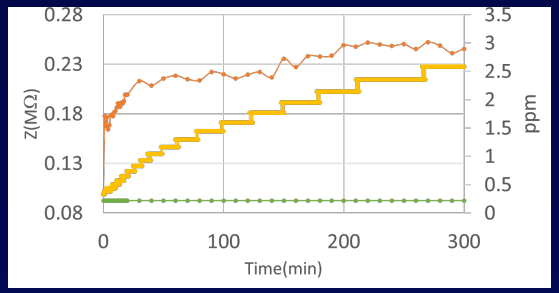
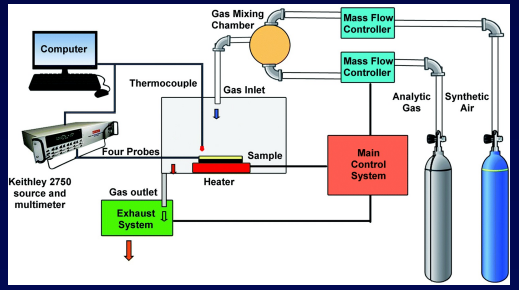
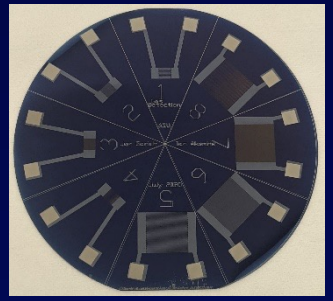
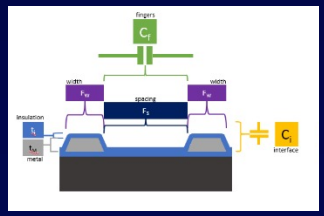
Constantly on the Lookout: Low-cost Sensor Enabled Explosive Detection to Protect High Density Environments

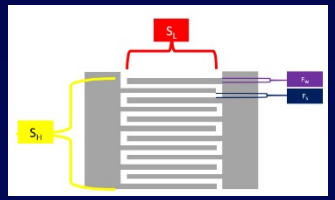
- Smart phones, coupled with simple, low-cost sensors can serve as lookout devices for many types of threats, e.g. Chemical spills, explosives, etc.
- This project develops the cyber-physical system that enables crowd-sourced threat monitoring by transparently using resources donated by people
- Sensor development, measurement, modeling, and calibration



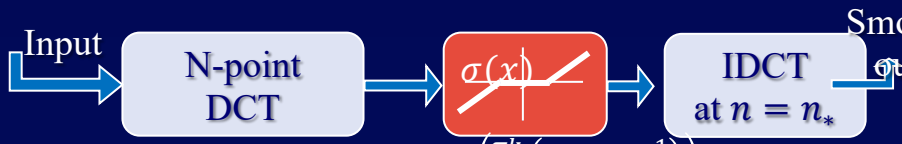








- Host-level tracking and baseline estimation using AI
  - The neural network at the host learns sensor behavior over time as data becomes available



- DCT: $F[n_0, k] = \sum_{l=0}^{N-1} f[n_0 - l] \cos\left(\frac{\pi k}{N}\left(N - l + \frac{1}{2}\right)\right), k = 0,1,..,N-1$
- Soft-thresholding $\boldsymbol{\sigma(x) = \mathbf{sgn}(x)\mathbf{ReLU}(|x| - b)}$, where b is learnable via back-propagation.

	Stationary	Crowd-sourced
Cost per sensor	$10,000	$5
Detection range	20m	1m
Protect K-12 school	$1M	$5K
Protect marathon	$1B	$100K