

Ahmed Kandil

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Portfolio | LinkedIn | GitHub | ORCID

PhD Applicant | Scientific Computing | Numerical Methods | CFD | HPC

Technical Expertise

Programming Languages

C++, Python, C, MATLAB, Rust and Java macros

Parallel and GPU Computing

MPI, OpenMP, CUDA, SLURM and Linux/HPC workflows

Simulation Software

STAR-CCM+, ANSYS Fluent, OpenFOAM, FDS and ANSYS Mechanical

Scientific Software Workflow

Git/GitHub, Cargo, Make, Linux command line and reproducible scripting

Data Analysis and Computer Vision

NumPy, Pandas, OpenCV, automated post-processing and quantitative comparison

Relevant Coursework

Master's: High Performance

Computing; Parallel Algorithms; Numerical Methods; Computational Fluid Mechanics; Computer Simulation; OpenFOAM Modelling; Data Analysis; Mathematical Machine Learning; Bayesian Learning

Bachelor's: Numerical Analysis; Fluid

Mechanics; Thermodynamics; Heat and Mass Transfer; Algorithms and Data Structures; Operating Systems and Microcontrollers; Image Processing; Computer Vision

Languages

English: C1; IELTS Academic 7.5 (2023)

German: B2

Arabic: native

Certifications

SOLIDWORKS Certified Expert (CSWE)

Interests

Football, swimming, motorsport and gardening

Profile

M.Sc. candidate in **Computer Simulation in Science** working at the intersection of CFD, scientific software and simulation validation. My interest in developing CFD solvers began during my bachelors and led me to pursue this Master's degree to deepen my knowledge of numerical methods, scientific computing and HPC.

My current research at **Fraunhofer FFB** and the **University of Wuppertal** focuses on humidity transport and data-driven validation, building on industrial CFD experience at **Vorwerk** and **GRIND for Engineering Solutions** and engineering leadership in Formula Student. I enjoy moving between the physics, numerical formulation and implementation of a problem – from defining boundary conditions and validating models to writing reproducible solver and post-processing workflows.

Education

M.Sc. Computer Simulation in Science

2023–present; expected 01/2027

Bergische Universität Wuppertal | Germany

72 ECTS completed; Master's thesis in progress.

Thesis: Numerical Optimisation of Air-Curtain Sealing for Humidity-Controlled Mini-Environments in Battery Cell Production. Supervisors: Univ.-Prof. Dr.-Ing. Fabian Brännström and Hasibe Turhan, Fraunhofer FFB.

Bachelor's Degree in Mechatronics Engineering

2018–2023

Mansoura University, Faculty of Engineering | Egypt

CGPA: 3.21/4.00; overall grade B, *Very Good* (85.11%); 180 credit hours. **Bachelor thesis:**

A+.

Thesis: Design of an Efficient Micro-Finned Cooling System for Thermal Management of Microprocessors. Supervisors: Dr.-Ing. Mohamed Sameh, Ing. Mohamed Samir Fouda and Ing. Omar Wahba.

Research and Professional Experience

Research Assistant - Simulation

06/2026–present

Fraunhofer Research Institution for Battery Cell Production FFB | Münster, Germany

- Develop the CFD methodology for air-curtain sealing of low-humidity mini-environments in battery cell production, modelling airflow together with heat and water-vapour transport.
- Define the baseline opening case with internal circulation active and the air curtain inactive, then formulate boundary conditions and sensitivity cases from measured operating data.
- Establish a validation workflow using humidity/dew-point, temperature and flow measurements to quantify moisture ingress and assess sealing performance.

Research Assistant - Simulation Validation

01/2026–present

University of Wuppertal | Wuppertal, Germany

- Validate crowd-dynamics simulations against experimental video data involving approximately 6000 participants.
- Build reproducible Python/OpenCV pipelines for automated counting, data-quality checks and comparison with manual reference data.
- Evaluate model outputs and derive 30 s and 60 s flow-rate metrics for quantitative simulation assessment.

Working Student - CFD Engineer

03/2024–11/2025

Vorwerk | Wuppertal, Germany

- Developed steady and transient STAR-CCM+ models for turbulent internal flows, heat and mass transfer, particle transport and phase-change processes.
- Automated mesh reports, plots and simulation reports with Java macros, improving workflow efficiency by approximately 20–40%.
- Interpreted simulation results and communicated engineering conclusions for design and development decisions.

