Tarik Dzanic

Curriculum Vitae

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Education

Aug. 2019 – May 2023 **Texas A&M University**
Ph.D. Ocean Engineering

Aug. 2018 – July 2019 **Georgia Institute of Technology**
M.Sc. Aerospace Engineering

Sep. 2014 – May 2018 **Princeton University**
B.S.E. Mechanical and Aerospace Engineering, *cum laude*

Experience

June 2023 – Present **Sidney Fernbach Postdoctoral Fellow**
Lawrence Livermore National Lab, *Center for Applied Scientific Computing*

May 2023 – Aug. 2023 **Visiting Scholar**
Princeton University, *Department of Mechanical and Aerospace Engineering*

April 2023 – May 2023 **Visiting Researcher**
NASA Ames Research Center, *Aerothermodynamics Branch*

June 2020 – May 2023 **Computing Scholar Intern**
Lawrence Livermore National Lab, *Center for Applied Scientific Computing*

May 2017 – Sep. 2017 **Computational Aerodynamicist Intern**
Haas Formula One Team

Publications

Journal Articles

12. Continuously bounds-preserving discontinuous Galerkin methods for hyperbolic conservation laws
    T. Dzanic. *Submitted*.
11. Positivity-preserving discontinuous spectral element methods for compressible multi-species flows
    W. Trojak, **T. Dzanic**. *Submitted*.
10. On the anti-aliasing properties of entropy filtering for under-resolved turbulent flows
    T. Dzanic, W. Trojak, F. Witherden. *Submitted*.
9. DynAMO: Multi-agent reinforcement learning for dynamic anticipatory mesh optimization with applications to hyperbolic conservation laws
    T. Dzanic, K. Mittal, D. Kim, J. Yang, S. Petrides, B. Keith, R. Anderson. *Journal of Computational Physics*, 505, 112924, 2024.
8. Validation of wall boundary conditions for simulating complex fluid flows via the Boltzmann equation: Momentum transport and skin friction
    T. Dzanic, F. Witherden, L. Martinelli. *Physics of Fluids*, 36, 017109, 2024.
7. Positivity-preserving entropy filtering for the ideal magnetohydrodynamics equations
    T. Dzanic, F. Witherden. *Computers & Fluids*, 266, 106056, 2023.
6. A positivity-preserving and conservative high-order flux reconstruction method for the polyatomic Boltzmann–BGK equation
    T. Dzanic, F. Witherden, L. Martinelli. *Journal of Computational Physics*, 486, 112146, 2023.
5. Bounds preserving temporal integration methods for hyperbolic conservation laws
    T. Dzanic, W. Trojak, F. Witherden. *Computers & Mathematics with Applications*, 135, 6-18, 2023.

4. Positivity-preserving entropy-based adaptive filtering for discontinuous spectral element methods
   T. Dzanic, F. Witherden. *Journal of Computational Physics*, 468, 111501, 2022.
3. Utilizing time-reversibility for shock capturing in nonlinear hyperbolic conservation laws
   T. Dzanic, W. Trojak, F. Witherden. *Computers & Fluids*, 247, 105652, 2022.
2. Partially-averaged Navier–Stokes simulations of turbulence within a high-order flux reconstruction framework
   T. Dzanic, S. Girimaji, F. Witherden. *Journal of Computational Physics*, 456, 110992, 2022.
1. Accuracy, stability, and performance comparison between the spectral difference and flux reconstruction schemes
   C. Cox, W. Trojak, **T. Dzanic**, F. Witherden, A. Jameson. *Computers & Fluids*, 221, 104922, 2021.

Conference Papers

9. Direct molecular gas dynamics simulations of re-entry vehicles via the Boltzmann equation
   T. Dzanic, L. Martinelli. *AIAA SciTech*, 2024.
8. Towards full molecular gas dynamics simulations of complex flows via the Boltzmann equation
   T. Dzanic, L. Martinelli. *Cambridge Unsteady Flow Symposium*, 2024.
7. Multi-agent reinforcement learning for adaptive mesh refinement
   J. Yang, K. Mittal, **T. Dzanic**, S. Petrides, B. Keith, B. Peterson, D. Faissol, R. Anderson. *International Conference on Autonomous Agents and Multiagent Systems*, p.14-22, 2023.
6. Reinforcement learning for adaptive mesh refinement
   J. Yang, **T. Dzanic**, B. Peterson, J. Kudo, K. Mittal, V. Tomov, J.S. Camier, T. Zhao, H. Zha, Tz. Kolev, R. Anderson, D. Faissol. *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 26, p.5997-6014, 2023.
5. Shock capturing methods in high-order flux reconstruction I: Graph viscosity and convex limiting approaches
   W. Trojak, **T. Dzanic**, F. Witherden. *AIAA SciTech*, 2021.
4. Numerical analysis and prediction of aero-optical effects
   D. Hartman, **T. Dzanic**, F. Witherden, A. Tropina, R. Miles. *AIAA SciTech*, 2021.
3. Fourier spectrum discrepancies in deep network generated images
   T. Dzanic, K. Shah, F. Witherden. *Neural Information Processing Systems (NeurIPS)*, 33, p.3022-3032, 2020.
2. Non-equilibrium wall modeling for large eddy simulation of stalled iced airfoils
   T. Dzanic, J. Oefelein. *AIAA SciTech*, 2020.
1. Higher-order implicit large eddy simulations of a VFE-2 delta wing
   T. Dzanic, L. Martinelii. *AIAA SciTech*, 2019.

Selected Invited Talks & Presentations

- Structure-preserving finite element methods for multi-physics applications
  Office of Science Advanced Scientific Computing Research (ASCR) Principal Investigator Meeting. Albuquerque, NM, USA.
- Constructing provably robust, constraint-satisfying finite element methods for computational physics
  Brown University. Providence, RI, USA.
- High-order computational fluid dynamics schemes on GPU architectures
  NASA Ames Research Center. Mountain View, CA, USA.
- Constructing provably robust, constraint-satisfying finite element methods for computational physics
  Lawrence Livermore National Lab. Livermore, CA, USA.
- Positivity-preserving entropy-based adaptive filtering for shock capturing
  PyFR Seminar Series, Imperial College London. London, UK.

Funding

Principal Investigator

2023 – 2024 Continuously bounds-preserving finite element methods for multi-physics applications
Sponsor: *Department of Energy Laboratory Directed Research and Development*
($190,000)

Achievements

2024 Computing Directorate SPOT Award, *Lawrence Livermore National Lab*
2023 – 2025 Sidney Fernbach Postdoctoral Fellowship, *Lawrence Livermore National Lab*
2023 Editor's Pick, *Physics of Fluids*
2023 Art of Science Showcase, *Air Force Office of Scientific Research*
2019 Department Excellence Fellowship, *Texas A&M University*
2018 George Bienkowski Memorial Prize Recipient, *Princeton University*
2014 – 2018 Questbridge Scholar, *Princeton University*

Teaching Experience

2022 Teaching Assistant for OCEN 345: *Theory of Ocean Engineering Structures*
Texas A&M University
2021 Teaching Assistant for OCEN 405: *Finite Element Analysis in Engineering Design*
Texas A&M University
2020 Teaching Assistant for OCEN 261: *Applied Numerical Methods with Python*
Texas A&M University
2018-2019 Teaching Assistant for AE 3340: *Design and Systems Engineering Methods*
Georgia Institute of Technology