Master's Thesis / Internship Project 1

Design, Simulation, and Experimental Validation of Microfluidic Platforms for Controlled Particle Transport

Host Organization: Perfusure ApS | Copenhagen, Denmark
Research Area: Microfluidics · Computational Fluid Dynamics · 3D Printing · Experimental Fluid Mechanics

Problem

Microfluidic technologies are transforming biomedical research by enabling precise control over fluid flow, transport, and cellular microenvironments. However, translating computationally designed microfluidic systems into reproducible experimental platforms remains challenging. Understanding how channel geometry, flow conditions, and fabrication methods influence fluid dynamics and particle transport is essential for developing reliable organ-on-chip technologies.

At Perfusure, we are developing next-generation microfluidic platforms that recreate controlled vascular flow conditions for human-relevant drug testing. We are looking for a motivated Master's student to bridge computational modelling, rapid prototyping, and experimental validation.

What You Will Do

- Perform computational fluid dynamics (CFD) simulations of existing microfluidic chip designs using COMSOL Multiphysics or equivalent software.
- Investigate velocity profiles, pressure distribution, wall shear stress, and particle transport under different flow conditions.
- Optimize selected channel geometries to achieve controlled and reproducible flow characteristics.
- Fabricate microfluidic prototypes using high-resolution 3D printing and suitable microfabrication techniques.
- Perform fluorescent bead and particle-tracking experiments to characterize transport, flow distribution, and particle trajectories.
- Compare experimental measurements with computational predictions to validate and refine the designs.

What You Will Gain

- Hands-on experience in computational modelling and microfluidic device development.
- Practical skills in rapid prototyping, 3D printing, and fluorescence-based flow visualization.
- Experience integrating numerical simulations with experimental validation.
- Exposure to organ-on-chip technologies, vascular mechanobiology, and translational biomedical engineering.
- Opportunity to contribute to the development of a industrial biotechnology platform, with potential for scientific publication.

Requirements

- Master's student in Mechanical Engineering, Biomedical Engineering, Chemical Engineering, Bioengineering, or a related discipline.
- Basic understanding of fluid mechanics and transport phenomena.
- Experience or interest in CFD tools such as COMSOL, ANSYS, or OpenFOAM.
- Interest in microfabrication, experimental measurements, and fluorescence microscopy.
- Programming skills in MATLAB or Python are advantageous.
- Independent, analytical, and motivated to work in an interdisciplinary environment.

Contact Details

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Interested candidates are encouraged to send a short motivation statement, CV, and relevant academic background. Project scope and duration can be adapted to university thesis requirements.