Saeed Mohsenian

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Google Scholar, LinkedIn, GithubResume

Research Interests

Mechanical / Thermal-Fluid Sciences:

Multiphase Flow Modeling: Gas-liquid/liquid-solid transport, nanofluid dynamics.
Thermal Management: Passive/active systems, micro/nanoscale heat transfer.
Vortex & Transient Dynamics: Unsteady, high-energy-density flow, pulsatile flows.
CFD & Optimization: Turbulence modeling, non-Newtonian flow, inverse problems.
Advanced Cooling: Heat sinks, phase-change materials, microchannel cooling.

Bio-fluidics & Biomechanics

CSF & Brain Hydrodynamics: CSF flow simulation, brain-tissue deformation.
Image-Based Modeling: 3D reconstruction from MRI data for personalized simulation.
Soft Tissue Biomechanics: Deformation, viscoelasticity, and mechanical stress modeling.
Biotransport Phenomena: Diffusion and convection of therapeutic agents.
Fluid-Structure Interaction (FSI): Coupling flow and tissue deformation in biomedical systems.
Medical Device Modeling: CFD-driven design of needles, catheters, and implants.

Skills

Computational Modeling Tools: Star-CCM+, ANSYS Fluent, SIMULIA, Moving Boundary Conditions
CAD & Meshing: SolidWorks, CATIA, ICEM CFD, Gambit
Programming: MATLAB, Python, Fortran, Maple, SQL
Other Tools: SigmaPlot, GetData Graph Digitizer, ITK-SNAP, ImageJ
Simulation Expertise: FSI modeling, multiphase and soft tissue transport, inverse problems, brain/CSF biomechanics, transient CFD

Education

Northeastern University | Boston, MA — Jan 2025
M.Sc. in Bioengineering

Babol University of Technology — February 2013
M.Sc. in Mechanical Engineering
Thesis Title: Microscale Thermal Transport and Mixing Behavior of Pseudoplastic Nanofluids in Microchannel Heat Exchangers

University of Mazandaran — June 2009
B.Sc. in Mechanical Engineering

Experience

Biogen, **Simulation Engineer, Internship** — *07/2023 – 07/2024*

- Performed CFD simulations (Ansys Fluent) to analyze drug transport in the brain via intrathecal and intracerebroventricular injection.
- Investigated drug mixing with CSF, postural effects, and needle design impact on delivery efficiency.
- Modeled tissue deformation and CSF dynamics using moving boundary conditions.
- Studied diffusion of drugs into soft tissues, aligning with soft tissue transport and deformation research.

Azad University, **Instructor** *09/2013 – 01/2021*

- Developed and implemented lesson plans to instruct students on Mechanical Engineering courses including: CFD, Fluid Mechanics, Heat Transfer, Thermodynamics, Engineering Mathematics.
- Conducted lectures, demonstrations and group activities in order to enhance learning experience.

Parsian Pharmaceutical Company, **Product Modeling Scientist** *05/2017 – 01/2021*

- Simulated injectable drug delivery using CFD, linking fluid behavior to in situ absorption and early PK effects.
- Modeled diffusion, convection, and mixing in anatomical geometries to evaluate delivery efficiency.
- Designed injector and nozzle components in CATIA, using simulation feedback to improve dose accuracy and reliability.
- Collaborated with formulation teams to model delivery kinetics under physiological conditions and refine dose-exposure predictions.
- Optimized flow and mixing in bioreactor and fill-finish systems, improving drug uniformity and reducing variability.

Manufacturing Company, **Thermal Engineer and CAD Designer** *01/2013 – 05/2017*

- Optimized radiators and intercoolers via CFD, improving thermal efficiency by 20%.
- Performed 50+ Ansys Fluent simulations to enhance airflow and reduce failure rates.
- Integrated advanced heat transfer concepts into designs.
- Partnered with cross-functional teams to implement solutions.
- Delivered 200+ CAD models in SolidWorks/CATIA.

Babol University of Technology, **Researcher** *03/2013 – 12/2018*

- Led the management of the Fluid Mechanics Lab at the University, overseeing research projects and ensuring effective utilization of resources.
- Conducted in-depth research focusing on CFD, heat transfer, and fluid mechanics, resulting in multiple publications in high-impact journals, showcasing strong academic and research capabilities.
- Proficient in utilizing various CFD models, including steady-state, multiple reference frame, and transient models, understanding their distinctions and applying them effectively based on specific use cases.

