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Drowning Detection in Farming Pond Using AI

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Abstract: *Drowning in farming ponds is a serious safety hazard in rural areas, posing risks to farmers, workers, and children living nearby. Traditional methods of monitoring water bodies, such as periodic checks or human supervision, are often insufficient due to limited manpower, delayed response, and the unpredictability of drowning incidents. Timely detection is critical to prevent fatalities, but current systems lack automation and real-time alert capabilities. To address these challenges, this project proposes an deep learning model EfficientDet-D4-based Drowning Detection System for farming ponds, designed to monitor water bodies continuously and detect potential drowning events automatically. The system utilizes video surveillance combined with AI algorithms, particularly computer vision and deep learning models, to analyse the behaviour of individuals in the pond. Deep learning model EfficientDet-D4 are employed to identify abnormal patterns such as sudden submersion, prolonged immobility, or struggling motions indicative of drowning. In addition, motion detection techniques help distinguish between normal pond activities, such as fishing or swimming, and dangerous situations requiring immediate attention. Once a potential drowning event is detected, the system generates instant alerts through multiple channels, including SMS, mobile applications, or audible alarms, enabling quick intervention by nearby personnel or rescue teams. An important aspect of this system is its real-time monitoring capability, which minimizes human error and significantly reduces response time. The AI model can also be trained to recognize different environmental conditions, such as low light, rain, or water turbulence, ensuring reliable detection under various circumstances. Furthermore, the system can be integrated with IoT-enabled devices, such as automated sirens or rescue drones, to enhance the effectiveness of emergency response. In conclusion, this project demonstrates how AI and modern technology can transform traditional safety practices, providing a reliable mechanism to prevent drowning incidents in farming ponds. It combines advanced machine learning techniques, real-time surveillance, and automated alert systems to create a proactive solution for rural water safety. The proposed system not only addresses an urgent public safety issue but also offers a framework for future applications of AI in monitoring and safeguarding rural communities.*

Keywords: Drowning Detection, Farming Ponds, Computer Vision, Deep Learning, Real-Time Monitoring, IoT, Safety System

I. INTRODUCTION

Drowning in farming ponds is a critical safety issue in rural areas, especially affecting children, farmers, and workers. Traditional monitoring methods rely on human supervision, which is unreliable and inefficient for continuous observation.

With advancements in Artificial Intelligence (AI) and computer vision, automated systems can now monitor water bodies in real time. This project proposes an AI-based drowning detection system using deep learning (EfficientDet-D4) to identify abnormal behaviors such as struggling, immobility, or sudden submersion.

The system ensures quick response through real-time alerts, reducing fatalities and improving safety in agricultural environments.

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II. PROBLEM STATEMENT

Accidental drowning in farming ponds remains a major concern due to:

- Lack of continuous monitoring
- Delayed detection of incidents
- Dependence on manual supervision

Existing systems fail to provide real-time alerts, leading to preventable loss of life. Therefore, an automated, accurate, and real-time drowning detection system is required.

III. OBJECTIVES

- To develop an AI-based drowning detection system
- To monitor farming ponds continuously using video surveillance
- To detect abnormal human behavior in water using deep learning
- To generate real-time alerts (SMS, alarms, app notifications)
- To reduce response time and prevent fatalities

IV. LITERATURE SURVEY

Sr. No.	Author & Year	Method/Technique Used	Key Findings	Limitations
1	Q. He et al. (2023)	YOLOv5, Faster R-CNN	Achieved high accuracy (mAP up to 92.24%) for drowning detection	Low FPS in Faster R-CNN, not suitable for real-time
2	Y. Zeng et al. (2023)	2.5D Deep Learning (CNN)	Improved classification accuracy for drowning diagnosis	Limited real-time application, complex model
3	A. Sasithradevi et al. (2024)	YOLOv8, YOLOv5	Effective real-time object detection in pond environments	Trade-off between accuracy and runtime
4	P. H. Regalado et al. (2025)	IoT + AI + MR	Real-time monitoring with low latency and high accuracy	High system complexity
5	Q. T. Do et al. (2022)	Transfer Learning (CNN)	Achieved 98% accuracy in detection tasks	Limited real-world evaluation
6	M. Hussain (2023)	Computer Vision	Effective in real-time visual analysis and decision-making	Depends on data quality

V. WORKING OF SYSTEM

The system works in the following steps:

Video Capture:

Cameras capture real-time video from the pond.

Preprocessing:

Frames are resized, cleaned, and normalized.

Feature Extraction:

EfficientDet-D4 model extracts features from images.

Detection:

The system identifies drowning patterns such as:

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Sudden submersion
Irregular motion
Lack of movement

Alert Generation:

Alerts are sent via SMS, alarms, or mobile apps.

VI. SYSTEM DESIGN

Components:

- Camera (Input device)
- Preprocessing module
- Deep Learning Model (EfficientDet-D4)
- Decision-making system
- Alert system

Diagrams Included:

- DFD Level 0, 1, 2
- Activity Diagram
- Use Case Diagram
- Sequence Diagram
- Component Diagram
- Deployment Diagram

Technology Used:

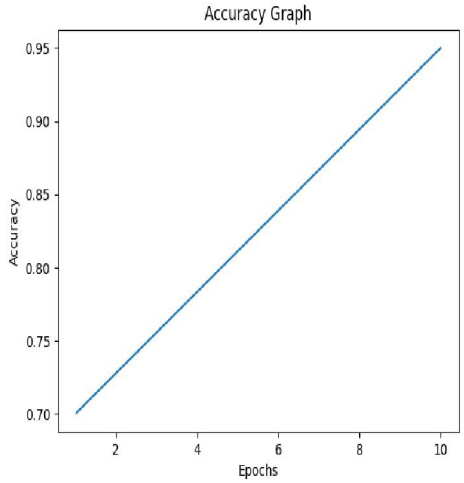
- Python
- TensorFlow
- OpenCV
- Tkinter

VII. RESULTS

The system successfully detects drowning scenarios in real time.

