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Shashank Jaiswal
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Education

Purdue University, West Lafayette
PhD in Aeronautics and Astronautics ..... May'18 - May'21
MS in Physics and Astronomy ..... Aug'19 - May'21
MS in Aeronautics and Astronautics ..... Aug'16 - May'18

Indian Institute of Technology (IIT), Hyderabad
B.Tech in Mechanical Engineering (Honors) ..... Aug'12 - May'16

Work Experience

Altair Engineering, Troy, MI ..... 17 May'21 - Present
Sr. Software Developer - High Performance Computing with *Brian Janes (Senior Director)*
Created an asynchronous event-driven method/system for resource allocation, resource monitoring, and resource scheduling on massively parallel/distributed high performance computing systems.
[Here's a simple analogy: Suppose you are expecting a package. You can call the mailing agency everyday and ask them where your package is. This is termed polling. Or the mailing agency can notify you whenever the package is dispatched, shipped, and delivered. The "dispatch, shipping, delivery" are called events. We can appreciate that the latter process is more efficient ... Imagine a scenario "the mailing agency receives call from thousands of customers asking where their package is" verses "the mailing agency notifies you of events"]

Mentor Graphics (Siemens), Wilsonville, OR ..... 6 May'19 - 6 Sep'19
R&D Calibre Design-to-silicon Intern with *Dr. Fedor Pikus (Chief engineering scientist)*
Research in development of quantum algorithms for Electronic Design Automation (see patents [1, 2]).
[Quantum Computing carries an enormous practical significance and relevance to basic sciences, and beyond. Our work focused on identifying, adapting, developing, and applying quantum algorithms to solve NP-hard problems arising in circuit design and verification.]

Purdue University, West Lafayette, IN ..... 1 Jan'17 - 15 March'21
Research Assistant with *Dr. Jingwei Hu, and Dr. Alina Alexeenko*
Research in development of numerical methods for solving high dimensional partial differential equations on massively parallel architectures (see monographs [3, 4] and National Science Foundation Grant #1854829).
[Suppose you want to launch a rocket in space. You may wish to shape the vehicle to minimize fuel consumption. Numerical simulations of flow over the vehicle therefore become useful. In space, the air is rarefied. Therefore, the molecular level simulations are carried out utilizing Monte Carlo (MC). But MC introduces statistical uncertainties. My doctoral work focused on development of simulation tools without those uncertainties. These simulations may take months on even supercomputers.]

Research interests

High performance computing, Reinforcement Learning, Quantum computing, Augmented Reality, Computational Fluid Dynamics.

Patents

[1] F. G. Pikus and **S. Jaiswal**, Limited basis quantum particle definitions in applications of quantum computing to electronic design automation processes, (2020), US Patent 10,846,448.
[2] F. Pikus and **S. Jaiswal**, Adaptive penalty term determinations in applications of quantum computing to electronic design automation processes. (2020), US Patent App. 16/688,028

Monographs

[3] S. Jaiswal, *Isogeometric schemes in rarefied gas dynamics context,* Comput Methods Appl Mech Eng **383**, 113926 (2021).
[4] S. Jaiswal, *Non-linear Boltzmann equation on unstructured-hybrid non-conforming multi-domains,* J. Comput. Phys. (2021)

Skills

Programming: C++, Python, Javascript, Tcl, Solidity, MPI, CUDA, Linux
Scientific computing: Numerical methods, Quantum algorithms, Parallel/distributed algorithms, Smart contracts
Specific Tools: Tensorflow, PyTorch, Unity, Qiskit, OpenFOAM, ZeroMQ, React

- Experience with programming in Python, C++ (8+ years).
- Experience with parallel and distributed computing: MPI, CUDA, OpenMP, JAX.
- Experience with decentralized computing: Solidity, Smart-contracts, NFTs.
- Experience with development of quantum algorithms and quantum software stacks.
- Experience with PDE based machine-learning models and reinforcement learning.
- Experience with development of numerical schemes for solving partial differential equations (PDE).
- Experience with finite element, isogeometric schemes, multi-physics design, simulation, and analysis.
- Experience with writing performance portable codes, profiling (LLVM sanitizers, valgrind, udb, gdb).
- Proficient working in a Linux/UNIX environment; git/subversion/p4, build/test systems, testing/release processes.

