

# Rik Williamson

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github.com/rikeroo

## Experience

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**Embedded Software Engineer**, Lotus Cars – Hethel, Norfolk July 2024 – Present

- Developed and maintained ECU software in C, following MISRA standards for multiple high-performance vehicles, including Gordon Murray Automotive's T50S, T50, T33, and the Czipper hypercar
- Developed and integrated sensor signal processing drivers, leveraging external microprocessor package modules such as the eTPU for real-time critical signal handling
- Collaborated with Calibration Engineers to develop, test and validate diagnostic strategies for state-of-the-art vehicle powertrains, including Czipper's twin-turbo V8 + HV hybrid system
- Created and maintained Python-based automation and analysis tools to enhance calibration workflows, support software engineers, and improve overall software quality

**Innovation Intern**, Aegis Engineering Systems – Derby June 2024 – July 2024

- Recruited following a Hackathon hosted by Aegis at the University of Sheffield
- Conducted research into the feasibility of a multi-agent LLM system, constructing a performance evaluation framework for effective iterative system improvements
- Built a prototype system, along with a research report detailing the process, motivations behind the project and next steps for incorporating upcoming machine learning tools

## Skills

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**Languages:** C, Python, C++, MATLAB, Java, Go

**Automotive Tools:** CANalyzer, Vector CANape, Vector CANoe, ECT, INCA, MATLAB Simulink

**Design Tools:** Fusion 360, KiCad, SolidWorks, OnShape

**Simulation and Analysis:** Ansys Fluent, Ansys Mechanical, XFoil

## Education

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**University of Sheffield** – Master of General Engineering (Mechanical) 1st Class July 2024

- Studied Mechanical, Electrical, Systems & Control, Civil, Software and Aerospace engineering, providing a foundation for cross-functional collaboration and holistic problem-solving
- Combined breadth with a mechanical engineering specialisation (Years 3 & 4), developing strong technical skills for in-depth problem-solving while retaining the flexibility to pursue interests across diverse engineering fields.

**City of Norwich School** – A-Levels: AAAB - Maths, Physics, EPQ, Chemistry June 2019

## Projects

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**Manufacturing Process Control and Optimisation with Reinforcement Machine Learning** Oct 2023 – Sep 2024

- Developed a Deep Learning Neural Network to model a multi-variable slot-die manufacturing process and applied Reinforcement Learning for control and optimisation
- Developed proficiency with time-series LSTM Neural Network models, practically applying them to create a simulation environment for a Reinforcement Learning controller
- Gained experience training neural networks with realistic experimental data, whilst avoiding over-fitting

**Design and prototyping of Fighting Robot to Compete in a National Tournament** June 2023 – Sep 2024

- Designed a high torque, high resolution robot drive system using BLDC motors and belt driven gear reduction with CAD, whilst remaining within strict packing constraints and ensuring ease of disassembly

- Developed custom performance test rigs and procedures for stall torque and velocity reversal to fine-tune electronic speed controller programming and evaluate situation specific performance
- Created a professional engineering report detailing overall robot design, legal and standardisation concerns, quality management procedures as well as marketing and sustainability considerations
- Led group meetings, delegating tasks to group members while setting up frameworks for effective collaboration by avoiding duplicate work through time-efficient, focused meetings

#### **Custom-PCB for embedded system Habit Reminder device**

Nov 2023 – Present

- Independently designed and prototyped a custom PCB using KiCad based on a bare ESP32 C3 module alongside studies, applying electronic design fundamentals to reduce noise and ensure device stability
- Researched and selected optimal components using datasheets, balancing cost, availability and performance while improving proficiency reading technical documentation
- Created firmware in C++ using Object Oriented Programming; integrating external ToDoist APIs, an NTP Client, Webserver, OLED display, NeoPixel LEDs and physical user input

#### **Non-Linear FEA Model for new and aged Engine Mounts**

Nov 2023

- Created a non-linear FEA model for a multi-material elastomer-hydraulic engine mount, incorporating a novel strategy to account for geometric changes due to aging, resulting in improved accuracy
- Validated results against experimental data, critically analysing discrepancies and limitations in both FEA and experimental techniques
- Proposed design recommendations based on results, taking into account manufacturing and budgetary constraints, as well as the impact of material aging on performance

#### **Autonomous MAV Aerofoil Specification and Optimisation**

Nov 2022

- Proposed an optimal aerofoil profile and aspect ratio for an electric MAV, meeting design requirements (speed, mass, wing area) through XFOIL simulations and analytical validation
- Evaluated trade-offs between lift, drag, stability and maneuverability, selecting NACA profiles to achieve application specific performance goals
- Considered manufacturing constraints associated with thin and long low-drag aerofoils, researching wing spar manufacturing methods and similarly scaled air craft wing spans to determine feasibility

#### **Backwards Step Numerical Simulation CFD analysis**

May 2023

- Built a CFD model to accurately represent the backwards facing step experiment, choosing an appropriate turbulence model through consideration of accuracy given specific flow dynamics
- Justified use of pressure-based solver and the Coupled algorithm through consideration of simplifications to terms in the Reynolds Averaged Navier Stokes equation and computational limitations
- Developed a MATLAB program to parse through raw experimental data and produce all required figures, allowing for rapid model development without figure re-formatting and insertion

#### **Hobbies**

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**Cycling:** Competed in Downhill Mountain biking, commute by bike and explore with a Gravel bike

**Climbing:** Competed in Boulderling, placing 1st in several regional competitions. Continue to climb recreationally indoors and outdoors with frequent trips to the peak district to boulder

**HomeLab:** Maintain a local network, with a type-1 hypervisor virtualising multiple linux servers, a docker host, and a network file share

**FPV Drones:** Learned to Build, fly and maintain various form-factor FPV drones, learning PID tuning, BLDC motor drive optimisation and battery specification depending on thrust requirements