



AARHUS  
UNIVERSITY  
DEPARTMENT OF ENGINEERING

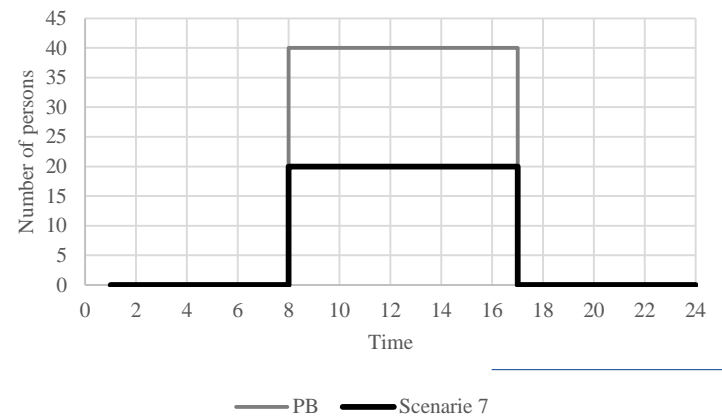
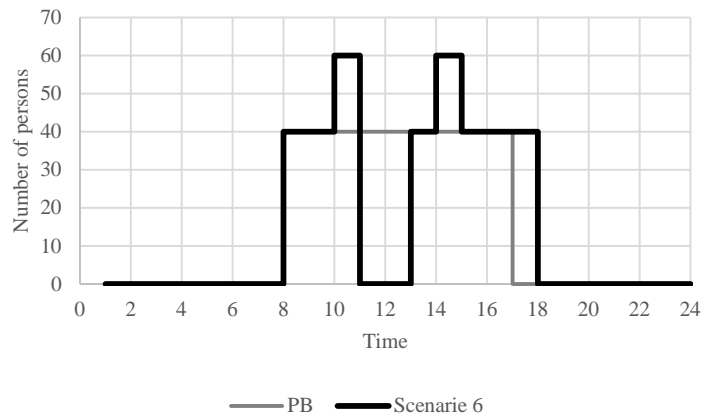
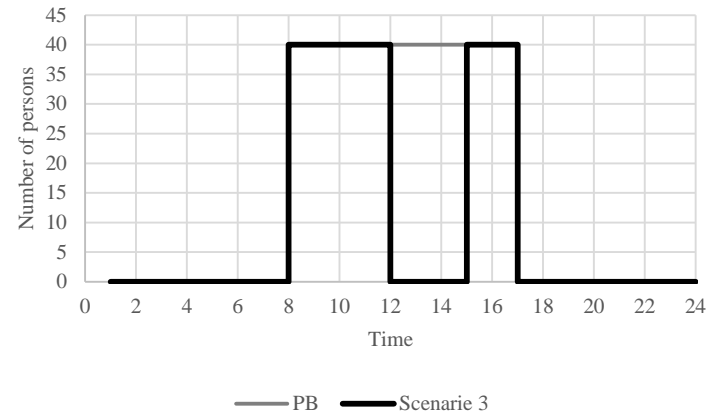
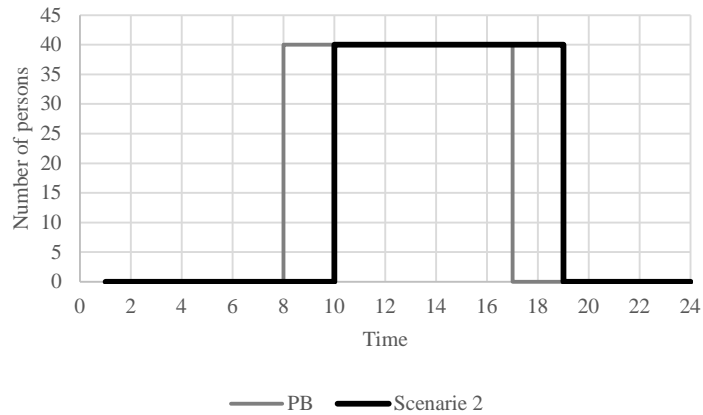
# SMART GRID POTENTIAL IN EXISTING RESIDENTIAL BUILDINGS

