SWAMENATHAN RAMESH

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EDUCATION

University of Michigan, Ann Arbor, MI **August 2021 – December 2022**

Master of Science in Aerospace Engineering | GPA 4.0 /4.0

SSN College of Engineering, Anna University, Chennai, India **June 2017 - June 2021**

Bachelor of Engineering in Mechanical Engineering | CGPA 8.95/10

ACADEMIC PROJECTS AND COURSEWORK

Research Assistant | Prof. Steve Cessio and Dr. Harish Ganesh **September 2022 - present**

- Tasked with **experimental design** of X-ray visualization of Kelvin-Helmholtz instabilities in an immiscible multiphase flow. Project scope involves literature survey, **CAD design** of setup and finally running experiments to verify validity of setup.

Research Assistant | Kwabi Lab **May 2022 - present**

- Developed a **MATLAB** model to simulate reactions of azobenzene photoacids in seawater on illumination to characterize dependence of the pH swing on the pKa of the photoacids and inferring optimum pKa values and corresponding photoacid for the application. As part of a project to enable CO_2 release and capture from seawater using ionic exchange membranes with photoacids.
- Development of a cyclic-voltammetry and constant current model on **MATLAB** for a PCET-activated quinone polymer film that enables pH swing for CO_2 release and capture.

Graduate Student Researcher | Independent Study **February 2022 – April 2022**

- Assessed and documented the condition of turbulence reduction screens in the UMich low speed wind tunnel. Performed a trade study on **MATLAB** making use of existing literature and provided suggestion for a cost-saving combination of 3 screens with progressively more refined meshes. Developed schematics on **CATIA** for the screen assembly and screen tensioning mechanisms.

Data-driven and Reduced Complexity Modelling **April 2022 (Winter 2022)**

- Performed a comparison study of intrusive and non-intrusive reduced-order models for a 1D reactive compressible flow problem. Intrusive ROM employed was POD-Galerkin from the open source PERFORM modular-ROM solver. Non-intrusive ROM was a convolutional autoencoder with long short-term memory (CAE-LSTM) developed using **Python** and PyTorch functionalities.
- The study titled "Performance of Intrusive and Non-Intrusive ROM Techniques for a 1D Combustion Problem" was done for a group term project.

Computational Fluid Dynamics **August 2021 – December 2021 (Fall 2021)**

- Developed 3 solver codes on **MATLAB** using **Finite Difference Method, Finite Volume Method and Staggered Storage method** for 2D flow in diffuser, fuel sloshing in a rectangular tank and a driven-cavity flow problem respectively.

Numerical Studies on the Estimation of Fatigue Life of Preloaded Aircraft Fasteners **January 2021 – April 2021**

- Investigated how changing the preload affects the fatigue life cycles in a fastener made of Al 2024-T4 material which is typically employed in aircrafts. Made use of the **Abaqus FEA** and **FESafe** software packages to design and run analysis of the bolt model and compute the Worst-Life repeats of the model. Two cases were considered: bolt without crack and with crack (crack ratio = 0.1).

Other coursework: Inference, Estimation and Learning; Hypersonic Aerothermodynamics; Compressible Flow; Electric Propulsion; Combustion Processes; Introduction to Turbulence; Data Structures and Algorithms; CAD/CAM Laboratory

INDUSTRIAL EXPERIENCE

Tafe Gears Division, Kanchipuram, India **June 2019**

In-plant trainee

- Gained first-hand knowledge of the gear manufacturing process for tractors. Provided plans to optimize the functioning of the packaging department by using pick and place robots.

Hindustan Aeronautics Limited – Aircrafts Division, Bengaluru, India **November 2018 – December 2018**

Student Intern

- Exposed to various conventional and non-conventional machining processes involved in the aircraft and fighter jet industry and other essential aircraft components like plug doors used for entry into a commercial airliner's fuselage.

CO-CURRICULAR ACTIVITIES AND ACHIEVEMENTS

Behavioural Model for Virtual Commissioning Systems | Ford Hackathon | 1st Place **May 2020**

- Led a team in implementing behavioral models for a nutrunner, emergency stop button and a vision system to provide necessary feedback to a Programmable Logic Controller (PLC). Designed the interface using Python tkinter module. Educational experience on Industry 4.0.

Air Wind Turbine | IICDC | Semi-finalist **October 2019 – August 2020**

- Involved in developing a concept design for an air wind turbine generator (AWTG) for the Indian Innovation Challenge Design Contest (IICDC). Designed a CATIA model of a suitable airfoil. Semi-finalist in the same contest.

SKILLS AND CERTIFICATIONS

- Programming: **MATLAB and Python - Intermediate, C and C++ (Object Oriented Programming) - Beginner**
- Computer Aided Design/Analysis: **CATIA, Ansys WB, Fluent, Abaqus - Intermediate**
- Online Courses: edX – Hypersonics (University of Queensland), Intro to Astrophysics (EPFL), Space Mission Design and Operations (EPFL); Coursera – Intro to Machine Learning (Stanford)