Title: Next-Generation Aircraft: Design and Optimization

Bio: Mohsen is a Post-Doctoral Fellow at Polytechnique Montreal, working on Finite Element Neural Network Method (FENNM) as a base model to create digital twins, in collaboration with Hydro-Quebec and Maya HTT. He graduated from Concordia University with a PhD in Mechanical Engineering. He has over seven years of experience developing high-order unstructured solvers and shape optimization techniques. Moreover, he has industrial experience as an aerodynamic and aeroacoustic specialist to design an electric Vertical Take-Off and Landing (eVTOL) vehicle at Limosa Inc.

Abstract: Reynolds-Averaged Navier-Stokes (RANS) models are extensively used in engineering simulations but often fail to accurately capture the complex, unsteady, and three-dimensional turbulent flows characteristic of advanced aerospace applications. My research focuses on the development of high-order Computational Fluid Dynamics (CFD) solvers utilizing scale-resolving techniques, such as Large Eddy Simulation (LES) and Direct Numerical Simulation (DNS), to enhance predictive accuracy for industrially relevant fluid dynamics problems.

This presentation will address the importance of high-order numerical methods and their applications in the aviation industry. Recent advancements in these methods will be discussed, alongside their role in aircraft shape optimization. Particular attention will be given to leveraging state-of-the-art techniques to enhance the performance of conventional tube-and-wing configurations and to design innovative aerodynamic topologies.