Selected Publications

- Measurement of CSF flow and brain motion in Chiari malformation type I subjects undergoing posterior fossa decompression surgery, **https://doi.org/10.3171/2024.11.JNS241509**
- Pre-surgical assessments of CSF flow and brain motion are indicative of improved cerebral dynamics following surgery in Chiari Malformation I, **https://archive.ismrm.org/2024/1182.html**
- Association between resistance to cerebrospinal fluid flow and cardiac-induced brain tissue motion for Chiari malformation type1, **https://doi.org/10.1007/s00234-023-03207-9**
- Effect of internal heat source and non-independent thermal properties on a convective–radiative longitudinal fin, **https://doi.org/10.1016/j.aej.2022.01.063**
- Dynamic analysis on the epidemic model of infectious diseases using a powerful computational method, **https://doi.org/10.1142/S0129183122500838**
- Evaluation of weighted residual methods for thermal radiation on nanofluid flow between two tubes in presence of magnetic field, **https://doi.org/10.1016/j.csite.2022.101867**
- Theoretical analysis on MHD nanofluid flow between two concentric cylinders using efficient computational techniques, **https://doi.org/10.1016/j.aej.2021.08.047**
- A novel spectral relaxation approach for nanofluid flow past a stretching surface in presence of magnetic field and nonlinear radiation, **https://doi.org/10.1016/j.rinp.2021.105141**
- Numerical analysis on heat transfer of parabolic solar collector operating with nanofluid using Eulerian two-phase approach, **https://doi.org/10.1080/10407782.2021.1950412**
- Design optimization and experimental investigation of CPU heat sink cooled by alumina-water nanofluid, **https://doi.org/10.1016/j.jmrt.2021.09.021**

- Multi-objective grey wolf optimization of solar chimneys based on an improved model incorporating a wind turbine power curve, **https://doi.org/10.1016/j.enconman.2021.114231**
- Investigation of electrospun nanofibers with an electrified non-Newtonian jet using differential quadrature method, **https://doi.org/10.1016/j.ijhydene.2018.02.084**
- Numerical investigation of non-Newtonian nanofluid flow in a converging microchannel, **https://link.springer.com/article/10.1007/s12206-016-1240-0**
- Numerical study of laminar non-Newtonian nanofluid flow in a T-Junction: Investigation of viscous dissipation and temperature-dependent properties, **https://doi.org/10.1016/j.applthermaleng.2016.07.122**
- Entropy generation analysis of a confined slot impinging jet in a converging channel for a shear thinning nanofluid**,** **https://doi.org/10.1016/j.applthermaleng.2016.03.067**
- Analytical and Numerical investigation of natural convection in a heated cylinder using Homotopy Perturbation Method, **https://doi.org/10.4025/actascitechnol.v36i4.16602**

Selected Projects

Design and Optimization of High-Efficiency Radiator for Automotive Applications
- Led the design of a high-efficiency automotive radiator, improving heat transfer by and reducing thermal management costs.
- Conducted CFD simulations (Ansys Fluent) and optimized fin/channel geometry using SolidWorks and CATIA.
- Validated results through experimental testing to ensure compliance with industry standards.

Numerical Study of Laminar Non-Newtonian Nanofluid Flow in a T-Junction
- Investigated viscous dissipation and temperature-dependent properties of nanofluids using Ansys Fluent to improve thermal management in microfluidic systems.
- Developed new correlations for thermal conductivity and rheological behavior, enhancing CFD model accuracy.
- Published results in Applied Thermal Engineering, advancing the understanding of nanofluid flow and heat transfer.

Design Optimization of CPU Heat Sink Cooled by Nanofluid
- Optimized the design of a CPU heat sink using alumina-water nanofluid, improvement in cooling efficiency.
- Conducted thermal analysis and CFD simulations to evaluate heat transfer and fluid flow, ensuring the design met performance requirements.

Latent Heat Thermal Energy Storage with Phase Change Materials
- Developed CFD models to study phase change materials (PCMs) for thermal energy storage applications.
- Optimized the design of PCM-based systems to improve energy efficiency and thermal performance.

Optimization of Bioreactor Fluidic Systems
- Redesigned bioreactor internal components by creating CAD models and simulating mixing and flow dynamics, collaborating on prototype fabrication.
- Reduced fluid resistance, improved mixing efficiency, and lowered manufacturing costs.

Development of Drug Delivery Systems
- Simulated transient fluid dynamics and refined assembly protocols for patient-specific drug delivery systems.
- Enhanced dosage accuracy, supporting precise and regulated drug administration.

Thermal Management of Pharmaceutical Processes
- Used Ansys Fluent to simulate thermal profiles in bioreactors, designing systems to minimize thermal gradients.
- Achieved a 23% reduction in temperature gradients, improving process consistency and product quality.

Fabrication and Testing of Fluidic Components
- Employed CAD and simulation tools to design, fabricate, and validate fluidic components, streamlining the R&D process.

- Cut prototyping time by 30% and ensured compliance with specifications and standards.