

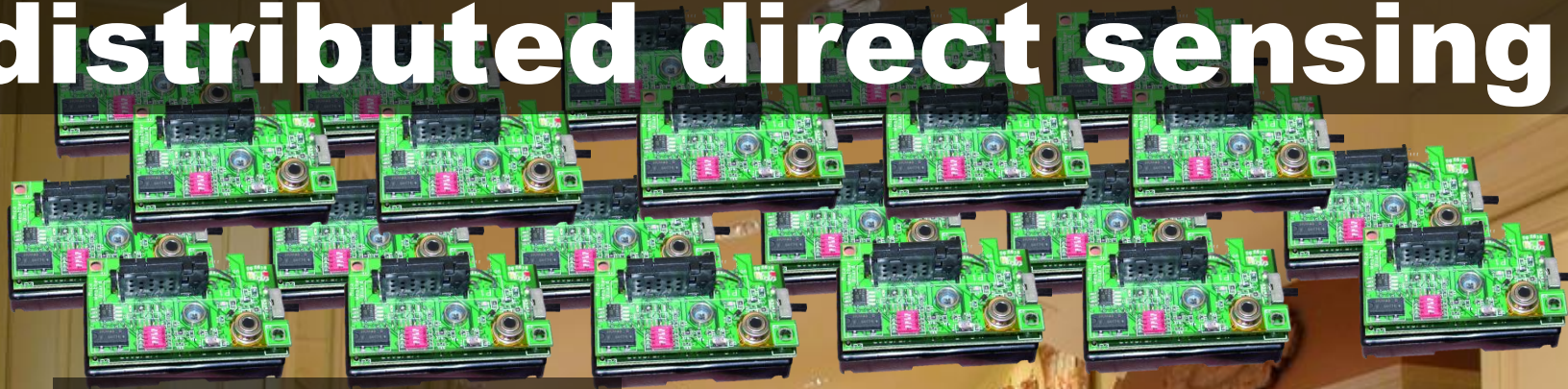
Infrastructure Mediated Sensing for Assistive Care Environments

@jonfroehlich

what can we learn about human activity

through the use of electrical
appliances / water fixtures in
the home?

