

NISHANT BHATTA

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Education

North Carolina State University Jan. 2021 – Dec. 2024 (Expected)
PhD in Mechanical Engineering (GPA: 4.0) Raleigh, NC

Pulchowk Campus, Tribhuvan University Apr. 2017 – Apr. 2019
M.Sc. in Mechanical Systems and Design Engineering (Score: 86.53 %) Pulchowk, Lalitpur

Pulchowk Campus, Tribhuvan University Nov. 2011 – Nov. 2015
Bachelor of Engineering in Mechanical Engineering (Score: 79.85 %) Pulchowk, Lalitpur

Relevant Coursework

- Two-phase Flow Simulations
- Turbulence
- Advanced Fluid Mechanics
- Aerosol Sci.&Technol.
- Computational Fluid Dynamics
- Polymer Sci.&Technol.
- Linear/Non-linear Vibrations
- Non-linear Dynamics

Experience

North Carolina State University Aug. 2021 – Present
Graduate Research Assistant Raleigh, NC

- Performed centrifugal desaturation and pressure-driven desaturation Volume-of-Fluid (VOF) simulations to characterize wetting saturation of a virtual nonwoven filter.
- Designed custom-made centrifuge experiments and compared them with air-driven Porometer experiments to study capillary pressure vs saturation relationship in a nonwoven filter.
- Coupled VOF simulations with DPM in ANSYS Fluent to study particle tracking in a partially wetted filter through custom-made user-defined functions.
- Wrote an in-house mathematical morphology code to conduct multiphase fluid intrusion or fluid drainage simulations in a virtual nonwoven filter and compared the results with other numerical techniques such as VOF and energy minimization (such as Surface Evolver).

North Carolina State University Jan 2021 – July 2021
Graduate Teaching Assistant Raleigh, NC

- Helped in designing MAE 305 course for undergraduate students on basic electrical circuits, strain gauge installation, temperature measurement, and fabrication and characterization of composite materials. Taught and graded this course for Spring 2021 and Summer 2021.

Advanced College of Engineering and Management Nov. 2016 – Dec. 2020
Instructor Kupondole, Lalitpur

- Designed course structure and gave lectures to undergraduate students on Engineering Thermodynamics and Engineering Drawing. Focused more on projects and practical-based approach to learning.

Innovation, Incubation and Entrepreneurship Center (IIEC) Apr. 2017 – Mar. 2019
Graduate Research Assistant, Part-time Pulchowk, Lalitpur

- Developed mathematical model of a concept medical drone and implemented it in MATLAB and the behavior of the drone under various input commands was studied.
- Developed analytical model on flow-induced vibrations due to the impingement of jet on a Pelton turbine.
- Developed analytical framework to study the vibrations of Pelton turbine when there is rotating unbalance in the system.

E&T Nepal Pvt. Ltd. Nov. 2015 – Apr. 2016
CAD Engineer Sallaghari, Bhaktapur

- Part of a solver-team to fix the bugs and errors in a particle method CFD software based on smoothed particle hydrodynamics.
- Various training on solid modeling/design in CATIA software, and C++ programming language.

Publications

- Bhatta, N., Tafreshi, H. V., & Pourdeyhimi, B. (2024). Toward formulating coalescence filtration: Characterizing wetting saturation via centrifugal force. *International Journal of Multiphase Flow*, 170, 104641.
- N. Bhatta, H.V. Tafreshi, and B. Pourdeyhimi, Full Morphology Simulations to study fluid intrusion in fibrous structures, *Colloids and Surfaces A: Physicochemical and Engineering Aspects* (**under review, 2023**)
- N. Bhatta, H.B.Dura, J.Tharu, and M.C. Luintel, Analytical Prediction of the jet force in Pelton Turbine, *In Vibration Engineering and Technology of Machinery: Proceedings of VETOMAC XVI 2021*, Springer International Publishing, 2023
- Bhattarai, S., Poudel, K., Bhatta, N., Mahat, S., Bhattarai, S. and Thapa Magar, K.S., 2018. Modeling and development of baseline guidance navigation and control system for medical delivery uav. *In 2018 AIAA Information Systems-AIAA Infotech@ Aerospace* (p. 0508).
- Bhatta, N., Luintel, M.C., Tharu, J.K. and Karki, S., 2019. Vibration response of Pelton turbine unit under rotating unbalance. *In Proceedings of IOE Graduate Conference* (Vol. 6, pp. 101-107).
- Tharu, J.K., Bhatta, N., Karki, S. and Luintel, M.C., 2019. Free Vibration Analysis of Simply Supported Pelton Turbine: A Case of Flexible Rotor Bearings. *In Proceedings of IOE Graduate Conference*.

