# Using machine learning methods to save energy in smart homes

**Bc. Adam Grünwald**

Excel@FIT 2024

BRNO UNIVERSITY OF TECHNOLOGY — FACULTY OF INFORMATION TECHNOLOGY

## INTRODUCTION

- Rising energy costs and environmental concerns require innovative approaches to residential energy management.
- The solution based on predicting consumption using the LSTM model trained on data from the smart home together with an algorithm that optimizes hot water heating results in savings of 27% while maintaining comfort levels.

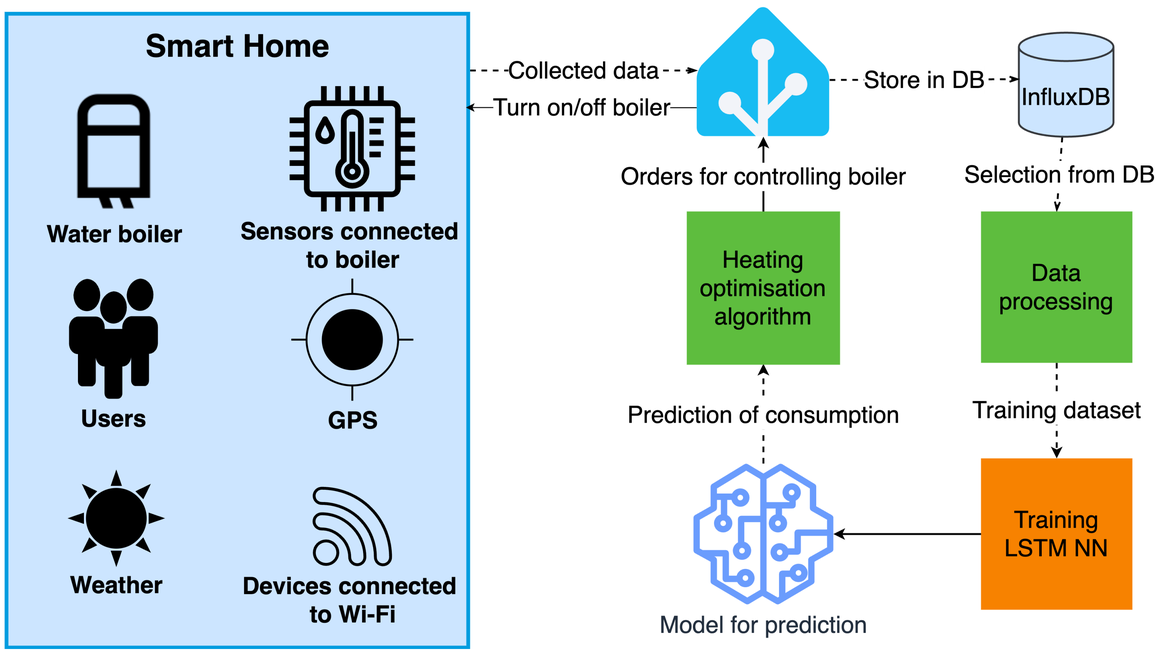


**Figure 1**: Schematic of the smart heating system.

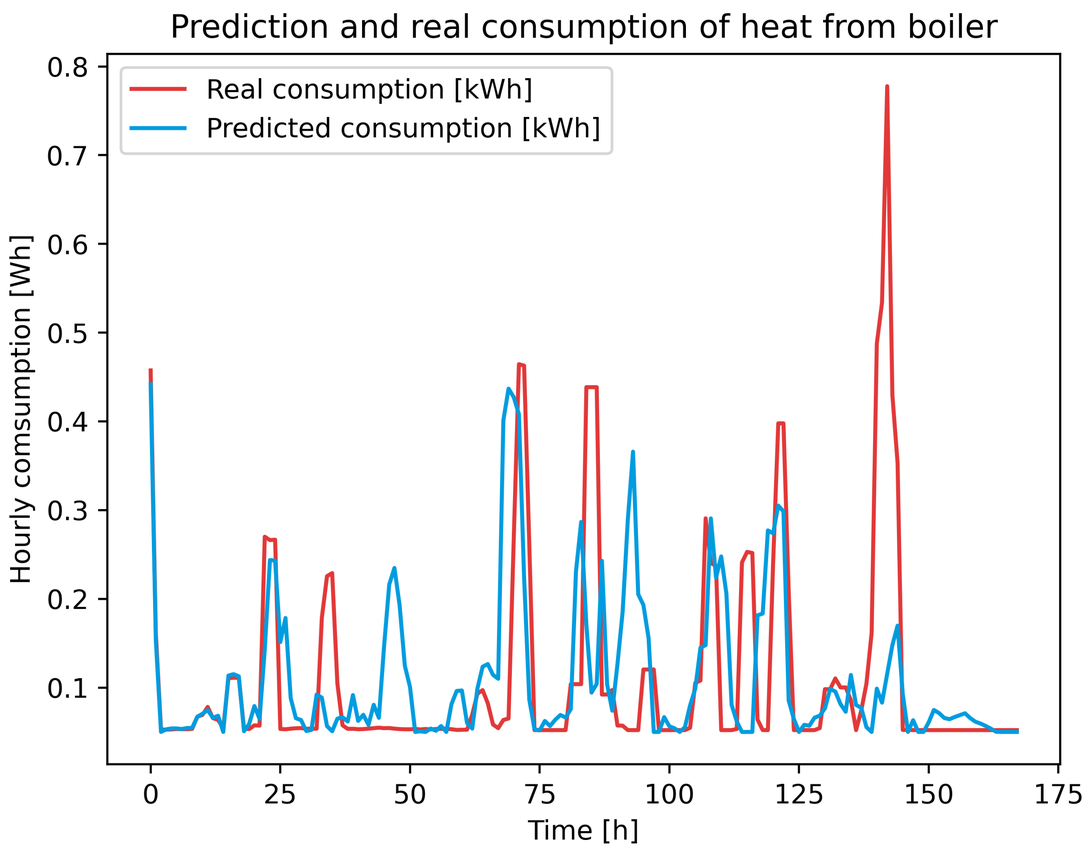


**Chart 1**: The predicted and actual consumption of heat from the boiler with a deviation of 0.17 RMSE.

## PREDICTION

LSTM network was trained on six months of data from two smart homes.
The predictions (**Chart 1**) are then used in the algorithm for smart boiler heating.

## ALGORITHM

The water in a boiler is heated by the anticipated amount of energy just before consumption, resulting in an increasing ratio between the consumed and added heat (**Chart 2**).