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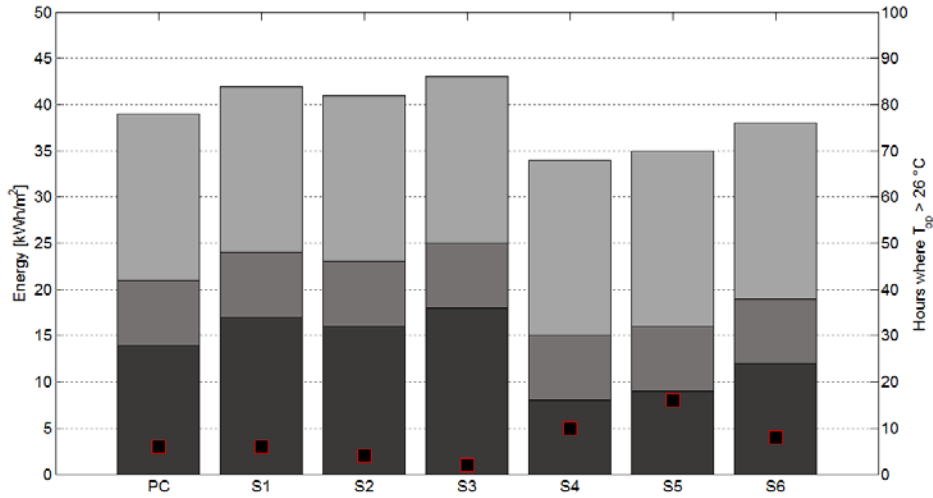
U N E R S I T E T

# SIMPLE OCCUPANCY SCHEDULES

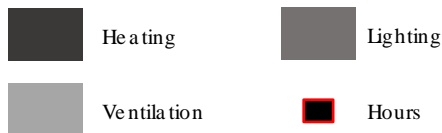
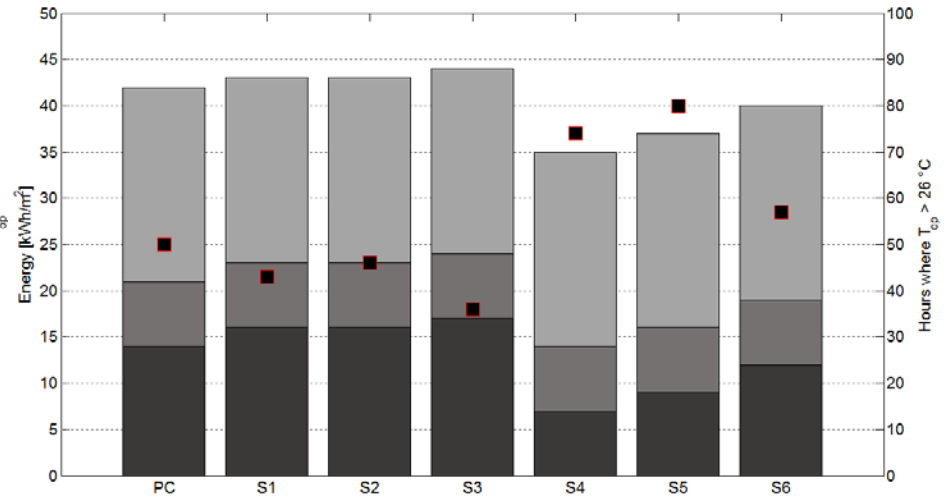