distributed direct sensing



other parts of the house

refrigerator

microwave

coffee maker



light switches



stove



convection oven



infrastructure mediated sensing

other parts of the house

refrigerator

microwave

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light
switches

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convection oven

Powerline Event Detection Sensor

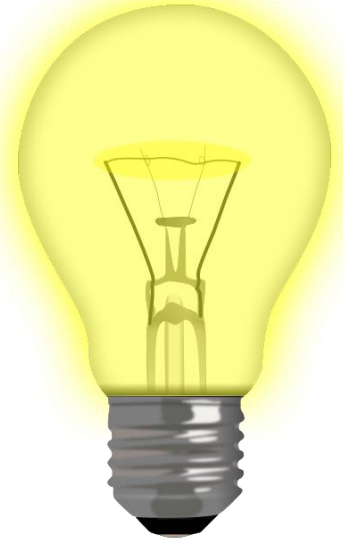
three design goals



low-cost



easy-to-install



device-level
information

device-level information

sometimes called
disaggregated or
disambiguated
data

information down
to the *particular*
device, water
fixture, gas fixture



or



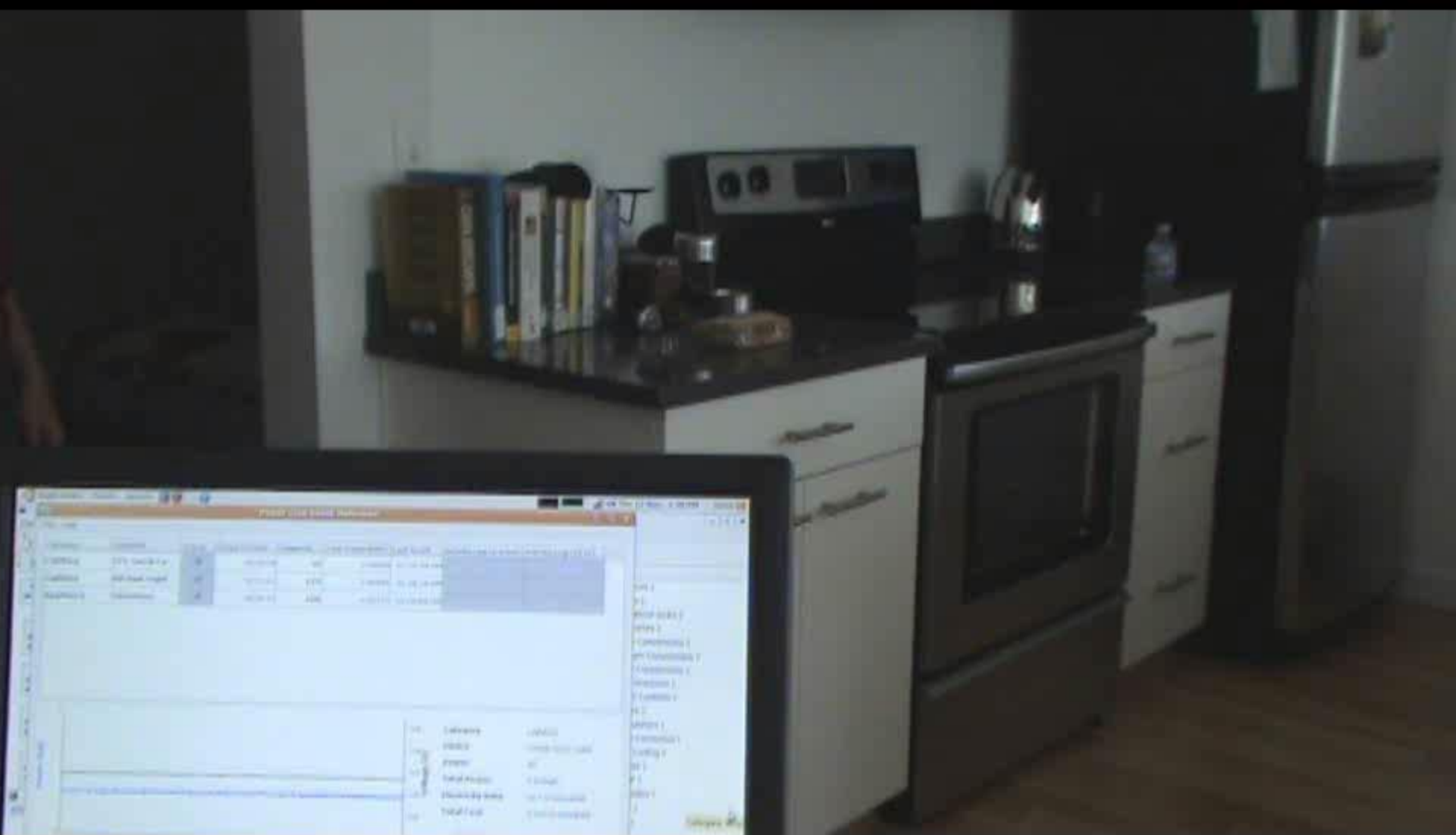
or



or









HYDRSENSE

Infrastructure-Mediated Single-Point Sensing of Whole-Home Water Activity

Jon Froehlich¹, Eric Larson², Tim Campbell³, Conor Haggerty⁴, James Fogarty¹, Shwetak N. Patel^{1,2}