Academic Distinctions

- Awarded **ACM SIGHPC Travel Grant for PASC'19** (1/4 awardees internationally, 1/2 awardees outside EU), 2019.
- At 22, I co-wrote the first **National Science Foundation (NSF CDS&E #1854829)** proposal for $\sim$ \$0.35 million based on my Masters research work, 2018. Purdue University, West Lafayette.
- Awarded **Undergraduate Research Excellence** (among $\sim$ 1% of the batch), 2016. Indian Institute of Technology, Hyderabad.
- **All India Rank 1335** among $\sim$ 1.3 million examinees (top $\sim$ 0.1%), in All India Engineering Entrance Examination (AIEEE), 2012.

Publications

[5] **S. Jaiswal**, J. Hu, J. K. Brillon, and A. A. Alexeenko, *A discontinuous Galerkin fast spectral method for multi-species full Boltzmann on streaming multi-processors,* in *Proceedings of the Platform for Advanced Scientific Computing Conference*, PASC '19 (ACM, 2019) pp. 4:1–4:9.

[6] **S. Jaiswal**, A. A. Alexeenko, and J. Hu, *A discontinuous Galerkin fast spectral method for the multi-species Boltzmann equation.* Computer Methods in Applied Mechanics and Engineering **352**, 56 (2019).

[7] **S. Jaiswal**, A. A. Alexeenko, and J. Hu, *A discontinuous Galerkin fast spectral method for the full Boltzmann equation with general collision kernels.* Journal of Computational Physics **378**, 178 (2019).

[8] **S. Jaiswal**, A. Pikus, A. Strongrich, I. B. Sebastião, J. Hu, and A. A. Alexeenko, *Quantification of thermally-driven flows in microsystems using Boltzmann equation in deterministic and stochastic contexts.* Physics of Fluids **31**, 082002 (2019), [Invited].

[9] **S. Jaiswal**, J. Hu, and A. A. Alexeenko, *Fast deterministic solution of the full boltzmann equation on graphics processing units,* AIP Conference Proceedings **2132**, 060001 (2019).

[10] **S. Jaiswal**, I. B. Sebastião, A. Strongrich, and A. A. Alexeenko, *FEMTA micropropulsion system characterization by DSMC,* AIP Conference Proceedings **2132**, 070006 (2019).

[11] **S. Jaiswal**, I. B. Sebastião, and A. A. Alexeenko, *DSMC-SPARTA implementation of M-1 scattering model,* AIP Conference Proceedings **2132**, 070023 (2019).

[12] A. Pikus, I. B. Sebastião, **S. Jaiswal**, M. Gallis, and A. A. Alexeenko, *DSMC-SPARTA implementation of majorant collision frequency scheme,* AIP Conference Proceedings **2132**, 070026 (2019).

[13] **S. Jaiswal**, R. Reddy, R. Banerjee, S. Sato, D. Komagata, M. Ando, and J. Okada, *An efficient GPU parallelization for arbitrary collocated polyhedral finite volume grids and its application to incompressible fluid flows.* in *23rd IEEE High Performance Computing Workshop* (IEEE, 2016).

[14] S. Holay, R. Reddy, **S. Jaiswal**, and R. Banerjee, *High fidelity simulations of binary collisions of liquid drops.* in *18th Annual Conference on Liquid Atomization and Spray Systems* (ILASS, 2016).

[15] **S. Jaiswal** and N. Dongari, *Implementation of Knudsen layer effects in open source CFD solver for effective modeling of microscale gas flows.* in *Proceedings of 1st International ISHMT-ASTFE and 23rd National Heat and Mass Transfer conference* (ISHMT-ASTFE, Kerala, India, 2015)