# PREDICTIVE CONTROL

Single Person Office - South / Heavy

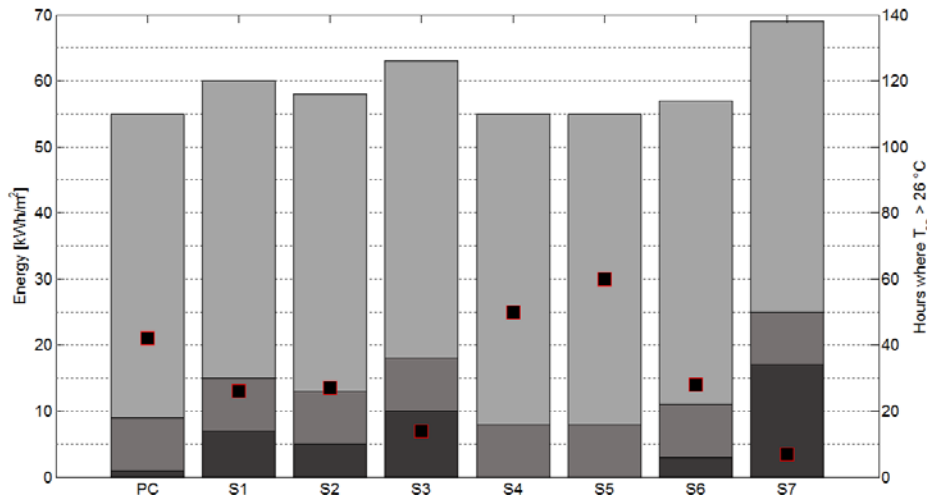


Single Person Office - South / Light

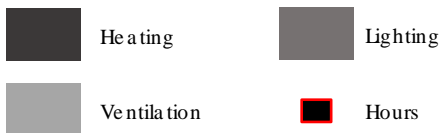
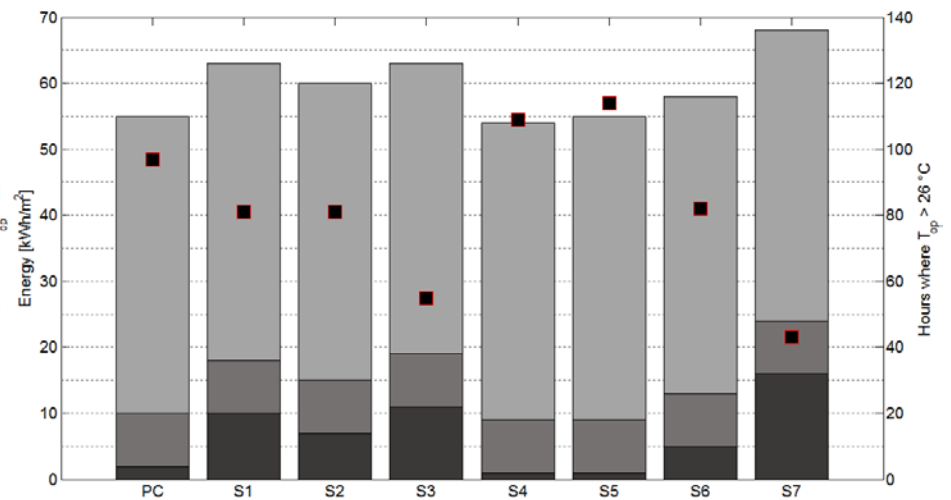