¹Computer Science & Engineering, ²Electrical Engineering,
³Mechanical Engineering, ⁴Community, Environment, and Planning

hydrosense



- **single-point** pressure-based sensor of water usage
- **identifies water usage activity down to its source**(e.g., toilet)
- provides **estimates of flow** at each fixture



typical water meters

- only provide aggregate information on water usage
- require pipe modification for installation

traditional inline
water meter

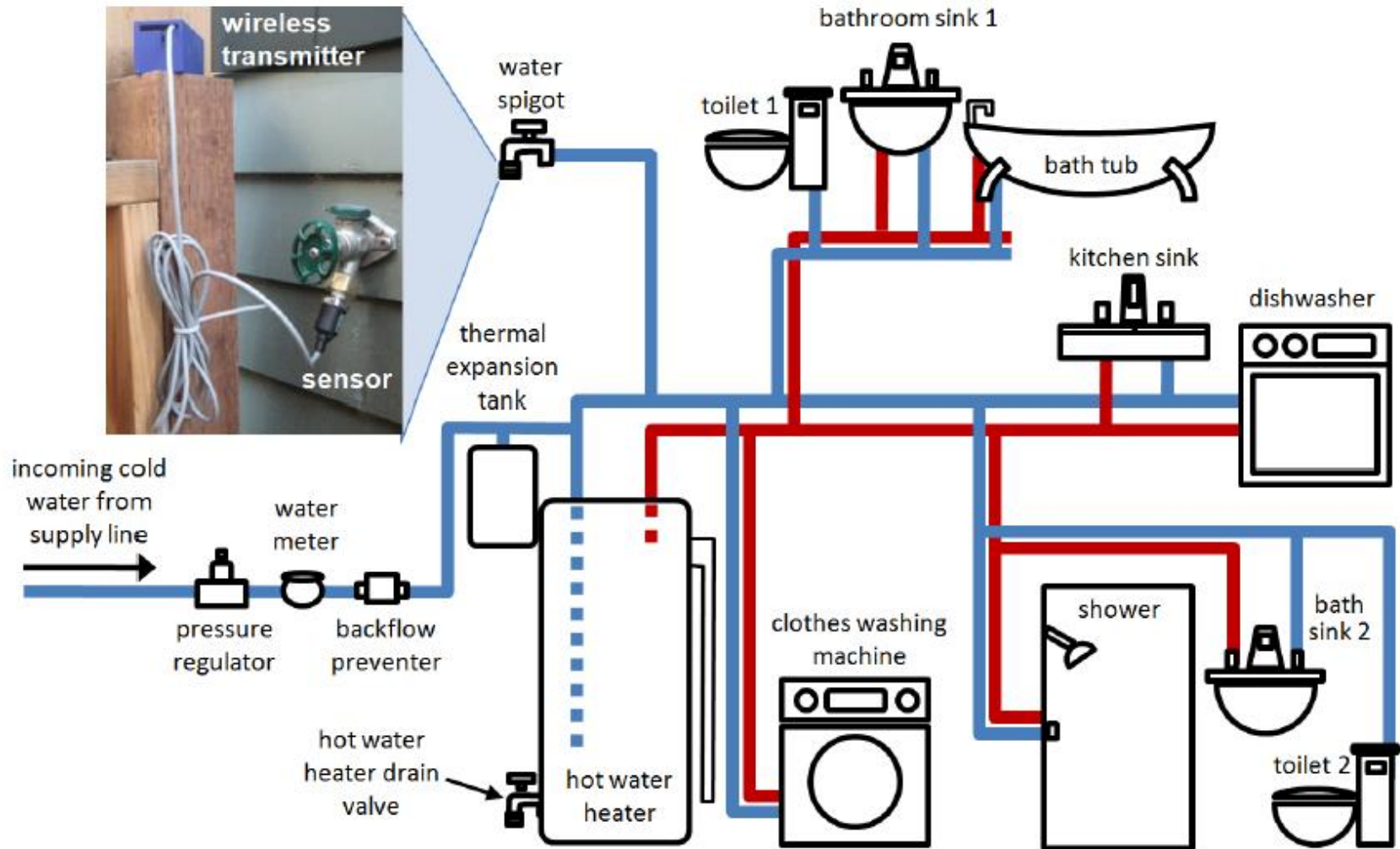
hydrosense: pressure-based sensor

