Adam Lawrence

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Education

University of Melbourne Melbourne, Australia
Master of Engineering, Environmental (First Class Honours) GPA: 3.84/4.0 *Aug 2021 – Dec 2023*
- Relevant Coursework: Topped the class in Computational Fluid Dynamics and Remote Sensing
- Scholarships: Mann Scholarship, merit based scholarship for highest achieving hydraulic engineering student

University of Illinois Urbana-Champaign Champaign, Illinois
Academic Exchange *Aug 2023 – Dec 2023*
- Coursework: Advanced Finite Element Methods, Parallel Numerical Algorithms, Applied Parallel Programming

University of Melbourne Melbourne, Australia
Bachelor of Science, Major of Environmental Engineering & Diploma of Computing *Jun 2021*

Experience

Graduate Research Assistant Aug 2023 – Present
University of Illinois Urbana-Champaign *Champaign, Illinois*
- Constructed a model in OpenFOAM and C++ to act as a digital twin of a a submerged propeller in a river
- Formulated novel inflow boundary condition to capture a river's average parabolic velocity profile
- Delved into the detailed study of turbulent effects near the propeller and its effect on energy generation

Graduate Research Assistant Jan 2023 – Aug 2023
University of Melbourne *Melbourne, Australia*
- Built a model of a moving ship using OpenFOAM and C++ to provide data for an autonomous shipping AI
- Integrated advanced CFD strategies, such as overset meshing and coupled multi-region conjugate solvers
- Parallelized legacy code for a higher-order spectrum solver with MPI, leading to substantial performance increases

Research Intern Dec 2021 – May 2022
University of Melbourne *Melbourne, Australia*
- Used Python to analyze ocean data to assess the impact of Climate Change on the ocean around South-East Asia
- Computed the RAO of ships over three decades, correlating ship stability with observed navigational changes
- Analyzed links between climate change and asylum seeker boat accidents, which contributed to a journal paper

Projects

Remote Sensing for Hydraulic Modelling | *Python, C++*
- Developed a workflow to extract parameters solely from satellite data that can be used with hydraulic models
- Devised novel algorithms to compute water depth and surface roughness from SRTM and Sentinel-2 data
- Implemented graph algorithms to accurately determine river width, length, slope, and flow rate

Environmental Flows in OpenFOAM | *OpenFOAM, C++, Bash, Python*
- Built a specialized computational fluid dynamics toolkit for conducting environmental flow design and analysis
- Wrote a shallow water equation solver in C++ to be used with OpenFOAM
- Designed a custom coupler in bash and C++ to link hydrologic software to the hydraulic model's inflow boundary

Parallel Streamline Upwind Petrov-Galerkin Solver | *C++, CUDA, Python*
- Designed to work with triangular element meshes for the 2-dimensional unsteady Navier-Stokes equations
- Implemented CUDA-based computation of local stiffness, mass, and force element matrices

Community Involvement

International Conference on Ocean, Offshore & Arctic Engineering Jun 2023
- Volunteer assistant organizer of academic conference with over 800 attendees from around the world

Technical Skills

Languages: C/C++, Python, Fortran, Bash
Computational Modelling & Simulation: OpenFOAM, ANSYS, ParaView, HEC-RAS, PETSc
Parallel Computing: CUDA, MPI, OpenMP, HPC, Slurm, Linux, Dask
Remote Sensing and Geospatial Analysis: GDAL, Xarray, Dash, QGIS, HDF, NetCDF, VTK