**Dr. Ali Ghahramani Meeting Notes**

Kinetic facades – use of smart systems to automate enclosure motion for performance, not architectural reasons

IEQ – In theory, much more important because salary and thus performance is 100 time the overhead cost of utilities.

Problems of IEQ vs productivity studies – lack of quantifiability, low responsiveness of existing systems to human comfort and IEQ

“Easy” things to automate – fans, windows, optimize energy use per ventilation level achieved for either or both

Investigate dynamic responsive control feedback

Consider the importance of deadband and setpoint when determining proper ventilation  
Deadband paper - <http://www.sciencedirect.com/science/article/pii/S0306261915016888>

Emphasize the ability to port project to other climates or building systems (such as lighting instead of just ventilation) as a system of logic that can be used in various applications.

Determine acceptable industry norms as a baseline (ex, 15 cfm is an industry standard for minimum ventilation rate)

Consider not just energy losses through windows as a tradeoff of ventilation, but consider energy savings of using it as a cooling mechanism to quantify natural ventilation.

Use sensor data to run small local systems rather than building size HVAC systems or to effect change in the human parts of the system (public opinion/pressure/choices). Both are effective ideas.

Emphasize that it solves personalized ventilation by giving people more options and ways to control their environment. We could add control by recording the number of human overrides per cycle to use that as a metric of satisfaction like I mentioned earlier.  
  
Don’t tackle quantifying effects of air quality on productivity. It’s the holy grail of IEQ studies. Rather state its importance and link to energy savings as something with a quantifiable dollar amount, knowing that productivity is typically orders of magnitude more important if a similar effect on that can be achieved.

Other problems to address:

* little application of this technology in industry
* what sensors to use (recommends NOx, CO2, and PM)
* most of these systems use different languages (different robotics for smart windows vs fans vs large ventilation systems, etc.) which is why we see little global optimization