TECHNICAL IMPLEMENTATION

TECH STACK

- **MATLAB R2023a:** Signal processing, feature extraction, classification
- **MATLAB App Designer:** Interactive game interface development
- **Arduino IDE:** ESP32 programming for microcontroller interface
- **C++:** Low-level hardware control and signal acquisition

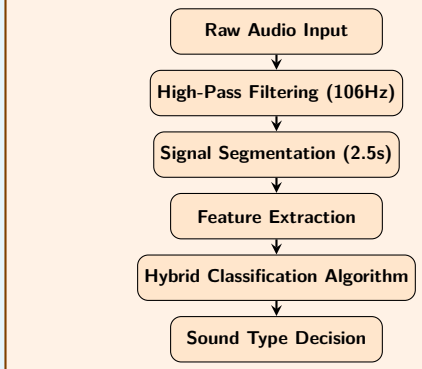
HARDWARE COMPONENTS

- **ESP32 Development Board:** Dual-core microcontroller with Wi-Fi
- **MAX4466 Microphone:** Electret mic with adjustable gain
- **High-Pass Filter:** RC filter (Fc=106Hz) for noise reduction
- **RGB LEDs:** Visual feedback for game responses
- **USB-Serial:** Data transmission between ESP32 and computer

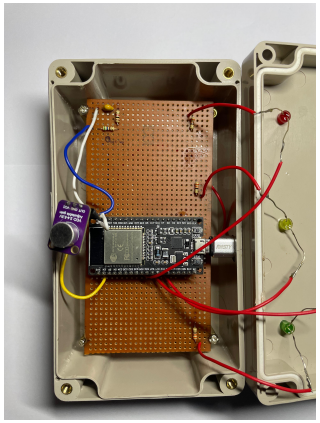
AUDIO SPECIFICATIONS

- **Sample Rate:** 44.1kHz | **Bit Depth:** 16-bit | **Channel:** Mono
- **Analysis Window:** 2.5s capture | **Processing:** Real-time

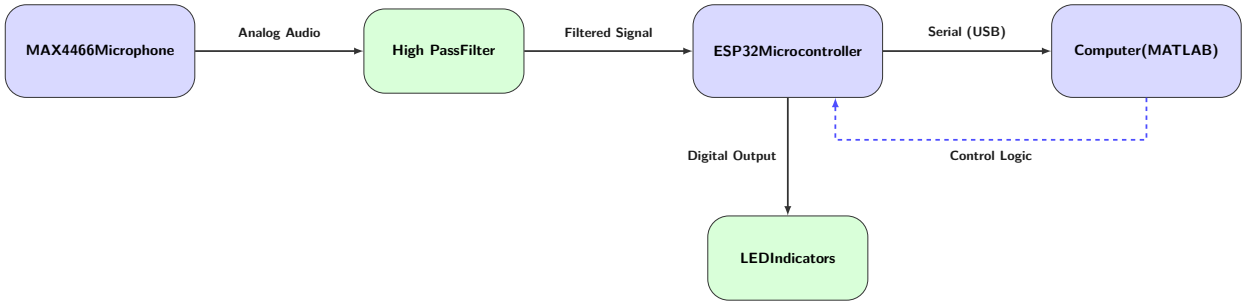
SIGNAL PROCESSING FLOW



Inside View of Game Hardware



Hardware Connection Diagram



Complete Hardware Setup