Popular science summary of the PhD thesis

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Title of the PhD thesis	Re-modelling buildings: Data-efficient models to evaluate energy efficiency in operative buildings
PhD school/Department	DTU Compute

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology. Before the thesis defence, the summary is sent to DTU's Office for Communication and Media and to the media *Ingeniøren*:

More than half of the world's population lives in cities, and the number is expected to rise in the coming decades. Given the current population growth, it is necessary to optimise how buildings use energy to ensure sustainable urban development.

The building sector is being digitalised due to the appearance of cheaper monitoring devices and an increase in computational power. Still, it is often challenging to use data from numerous sensors due to potential issues during installation and maintenance. In addition, data is collected by different stakeholders, so access to consolidated databases is scarce. Moreover, extensive monitoring of occupied buildings might raise privacy concerns.

This work explores methods to develop building models that can assimilate information about buildings' operation without the need for abundant measuring devices or a detailed description of the building. First, we study traditional building models based on complex heat transfer equations to develop simpler structures that hold physical interpretation. Second, we investigate statistical methods to efficiently integrate into our models phenomena that are impossible to incorporate using heat transfer principles.

We see that the proposed methods are flexible and enhance current building models, so they work with limited resources. Moreover, the methods discussed can be used to tailor specific models to describe concrete processes in occupied buildings. Thus, the outcomes of this thesis are useful for researchers and practitioners that want to study building energy use on a large scale. In particular, we discuss different applications such as identifying retrofitting opportunities, quantifying building energy flexibility and urban planning.

Please email the summary to the PhD secretary at the department