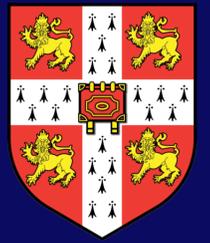


# Co-Processor Assisted Mobile Sensing

Petko Georgiev

Computer Laboratory, University of Cambridge



## Research challenge



Sensor data processing energy issues:

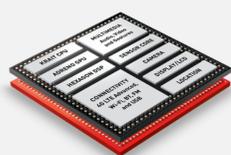
- ▶ **continuous** stream of information;
- ▶ **high** sampling rates;
- ▶ **multitude** of sensing apps.

## Objective

Enable the **energy efficient continuous** processing of **multiple** personal sensing applications deployed on a range of **co-processor** enabled mobile devices.

## Approach

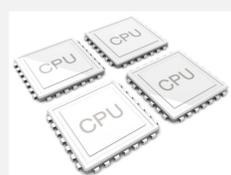
- ▶ Exploiting the **low-power co-processor (DSP)** on mobile devices.
- ▶ Utilising the **network** of smartphones and wearables for **opportunistic computational offloading**.
- ▶ Adapting to mobile **user behaviour** to exploit **contextual opportunities**.



## Always-on smartphone sensing

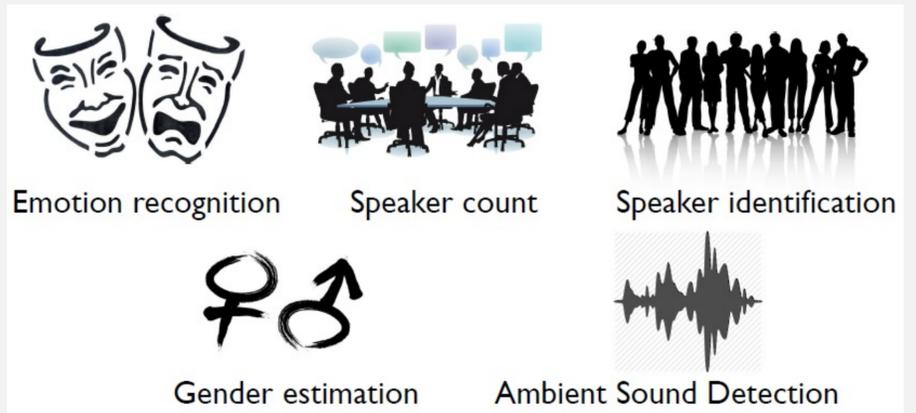


DSP master

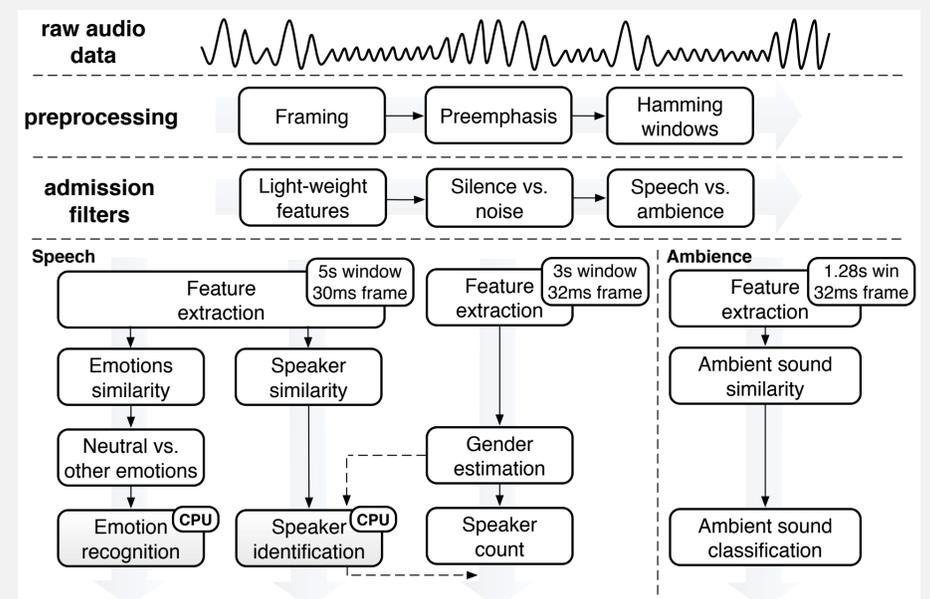
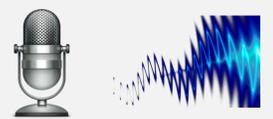


CPU slave

## DSP.Ear



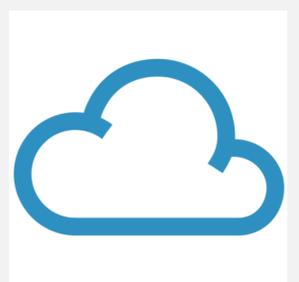
DSP.Ear enables **truly continuous microphone sensing for multiple behavioral inferences**: 3 to 7 times more energy efficient than naïve CPU deployments.



P. Georgiev, N. D. Lane, K. K. Rachuri, C. Mascolo, *DSP.Ear: Leveraging Co-Processor Support for Continuous Audio Sensing on Smartphones*. SenSys 2014

## Dynamic scheduling

Population-based metaheuristics to schedule sensing pipeline computations across **CPU** cores, **DSP** threads and **Cloud** services.



		CPU	DSP	Cloud
Emotion Recognition	F	2	4	
	C	0	10	14
	C	20		40
SpeakerId	F	0	6	
	C	0		132
	C	0	7	0
Activity Recognition	F	0	7	
	C	0	7	0

