



# THERMAL COMFORT OPTIMIZATION

## Assignment

The goal of this project is to simulate the air circulation and temperature profile in a room over time for different setups of isolation, ventilation and temperature control (heating and cooling). This is done by making a CFD simulation. Because running CFD simulations is expensive, a reduced order model (ROM) can be made based on the CFD simulation to quickly investigate new setups. The idea is to find an optimal setup which keeps the room in a specified temperature range, while also being energy efficient. Because of the time-dependent outdoor temperature, one needs to apply uncertainty quantification techniques in the optimization. A suitable way to do so is to build a parametric representation of the data and use clustering to select suitable 24h-scenarios.

## Activities

The project starts by making a 2D CFD simulation which is extended to 3D. The options for isolation, ventilation and temperature control are modelled next, followed by the computation of temperature scenarios. Then, one can combine the simulation with the scenarios into a reduced model, which is used for optimization.

## Internship overview

- Master Student
- Graduation
- Mathware
- Location: Eindhoven

## Technologies

- Computational Fluid Dynamics
- Model Order Reduction
- Uncertainty Quantification



## Context

For historical reasons, buildings in the Netherlands have been built to capture as much heat as possible due to cold winters and mild summers. With climate change leading to longer, hotter summers with less cooling during the nights, this can lead to overheated rooms. Isolation is a solution which helps to keep houses warm during winters and cold during summers. However, too much isolation can have an unwanted effect on the air quality inside when the ventilation is insufficient, or improperly adjusted for temperature differences. A reduced air quality can lead to health issues and needs to be avoided.



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- A comfortable and personal work environment
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- Great career opportunities
- Contributing to a safe, healthy and sustainable society

## Get in touch!

Would you like to know more about this student assignment?

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