Key Results:

Accurate detection of drowning events



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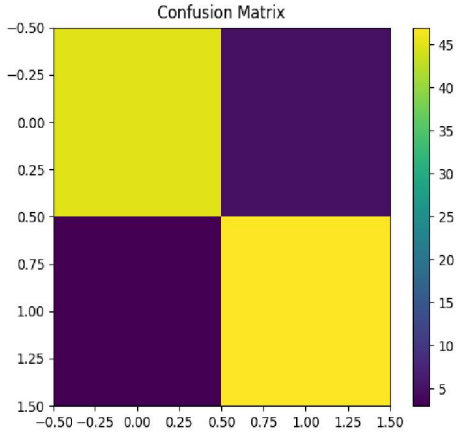
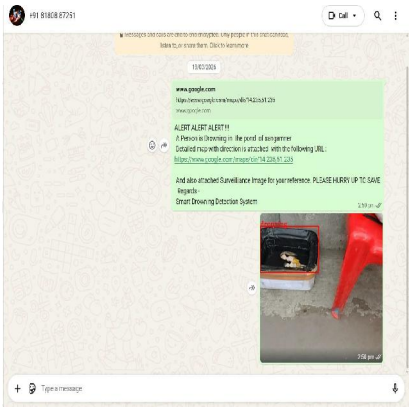
Real-time alert generation
Works under different environmental conditions



Outputs:
Detection of empty pond vs drowning situation
WhatsApp alert with image and location



VIII. CONCLUSION

The proposed AI-based drowning detection system provides an efficient and reliable solution for monitoring farming ponds.
It reduces dependency on manual supervision and ensures quick response through real-time alerts. The system is cost-effective, scalable, and suitable for rural environments.
This project demonstrates how AI can enhance safety and prevent accidents in agricultural areas.

IX. FUTURE SCOPE

- Improve accuracy using advanced deep learning models
- Integration with IoT devices for smart monitoring
- Development of mobile application
- Use of drones for large area monitoring
- Addition of underwater sensors and cameras

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- Cloud-based storage and analytics

REFERENCES

[1] Q. He, Z. Mei, H. Zhang and X. Xu, "Automatic Real-Time Detection of Infant Drowning Using YOLOv5 and Faster R-CNN Models Based on Video Surveillance," in *Journal of Social Computing*, vol. 4, no. 1, pp. 62-73, March 2023, doi: 10.23919/JSC.2023.0006.

[2] Y. Zeng *et al*., "A 2.5D Deep Learning-Based Method for Drowning Diagnosis Using Post-Mortem Computed Tomography," in *IEEE Journal of Biomedical and Health Informatics*, vol. 27, no. 2, pp. 1026-1035, Feb. 2023, doi: 10.1109/JBHI.2022.3225416.

[3] A. Sasithradevi *et al*., "DePondFi'23 Challenge on Real-Time Pond Environment: Methods and Results," in *IEEE Access*, vol. 12, pp. 157975-157987, 2024, doi: 10.1109/ACCESS.2024.3482867.

[4] P. H. Regalado and T. Han, "MediVerse: A Secure and Scalable IoT-MR Framework for Real-Time Health and Performance Monitoring," in *IEEE Access*, vol. 13, pp. 97511-97528, 2025, doi: 10.1109/ACCESS.2025.3570731.

[5] Q. T. Do and J. Chaudri, "Creating Computer Vision Models for Respiratory Status Detection," *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Glasgow, Scotland, United Kingdom, 2022, pp. 1350-1353, doi: 10.1109/EMBC48229.2022.9871978.

[6] M. Hussain, "When, Where, and Which?: Navigating the Intersection of Computer Vision and Generative AI for Strategic Business Integration," in *IEEE Access*, vol. 11, pp. 127202-127215, 2023, doi: 10.1109/ACCESS.2023.3332468.

[7] E. Paolini, L. Valcarenghi, L. Maggiani and N. Andriolli, "Real-Time Network Packet Classification Exploiting Computer Vision Architectures," in *IEEE Open Journal of the Communications Society*, vol. 5, pp. 1155-1166, 2024, doi: 10.1109/OJCOMS.2024.3363082.

[8] A. Keresh and P. Shamoi, "Liveness Detection in Computer Vision: Transformer-Based Self-Supervised Learning for Face Anti-Spoofing," in *IEEE Access*, vol. 12, pp. 185673-185685, 2024, doi: 10.1109/ACCESS.2024.3513795.

[9] G. Shen, B. Zhao, X. Chen, L. Liu, Y. Wei and T. Yin, "Human Fall Detection Based on Re-Parameterization and Feature Enhancement," in *IEEE Access*, vol. 11, pp. 133591-133606, 2023, doi: 10.1109/ACCESS.2023.3335833.\