

Oussama Romdhani

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Background

Specialist in computational fluid dynamics (DNS, LES, and RANS), climate modeling, and data analysis. Currently, implementing high performance, large-scale parallel computing techniques for geophysical flows' modeling and natural hazard risk assessment. I received a M.Sc. in Civil and Environmental Engineering with experience in Physics-Based and Data-Driven methods for design, implementing, and analysis of multi-physics systems. Having a multidisciplinary background in Engineering with emphasis on Applied Mathematics and Data Science techniques.

Professional Experience

Research Assistant in Civil and Environmental Engineering

University of Houston, Houston, TX, US

- Studying and characterizing deep convection activity in the Greater Houston area using ideal and real WRF-ARW simulations.
 - Investigating the interacting effects of turbulence closure, horizontal mixing length, and microphysics parametrization on convective cloud organization.
 - Examining mechanisms of self-aggregation and roles of cold pools and sea-breeze in modulating convective cloud organization.
 - Evaluating the performance of WRF model in forecasting deep convection across the gray zone.
- Jan. 2025
to
present

Research Assistant in Civil and Environmental Engineering

Teacher Assistant of Fluid Dynamics and Hydraulic Engineering Course

Teacher Assistant of Environmental Engineering Course

University of Houston, Houston, TX, US

- Conducted high performance computational fluid dynamics simulations (Weather Research and Forecasting WRF and WRF-LES) for urban and coastal applications (Fortran, OpenMPI, Unix).
 - Investigated the interacting effects of aerodynamic and thermal roughness lengths, momentum exchange coefficient, and horizontal mixing length on forecast accuracy and hurricane dynamics.
 - Designed, integrated, and optimized in-house parallelized modules for Reynolds stresses computation in WRF model.
 - Led the development and implementation of advanced algorithms for processing and analyzing airborne dropsonde data and doppler radar data (NOAA). A rigorous quality assessment is conducted to ensure the integrity and reliability of the data for downstream analysis (Python).
 - Studied the impact of ocean warming under moderate emission scenario on hurricane track trends and environmental flow patterns (Fortran, OpenMPI, Unix).
 - Investigated the impact of PBL parametrization on hurricane induced flood forecasts using coupled Hydro-Meteorological models, leading to 16% and 34% improvements in streamflow bias and correlation.
 - Assessment of possible sources of high pollution concentrations using satellite images and hybrid single-integrated trajectory (HYSPLIT) model.
- Jan. 2021
to
Dec. 2024

Design Engineer (Project Losange: 1.48 billion \$)

Spec Technologies, Tunis, Tunisia

- Performed detailed OSP designs specifically adhering to provided design standards and conducted finite element analysis of network's structural components.
 - Created high level preliminary route design and facility specifications to match field request instructions (AutoCAD, ArcGIS).
 - Implemented project control measures, including cost tracking, change management, and performance evaluation, to optimize project outcomes.
 - Implemented data quality checks and transformations to ensure data accuracy and consistency (SQL).
 - Collaborated with cross-functional teams to understand data requirements and optimize data processing workflows (Python).
- Sep. 2018
to
Dec. 2020

- Formulated partnerships and worked closely with stakeholders, management, and employees to improve workflows.
- Researched, evaluated, and implemented algorithms for supplier collaboration, leading to reduced costs and increased revenues.
- Envisioned, developed, and implemented supply chain solutions, resulting in a decrease in days under construction for new projects.

Research Assistant (Landfill Borj Chakir: 4 million \$)

National Waste management Agency “ANGED”, Tunis, Tunisia

- Conducted in-situ sampling and analysis of surface water and air quality assessment near the landfill.
- Conducted research and analysis to improve the accuracy and efficiency of numerical methods for simulating unsaturated flow in soils.
- Utilized advanced CFD techniques to capture relevant flow and transport phenomena, such as multiphase flow or non-equilibrium conditions.
- Analyzed and interpreted simulation results to provide insights into infiltration dynamics, groundwater recharge, and pollutant transport. Jan. 2018
- Collaborate with a diverse team of professionals, including environmental scientists, geologists, surveyors, and regulatory officials to address project-related issues, and ensure project goals are achieved. to Jun. 2018
- Performed quasi-two-dimensional hydrologic analysis of water movement in landfills (HELP model).

