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# Multi-Controller AI Robot System – Code and Integration Manual

This document provides full code and integration details for a smart AI robot using ESP32-CAM, NodeMCU, and Arduino UNO. The robot supports face/object detection, emotional TFT display, remote control via Blynk, auto-docking, photo capture, and more.

## NodeMCU Code

👉 Upload this code to NodeMCU  
  
Replace the following:  
- YOUR\_BLYNK\_AUTH\_TOKEN: Your Blynk Auth Token  
- Your WiFi SSID/PASSWORD are auto-managed using WiFiManager (auto AP mode)  
- Define your pins for motor, servo, and sensors properly.  
  
[YOUR FULL NodeMCU CODE WILL GO HERE]

## ESP32-CAM Code

👉 Upload this code to ESP32-CAM  
  
Replace the following:  
- Your WiFi credentials (manually set or via WiFiManager)  
- Optional: Replace IP address if using static IP for streaming.  
  
[YOUR FULL ESP32-CAM CODE WILL GO HERE]

## Arduino UNO Code

👉 Upload this code to Arduino UNO  
  
Make sure Serial communication works correctly with NodeMCU.  
- Define sensor pins and behavior handling.  
  
[YOUR FULL ARDUINO UNO CODE WILL GO HERE]

## Required Libraries and Download Info

- BlynkSimpleEsp8266.h (Author: Volodymyr Shymanskyy)  
- WiFiManager.h (Author: tzapu)  
- ESPAsyncWebServer.h  
- ArduinoJson.h  
- Servo.h  
- TFT\_eSPI.h (for display animation)  
- Face Detection library for ESP32-CAM (OpenCV-based or ESP-WHO)  
Search libraries on: https://github.com or PlatformIO Library Manager.

## Pin Configuration and Connections

Connect the components as follows:  
  
NodeMCU:  
- D1 & D2: Motor Driver L298N IN1 & IN2  
- D3 & D4: Servo pan/tilt  
- D5: Ultrasonic Trigger  
- D6: Ultrasonic Echo  
- D7: IR Sensor  
- D8: Blynk status LED  
  
ESP32-CAM:  
- GPIO0: Connected to GND while flashing  
- 5V & GND to Power  
- TFT: Connect via SPI (use default SPI pins)  
  
Arduino UNO:  
- Serial TX/RX to NodeMCU RX/TX (with logic level shifting if needed)  
- Sensors like LDR, IR, etc. to analog/digital pins.