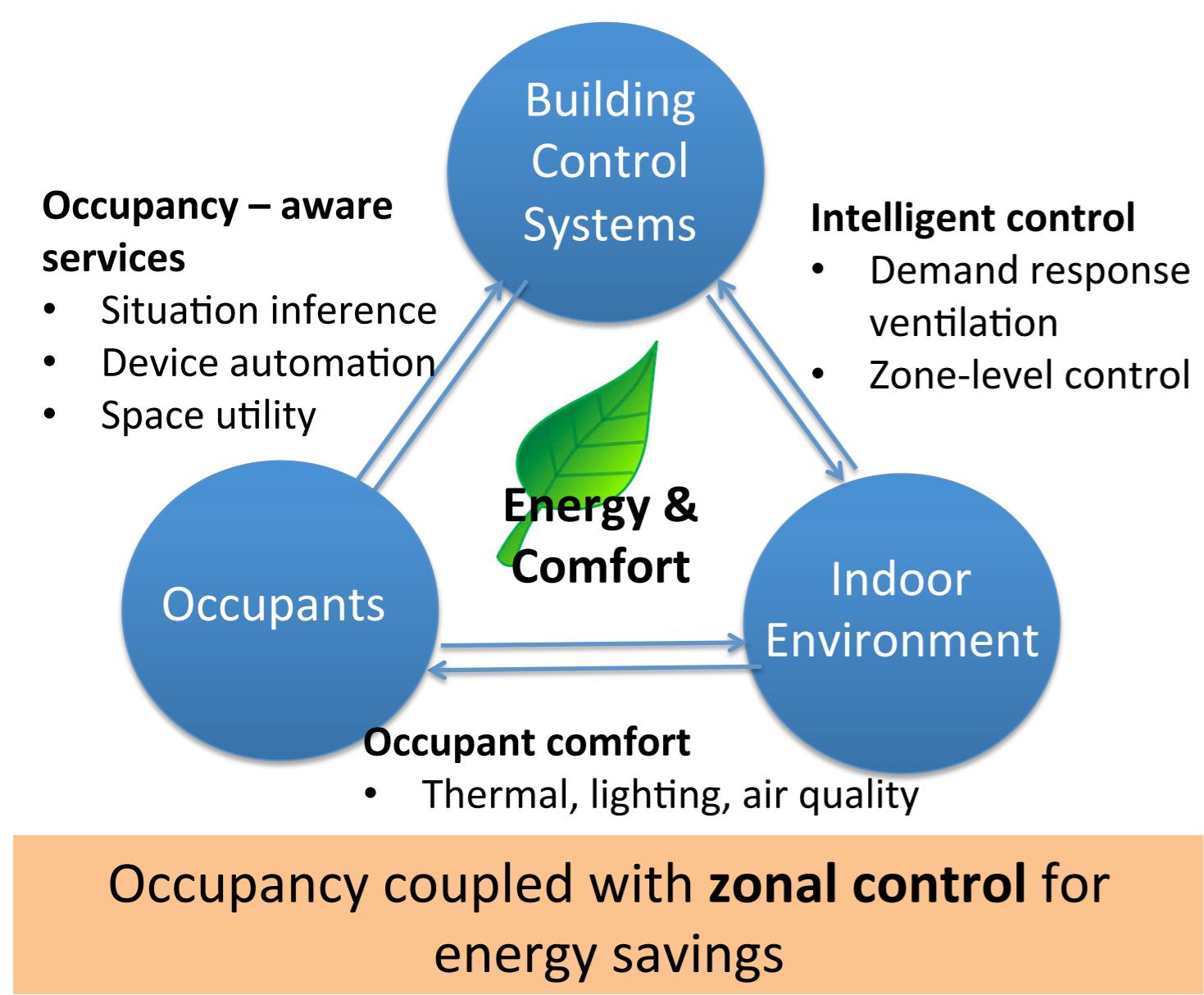




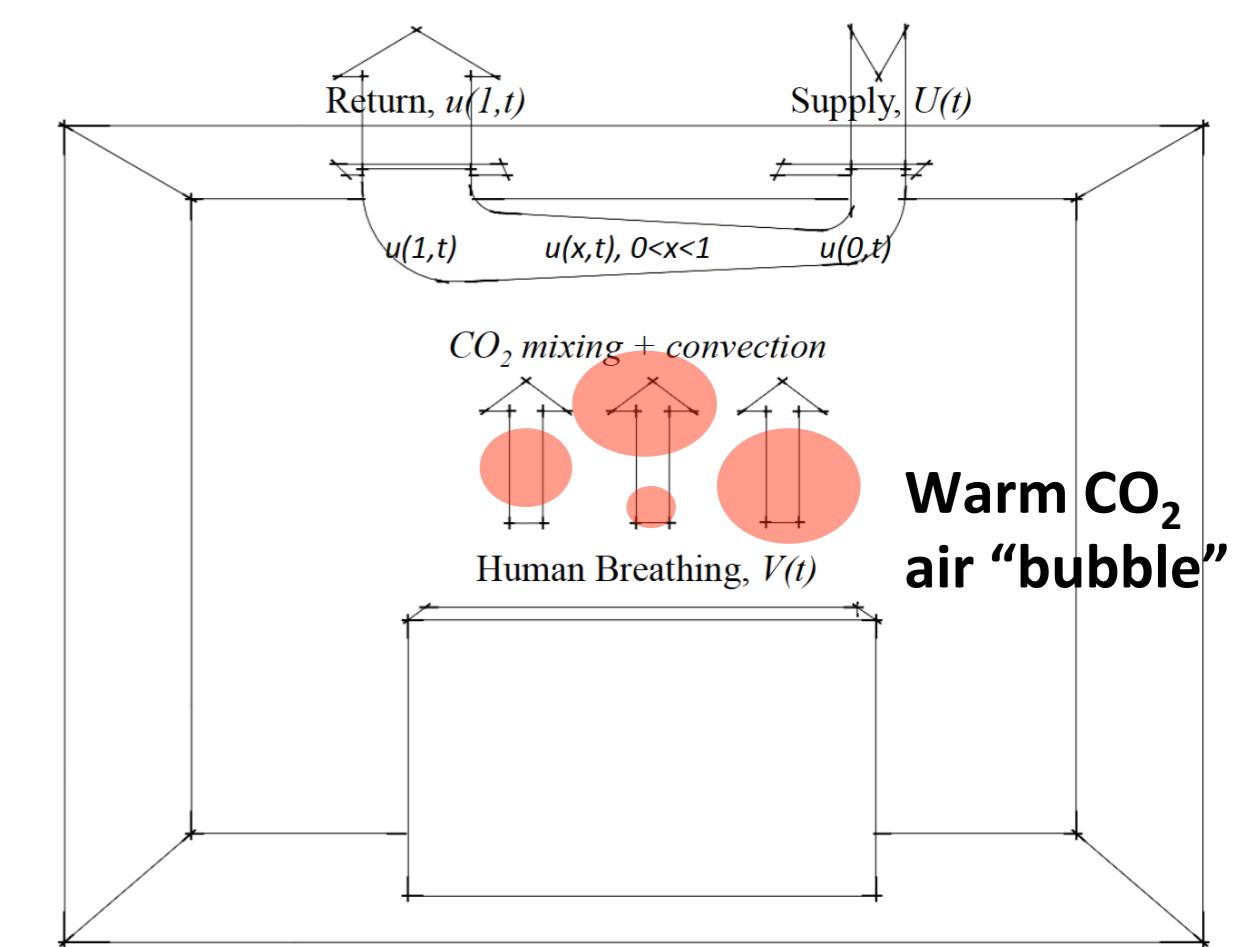
