Xu (Larry) Duan

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EDUCATION

The University of Texas at Austin Aug. 2024 - Dec 2025 (Expected)
Master of Science in Mechanical Engineering, Dynamic System and Control Area Austin, TX
- Co-Advised by Dr. van Oort and Dr. Chen
- Relevant Coursework: Multiscale Methods in CFD, Transport Phenomenon, Nonlinear Programming.

Shanghai Jiao Tong University Sep. 2019 - Jul. 2023
Bachelor of Engineering in Naval Architecture and Marine Engineering Shanghai, CN
- GPA: **3.79/4.3, 89/100**
- Advised by Dr. Fu
- Relevant Coursework: Finite Element Method, Computational Fluid Dynamics, Multivariate Statistical Analysis, Differential Geometry, Functional Analysis, Matrix Theory, Convex Optimization, Thinking and Approach of Programming (C++), Data Structures (C++)

INDUSTRIAL EXPERIENCE

RAPID Aug. 2024 - Present
Well Hydraulics and Thermodynamics Research Assistant, Supervisor: Dr. van Oort Austin, TX
- Developed a two-phase fluid model to analyze well hydraulics and thermodynamics in MATLAB, using the Finite Volume Method (FVM) to predict pressure profile, flow rates, and temperature, with validation against experimental data.
- Implemented a blowout risk mitigation plan with bottomhole pressure and temperature control.
- Conducted Fluid-Structure Interaction (FSI) analysis to calculate the forces and torques exerted by drilling fluid on the drillstring, using the Lattice Boltzmann Method (LBM), achieving less than 3% variance when validated against Ansys simulations.

State Key Laboratory of Ocean Engineering Sep. 2023 - Jun. 2024
Ocean Engineering Research Assistant, Supervisor: Dr. Fu Shanghai, CN
- Developed a Fortran program to numerically solve fully nonlinear Boussinesq Wave Model from scratch.
- Applied the Monotonic Upstream-centered Scheme for Conservation Law (MUSCL) for spatial discretizing and utilized the third-order Strong Stability-Preserving (SSP) Runge-Kutta scheme for time integration.

Haipeng Marine Engineering (Shanghai) Co. Jul. 2023 - Aug. 2023
Hydrodynamics and Structural Engineering Intern Shanghai, CN
- Calculated the Morison loads of the fish farming nets and cages which were then applied to the coupled rigid-body motion equation and coupled hydroelastic equation to predict the motion and loads of large fish cages.
- Analyzed the time-domain responses of net tension under wave excitation using the coupled rigid-body motion equation and results showed an average increase of 51% in net tension at key positions when accounting for diffraction and radiation waves induced by large floating bodies, which are often neglected in existing literature.
- Conducted a hydroelastic analysis of fish farming vessels using the coupled hydroelastic equation, finding that the bending moment of the novel elastic model at the section near the middle is 48% of that in the existing rigid model.

ACADEMIC EXPERIENCE

Shanghai Jiao Tong University Sep. 2023 - Jan. 2024
Teaching Assistant for Junior-level Structural Dynamics Shanghai, CN
- Guided junior students in learning Abaqus and constructing a basic ship model to do modal analysis.
- Taught students how to apply the FEM to develop a program to solve non-homogeneous beam bending problems.

SELECTED PROJECTS

Shallow Water Wave Simulation using (FVM)
- Simulated water wave propagation over shallow, variable-depth terrain using the Finite Volume Method (FVM) in FUNWAVE, developed in Fortran on a Linux system.
- Applied higher-order numerical techniques to discretize fully nonlinear Boussinesq wave equations for accuracy.
- Developed a Python program to dynamically visualize the time evolution of waves.

Control System Design for an Underwater Vehicle
- Developed a Simulink model for simulating an underwater vehicle, incorporating a 4-DOF dynamic model of the ROV, along with a propulsion system model and a voltage allocation module.
- Designed a Proportional Integral Differential (PID) control system to correct deviations between the robot's actual depth and heading, achieving 18.50% and 31.57% overshoot, with settling time of 5.13s and 12.84s for depth and heading, respectively.

Thermal and Mechanical Simulation of a CPU Heatsink with SolidWorks

- Created a 3D model of the CPU heatsink in SolidWorks using sketching and part modeling techniques.
- Performed thermal and mechanical simulations in SolidWorks to evaluate stress distribution and temperature behavior across the heatsink under operational conditions.

Solving Linear Advection Equation using Streamline-Upwind Petrov-Galerkin (SUPG) Method

- Solved the linear advection equation with adaptive mesh refinement using deal.II on a Linux system.
- Utilized parallel computing with multiple processors accessing shared memory techniques in deal.II to assemble the global matrix and accelerate computation.

Comparison between Finite Element, Finite Volume and Finite Difference solutions of Lid-driven Cavity Flow

- Solved the Lid-driven Cavity Flow problem in MATLAB and Python using the finite difference method, SIMPLE algorithm with finite volume discretization, and Galerkin finite element method.
- Demonstrated that the finite difference method is the fastest and most robust flow changes but less accurate than the SIMPLE implementation.

Book Lamp Control System using PLC

- Designed and implemented a control system for opening and closing book lamps using Programmable Logic Controllers (PLC).
- Developed and debugged a program to process analog signals from a photosensitive resistor, converting them into digital signals to monitor and adjust light intensity.

Wind Speed Prediction with Neural Networks and Signal Decomposition Techniques

- Conducted short-term wind speed forecasting using a Long Short-Term Memory (LSTM) neural network, applying and comparing various signal decomposition techniques to reduce data randomness.
- Generated a scientific paper presenting the findings.

PUBLICATIONS

- X Duan, Y Zhang, P Ashok, D Chen, E van Oort (2025). Coupled Managed Pressure and Temperature Drilling in Geothermal and HPHT Wells. 50th Stanford Geothermal Workshop.
- X Duan, Y Zhang, P Ashok, D Chen, E van Oort (2025). Hydraulic Forces Induced by Drillstring Whirling and Rotation Dynamics: A Numerical Investigation in 2D and 3D Domains. 44th OMAE. [Accepted]

HONORS & AWARDS

Philip C. and Linda L. Lewis Foundation Graduate Fellowship — Aug. 2024
CCS (China ship Classification Society) Scholarship (10%) — Sep. 2022 & Sep. 2020
Shengshen Scholarship (5%) — Sep. 2020

SKILLS AND QUALIFICATIONS

Programming: Python, C/C++, Linux, MATLAB, Fortran (with MPI & OpenMP)
Software: SolidWorks, Ansys, Abaqus, Paraview, deal.II, PETSc, AutoCad, OrcaFlex, HydroStar, Office suite
IELTS: 7.0 (Listening: 7.5, Reading 8.0, Writing: 7.0, Speaking: 6.0)
GRE: 336+4.0 (Verbal: 166, Quantitative: 170, Analytical Writing: 4.0)

Transferable Attributes:

- Superior diagnostic skills for issues and innovative invention practices;
- Capacity to coordinate and optimize solutions and conduct flexible commissioning;
- Collaborative teamwork skills;
- Foresight and vision to evaluate the complexity of projects.