

Mokbel Karam
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Department of Chemical Engineering
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Research Interests

My research focuses on increasing the efficiency of numerical techniques for simulating reacting flows using supercomputers. I am focused on producing and developing methods that help to reduce the computational cost involved in these simulations. Following this objective, I worked on projects in different areas involving: Low-Mach-number flows, Pressure Projection Methods, Modified Equations, Machine Learning, Computational Fluid Dynamics, Time Integrators, Parallel Computing.

Education

- 2017– Ph.D. Candidate, Chemical Engineering Department / University of Utah, Salt Lake City Utah
- Current GPA: 3.88
- 2013–17 Bachelor in Mechanical Engineering / Notre Dame University, Zouk Mosbeh, Lebanon
- Graduated with a GPA of 3.89, Highest distinction.
 - Dean's List for all semesters
 - Scholarship: 75% Scholarship, all semesters

Skills

Communication Skills:

- Leadership skills: President of the American Society of Mechanical Engineers student section at NDU-North Lebanon Campus in 2013-2014.
- Languages: English, French (Fair), Arabic (Native Language)

Computer Skills:

C++, Object Oriented Programming (OOP), Python, Tensorflow, Sci-kit Learn, Sympy (symbolic library Python), Matlab, Web app development using Dash Python, Latex.

Publications

- 2021 **Mokbel Karam**, and Tony Saad, "Stability criteria for advection diffusion using explicit multi-stage integrators", 2021, International Journal for Numerical Methods in Fluids, (pending submission).
- 2021 **Mokbel Karam**, and Tony Saad, "Comments on "Approximate Projection Method for the Incompressible Navier-Stokes Equations"", 2021, AIAA Journal (pending submission).
- 2021 **Mokbel Karam**, and Tony Saad, "BuckinghamPy: A python software for dimensional analysis", 2021, SoftwareX (pending submission).

- 2021 Hayden A. Hedworth, **Mokbel Karam**, Josh McConnell, James C. Sutherland, and Tony Saad, "COVID-19 Mitigation for Orchestras using Computational Fluid Dynamics", 2020, Science Advances (under review).
- 2020 **Mokbel Karam**, James C. Sutherland, and Tony Saad, "Low-Cost Runge-Kutta Integrators for Incompressible Flow Simulations", 2020, Journal of Computational Physics (conditionally accepted).
- 2020 **Mokbel Karam**, James C. Sutherland, and Tony Saad, "PyModPDE: A python software for modified equation analysis", 2020, SoftwareX (Volume 12, 100541).
- 2019 **Mokbel Karam**, Tony Saad, Michael Hansen, and James C. Sutherland, "A Framework for Analyzing the Temporal Accuracy of Pressure Projection Methods", 2019 AIAA Computational Fluid Dynamics Conference, AIAA Aviation Forum, (AIAA 2019-3634).
- 2018 Tony Saad, **Mokbel Karam**, and James C. Sutherland, "An Explicit Variable-Density Projection Method for Low-Mach Reacting Flows on Structured Uniform Grids", 2018 Fluid Dynamics Conference, AIAA Aviation Forum, (AIAA 2018-4266).

Presentations

- 2019 **Mokbel Karam**, Tony Saad "Efficient Runge-Kutta Methods for Incompressible Flow", 2019 Graduate Symposium, Chemical Engineering Department, The University of Utah.
- 2019 **Mokbel Karam**, Tony Saad "On a Class of High-Order, Low-Cost Time Integrators for the Navier-Stokes Equations", 2019 Rocky Mountain Fluid Mechanics (RMFM) Research Symposium, CU Boulder.
- 2019 **Mokbel Karam**, Tony Saad, Michael Hansen, and James C. Sutherland, "A Framework for Analyzing the Temporal Accuracy of Pressure Projection Methods", 2019 AIAA Computational Fluid Dynamics Conference, AIAA Aviation Forum, (AIAA 2019-3634).
- 2019 **Mokbel Karam**, Tony Saad, and James C. Sutherland, "Efficient Multistage Time Integrators for Incompressible Flows Using Projection Methods", SIAM Conference on Computational Science and Engineering.
- 2019 **Mokbel Karam**, Fady Najjar, Ming Jiang, James Sutherland, and Tony Saad. "Exploring the Predictability of Random Forests & Deep Neural Networks for the Sedov-Von Neumann-Taylor Blast Wave Solution", SIAM Conference on Computational Science and Engineering.
- 2018 Tony Saad, **Mokbel Karam**, and James C. Sutherland, "An Explicit Variable-Density Projection Method for Low-Mach Reacting Flows on Structured Uniform Grids", 2018 Fluid Dynamics Conference, AIAA Aviation Forum, (AIAA 2018-4266)
- 2018 **Mokbel Karam**, Fady Najjar, Ming Jiang, James Sutherland, and Tony Saad. "Applying Machine Learning to the Sedov-von Neumann-Taylor Blast Wave", 2018 Rocky Mountain Fluid Mechanics (RMFM) Research Symposium, CU Boulder.
- 2018 **Mokbel Karam**, Fady Najjar, Ming Jiang, James Sutherland, and Tony Saad. "Applying Machine Learning to the Sedov-von Neumann-Taylor Blast Wave", Seminar, Lawrence Livermore National Laboratory.

Experience

- 2018 Internship at Lawrence Livermore National Laboratory with 10 weeks focus on Machine Learning, funded by the Predictive Science Academic Alliance Program II, Livermore CA , from June 4th to August 10th.
- 2016 Gained one month of experience in maintenance of kilns at a cement plant, August 2016
- 2016 Gained one month of experience in maintenance of refrigeration system at a food processing company, July 2016
- Have been tutoring Math and physics lessons for high school students.

Reference

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