# PREDICTIVE CONTROL

Classroom (40 pers) - South / Heavy



Classroom (40 pers) - South / Light



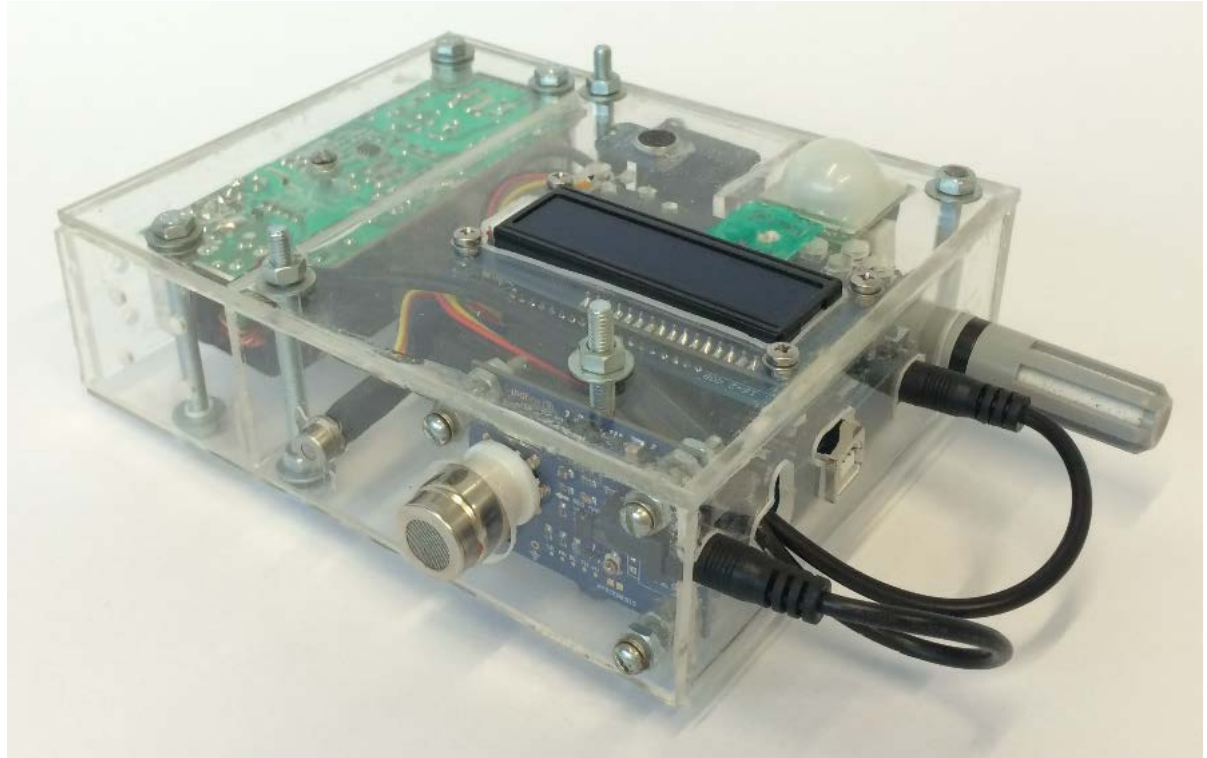
# RESULTS

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- › Affects both energy consumption and thermal indoor climate
- › Thermal mass is very important to prevent thermal discomfort
- › A key input for predictive control is occupancy

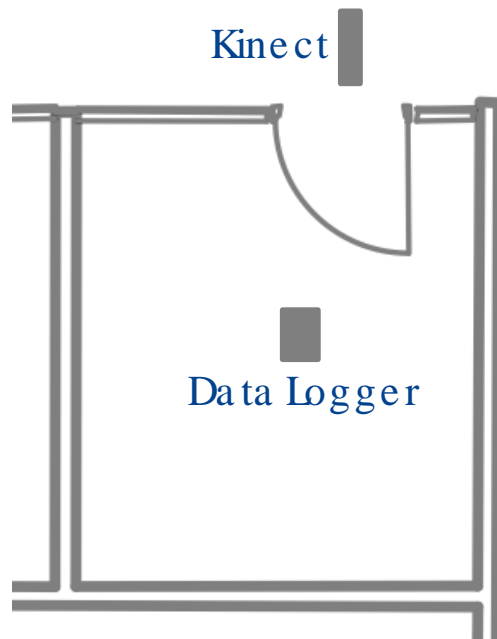
# REAL-TIME DETECTION OF OCCUPANCY

- › Temperature
- › Relative Humidity
- › CO<sub>2</sub>
- › Noise
- › PIR (Motion)
- › VOC



