



# Smart Cooling of Residential Building Spaces with Impinging Jets

Bakhtiyar Kalzhan, 2nd year MAE MSc student

## INTRODUCTION

In the era of global energy crisis and global warming, it is necessary to find energy efficient solutions. This work is an effort to see if impinging jets can be used as an energy-efficient substitute for space cooling, which will also provide thermal comfort for the occupants.

## AIM

To investigate if it possible to achieve thermal comfort and less energy consumption by using impinging jets for focused cooling of an occupant inside a room.

## OBJECTIVES

- Compare energy consumption between traditional cooling and impinging jet cooling through simulations
- Evaluate thermal comfort

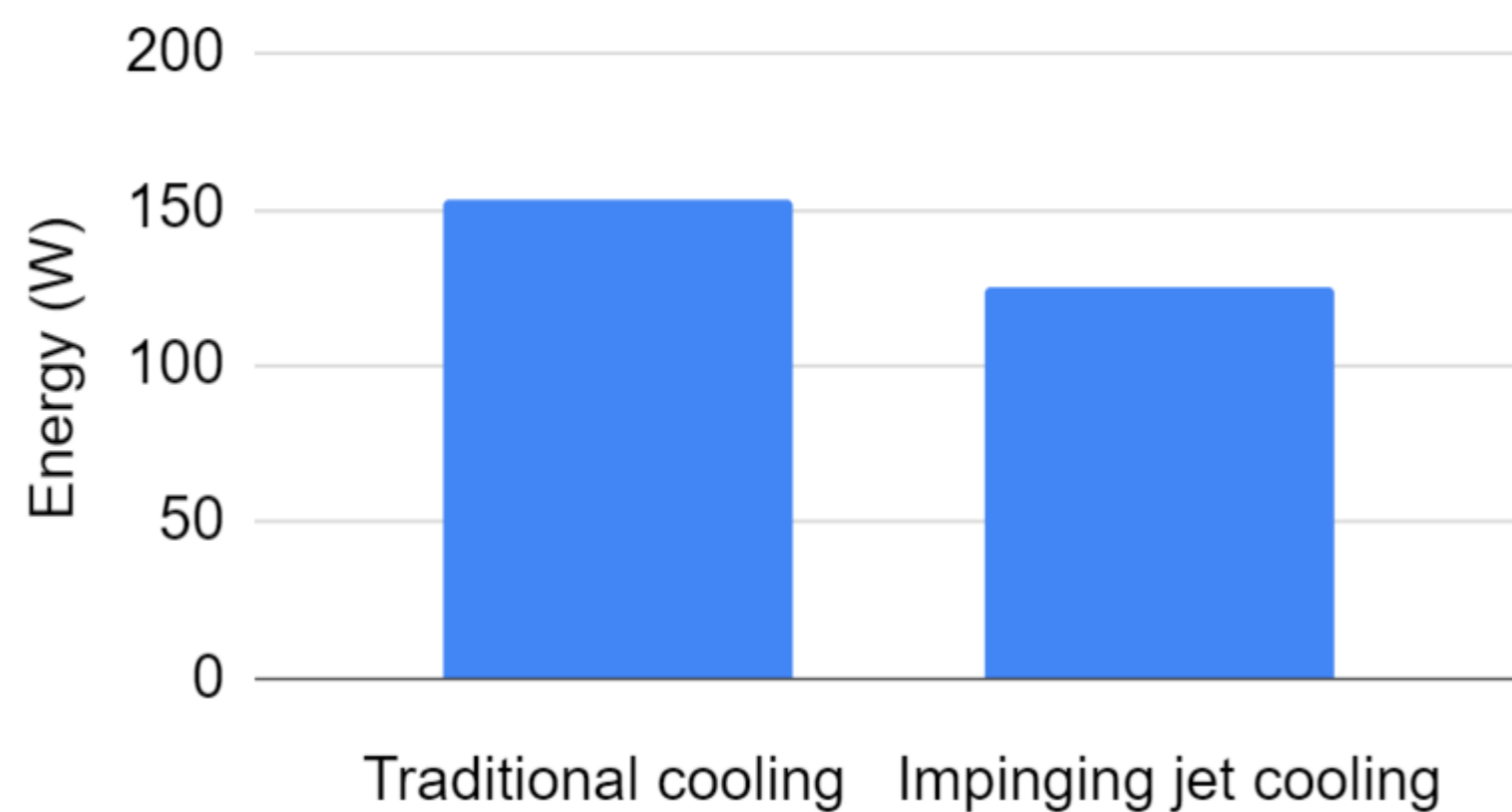
## METHODOLOGY

Experimental data on a room with dimensions of 2.95 m (length) x 2.95 m (width) x 2.4 m (height) was used as a basis for numerical investigations. The room had a sitting person in the room center. The geometry of the person was simplified to reduce the computational cost.

