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SIRINTEL TECHNOLOGIES PRIVATE LIMITED

Address: 2696, Tanvi's, 2nd floor, Mama's Joint Road, 2nd Main 3rd Cross Rd, above Peter England showroom, MCC B Block, Davanagere, Karnataka 577004



अखिल भारतीय तकनीकी शिक्षा परिषद्
All India Council for Technical Education



PYTHON AI WITH OPENCV FOR FACE DETECTION AND MICROCONTROLLER INTEGRATION

15-Week Syllabus: Python AI with OpenCV for Face Detection and Microcontroller Integration

Week 1: Introduction to Python AI and OpenCV

- Overview of Python AI and its applications.
- Introduction to OpenCV and its role in image processing.
- Installing necessary software: Python, OpenCV, and IDE setup.
- Basic image processing with OpenCV (loading, displaying, and saving images).

Week 2: Basics of Face Detection with OpenCV

- Understanding Haar cascades and their role in face detection.
- Implementing basic face detection using pre-trained models in OpenCV.
- Real-time face detection using webcam input.
- Introduction to object detection and comparison with face detection.

Week 3: Advanced Face Detection Techniques

- Introduction to deep learning-based face detection methods (e.g., DNN module in OpenCV).
- Implementing face detection using deep learning models.
- Comparison between Haar cascades and deep learning models for accuracy and performance.
- Fine-tuning detection parameters for better accuracy.

Week 4: Integrating OpenCV with Microcontrollers

- Introduction to microcontrollers: Arduino Uno and ESP8266.
- Setting up communication between Python (OpenCV) and microcontrollers via serial communication.
- Sending basic commands from Python to Arduino/ESP8266 based on face detection.

Week 5: Home Automation using Face Detection

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- Overview of home automation systems.
- Implementing a simple home automation project (e.g., controlling lights or fans) using face detection and Arduino/ESP8266.
- Interfacing OpenCV with the Blynk app for remote control.

Week 6: Anti-Theft Detection System

- Understanding the principles of anti-theft detection systems.
- Implementing face recognition to identify authorized vs. unauthorized persons.
- Triggering alarms or notifications via Arduino/ESP8266 when unauthorized access is detected

Week 7: Integrating Blynk with Anti-Theft System

- Introduction to Blynk app and its features.
- Connecting Blynk with ESP8266 for real-time monitoring.
- Sending face detection results to the Blynk app.
- Setting up notifications and alerts in Blynk for anti-theft detection.

Week 8: Military Applications using Face Detection

- Overview of military applications where face detection is beneficial.
- Implementing a basic security system with face detection for restricted access areas.
- Enhancing the system with additional sensors (e.g., PIR, ultrasonic) connected to Arduino/ESP8266.
- Implementing missile detection and alert systems using object detection techniques.

Week 9: Advanced Image Processing Techniques

- Introduction to image filtering, edge detection, and contour detection.
- Enhancing face detection with advanced preprocessing techniques.
- Implementing face detection under various lighting conditions and angles.
- Detecting objects like ambulances and triggering toll gate openings using microcontroller signals.

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Week 10: Face Recognition with OpenCV

- Introduction to face recognition vs. face detection.
- Implementing face recognition using OpenCV and pre-trained models.
- Storing and managing recognized faces in a database.
- Implementing automatic face detection-based attendance systems.

Week 11: Integrating Face Recognition with Microcontrollers

- Sending recognized face data to Arduino/ESP8266.
- Implementing access control systems using face recognition.
- Logging access events in Blynk or a local database.
- Detecting and alerting based on male and female face recognition with age estimation.

Week 12: Object Detection and Pothole Detection for Blind Assistance

- Implementing object detection using OpenCV.
- Developing a system to detect potholes and provide audio alerts for blind people.
- Interfacing with Arduino/ESP8266 for real-time pothole detection and alert systems.

Week 13: Worker Safety and Helmet Detection

- Introduction to safety systems in industrial environments.
- Implementing a worker safety helmet detection system using OpenCV.
- Sending alerts to microcontrollers if safety equipment is not detected.
- Integrating this system with the Blynk app for real-time monitoring.

Week 14: Vehicle Number Plate Detection and Theft Alert

- Implementing vehicle number plate detection using OpenCV.
- Integrating the system with microcontrollers for real-time vehicle identification.
- Sending theft alerts based on detected number plates.
- Discussing other real-time object detection projects for security and monitoring.

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Week 15: Final Project Presentation and Evaluation

- Choosing a project from the previous weeks (e.g., missile detection, ambulance detection, worker safety).
- Finalizing the project and preparing a presentation.
- Demonstrating the working project to peers or evaluators.
- Discussing potential improvements and future work.
- Evaluation and feedback on the overall course and project.

Additional Project Ideas

- Smart traffic light systems based on real-time vehicle detection.
- Face recognition-based door lock systems.
- Real-time crowd monitoring and management using OpenCV.
- Animal detection and deterrent systems for agricultural fields.
- Smart parking systems with vehicle detection and slot assignment.
- Real-time fire detection and alert systems.
- Smart surveillance systems with intrusion detection and alert.
- Intelligent retail systems with customer counting and analysis.
- Gesture recognition for controlling smart home devices.
- AI-based pet recognition and monitoring systems.

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