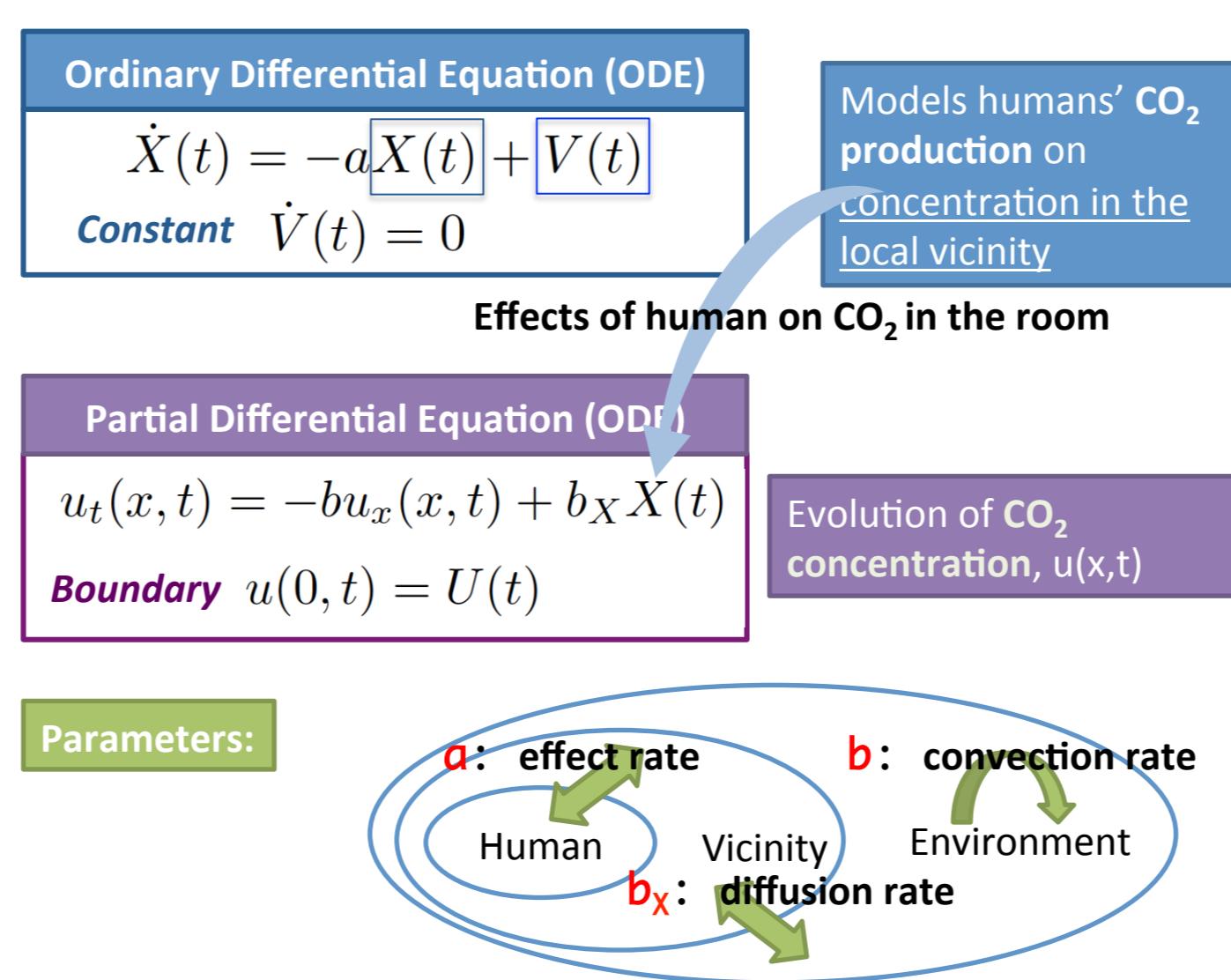
Sensing by Proxy: Occupancy Detection Based on Indoor CO₂ Concentration

