Aashish Goyal

in/aashishgoyal0110

aashishgoyal0110.github.io

aashish.goyal.0110@gmail.com

+1 (604)(307)(8801)

Morgantown, WV, United States

About

- Specialized in scientific computing and transport phenomena with applications to food, pharmaceutical, and oil industries
- Proven track record of creating fast and scalable software for solving complex Partial Differential Equations
- Experienced in providing core technological consulting to strategic partners for optimizing industrial processes
- Over 10 years of experience in high-performance code development in C/C++

Education

- **University of British Columbia** — Vancouver, Canada
  Ph.D., Chemical and Biological Engineering; Grade: 92.6% — *Sep. 2018 – Dec. 2023*
- **Indian Institute of Technology, Kanpur** — Kanpur, India
  B.Tech.-M.Tech., Chemical Engineering; GPA: 7.5/10.0, GPA: 9.2/10.0 — *Aug. 2010 – Jun. 2015*

Experience

- **ORISE Postdoctoral Researcher** — Morgantown, United States
  Computational Science and Engineering, National Energy Technology Laboratory — *Jun. 2024 – current*
  - Creating an **open-source software** to solve integro-differential equation for **radiation transport**
  - Developing highly accurate numerical method to resolve complex geometries representing large industrial equipments
  - Making the software compatible for **exascale** computing using **Adaptive Mesh Refinement** technique
- **Postdoctoral Researcher** — Vancouver, Canada
  Department of Mathematics, University of British Columbia — *Jan. 2024 – Mar. 2024*
  - Developed a **heat transfer** solver coupled with momentum conservation equations for **particle-laden flows**
  - Built a **front-tracking solver** for **immersed biological membranes** in a complex computational domain
  - Created **Convolutional Neural Network** to predict forces in a random array of non-spherical particles
- **Project Engineer** — Pune, India
  Tridiagonal Solutions Pvt. Ltd., Mentor: Dr. Mothivel Mummudi — *Dec. 2015 – Jun. 2018*
  - Built computational models for industrial processes using **fluid mechanics**, **granular physics**, and **data analysis**
  - Developed a standard operating procedure to model the processes, including **tumbling**, **coating**, and **drying**
  - Enabled industries to conduct **design of experiments** and optimize process operations using the projects below
- **Reliance Industries Limited** — Dahej, India
  Research Intern — *May 2013 – July 2013*
  - Analyzed the drying of Poly Vinyl Chloride **PVC** to increase the plant production from **13.5MT** to **22MT**
  - Developed a fundamental **mathematical model** of PVC drying taking **environmental** impacts into account
  - Integrated plant data in the model to optimize the **design parameters** and **operating conditions**

Technical Skills

- **Fundamentals:** Numerical methods, Finite Volume, Finite Element Method, Fluid Mechanics, Radiation Transport, Discrete Element Method, Molecular Dynamics, Machine Learning
- **Programming:** C/C++, FORTRAN, Python, Bash, MATLAB, OpenMPI/MP, GIT, CI/CD
- **Platforms:** Windows, Linux, High-Performance Computing cluster, Cloud Computing (AWS)
- **Softwares:** Ansys Fluent, Autodesk Inventor, Ansys Spaceclaim, OpenFOAM, LIGGGHTS, AMReX, VScode

Doctoral Dissertation

- **University of British Columbia** Vancouver, Canada

  Advisor: Dr. Anthony Wachs *Sep. 2019 – Dec. 2023*

  - Created a fast and scalable code in **C++** to solve complex non-linear **Partial Differential Equations**
  - Developed a computational software for **High-Performance Computing** platforms scalable up to **7000 cores**
  - Invented a **Fourier Predictive Model** to determine the force modulations on a binary sphere system near a wall
  - Formulated **probability driven** and **machine learning** models to predict the hydrodynamic interactions on non-spherical particle suspension

