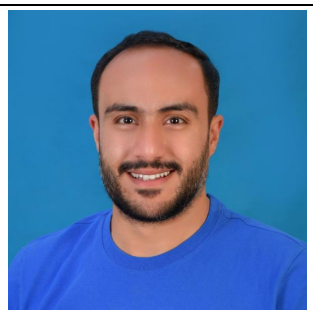
#	**Michael Magdy Wahba** MSc Mechatronics Engineering – GUC	
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Presentation title:	**Development of a Machine Learning Model to predict CFD Simulations**	

Buildings account for up to 40 % of global energy consumption and are a major source of greenhouse-gas emissions. While Computational Fluid Dynamics (CFD) provides the spatially resolved accuracy needed for detailed thermal and airflow analyses, its high computational cost and expertise requirements limit its use in large-scale parametric studies. Zero-dimensional (0D) models offer rapid, cycle-average predictions but cannot capture local phenomena critical to room-scale comfort and energy-use assessments.

In this work, we explore a hybrid approach that leverages machine-learning (ML) surrogates to emulate room-scale CFD simulations and thereby reduce the number of full CFD runs required. Experiments were conducted in a controlled laboratory room at an international university branch, generating CFD data under varying boundary conditions. A suite of ML algorithms was trained on datasets of increasing size to quantify the trade-off between training-set computational expense and surrogate-model accuracy.

Results demonstrate that, depending on model type and training-set size, ML surrogates can predict key thermal and airflow metrics with up to 98 % accuracy, while cutting total simulation time by orders of magnitude compared to pure CFD workflows.

This study shows that carefully calibrated ML models can serve as efficient proxies for CFD in building-energy research, enabling rapid exploration of design and control strategies with minimal loss of fidelity.

Short CV:

A Passionate researcher with over 11 years of experience in both academic and industrial fields. Certified as an Advanced Robotics Engineer from KUKA UK (Wolverhampton) and oversaw the mechanical project coordination of one of the biggest combined cycles worldwide (Fast-Track Project) at the New Administrative Capital's Power Plant in Egypt with 4.8 GW.

Won *Innoventures Competition* for startups funding as the Founder of Track Tech company for industrial solutions. Currently working as a Lecturer in Mechanical Engineering at Coventry University international branch in Egypt, and a PhD Candidate in environmental Engineering and sustainability at NOVA University Lisbon.

CV:

Education:

BSc Mechatronics Engineering – The German University in Cairo, Egypt (2008 – 2013)

MSc Mechatronics Engineering – The German University in Cairo, Egypt (2014 – 2016)

PhD Environmental Engineering Technology – NOVA University Lisbon, Portugal (2022 – Present)

Experience:

Mechatronics Engineer – Egyptian General Automotive (2012)

Assistant Lecturer – The German University in Cairo (2014 – 2016)

Robotics Engineer – EgyRobo for Robotic Systems KUKA (2015 – 2016)

Project Coordinator – ORASCOM Construction (2016 – 2017)

Founder and CEO – Track Tech (2017 – 2020)

Assistant Lecturer – Coventry University Branch in Egypt (2020 – 2024)

Lecturer – Coventry University Branch in Egypt (2024 – Present)