# Adaptive HCI: Privacy-Focused Real-Time Finger-LED Tracking, Text Inference & Visualization

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**Xamera** is a mobile app designed to explore the feasibility of using smartphone cameras and LED-equipped gloves for real-time gesture tracking and visualization. Inspired by Dr. Xiao Zhang’s research on LED-based hand-pose estimation, this project evaluates whether consumer devices can support air-writing—a method of writing in the air with a tracked finger—by leveraging the rolling shutter effect of smartphone cameras for both visual input and built-in privacy filtering. LEDs serve as precise finger pointers, enabling accurate motion capture.

The app allows multiple users to write in the air simultaneously, distinguishing them through unique light patterns. It integrates machine learning for LED tracking and text conversion while refining motion paths for smooth visualization. By reconstructing 3D motion and displaying it both normally and in VR, Xamera has potential applications in smart homes, AR/VR interactions, and assistive technologies. This feasibility project aims to showcase the technical possibilities through a refined, user-friendly application leveraging modern mobile hardware, laying the groundwork for future advancements in air-writing interfaces.