Understanding the flaming behavior of cladding products through numerical simulations

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Research Question: How to systematically evaluate the potential fire risks of current non-compliant combustible cladding associated in recent high-profile building fires around the world?

BACKGROUND

Recent high-profile building fires involving combustible external cladding in Australia as well as Dubai, China and the United Kingdom have created a heightened awareness by the public, government and commercial identities to act on the risks associated with the non-compliance building structures.

With the urgent need to resolve the present fire risks of existing building products and develop economically viable solutions, it is paramount that an fire assessment tool be developed to evaluate underlying risks for existing and ongoing development of non-compliant materials on buildings. A deeper understanding of the associated risks is not only beneficial to the building occupants, but also to emergency responders.

Above: Image of the Grenfell Tower Fire

OBJECTIVE

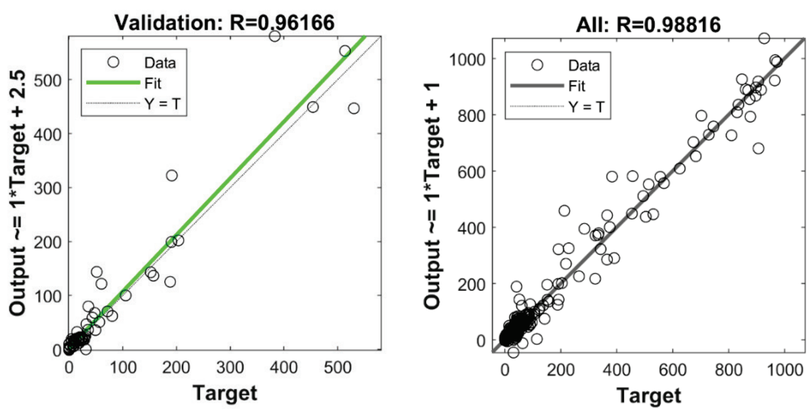
In this project, **an artificial neural network (ANN) based prediction model** using the fire database was developed to quantitatively evaluate fire risks for combustible cladding materials on buildings and provide an indicative grading system to demonstrate the hazardous levels.

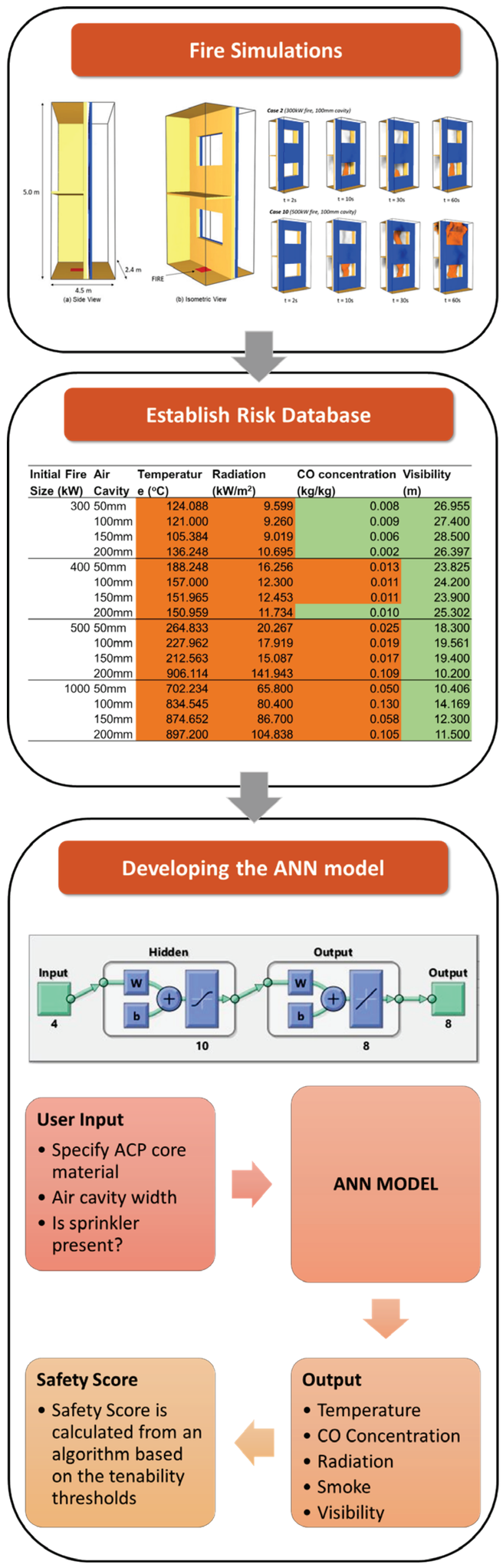
MAJOR OUTCOMES

- **Framework to Extract Essential Thermal Decomposition Properties -** A robust systematic approach has been developed to extract the pyrolysis model kinetics from Thermogravimetric analysis (TGA) and cone calorimetry test.

- **Establish risk database for different cladding configuration -** based on tenability limits in the Code of Practice for Fire Safety in Buildings (AS 4391-1999).

- **Artificial neural network (ANN) model tool for fire safety assessment -** The ANN was successfully trained with an overall R (fitness) of 0.988 with most of the prediction errors within 1% RMS error.





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