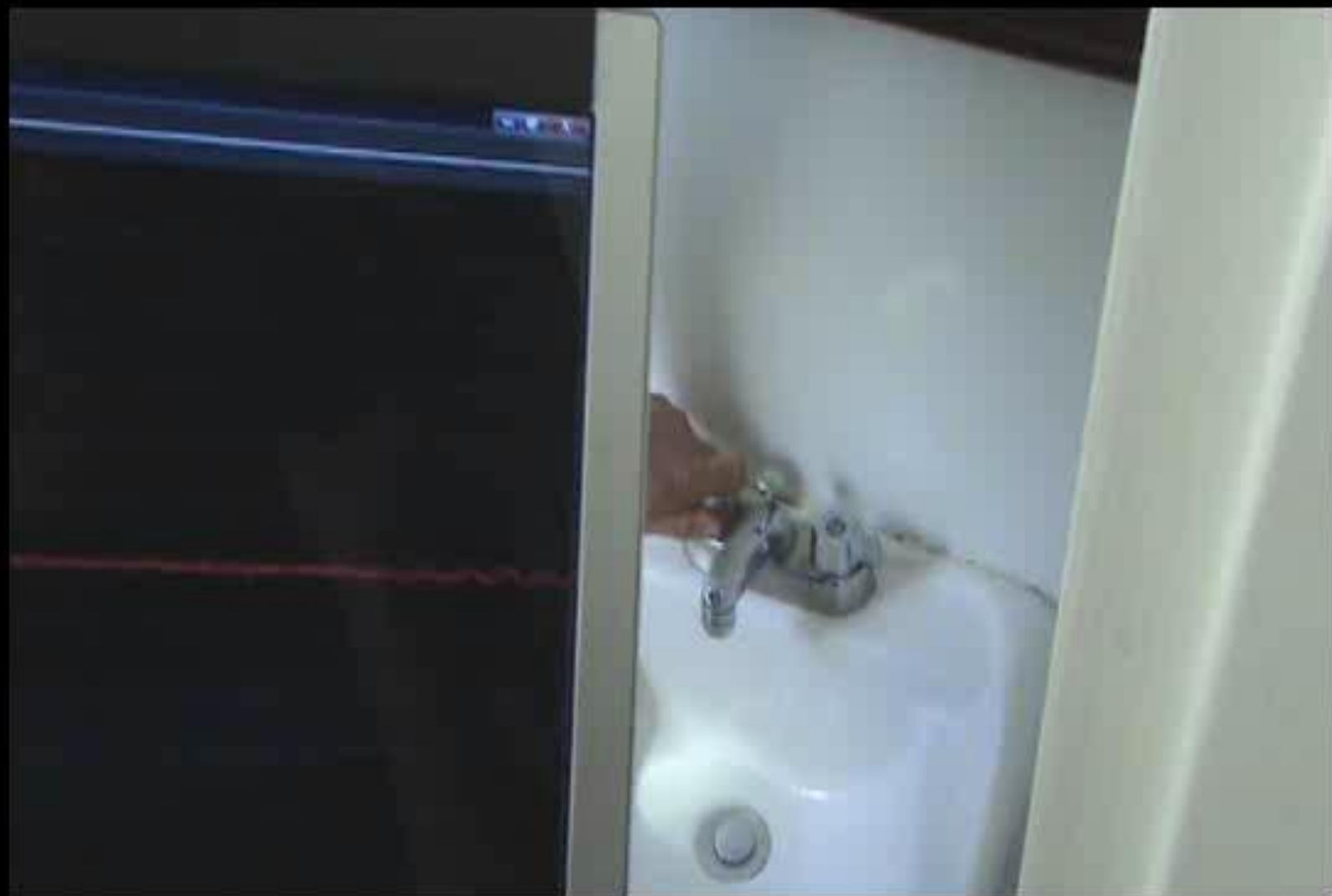


pressure waves



closed pressure system





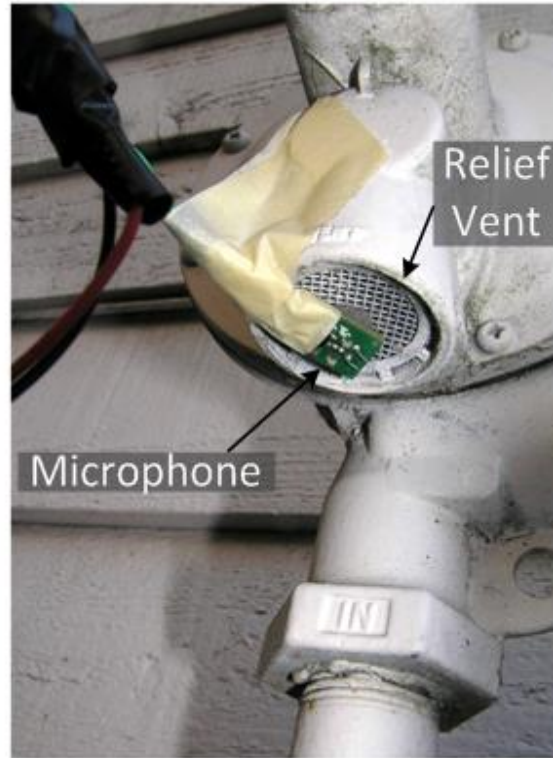
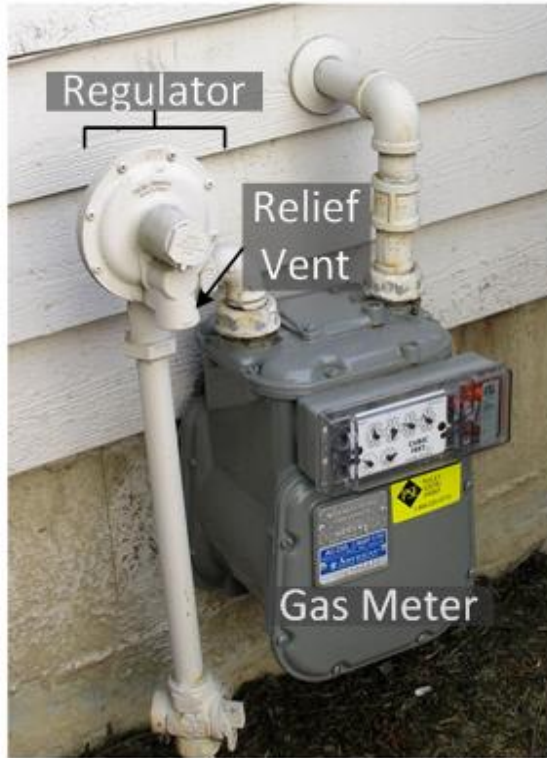
GasSense: Appliance-Level, Single-Point Sensing of Gas Activity in the Home

