# Identifiability based parameter selection for calibration

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## Introduction

Context

The use of a calibrated building energy model is indispensable for many applications like building renovations

Objective

Optimize the max nb of parameters that could be included for calibration to avoid over parametrization and overfitting

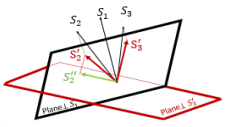
- Identifiability coupled to sensitivity analysis prior to calibration is proposed to select this maximum subset

## Framework overview understanding

Selection of influential & non-collinear parameter subset

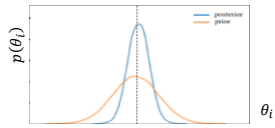
$$\begin{pmatrix} St_{1},1 & St_{1},2 & \cdots & St_{1},p \\ St_{2},1 & St_{2},2 & & St_{2},p \\ \vdots & \vdots & \ddots & \vdots \\ St_{N},1 & St_{N},2 & & St_{N},p \end{pmatrix}$$

Temporal sensitivity analysis




Orthogonalization & collinearity
Max nb of identifiable parameters

Bayesian inference

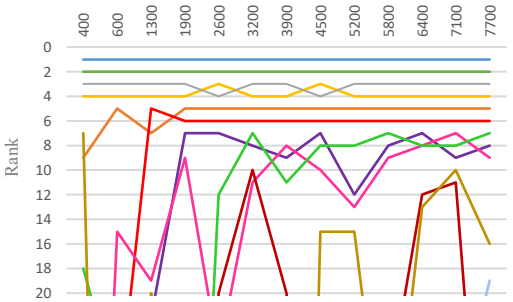



$p(\theta|D) \propto p(\theta)\ p(D|\theta)$

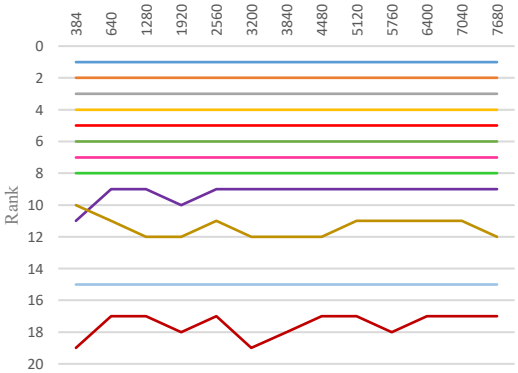
- $p(\theta|D)$ : posterior distribution
- $p(D|\theta)$: likelihood function
- $p(\theta)$ : prior distribution

## Robustness of RBD-FAST and MORRIS

RBD-FAST Model evaluations




Morris Model evaluations

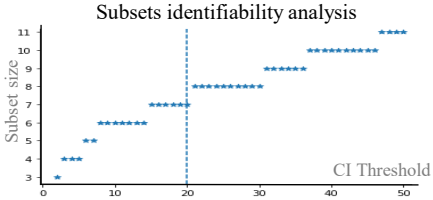



Ventilation
Solar albedo
Cp concrete screed
Dissipated heat
Heating power
Solar factor window F2
Cp concrete wall
Shutters scenario
U window F2
Conductivity polystyrene wallmate
Cp concrete slab
Conductivity polystyrene styrofoam

## Parameter selection and inference

Sensitivity based parameter selection

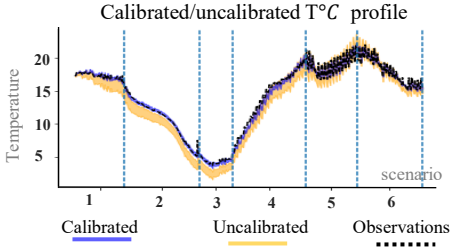
Subsets identifiability analysis



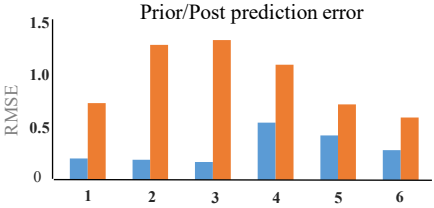

- Collinearity index threshold considered is 20
- Maximum number of identifiable prameters

Uncertainty propagation

Calibrated/uncalibrated T°$C$ profile




Prior/Post prediction error




- RMSE indicator used for the model evaluation
- Significant increase in model prediction accuracy

## Conclusion

- Max nb of parameters that can be inferred is estimated
- Morris was found to be more robust than RBD-FAST
- Better predictive performance attained with this methodology

## Perspectives

- Study of the effect of CI on the results
- Apply the methodlogy on several case studies