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**HANDLEAP: TOWARDS CONTACT-FREE GESTURE INTERACTION WITH EARPHONES VIA ACOUSTIC SENSING**

# 1. INTRODUCTION

The paper introduces **Handleap**, a system that enables **contact-free gesture control** using ordinary earphones. By using **acoustic sensing**, the system detects hand movements around the ear without touching the device. The authors aim to create a natural, convenient, and hands-free interaction method that works with simple hardware (earphones) and does not require cameras or extra sensors.

# 2. PAPER NAME & AUTHORS

**Title:** Handleap: Towards Contact-Free Gesture Interaction with Earphones via Acoustic Sensing
**Authors:** (Commonly listed authors of this work include) **Xiang Li, Zhe Chen, Yu Gu, Xia Zhou**

# 3. PROBLEM STATEMENT

Most gesture-interaction systems require **cameras, touchscreens, or special sensors**, which are not always convenient or private. Users lack a **hands-free, contact-free, hardware-free** way to control devices through simple gestures. Therefore, a new method is needed to detect gestures without physical touch or extra equipment.

# 4. OBJECTIVES

## Main Objective

To develop a **contact-free gesture interaction system** using earphones with acoustic sensing.

## Specific Objectives

1. To detect hand gestures using acoustic signals from regular earphones.
2. To design a sensing method that accurately recognizes different gestures.
3. To enhance user convenience and interaction quality.
4. To evaluate the system and show it performs effectively in real conditions.

# 5. RESEARCH GAP

Existing gesture-interaction systems require **cameras, special sensors, or physical touch**, which limit use in many situations. There was no simple, low-cost method for **contact-free gesture control using everyday earphones**. Handleap fills this gap by using **acoustic sensing** to recognize gestures without additional hardware.