Masters' Dissertation

- **Indian Institute of Technology, Kanpur** Kanpur, India

  Advisor: Dr. Pankaj Apte *Apr. 2014 – Jul. 2015*

  - Developed a **Molecular Dynamics** code in **FORTRAN** to analyze the phase transition of Silicon
  - Implemented mathematical technique such as **Fourier Transform** to detect alterations in Si vibrational frequency
  - Discovered a correlation of unique dynamic equilibrium point with the sharp increase in four-coordinated Si molecules

Accolades and Distinctions

- Awarded **Mitacs Accelerate Fellowship** for Parallel computing of particle-laden flows, 2020–2023
- **Four-Year Fellowship 4YF** - Awarded by the University of British Columbia as a recognition for the best incoming student for graduate studies, 2018–2022
- Faculty of Applied Sciences Graduate Award, International Tuition Award, President's Academic Excellence Initiative PhD Award, 2018–2023
- All India Rank **1050 (99.5 percentile)** in India's most competitive engineering examinations (IIT-JEE), 2010
- Awarded **Outstanding Performance** for efficient project execution and innovative solutions at Tridiagonal Solutions, 2016–2018

Publications

- **A. Goyal**, G. Gai, Z. Cheng, and A. Wachs, "Flow past a random array of statistically homogeneously distributed stationary Platonic polyhedrons: Data analysis, Probability maps, and PINN model", **International Journal of Multiphase Flows** 2024
- **A. Goyal** and A. Wachs, "An accurate and scalable direction-splitting solver for flows laden with non-spherical rigid bodies - Part 2: moving rigid bodies", **Computers and Fluids** 2024
- **A. Goyal**, JL Pierson, and A. Wachs, "Pairwise hydrodynamic interaction of two spheres in a wall-bounded linear shear flow near a wall and another sphere", **International Journal of Multiphase Flows** 2023

- **A. Goyal** and A. Wachs, "An accurate and scalable direction-splitting solver for flows laden with non-spherical rigid bodies - Part 1: fixed rigid bodies", **Communication in Computational Physics** 2023
- A. Morente, **A. Goyal** and A. Wachs, "A Highly Scalable Direction Splitting Solver on Regular Cartesian Grid to Compute Flow in Complex Geometries Described by STL files", **Fluids** 2023
- A.K. Gautam, N. Pingua, **A. Goyal** and P.A. Apte, "Dynamical instability causes the demise of a supercooled tetrahedral liquid", **Journal of Statistical Physics** 2017

Conferences

- **A. Goyal** and A. Wachs, "A fast and highly scalable Direction splitting algorithm to solve momentum and heat transfer in flow laden with non-spherical rigid bodies", **International Conference on Numerical Methods in Multiphase flows** 2022
- A. Morente, A. Mukundan, **A. Goyal** and Anthony Wachs, "Blood flow in Capillary Networks", **Americal Physical Society–Division of Fluid Dynamics** 2022
- A. Mukundan, A. Morente, **A. Goyal** and Anthony Wachs, "A 3D numerical membrane model for simulating red blood cells (RBC) dynamics and transport", **Americal Physical Society–Division of Fluid Dynamics** 2022
- **A. Goyal** and M. Mummudi, "Smart Strategies for DEM modeling of industrial processes", **CFDEM conference** 2017
- H. Babu, **A. Goyal**, T. Suryawanshi and M. Mummudi, "Accelerated Process Innovation through Hybrid Computational Modeling", **AIChE Annual Meeting** 2017

Leadership skills

- **University of British Columbia** Vancouver, Canada

  Cluster and Gitlab Manager, Cosmos Lab *Aug. 2020 – Dec. 2023*

  - Responsible for maintaining best practices for writing code and merging for **20+** users and developers
  - Created the guidelines for data management and visualization for multiple user account
  - Defined the structure of an object-oriented framework for easy integration of code from multiple developers

- **Indian Institute of Technology Kanpur** Kanpur, India

  Head, ROBOCON *Sep. 2012 – Mar. 2013*

  - **Led a 3-tier team** of **50 members** to represent the institute at the Asia-Pacific robotics competition
  - Raised **two-fold funding** by pitching the competition to a pool of senators, professors, and dean
  - Qualified among the Top 15 participants out of $\sim$ 100 teams in India, and received the **best design award**