Harmonica

Always-on, Instant-away.
Enhanced audio experience with ambient awareness

Headphones Block Your Hearing

Headphones are used to enjoy music or block noise, which help you better focus or relax.

They also block your timely reactions to emergencies, broadcasts, and greetings, and reduce your responsiveness to the ever-changing environment.

As a result, you need to put on and off headphones frequently at conversations, outdoor walks, or waiting at terminals.

Always-on, Instant-away through Ambient Awareness

An ML-powered real-time software solution which monitors, predicts and reacts to the surroundings, featuring:

Acoustic Ambience
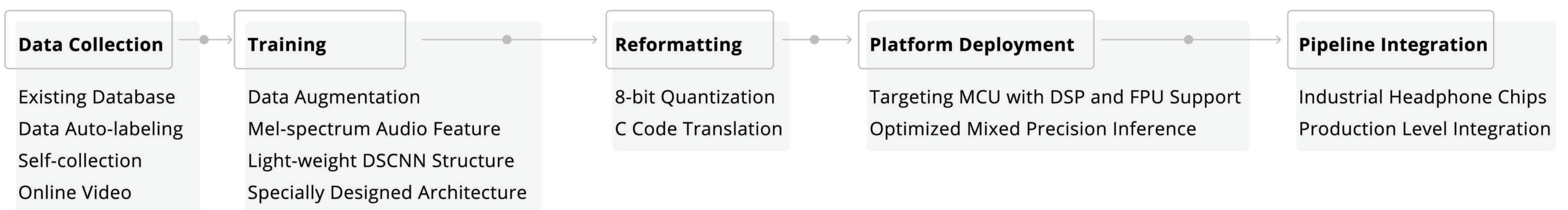Audio scenes – engine noise, babble noise
Audio events – keywords, sirens