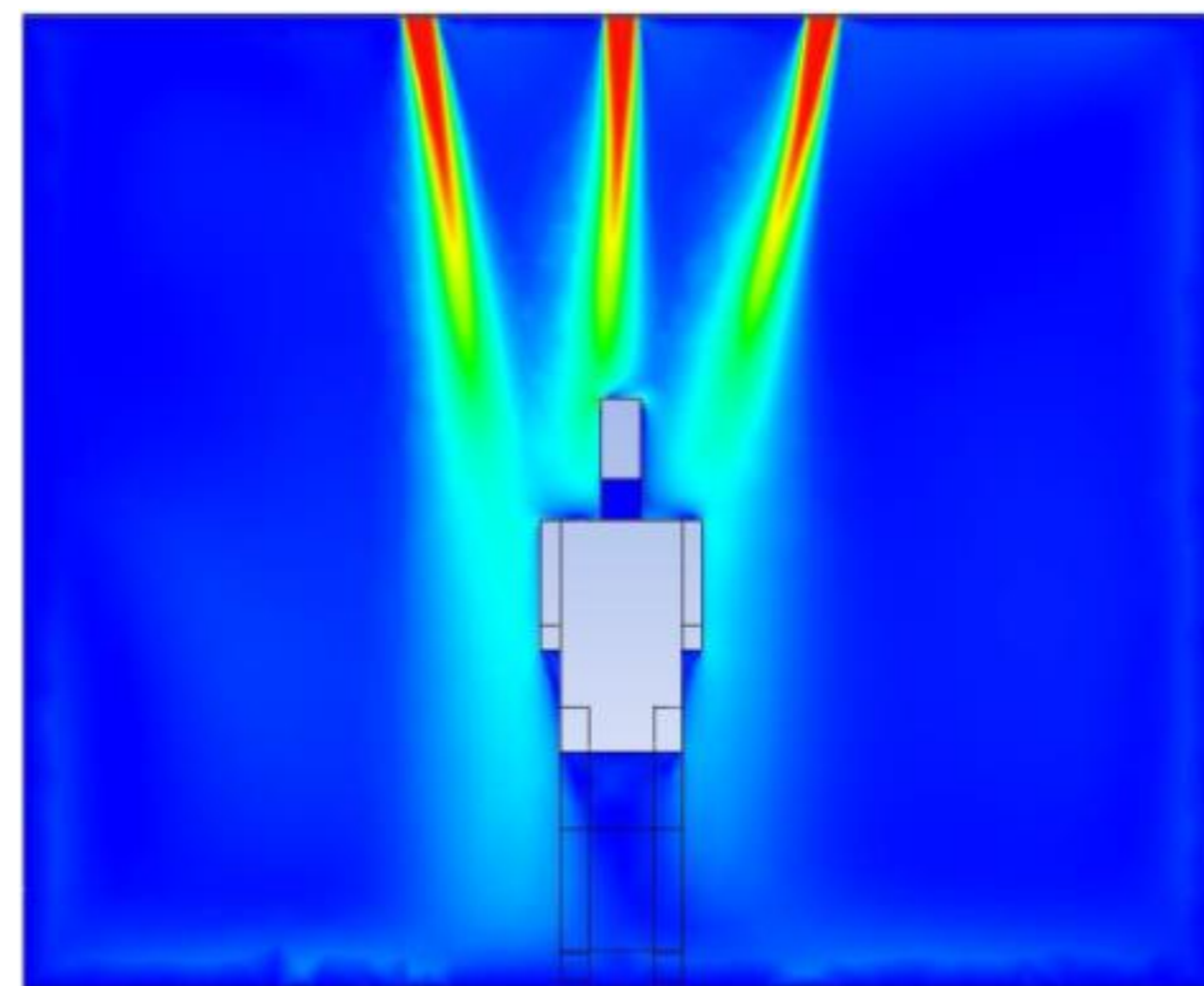


Mesh verification and model validation were the first steps in preparing the computational domain. Ansys CFX module was used for these purposes. The validated model was used for further simulations to find out the flow and jets characteristics. The thermal comfort was assessed by the CBE comfort tool based on the ASHRAE 55 standard.

## RESULTS



Energy consumption comparison between traditional and jet cooling revealed that the use of impinging jets is able to save 18.3% of energy



Three impinging jets with an inlet velocity of 2 m/s and the diameter of 8 cm were enough to achieve comfort regardless of the directed angle.

## CONCLUSIONS & RECOMMENDATIONS

- Impinging jets are able to provide thermal comfort
- Impinging jets can save 18.3% of energy compared to traditional cooling
- An extensive parametric optimization might be the basis for future work

Luis R. Rojas-Solórzano, Associate Professor  
luis.rojas@nu.edu.kz