Ahmed Bakkar, PhD

Guelph, ON, Canada

+1 (514) 653 09 30
aebakkar@gmail.com

Profile

- Comprehensive knowledge of the Finite-Element Method (FEM) and multi-phase flow modelling.
- Experienced in applying CFD to complex engineering problems.
- Knowledgeable in the areas of Fluid Dynamics, Heat Transfer and Turbomachinery.

Current Position

CFD Scientist Feb 2019
RWDI -
Guelph, ON, Canada

- Conduct various numerical CFD simulations, in collaboration with other engineers and project managers, for specialized projects:
  - Assess the thermal impacts of the floating solar photovoltaic (PV) systems to be installed on Singapore's Tengeh and Upper Peirce reservoirs – Conjugate Heat Transfer
  - Evaluate sand mitigation strategies to be deployed along the Etihad rail network (UAE) – Surface Shear
  - Assess Covid-19 related risks for dental clinics – Contaminant dispersion
  - Conduct urban wind simulations for high-rise buildings – LES/IDDES simulations
  - Conduct thermal comfort studies for various iconic projects – RANS simulations
  - Simulate fire scenarios to determine egress times – LES simulations
- Conduct R&D aimed at improving the existing tool repository:
  - Applied the canopy model for modelling porous media (trees and fences) within the openFOAM framework
  - Wrote a Python code for estimating droplet trajectory analytically while accounting for evaporation
- Consult with clients on technical aspects of their projects, providing design guidance and recommendations.

Professional Experience

Postdoctoral Research Fellow Jan 2018
CFD Lab, McGill University Jan 2019
Montréal, QC, Canada

- Assisted in developing a 2-year research plan in collaboration with partners (Bell Helicopter, NSERC).
- Estimated research timelines and established work plans to ensure delivery deadlines are met.
- Assisted in managing research budget (~600K CAD).
- Co-supervise graduate students (Ph.D. and M.Sc.) in the following research areas: Fluid-Structure Interaction (FSI) using XFEM, Smoothed Particle Hydrodynamics (SPH) for droplets, gappy Reduced-Order Modelling (ROM) for data reconstruction, and Ice-Accretion and Shedding Tools for helicopters.

Mechanical Design Engineer Nov 2008
WS Atkins Mar 2009
Sharjah, UAE

- Investigated using natural ventilation instead of conventional AC systems for an eco-lodge (LEED).
- Reviewed and adjusted thermal load calculations for carpark smoke clearance system.
- Performed detailed thermal load calculations for the various projects.
- Coordinated design issues with the various in-house departmental teams.

Junior Mechanical Design Engineer Sep 2007
Dar Al-Handasah Oct 2008
Giza, Egypt

- Participated in meetings with client and in-house teams to deliberate over designs issues.
- Performed detailed hospital room pressurization in accordance with building standards.
- Designed under-floor HVAC system for international airport control tower.
- Conducted thermal load calculations and system designs for various projects.

Education

Doctor of Philosophy (**Ph.D.)** in **Mechanical Engineering** Sep 2011
McGill University Feb 2018
Montréal, QC, Canada

- Thesis: "A Finite-Element Level-Set Eulerian Model of Supercooled Large Droplet Dynamics".
- Supervisors: Prof. Wagdi Habashi, and Dr. Marco Fossati.
- Introduced a novel approach improving the conservation characteristics of the Level-Set method.
- Developed a general multi-phase numerical framework in Fortran using MPI.
- Conducted a preliminary parametric study into supercooled large droplet impingement.
- Graduate courses: Advanced Fluid Mechanics, Applied Mathematics 1, Computational Aerodynamics, Finite-Element Methods in CFD, Turbomachinery and Propulsion.
- Teaching Assistant: Thermodynamics I, Mechanical Laboratories I, Turbomachinery and Propulsion and Finite-Element methods in CFD.

Master of Science (**M.Sc.)** in **Mechanical Engineering** Jun 2009
Cairo University Aug 2011
Giza, Egypt

- Thesis: "Humidification-Dehumidification of Saline Water Using Solar Chimney".
- Supervisor: Prof. Abdalla Hanafi.
- Developed a numerical model for a novel desalination plant using the Solar Chimney in MATLAB.
- Conducted a feasibility study for the proposed plant.
- Graduate courses: Theory of fine Measurements, Computational Methods in Energy, Advanced Fluid Mechanics, Turbulent Flow, Heat Convection.
- Teaching Assistant: Powerplant Systems Design and Fundamentals of Heat Transfer.

Bachelor of Science (**B.Sc., Honors)** in **Mechanical Engineering** Sep 2002
Cairo University Jun 2007
Giza, Egypt

Skills

Coding: FORTRAN, C++, Python, MPI, MATLAB.
Libraries: PETSc, Metis, MUMPS, Library of Iterative Solvers (Lis).
Software: Star-CCM+, openFOAM, FDS, ICEM, Fluent, AutoCAD.

Awards

McGill Engineering International Tuition Award Sep 2011
McGill University Apr 2014
"Funding to attract high calibre international doctoral students to the Faculty of Engineering's PhD programs"- 8K CAD per year for a maximum of 3 years.

Adel Barakat Graduation Project Award Jan 2007
ASHRAE, Cairo Chapter
Awarded to the best graduation project in the area of Air-Conditioning.