Thesis

Dynamic Response of Pelton Turbine Unit under Rotating Unbalance | *Graduate thesis* **March 2019**

- Developed analytical framework to study rotating unbalance in the Pelton turbine when there is an unbalance in the disk and the shaft.
- Investigated the oscillations of the Pelton turbine under the condition of rotating unbalance.
- Analyzed the effect of eccentricity on oscillations induced by the impact of the water jet on Pelton buckets.
- Compared the results of the analytical framework with available rotor dynamics solvers.

Numerical Modeling of Multi-rotor Hovercraft System | *Undergraduate Thesis* **October 2015**

- Developed mathematical framework to model the systems and sub-systems of a concept medical drone (quadcopter).
- Developed a Simulink model of the entire control system and sub-systems of the quadcopter.
- Created MATLAB scripts to simulate the dynamic behavior of the quadcopter.
- Performed simulations to understand the response of the quadcopter under various input conditions, and use that information to stabilize the quadcopter.

Projects

Droplet detachment from fiber in electric field | *SolidWorks, ANSYS Fluent, C++* **March 2023**

- Created UDFs to simulate the dielectrophoretic and coulombic forces acting on a droplet due to an electric field.
- Performed VOF simulations with custom-made UDFs to study detachment of droplets from a fiber

Multiphase solver for channel flow | *Python, MATLAB* **March 2023**

- Created a solver from scratch to solve the Navier-Stokes equation on staggered grids for an open-channel flow problem.
- Implemented level-set method to track the interface of the droplet as it advects across the domain.
- Implemented surface tension as a body force term in the momentum equation.

Filtration simulation | *SolidWorks, ANSYS Fluent, Mathematica* **October 2021**

- Created non-overlapping virtual filters in a given simulation domain.
- Used DPM model to track the particles in a flow-field. Pressure Drop and Collection efficiency was calculated.

Turbulence | *MATLAB* **March 2021**

- Studied turbulent statistics from a set of velocity data obtained from large eddy simulation of a turbulent shear layer, for instance, correlation coefficient, PDF, joint PDFs, marginal PDFs, autocorrelations and integral time-scales.
- Studied Turbulence RANS models through numerical simulations along a flat plate. Spalart Allmaras (one-equation model) and k-omega (two-equations model) were used for the study.
- Studied Taylor length scales and 1-D energy spectra from LES data. Subgrid viscosity calculations were made through different eddy viscosity models.

- Gaussian white noise was included in a periodically driven elastic oscillator to form stochastic differential equations.
- Performed Euler-Maruyama simulation for the approximate solution of stochastic differential equations.
- Different parameters for the periodically driven elastic oscillator were varied, and subsequent FFT plots were analyzed to study the dynamics of the oscillator.

Technical Skills

Languages: Python, C/C++, MATLAB, Maple, Mathematica

Design and Modeling: SolidWorks, CATIA, Design Modeler, SpaceClaim

CFD and Interface Modelling: ANSYS Fluent, COMSOL, GeoDict, Surface Evolver

Experimental: Goniometer, Porometer, High-speed camera, Raspberry Pi, Centrifuge (custom-setup)

Others: High-Performance Computing (HPC), Data Processing, MS packages, LaTeX, Techplot

Awards

1. MAE Symposium Spring 2022 Poster Competition Winner at NC State University
2. MAE Symposium Spring 2024 Poster Competition Winner at NC State University
3. Induction into Phi Kappa Phi Honor Society for outstanding academic achievements.

Leadership / Extracurricular

Nepalese Student Association (NSA)

Primary Advisor

Jan. 2022 – Aug. 2023

North Carolina State University

- Acted as a mediator between NSA and the university.
- Advised the committee to work towards goals that improve and promote community service, academics, and unity.
- Helped the new-coming students settle into life in the US by passing them relevant information.