CFD Engineer

06/2023–10/2023

GRIND for Engineering Solutions | Mansoura, Egypt

- Delivered three-dimensional ANSYS Fluent studies for industrial airflow, HVAC and thermal-management projects, including geometry, meshing, physics setup and boundary conditions.
- Performed mesh-refinement and parametric studies to compare design alternatives and improve flow and thermal performance.
- Prepared client-facing technical reports and translated CFD findings into practical recommendations for design and manufacturing teams.

Selected Scientific Computing Projects

Rust-FVM-Heat-Conduction

Rust

- Implemented a dependency-free two-dimensional steady heat-conduction solver using the cell-centred finite-volume method, Gauss–Seidel iteration and fixed-temperature boundary conditions.
- Monitored convergence and exported reproducible temperature-field, residual and case-summary outputs to CSV and SVG files.

Lid-Driven Cavity Solver Comparison

C++, C, MATLAB, Python, MPI, OpenMP, CUDA

- Built a cross-language benchmark for the two-dimensional incompressible lid-driven cavity using serial, OpenMP, MPI, hybrid MPI/OpenMP and prototype CUDA implementations.
- Implemented a SIMPLE-style pressure-correction workflow and validated centreline velocities against the Ghia et al. benchmark.
- Ran structured parameter studies over grid size, Reynolds number, convection scheme and pressure solver on a university SLURM cluster, comparing runtime, convergence and solution quality.

D2Q9 Lattice Boltzmann Poiseuille Solver

C++

- Implemented a D2Q9 BGK solver with body-force driving, bounce-back walls and periodic streamwise treatment, then validated the numerical velocity profile against the analytical Poiseuille solution.
- Added automated post-processing and a GitHub Actions workflow for build-and-run validation.

Distributed TSP Solver

C, MPI

- Developed a distributed-memory optimisation solver using MPI, Parallel Tempering and Metropolis–Hastings logic; analysed communication cost, speedup and code efficiency on a university Linux cluster.

JuPedSim Evacuation Analysis

Python, simulation validation

- Analysed pedestrian-flow and evacuation simulations, post-processed trajectories and compared model behaviour with experimental observations.

Formula Student, Motorsport and Judging Experience

Design Judge - Formula Student Switzerland

07/2026

Formula Student Switzerland | Switzerland

Engineering Design Event: evaluation of student vehicle design, technical reasoning and team communication.

Cost and Manufacturing Judge - Formula Student Poland

08/2025

Formula Student Poland | Poland

Assessed cost, manufacturing feasibility and technical communication and provided feedback to participating teams.

Design Judge - Formula Student Switzerland

07/2025

Formula Student Switzerland | Switzerland

Evaluated student vehicle design and engineering decisions and provided structured technical feedback during the Engineering Design Event.

Aerodynamics Member

11/2023–06/2024

Green Lion Racing, University of Wuppertal | Wuppertal, Germany

Supported aerodynamic development and CFD-related technical work during the team's vehicle-development activities.

Head of Aerodynamics

09/2022–06/2023

Mansoura Motorsport | Mansoura, Egypt

- Led a 7-member aerodynamics team and managed CFD-based development, design reviews and integration with the complete vehicle.
- Used full-car simulations and aerodynamic maps to guide component development and support vehicle-performance decisions.

Chief Engineer - Formula Student UK

05/2022–06/2023

Mansoura Motorsport | Mansoura, Egypt

- Coordinated vehicle development and integration across a multidisciplinary team of approximately 60 members while holding concurrent technical and leadership responsibilities.
- Connected aerodynamic, chassis, manufacturing and vehicle-dynamics work; combined changes produced a simulation-estimated lap-time reduction of approximately 1.0 s.
- Contributed to mass-reduction work that lowered chassis mass by approximately 5 kg and total vehicle mass by approximately 30 kg.

Manufacturing and Sustainability Member

09/2021–08/2022

Mansoura Motorsport | Mansoura, Egypt

Supported manufacturing planning, cost awareness and sustainability considerations for the vehicle-development programme.

Chief Engineer - EVER Rally Vehicle

11/2020–03/2022

Mansoura Motorsport | Mansoura, Egypt

Coordinated technical development and vehicle integration for the national EVER competition project.

Aerodynamics Member

08/2020–07/2022

Mansoura Motorsport | Mansoura, Egypt

Developed and evaluated vehicle-body, full-car CFD and front-wing improvements associated with a simulation-estimated lap-time reduction of approximately 0.2 s.

Referees

Hasibe Turhan — Research Associate, Fraunhofer Research Institution for Battery Cell Production FFB

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Dr.-Ing. Jette Degenhardt — Postdoctoral Researcher, Forschungszentrum Jülich

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Pablo Mosquera Michaelsen — Acting Principal Engineer, Fluid Mechanics and Heat Transfer, Vorwerk Group

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