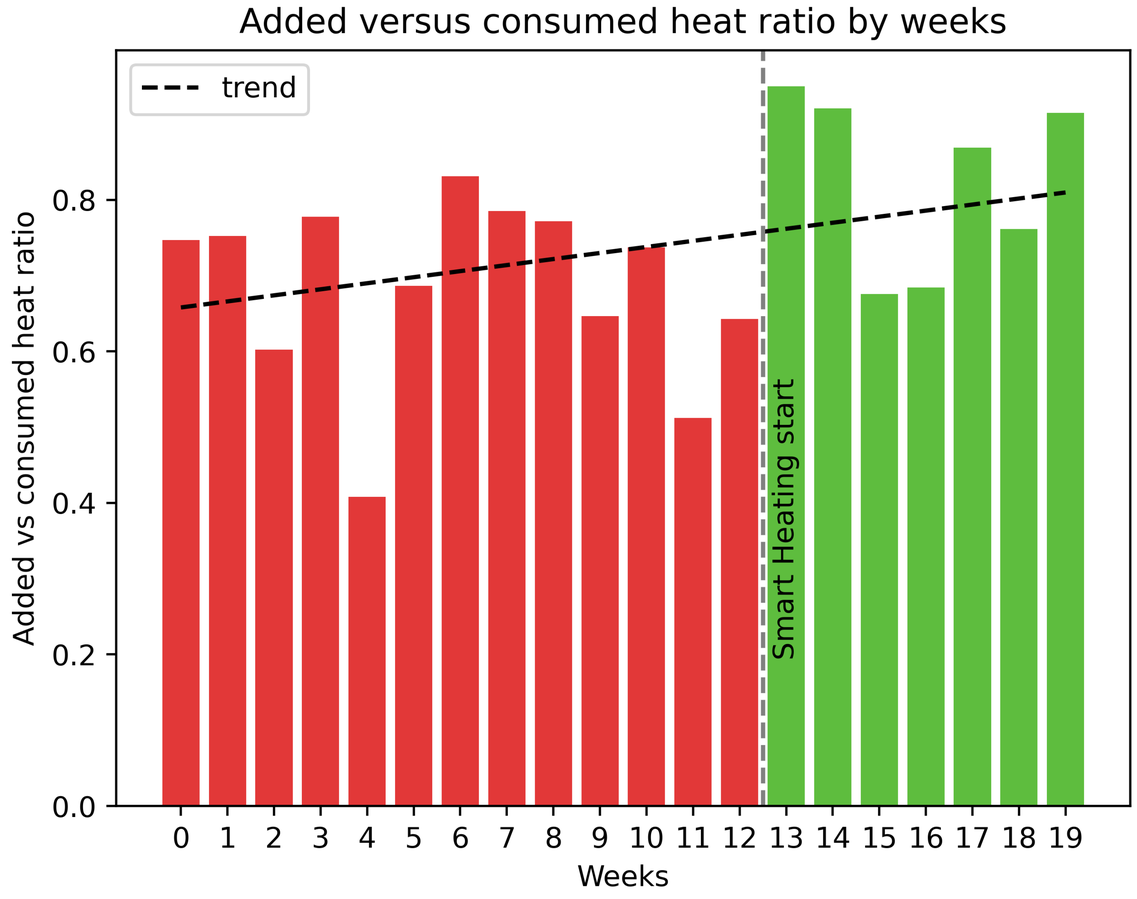


**Chart 2**: Increasing trend of the ratio between the heat consumed and supplied to the boiler.

## RESULTS

Due to selective heating, electricity consumption decreased by 27% (**Chart 3**) in the