Research Assistant

Center for Environmental and Sustainability Research CENSE, University of Lisbon, Portugal

- Worked closely with electricity providers and environmental agencies to conduct in-depth energy consumption analysis during extreme weather events (TIMES model). Oct. 2017
- Developed data-driven model to predict real time variations of energy production costs in terms of climate conditions in Portugal (Python). to Jan. 2018
- Investigated carbon emissions and environmental footprint driven by supplemental electricity production in response to increasing energy demand.

Civil and Structural Engineer (bridge design, part of rehabilitation project of RR85 road: 3.3 million \$)

Bureau des Etudes Techniques d’Assistance et de Pilotage “BETA Pi”, Tunis, Tunisia

- Conduct a comprehensive analysis of the watershed and perform model-based estimation of water flow beneath the structure (Global Mapper, ArcMap, HEC-RAS).
- Collaborate with architects, engineers, and other stakeholders to develop the initial concepts and ideas for the bridge design (AutoCAD). Jan. 2017
- Contribute to Bridge design and perform finite element modeling and coupled loads analysis (dimensioning according to Euro codes using Robot Structural Analysis). to Jun. 2017
- Prepare detailed technical drawings, plans, and specifications that outline the design intent and requirements.
- Ensure the bridge design compliance with applicable codes, regulations, and industry standards.

Research Assistant

Department of civil Engineering, Manipal University Jaipur, India

- Study the behavior of tall buildings under earthquake loads in the high seismicity region of Jaipur according to FEMA 310 norms. Jun. 2016
- Lead a team of 5 members to conduct seismic evaluation tests of the structure under investigation: Rebound hammer test, Ultrasonic pulse velocity meter test. to Sep. 2016
- Perform numerical analysis of the linear and nonlinear response of the building to seismic loads.

Education

Pd.D. in Atmospheric Sciences	Jan. 2025 to present
University of Houston , Houston, TX, US	
M.Sc. in Civil and Environmental Engineering	Jan. 2021 to Dec. 2022
University of Houston , Houston, TX, US	
M.Sc. in Hydraulic and Environmental Modeling	Sep. 2016 to Aug. 2018
National Engineering School of Tunis , Tunis, Tunisia	
B. E. in Civil Engineering	Sep. 2014 to Jun. 2017
National Engineering School of Tunis , Tunis, Tunisia	
First Cycle Diploma	Sep. 2012 to Jun. 2014
Prep. Inst for Engineering Studies of Tunis , Tunis, Tunisia	

Peer-Reviewed Publications and Conference Presentations

Romdhani, O., Zhang, J. A., & Momen, M. (2022). Characterizing the impacts of turbulence closures on real hurricane forecasts: A comprehensive joint assessment of grid resolution, horizontal turbulence models, and horizontal mixing length. *Journal of Advances in Modeling Earth Systems*, 1–24. <https://doi.org/10.1029/2021ms002796>

Romdhani, O., Matak, L., & Momen, M. (2023). Hurricane track trends and environmental flow patterns under surface temperature changes and roughness length variations, *Weather and Climate Extremes*, 2024, 100645, ISSN 2212-0947, <https://doi.org/10.1016/j.wace.2024.100645>.

Technical Skills

Programming Languages: Python, SQL, Fortran, MATLAB, Bash, Linux, R, C++, C, VBA, NCL.

Softwares: OpenFOAM, ArcGIS, Ansys (fluent), AutoCAD (Civil 3D), HEC-RAS, EPA SWMM, EPANET, HY-8, Robot Structural Analysis, SAP 2000.

Technologies: Docker, Kubernetes (moderate knowledge), HPC, VMs, OpenMPI, CI/CD, Git.

Cloud Technologies: Google Cloud, AWS (moderate knowledge).

Expertise: CFD, GIS, Applied Mathematics, Non-linear Analysis, Predictive Modeling, Statistical Analysis.

Languages: English, French, Arabic, German, and Spanish.

References:

Available upon request.