Gabe Cohn¹, Sidhant Gupta², Jon Froehlich², Eric Larson¹, Shwetak Patel^{1,2}

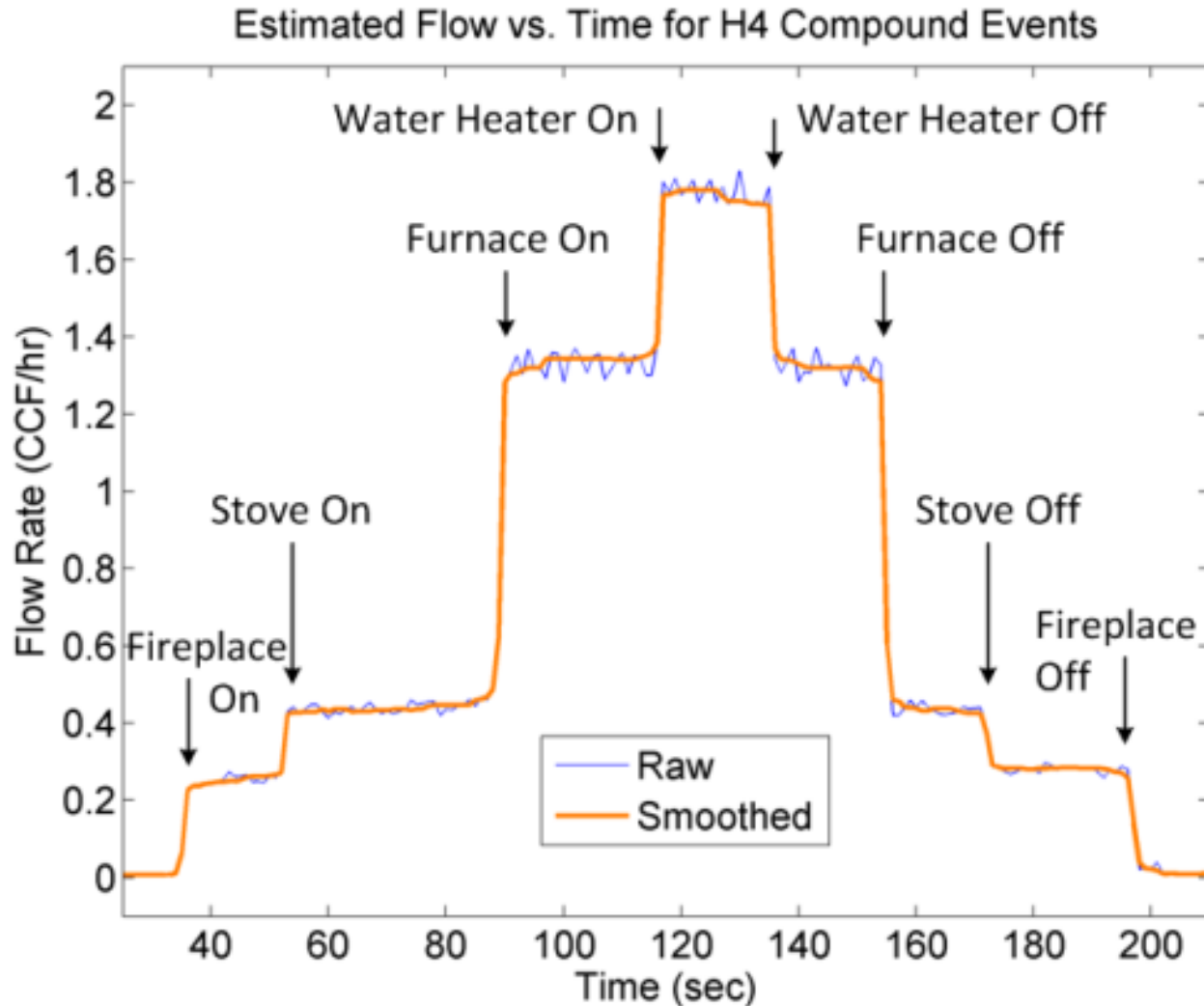
¹Electrical Engineering, ²Computer Science and Engineering



gassense installs on outside of gas regulator



example data



end user applications



science applications

- ability to track activity levels over time
 - are activity levels declining?
- where are most activities in the home taking place?
 - inform the design of the home
- automatic anomaly detection
 - has there been cooking/showering activity this morning?

Thank You!

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students



Jon Froehlich



Gabe Cohn



Sidhant Gupta



Eric Larson



Tim Campbell



Kate Everitt



Marilyn Ostergren

faculty



Shwetak Patel



James Fogarty



James Landay

