectiveness in practical applications.

Rushali

Paper 15- Single fish

RESULT

- There were not many studies on using image fusion to enhance the motion edge of fish bodies.
- Optical flow image fusion could alter the texture and color features of the original image.
- Detecting small targets becomes harder with more convolutional layers, as features of small objects can be overlooked.
- The algorithm might struggle to detect targets when fish move away from the camera.
- Image stretching or distortion can impact the accuracy of network detection .
- Image fusion results in a decrease in accuracy for detecting pH-induced behaviors.
- Changes in environmental factors (illumination, water fluctuations, reflections, etc.) lead to variations in image features. The network may extract color, texture, and morphological information differently, causing detection errors.
- Detection errors occur when fish exhibit specific postures, such as tilting upward or attaching dorsal fins to the pool wall.
- The network misclassifies certain fish behaviors, leading to errors in identification and accuracy.
- In real aquaculture environments with more fish, there can be issues of overlap and obscuration.
- Incomplete contours due to overlap limit the extraction of positional information by the network.
- Generalization challenges arise when applying the method to scenarios where there are changes in behavior before and after fish movement in the same environment.
- Differentiating between changes in behavior within the same environment and different time periods is not explicitly addressed.

- While the proposed method improves accuracy for detecting normal and hypoxic behaviors, it decreases accuracy for detecting pH-induced behaviors.
- The method's effectiveness varies across different types of abnormal behaviors.

CONCLUSION

- They applied a hybrid Gaussian motion edge extraction method to improve the positional information of fish in images.
- They chose a hybrid Gaussian algorithm based on foreground segmentation to prevent altering the texture and color features of the original image.
- Bidirectional Feature Pyramid Network (BIfpn) is added to YOLOv5 to address missing targets issue and Convolutional Layer Challenge.
- SPP is introduced after the up-sampled BIfpn to prevent image distortion caused by multi-scale fusion of BIfpn.

Paper 12 - Shoal of fish

RESULT

- Stable background for foreground segmentation of the shoal is difficult because of the disturbance of the complex environment such as water level, reflective regions of the water surface and equipments placed at the tank.
- PAOF faces challenges like improper velocity threshold determination and removal of reflective regions.
- It is difficult to detect fish near white water outlets.
- False detections may be caused by reflection noise.

- Changing physiological properties during an experiment can influence detection patterns.
- Shoals may slow down during specific experiment phases to conserve energy due to blood glucose consumption.
- Regular fish length measurement and fish adaptability to changing skin colors pose challenges.

CONCLUSION

- PAOF-based KEM may be used as it does not require foreground segmentation.
- Particle advection scheme and optical flow helps understand how individuals in a group move without having to track each one separately. Optimizing velocity thresholds and using interpolation for reflective regions counters the challenges faced by PAOF.
- Challenges in detecting fish near white water outlets can be addressed by changing the outlet color or optimizing detection.
- Proper processing of reflective regions is crucial to avoid false detections caused by reflection noise.
- Solutions to regular fish length measurement and fish adaptability to changing skin colors include bioenergetics models and spectrum-based means for detection.