Edge Computing
Real-time inference for CNN models with on-the-fly quantization on the current hardware
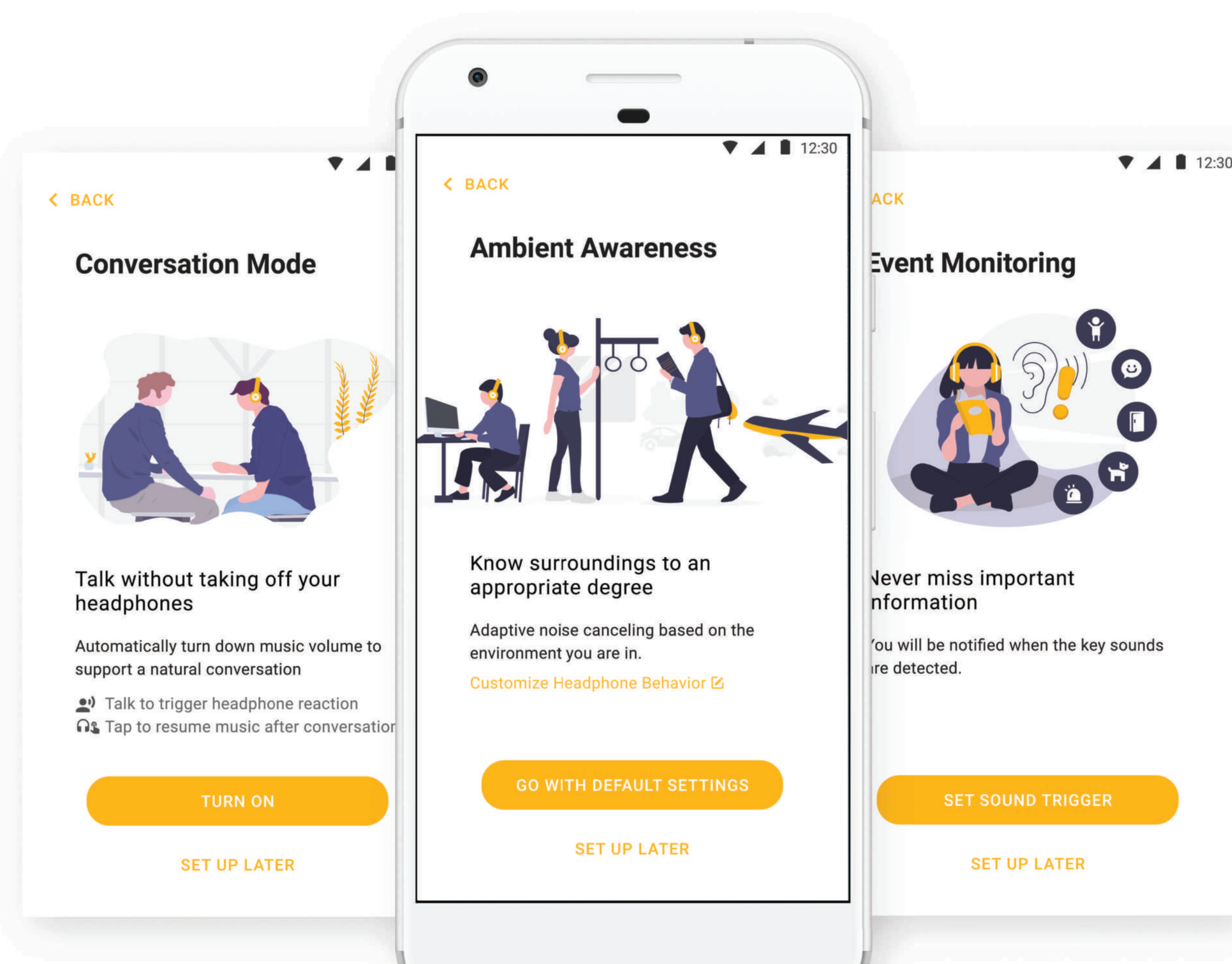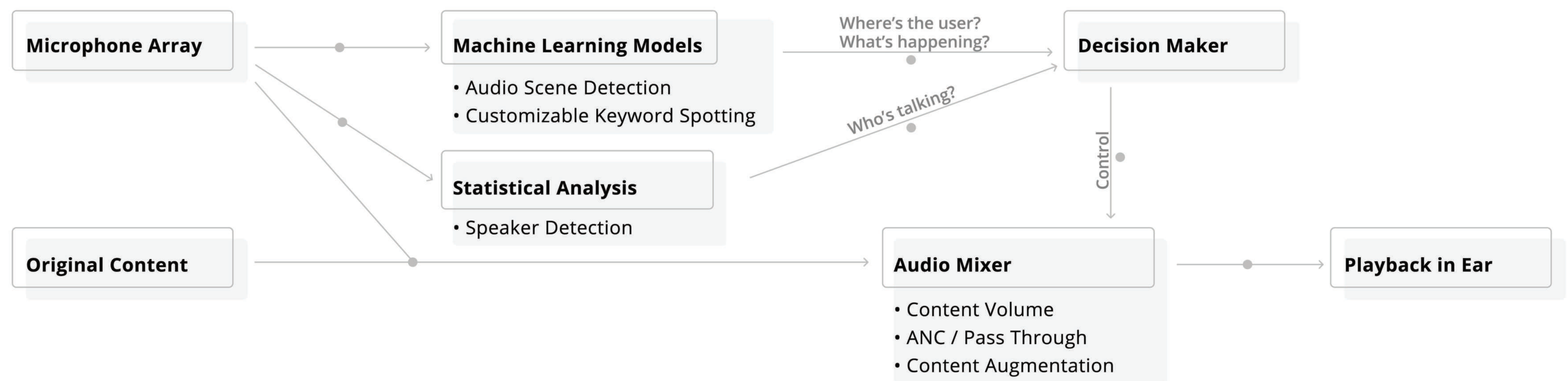
Deep Integration
Music volume down, voice pass-through, audio prompts

Approach

Data Collection
Existing Database
Data Auto-labeling
Self-collection
Online Video

Training
Data Augmentation
Mel-spectrum Audio Feature
Light-weight DSCNN Structure
Specially Designed Architecture

Reformatting
8-bit Quantization
C Code Translation

Platform Deployment
Targeting MCU with DSP and FPU Support
Optimized Mixed Precision Inference

Pipeline Integration
Industrial Headphone Chips
Production Level Integration

Solution

Microphone Array

Machine Learning Models
• Audio Scene Detection
• Customizable Keyword Spotting

Where's the user?
What's happening?

Decision Maker

Who's talking?

Statistical Analysis
• Speaker Detection

Original Content

Control

Audio Mixer
• Content Volume
• ANC / Pass Through
• Content Augmentation

Playback in Ear

Enhanced User Experience

We followed a human-centered design process, collected feedback and insights as we iterate and evaluate.

Conversation Mode
Talk without taking off your headphones
Automatically turn down music volume to support a natural conversation
Talk to trigger headphone reaction
Tap to resume music after conversation
TURN ON
SET UP LATER

Ambient Awareness
Know surroundings to an appropriate degree
Adaptive noise canceling based on the environment you are in.
Customize Headphone Behavior
GO WITH DEFAULT SETTINGS
SET UP LATER

Event Monitoring
Never miss important information
You will be notified when the key sounds are detected.
SET SOUND TRIGGER
SET UP LATER

Discover → Define → Ideation → Prototype → Evaluate → Develop → Deliver
Insights Insights