Ming Jin, Nikos Bekiaris-Liberis, Kevin Weekly, Costas Spanos, Alexandre M. Bayen

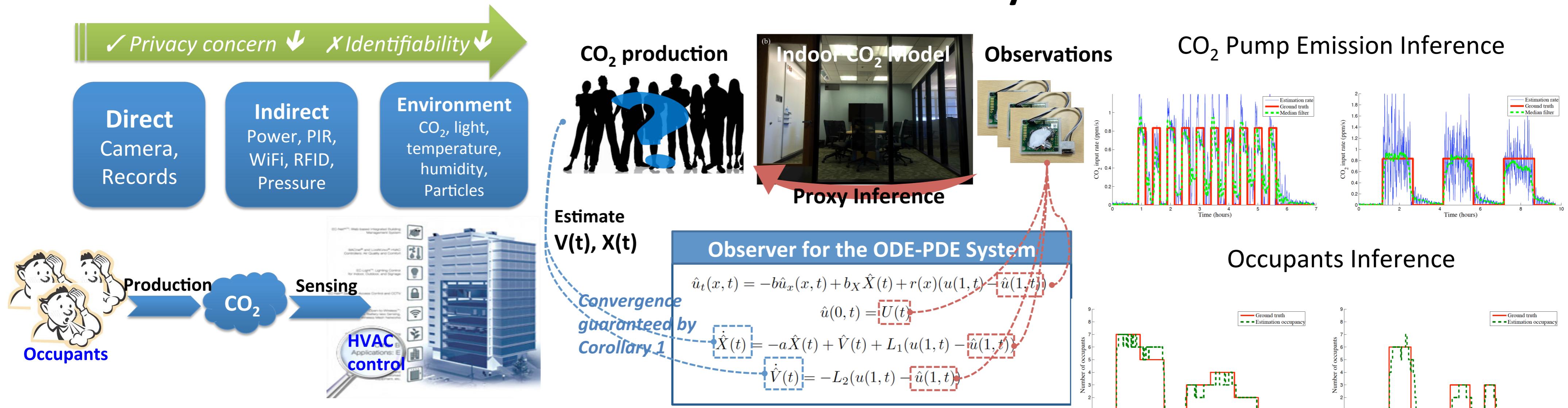
Motivation and Background



Proxy Design and Modeling

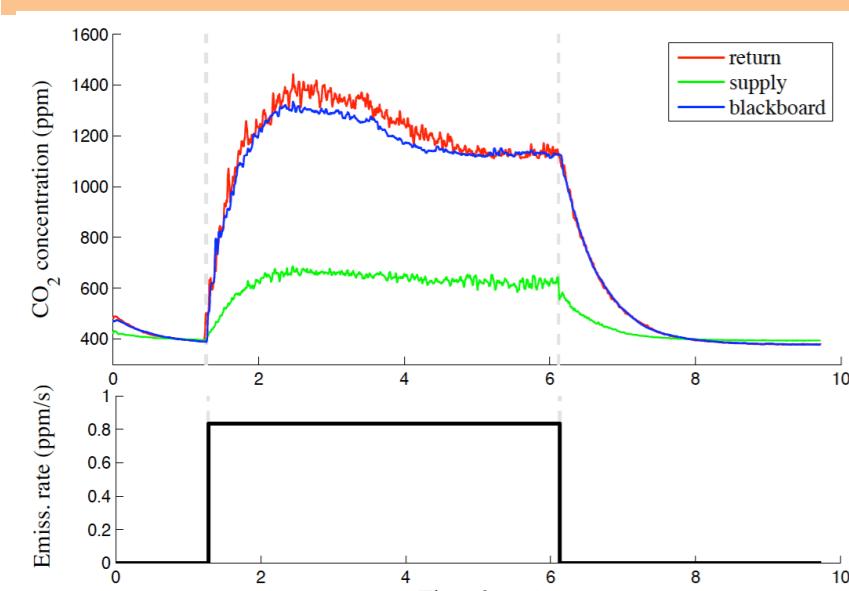


Proxy Inference



CO₂ Pump and Occupants Experiments

