Mohan Ananth

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Summary

Experienced researcher with 5 years of experience in computational fluid dynamics (CFD), heat transfer and data analysis.

Education

University of Wisconsin-Madison **Madison, WI, USA**
Ph.D. in Mechanical Engineering, CGPA – 3.9/4.0, *June 2024*
Minor in Mathematics

Indian Institute of Science **Bangalore, KA, India**
Master of Engineering in Mechanical Engineering, CGPA – 6.8/8.0, *2016*

R. V. College of Engineering **Bangalore, KA, India**
Bachelor of Engineering in Mechanical Engineering, CGPA – 9.42/10 *2013*

Research Experience

Multiphase Computational Fluid Dynamics Lab, UW-Madison

Graduate Research Assistant *2018-present*

Thermal analysis of urea spray injection to reduce NO_x in an engine exhaust system:

- Lagrangian-Eulerian (LE) simulations of urea sprays along with evaporation, thermolysis, and hydrolysis reactions of the vapors.
- Studied concentration of ammonia at the catalyst inlet of engine exhaust to reduce emission of nitrogen oxides.

Hybrid Solver to model urea water solution (UWS) spray and evaporation in cross flow:

- Developed hybrid solver in OpenFOAM framework, which consisted of
  - *Volume of Fluid (VoF)* method for large spray dynamics and
  - *Lagrangian-Eulerian (LE)* method for small droplets.
- Developed Computer Aided Design (CAD) model and meshed complex 3-hole urea injector.
- Implemented multicomponent vaporization model for UWS droplets.
- Energy and species transport equations were implemented to accommodate for the phase change.

Stability analysis tools for multi-phase flows:

- Developed tools to solve hydrodynamic stability in multi-phase flows using spectral discretization for
  - 2D Planar jets and
  - 3D Cylindrical jets.

Improvements in curvature and surface tension predictions in OpenFOAM solver interFOAM:

- *Distance-based function* implemented to improve prediction of surface tension forces.

Understanding primary modes responsible for high-speed liquid sheet breakup:

- Existing Kelvin-Helmohltz (KH) instability model for liquid sheet atomization predicts small-scale modes but it is observed that *Large-scale asymmetric modes* are primary factors for breakup.
- Our enhanced stability analysis tool predicted these large-scale modes, which was verified using high-fidelity computational fluid dynamics (CFD) simulations.

Data-driven techniques to analyze the modes in jet atomization:

- Analysed the *spray characteristics* in 3D cylindrical jets using two techniques:
  - *Machine learning technique* called *Dynamic Mode Decomposition (DMD)* and
  - *Continuous Wavelet transforms (CWT)*.

Indian Institute of Science, India

Graduate Research *2014-2016*

Multi-component evaporation of Heavy Fuel Oil using Fluent:

- Developed a *user defined function* in Ansys Fluent software to model *evaporation of multicomponent droplet*.
- Simulated *Heavy Fuel Oil (HFO) evaporation* and studied effects of concentration of HFO residue on evaporation rate.

Work Experience

Mahindra Research Valley, India
Senior Engineer *2016-2017*

Powertrain and fuel intake system

- Developed tools to calculate the *position and stiffness of the mounts* for 3-point and 4-point mount systems, using *moment of inertia* and *center of mass* of powertrain.
- Computer Aided Designing of fuel intake system and its integration into the vehicle body.

Tata Technologies, India
Graduate Engineer Trainee *2014*

Design of Manufacturing systems

- Computer aided design (CAD) and geometric design and tolerance (GDT) for positioning robotic arms in the manufacture and assembly of automotive parts.

Publications and Presentations

- **Mohan Ananth** and Mario F. Trujillo, *Breakup of Planar Liquid Sheets Injected at High Speed in a Quiescent Gas Environment*, Journal of Fluid Mechanics, 2023.
- **Mohan Ananth** and Mario F. Trujillo, *2PJIT: Two-phase 3D jet instability tool in cylindrical coordinates*, SoftwareX, 2022.
- Arpit Agarwal, **Mohan Ananth** and Mario F. Trujillo, *Evaluation and Improvements to Interfacial Curvature Predictions in interFoam*, Fluids, 2022.
- Mario F. Trujillo and **Mohan Ananth**, Insights into primary liquid atomization, Science Talks, 2024.
- **Mohan Ananth** and Mario F. Trujillo, *Large-scale instabilities observed in the breakup of high-speed 3D cylindrical jets injected into quiescent gas*, Institute for Liquid Atomization and Spray Systems, 2024.
- **Mohan Ananth** and Mario F. Trujillo, *Large-scale instabilities in the breakup of liquid sheets*, Institute for Liquid Atomization and Spray Systems, 2023.
- Chia-Wei Kuo, **Mohan Ananth**, Andrea Strzelec and Mario F. Trujillo, *VoFLE simulations to model UWS spray evaporation*, ASME-ICEM, 2022.

Leadership Experience

Board member of **Graduate Engineering Mechanics Society (GEMS)**, which organizes weekly graduate student seminars related to mechanics.

- Orientation for new graduate students and organizing weekly seminars in Fall and Spring semesters.

Board member of **Indian Graduate Student Association (IGSA)**, which is a registered student organization that aims to represent all Indian graduate students at the University of Wisconsin-Madison.

- Organizing events, including an annual cultural event, applying for grants, and helping new graduate students by providing information about housing, travel, and other related queries.

Member of **ASHA for education - Madison Chapter**: A fundraising organization for NGOs working towards providing education to underprivileged children in India.

- Organizing events to raise funds. Reviewing proposals from NGOs and disbursing funds. Raised funds by cycling 40 miles in 2021 and 80 miles in 2022.

Coursework

Mechanical Engineering: Fluid Mechanics, Advanced Heat Transfer, Gas Dynamics, Combustion, Computational Fluid Dynamics (CFD), Solid Mechanics

Computer Science: High Performance Computing, Machine Learning

Mathematics: Numerical Linear Algebra, Computational Methods-Finite Element, Finite-Difference and Spectral Methods, Applied Mathematics-Solutions to differential equations (ODEs and PDEs)

Technical Skills

Programming: Matlab, CUDA, Python, C++, Latex

Computational Fluid Dynamics (CFD): OpenFoam, Ansys Fluent

Computer Aided Design (CAD): Unigraphics, SolidWorks, Catia