AI & SUSTAINABILITY IN VET EDUCATION

Name of the Author/s: TR Team

Title of WP: WP3 – AI-SAVES@ProjectHub

Activity Reference: 3.2 – Project template for AI-SAVES@ProjectHub

Logo:

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AI-SAVES@PROJECTHUB PROJECT SUBMISSION TEMPLATE

This template provides a structured format for submitting projects to the **AI-SAVES@ProjectHub**. Each section should be completed thoroughly to ensure consistency and provide all necessary information for project evaluation and sharing within the hub.

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1. Project Title:

Drivesafe Pi 5: AI-Powered Driver Drowsiness and Attention Monitoring System.

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2. Project Category:

Select the most appropriate category for your project from the following options:

- AI in IoT
- AI for Industry 4.0
- AI in VET
- AI Tools and Resources

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3. Project Description:

This project is a computer vision system running on Raspberry Pi 5. It monitors driver eye movements in real-time to detect fatigue or drowsiness and triggers an alarm via buzzer and LED.

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4. Keywords:

Raspberry Pi 5, Mediapipe, Driver Safety, Picamera2, Eye Tracking

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5. Target Audience:

Identify the primary audience for this project. Choose one or more of the following:

- Both Educators and Students
- VET Institutions

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6. Project Objectives:

To respond within 1.5 seconds by calculating Eye Aspect Ratio (EAR) during drowsiness and to prevent accidents.

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7. Project Timeline:

- Start Date: 23.01.2025
- End Date: 30.02.2016

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8. Resources Provided:

List any resources that will be used or provided within the project, including documents, lesson plans, software, or hardware (e.g., AI-SAVES Kit). These resources should be uploaded in appropriate formats (e.g., PDF, DOCX, ZIP).

Example:

- Raspberry Pi and sensor kits (AI-SAVES Kit)
- Python programming guides for AI implementation
- Lesson plan: "Introduction to AI for Beginners" (PDF)
- Project report template (DOCX)

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9. Tools and Technologies Used:

1- AI-VET Kit Components:

- Raspberry Pi 5 (8GB): The core processor for running high-demand AI models.
- AI Camera Module (Pi Camera v3): Captures high-definition frames for analysis.
- Buzzer: Provides an audible warning. Connected to Physical Pin 12 (GPIO 18).
- LED: Provides a visual warning. Connected to Physical Pin 18 (GPIO 24).
- Jumper Wires & Breadboard: Used for modular circuit assembly.

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2- Programming Environments:

- Python 3: The main language used for its extensive AI library support.
- Visual Studio Code: Used for script development and remote terminal access.

3- AI and Machine Learning Tools:

- Mediapipe (Face Mesh): A pre-trained deep learning model used for real-time facial landmark detection.
- OpenCV: Used for image manipulation, frame processing, and graphical overlays.

4- IoT and Cloud Services:

- RPi.GPIO: Used for low-level control of the Raspberry Pi's General Purpose Input/Output pins.

5- Datasets:

Live Stream Data: The system uses real-time video feed rather than a static dataset. The AI analyzes the dynamic distance between facial landmarks to determine the "Drowsy" or "Awake"

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10. Step-by-Step Implementation Plan:

- Hardware Assembly: The camera was connected via the CSI port, and the alert circuit was built on a breadboard.
- Environment Configuration: Python libraries were optimized for the Raspberry Pi 5 architecture (addressing NumPy version conflicts).
- Capture Optimization: Image frames were fetched using the Picamera2 library for maximum compatibility with the Pi 5's hardware.
- Detection Logic: A threshold of ratio < 33 was set to trigger the alarm if eyes remain closed for more than 1.5 seconds.

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11. Evaluation Criteria:

Accuracy: Successful detection of closed eyes in varied lighting conditions (Target: >90%)
Latency: The time between eye closure and alarm trigger (Target: <1.5s).

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System Stability: Sustaining a stable frame rate (Target: 20-30 FPS) without overheating the Pi 5.

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12. Languages Available:

"English, Turkish (translations in progress)"

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13. Contributors:

- **Zülfiye Okumuş (Project Lead) –** Lead educator responsible for project development and coordination.
- **Damla Yılmaz (Technical Expert) –** Provided expertise in AI programming and robotics.
- **Muhammet Köprü (Curriculum Designer) –** Developed lesson plans for AI-based handwriting recognition.
- **K. Burak Sipahi (Instructional Material Developer) –** Prepared supporting documents and coding materials used in the project.

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17. Feedback and Continuous Improvement:

- Feedback forms will be collected from participants.
- A final review session will be conducted.
- Future improvements will be planned based on feedback received.

Submission Notes:

Please ensure that all required documents and resources are attached to your submission. The AI-SAVES@ProjectHub review team will evaluate the submission based on the provided information. Once approved, the project will be published on the hub, and partners will be notified.

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