first household and by 20% in the second while maintaining comfort levels.

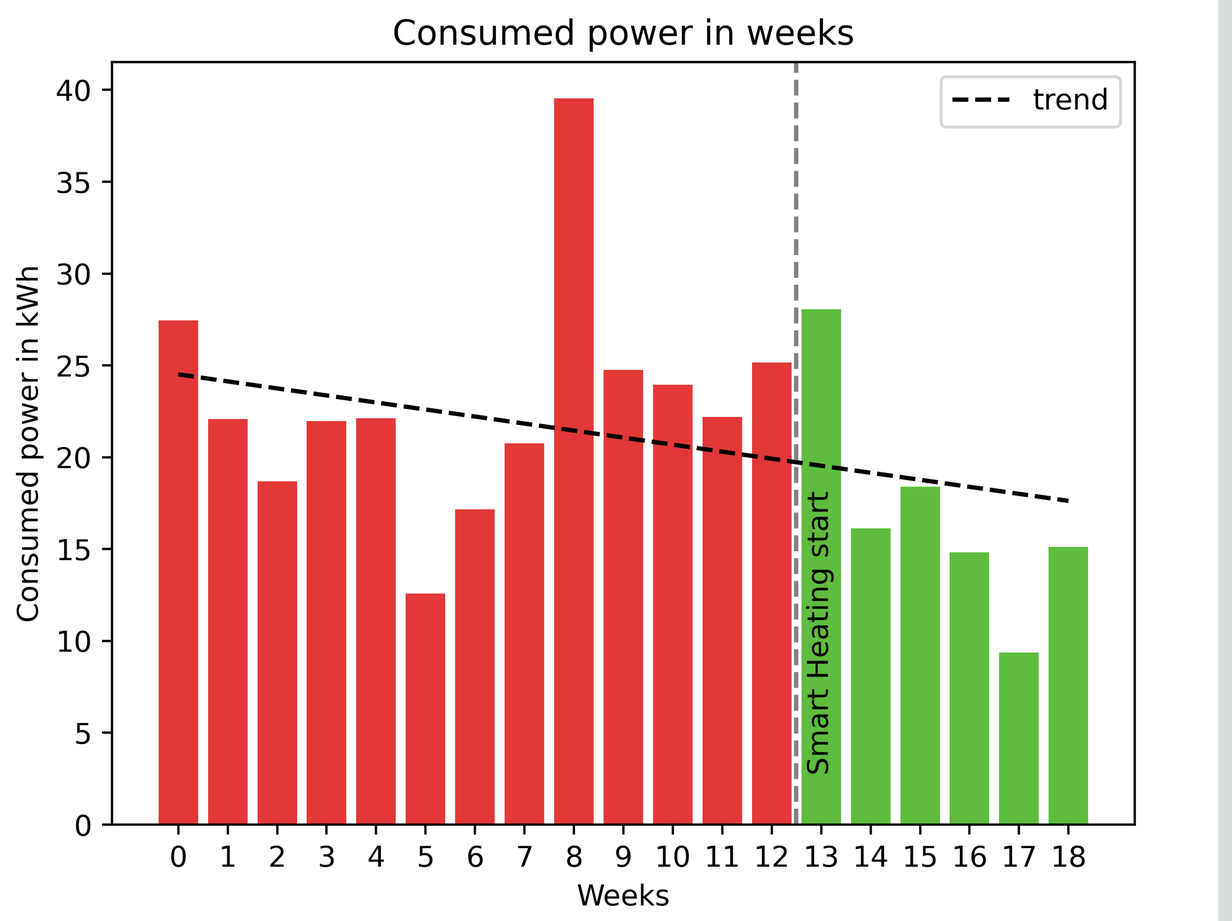


**Chart 3**: Weekly electricity consumption decreases over 27% after the introduction of smart heating in the first household.