

Manoja Rajalakshmi Aravindakshan

☎ (+1) 7657019533 | ✉ manojalax@gmail.com | 🌐 mra | **in** manojalax | maravind@purdue.edu

Research Interests

- Lumped parameter cardiovascular modeling to simulate and predict parameters affecting cardiac diseases
- Digital twins to study drug behavior (using organ-on-chip devices) and clinical outcomes

Academics

Indian Institute of Technology Kharagpur

PHD IN COMPUTER SCIENCE (PURSUING), GPA: 9.28/10.0

Department of Computer Science and Engineering

West Bengal, India

Jan 2020 - Present

- **PhD thesis** “Application of computational modeling towards digital twinning of human physiological and biochemical processes” submitted on 26th Dec, 2024
- **Coursework** Systems Biology, Computational Structural Biology, Applied Multivariate Statistical Modelling, Machine Learning, Deep Learning

Government Engineering College, Palakkad

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE, GPA: 8.54/10.0

University of Calicut

Palakkad, India

Aug 2012 - May 2016

Research/Work Experience

Purdue University

VISITING RESEARCH SCHOLAR, MECHANICAL ENGINEERING

West Lafayette, USA

Feb 2025 - Present

- Working on reduced order modeling of the circulatory system in Vlachos research group, exploring gaps in modeling of lymphatic and glymphatic systems

OVERSEAS VISITING DOCTORAL FELLOW, COMPUTER SCIENCE

Aug 2023 - Jan 2025

- Blood flow-electrical system analogy for vessel resistance, compliance, and inertance for analysis of pressure and flow rates in circulatory system
- Ordinary differential equations for parameter estimation and simulation
- Comprehensive whole-body model for facilitating pharmacokinetic studies in cardiac diseases
- Digital liver-on-chip simulator (DigiLoCs) for drug distribution in liver-on-chip

Indian Institute of Technology Kharagpur

RESEARCH SCHOLAR

West Bengal, India

Aug 2019 - May 2022

- Physiologically based pharmacokinetic (PBPK) modeling of drug distribution in liver-on-chip devices
 - Compartmental ODE model for simulating drug distribution through the integration of biological factors, hardware, and drug properties
 - Enhanced human clearance prediction through differentiation of active and passive processes across liver-on-chip platforms
 - *In vitro* to *in vivo* extrapolation for bridging *in vitro* findings with clinical relevance
- Computational approaches to insulin-glucose modeling and characterizing subtypes in type 2 diabetes
 - An extended insulin-glucose system including the role of adipokines (leptin) and BMI
 - Identified three distinct patho-clinical clusters among uncontrolled type 2 diabetes patients using data from a community health clinic

- Teaching Assistant: Foundations of Computing Science (CS60005), Algorithm Design and Analysis (CS60007), Computer Organization and Architecture (CS31001), Algorithms (CS21003)

SPONSORED RESEARCH AND INDUSTRIAL CONSULTANCY, IIT KHARAGPUR

Aug 2019 - Dec 2022

- Railway research projects by MHRD, India (IMP/2018/000471) Incorporating cab-signaling into interlocked signaling design with verification (IMPRINT-2) sponsored by SERB.
- Developed a commercially significant software (used by the zonal signalling sections of Indian Railways) to capture the layout and identify all possible routes and generate route control charts
- Programmed key modules in project “Software for Maintaining Institutes of Learning and Education (SMILE)”, sponsored by World Bank under TEQIP III (Ministry of Education, MHRD), Govt. of India)

Embedon Global Energy Pvt Ltd

Pune, India

SOFTWARE ENGINEER

Nov 2016 - June 2018

- Developed code for embedded system projects including (i) Interactive games for cardio by simulating light patterns using sensors (ii) Software for three-dimensional marking machine that permanently marks components

Internship

esqLABS GmbH

Saterland, Germany

RESEARCH INTERN

June 2023 - Dec 2023

- Developed scripts and software that describe digital twins for *in vitro* (organ-on-chip, 3D spheroids) systems
- Improved prediction of clinical outcomes to reduce time, costs and patient burden in drug development

Metflux Research Pvt Ltd

Mumbai, India

RESEARCH INTERN

Aug 2021 - Dec 2021

- Worked on the adult metabolism model with diet perturbation
- Simulated effect of diet on body weight to gain physiological insight of metabolism in the body

AAIC Technologies Pvt Ltd

Hyderabad, India

SOFTWARE DEVELOPER INTERN

Mar 2020 - July 2020

- GATE and machine learning course software, mentoring students and course content updation

Gate Overflow

Trivandrum, India

MENTOR AT Q/A SITE FOR COMPUTER SCIENCE

Aug 2019 - Feb 2020

- GATE Q/A book for computer science, mentoring and solving problems to enhance learning experience

Publications/Patents

- DigiLoCS: A leap forward in predictive organ-on-chip simulations. PLoS ONE 20(1): e0314083. doi:10.1371/journal.pone.0314083 (2025)
- System for design of Route Control Chart (RCC) and application logic for interlocked signaling, patent application no. 202431029893, filed on Apr, 2024
- Parameter estimation for the oral minimal model and parameter distinctions between obese and non-obese type 2 diabetes. DNA and Cell Biology Reports. doi:10.1089dcbr.2024.0018 (2024)
- Distinct patho-clinical clusters among uncontrolled type 2 diabetes patients: results from a prospective study in rural India. BMJ Open Diab Res Care. doi:10.1136/bmjdr-2021-002654 (2022)
- A closed-loop lumped parameter model for whole-body cardiovascular simulation (working paper)

Conferences/Workshops

- Talk on “Application of computational modeling towards digital twinning for human physiological systems” at *OVDf Symposium*, Purdue University (Dec 2024)
- Talk on “Digital twins for liver-on-chip device” at *Data-driven mechanistic models of complex biomedical systems workshop* at University of Birmingham, UK (Dec 2023)
- “Parameter estimation for the oral minimal model and parameter distinctions between obese and non-obese type 2 diabetes”, *Bioinformatics and Computational Biology Conference, BBCC* (Dec 2022)

Skills/Certifications

Frameworks Jupyter Lab, Matlab, Tensorflow, R studio, PK-Sim, WEKA

Certifications Professional development certificate, Purdue University; NPTEL Deep Learning Course (Top 1%); Diploma in Java Technologies from NIIT Palakkad

Achievements

- Awarded India's Science and Engineering Research Board (SERB) *Overseas Visiting Doctoral Fellowship (OVDF)* at Purdue University (Aug 2023)
- Awarded *Metflux research internship 2021* for aspiring computational biologists
- Opportunity to work on project *Online Despatch System for Fabrication and T&E of AVN Packages* at Vikram Sarabhai Space Centre, Trivandrum
- Rank holder in Calicut University and Batch topper award-Computer Science, 2016

References

Alex Pothen

Professor
Computer Science
Purdue University
apothen@purdue.edu

Chittaranjan Mandal

Professor
Computer Science and Engg
IIT Kharagpur
chitta@iitkgp.ac.in

K V Venkatesh

Professor, Head of Metflux Research
Chemical Engineering
IIT Bombay
venks@iitb.ac.in