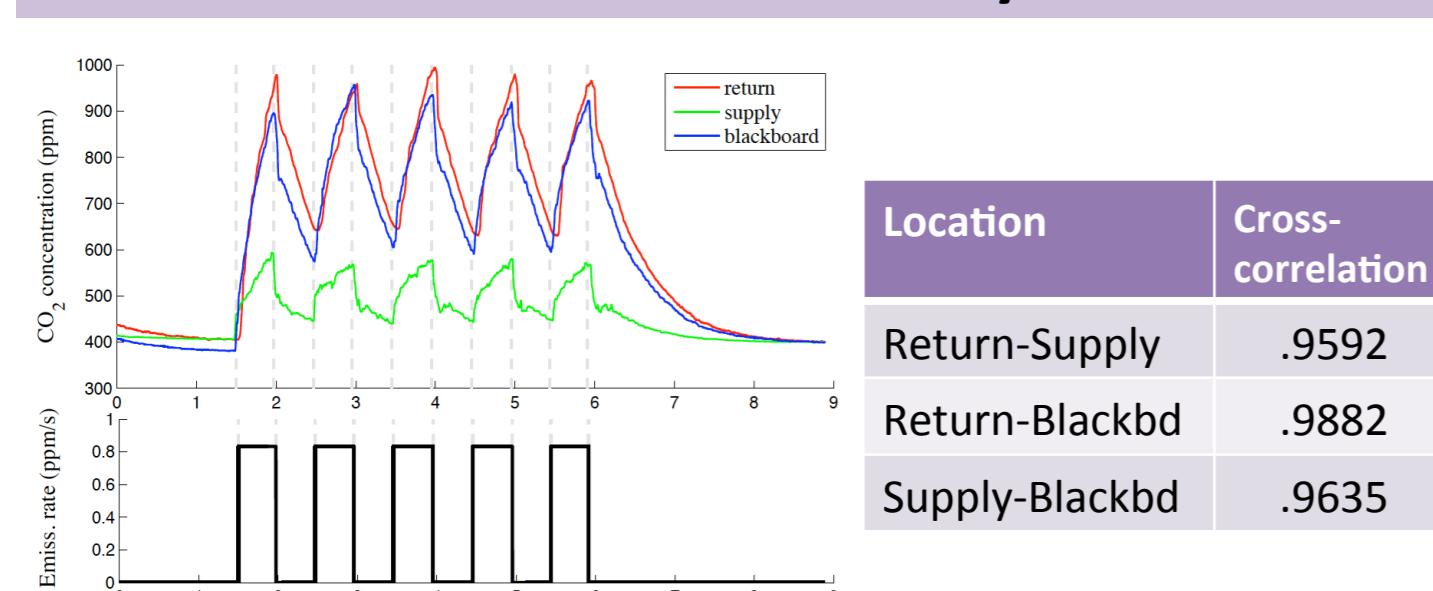
Hypothesis 1: when CO₂ is injected for a long time, system reaches steady state.



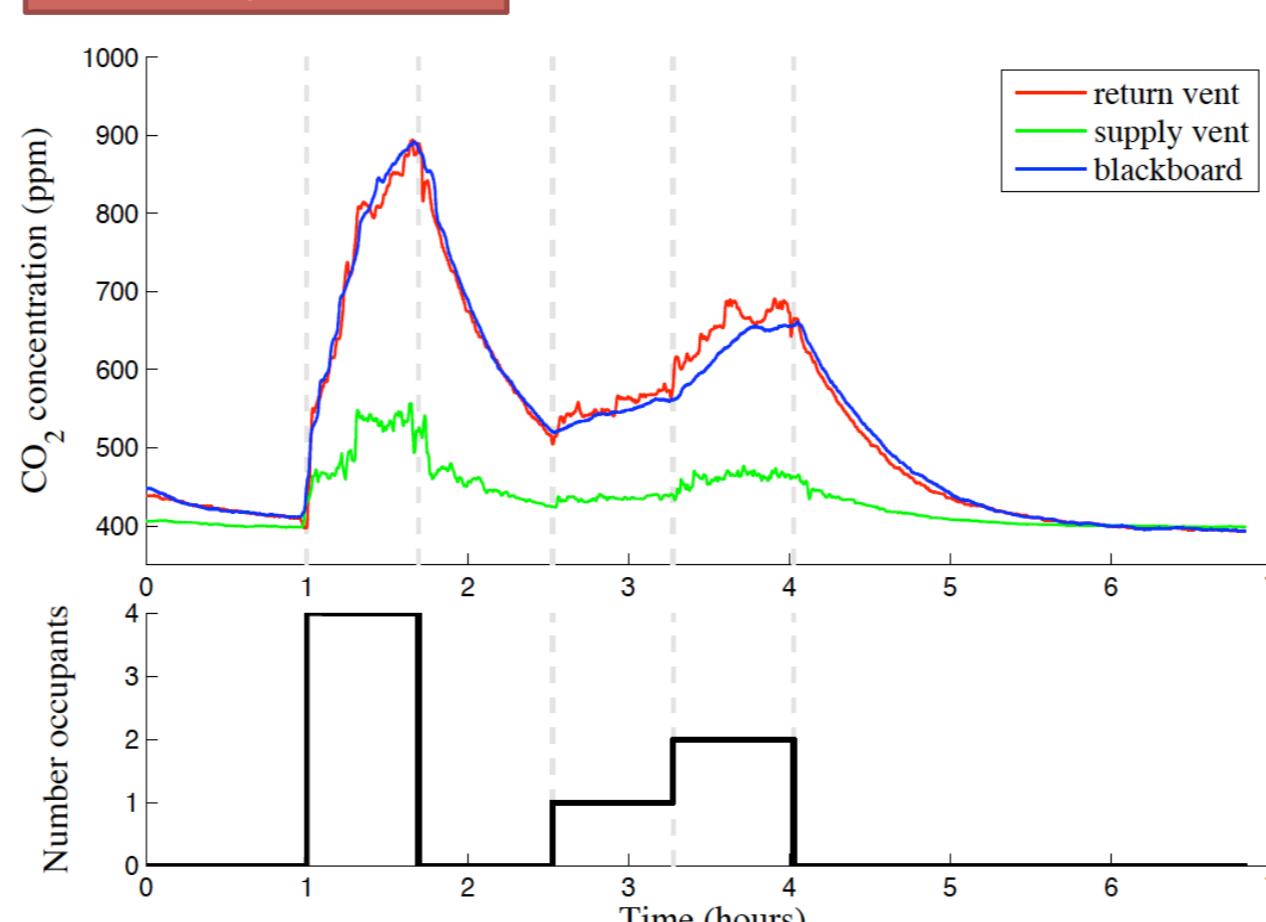
- Steady state: balance of mixing rates
- Takes ~3h to reach the state 1200ppm

