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:

Visual Passcode and Biometric Access Control: Secure Door Lock via Hand Gestures

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2. Project Category:

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

- Connected Systems and Smart Data (AI + IoT)
- AI for Industry 4.0
- Smart Environment and Monitoring
- AI Tools and Resources

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3. Project Description:

This project is a contactless AI security system running on Raspberry Pi 5. It uses computer vision to track hand landmarks in real-time and verifies if the user enters a specific sequence of gestures (e.g., "2-4-1") as a visual passcode. If the sequence is correct, access is granted; otherwise, a "WRONG ENTRY" warning is displayed in red on the screen.

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4. Keywords:

Raspberry Pi 5, Mediapipe, Picamera2, Hand Tracking, Contactless Security

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5. Target Audience:

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

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- Both Educators and Students
- VET Institutions

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6. Project Objectives:

Rasperry Pi 5, Mediapipe, Hand Tracking, Visual Passcode, Contactless Security, Python

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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.

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.

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3- AI and Machine Learning Tools:

- Mediapipe (Hands): A deep learning model used for real-time hand landmark detection
- OpenCV: Used for image manipulation, frame processing, and graphical overlays.
- Picamera2: Provides high-speed, hardware-compatible image capture.

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" state.

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10. Step-by-Step Implementation Plan:

- Hardware Assembly: Connecting the camera via the CSI port and assembling the alert circuit on a breadboard.
- Color Optimization: Implementing BGR to RGB conversion to ensure natural skin tones and correct visual feedback.
- Algorithm Development: Creating a logic to recognize the "2-4-1" sequence by detecting stable finger counts over a period of time.
- Security Verification: Testing the system's ability to validate the 3-digit sequence and trigger red warnings for incorrect

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11. Evaluation Criteria:

🎬 Accuracy: Success rate in identifying correct finger counts and hand landmarks (>90%).

🎬 Latency: The system's response time from gesture detection to access decision (<1.5s).

🎬 Security: Reliability in denying access when an incorrect sequence or wrong order is detected

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12. Languages Available:

"English, Turkish (translations in progress)"

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.

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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