# TESTING

## Project Room



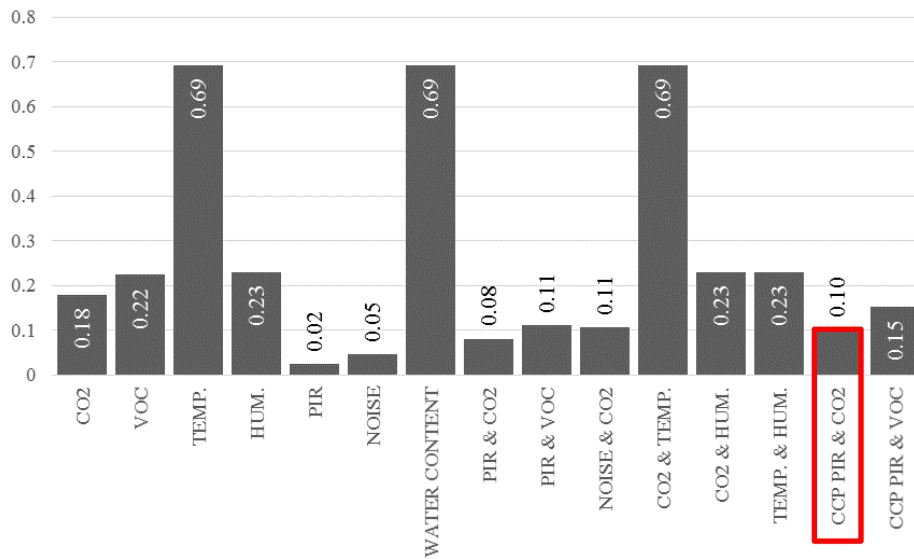
## Two-Bedroom Apartment



# RESULTS

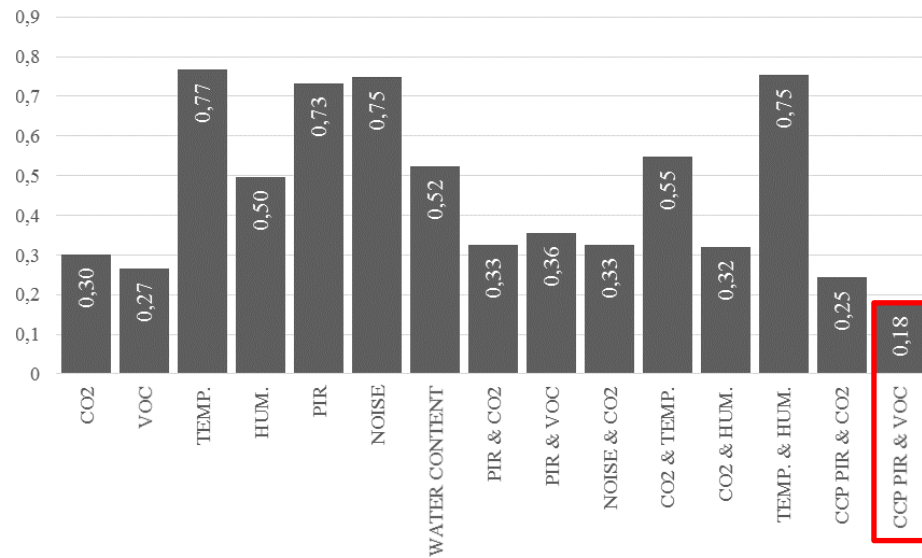
## Project Room

Mean Absolute Error - Historic Model



## Two-Bedroom Apartment

Mean Absolute Error - Historic Model





# FUTURE WORK

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- › MPC has the ability to easily and effectively handle complex systems with constraints and many inputs and outputs
- › Stochastic MPC (Include uncertainties of occupancy)
- › Connect SMPC to real-time occupancy detection



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