Hypothesis 2a: measurements exhibit periodic patterns if CO₂ injected periodically.

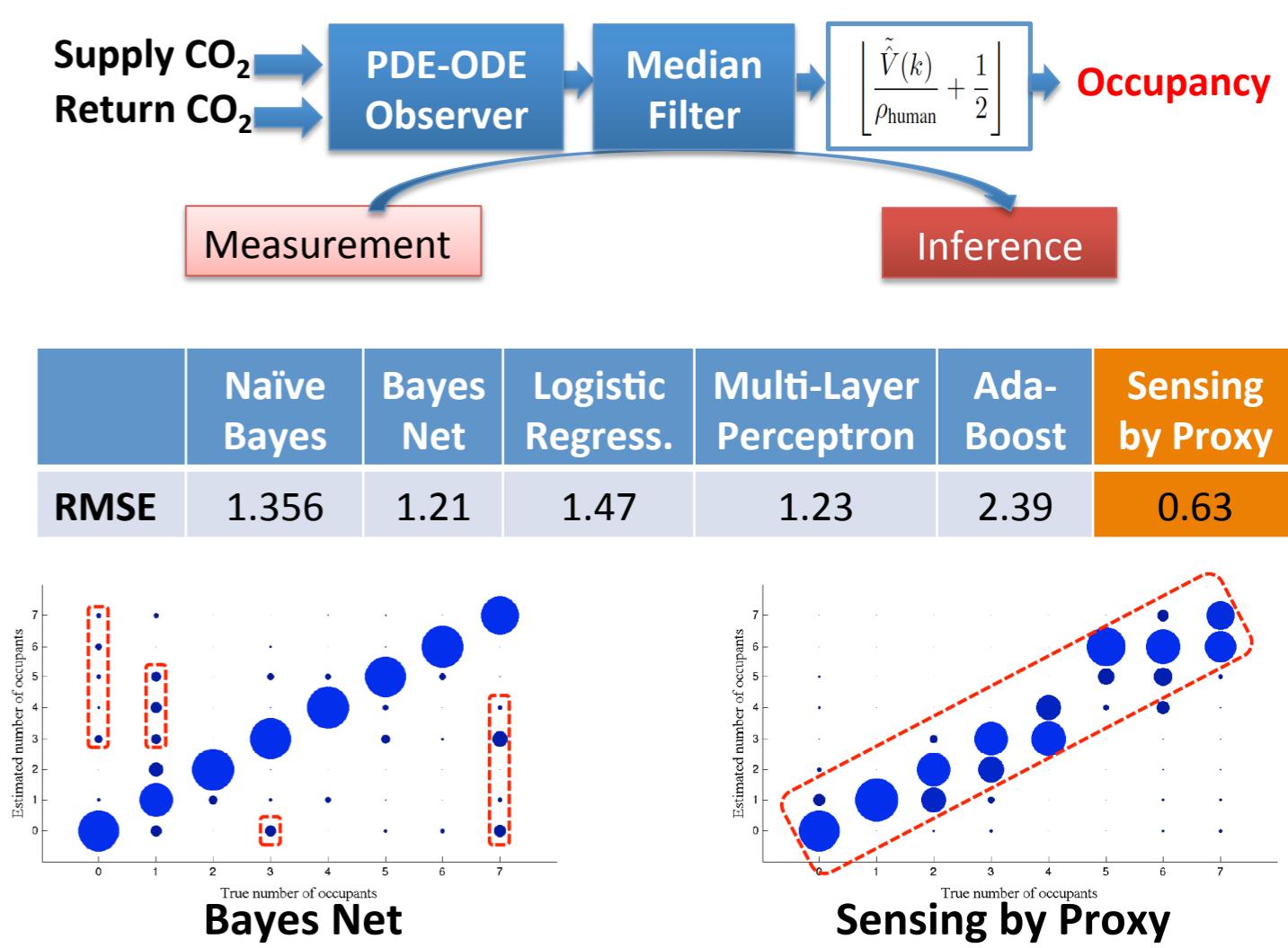
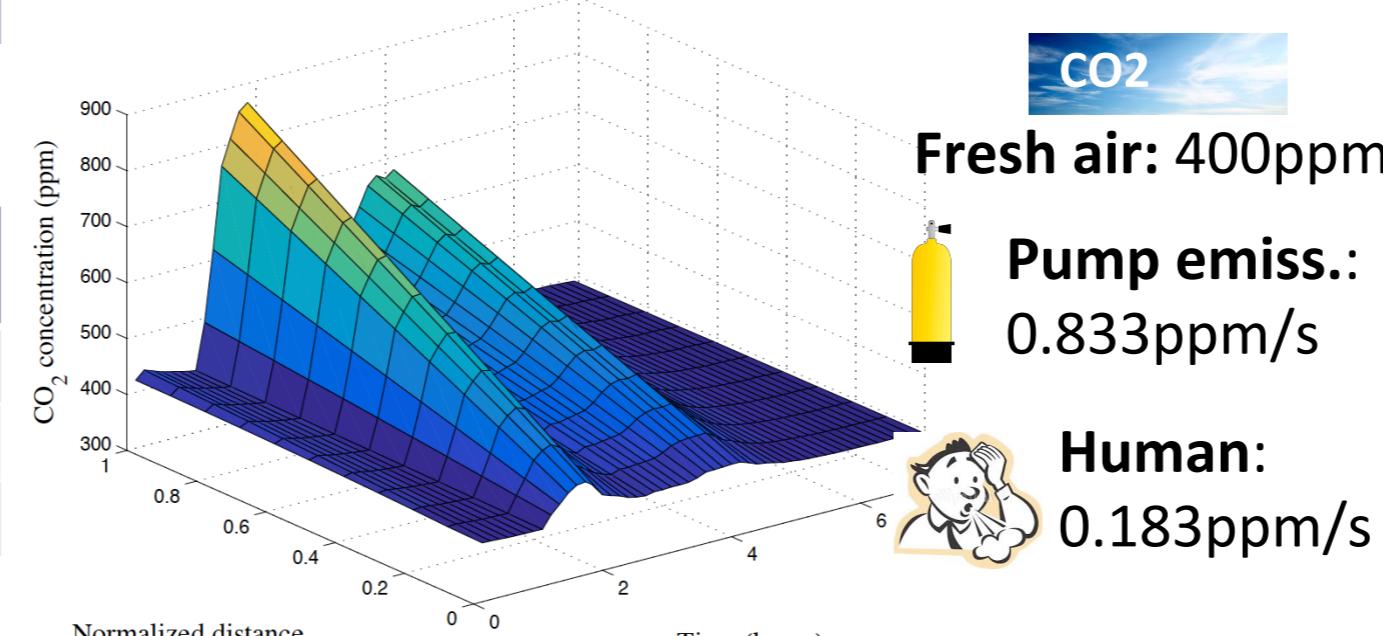
Hypothesis 2b: CO₂ from different points in the room react similarly.



Field Experiment



Spatial temporal simulation



Conclusion and Future

- Reliable: RMSE 0.6 vs. 1.2 (frac. person)
- Mis detection with small magnitudes
- Future work...**
- Implementation in larger indoor area
- Application of Sensing by Proxy to indoor pollutants source identification

Publication: Sensing by proxy: Occupancy detection based on indoor CO₂ concentration, 9th International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies, 2015