

U.G.N. KUMARA

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EDUCATION

University of Moratuwa

BSc. (Hons) in Mechanical Engineering; Minor in Mathematics (CGPA: 3.67)

Moratuwa, Sri Lanka

Feb 2022 – Present

EXPERIENCE

Trainee Software Engineer

Turbogen Consultancy (Pvt) Ltd.

Colombo 07, Sri Lanka

2024 Dec – 2025 Jun

- **Parametric Volute Tongue Fillet**

- > Developed a custom tangent surface creation algorithm with adjustable parameters to build a fillet for the volute tongue that combines all the surfaces into one volute geometry.
- > After achieving 1-2 second process time for the whole process, the algorithm was tested for 20 different test cases, of which 17 were successful.
- > Integrated the algorithm to Turbotides's codebase and shipped into production as a beta feature to be used as the final geometric addition in pump design workflows.

- **Constrained Parametric Curve Solver**

- > Developed a parametric curve solver that can maintain the tangency between curves, as well as other geometric items in real time when user changes the input variables interactively.
- > Used 2 solver architecture for reliability: Linear solver when suitable and Non-Linear solver as a backup. Both solvers were prototyped in python and then written in C++ to integrate into Turbotides's codebase.
- > The solver was used in new Bézier Blade editor as the backend, and was reused inside another airfoil editor, because the solver was made to be modular and independent.

- **Meridional Flow Solver**

- > Prototyped the solver described in the 1960 NASA paper **Use of Arbitrary Quasi-Orthogonals for Calculating Flow Distribution in a Turbomachine** in python to test the feasibility.
- > Implemented the solver in C++ while using OpenMP directives to parallelize the computation which reduced the computation time to sub-second.
- > The final code was integrated to Turbotides's codebase while using VTK plugins for visualization of the result: Pressure, Velocity, and Temperature contour plots.

ACADEMIC & PERSONAL PROJECTS

Desktop Thermal & Acoustic Analysis Framework (FYP)

2025 – Present

Python, Simulation, Research

- Developing a framework for rapid assessment of the working temperature, and fan noise level of a desktop computer when hardware and specific arrangement is given without relying on computationally heavy CFD simulations.
- Implementing a 3D potential flow solver coupled with Von Kármán momentum integral equations and Boundary Domain Integral Methods (BDIM) for thermal boundary layer analysis.
- Comparison against CFD results during development process for design decision making, and final experimental validation.

MEMS Radial Thermoelectric Cooler

2025

MATLAB, COMSOL Multiphysics, SolidWorks, Optimization

- Design and simulation of a radial Thermoelectric cooler (TEC) array coupled with micro channel heatsink to cool 3D stacked microchips.
- Developed a compact thermal model (CTM) for the TEC array and validated the CTM using parameterized SolidWorks geometry live-linked with COMSOL via MATLAB API.
- Performed preliminary optimization for the geometric parameters on CTM using MATLAB optimization toolbox, and finalized parameters were used to run fully coupled simulations in COMSOL.

CFD Study on Micro Channel Heat Sink

2025

ANSYS Fluent, Python, Matplotlib

- Conducted a conjugate heat transfer study in a micro-channel heatsink with circular ribs using ANSYS Fluent.
- Generated a poly-hexcore mesh with inflation layers in Fluent Meshing to resolve the boundary layer, adhering to acceptable mesh quality standards.
- Simulated 9 Reynolds numbers, validated against literature, and built unified contour plots using Python's Matplotlib package from exported Fluent data.

Gearbox Design for a Spacer Cart

2024

Python, SolidWorks

- Contributed to a group project designing a 3-speed forward + 3-speed reverse gearbox.
- Wrote Python scripts for brute-force search of feasible gear tooth/module combinations and generated BMD plots for shaft bending moment analysis.
- Performed gear safety calculations (Lewis, Buckingham, wear), bearing selection, and designed a full shifting mechanism with a ball-and-socket joint in SolidWorks.

Other: Fourier/DFT visualizations, complex mapping animations, POS systems (Java/MySQL), portfolio site built with Next.js + Tailwind.

PUBLICATIONS

“Linear Matrix Formulation for Directional Tangency Constraints in Parametric Curve Design”

— Published at MERS 2025. **Best Poster Award.**

SKILLS

Engineering Tools: SolidWorks, ANSYS Fluent/Mechanical, COMSOL, MATLAB, OpenFOAM

Graphics & Kernels: OpenCascade, Qt, PyVista, VTK, Processing

Programming: C++, Python (Numerical libraries, pandas, Matplotlib), Java, MySQL, Git, Arduino, React, Next.js

Domain Knowledge: Turbomachinery design, Computational Fluid Dynamics (CFD), Panel Methods, Numerical Optimization, Applied Mathematics, Heat Transfer