Jack Ulbrich-Baker

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Summary

Robotics Engineer with 3 years of experience developing robust, high-reliability hardware in mission-critical environments. Strong background in embedded hardware and software system design, power system design, control, and simulation across both terrestrial and space domains. Proven leadership in cross-functional teams, and hands-on design, test, and validation of multi-board embedded systems, with work on systems that must be robust and perform in demanding environments.

Education

Monash University Australia
Bachelor of Engineering (Honours) Robotics (Artificial Intelligence) *March. 2019 – May 2025*

Monash University Australia
Bachelor of Commerce Behavioural Economics *March. 2019 – December 2024*

Work Experience

Neutron GNC Intern November 2024 - March 2025
Rocket Lab *APC, New Zealand*

- Gained an extremely in depth understanding of rocket development and the GNC algorithms involved with flying and landing a rocket, especially Model Predictive control (MPC) and ZEM-ZEV control
- Developed the automated analysis of algorithms and control systems. My final deliverable was an automated report system that would analyse the simulation of 250+ vehicles and determine the performance of GNC algorithms.
- Produced 3 systems for automated Monte Carlo (MC) Simulation reporting, allowing for automated evaluation of Hardware in the Loop (HITL), MC Simulated Landing and in flight performance
- Supported closed-loop control analysis for actuator systems, focusing on dynamic stability and accuracy constraints in high-reliability embedded environments.

Chief Executive Officer July 2023 - July 2024
Monash Nova Rover *Clayton, Australia*

- Responsible for managing the teams' overall trajectory, and project management including a multi-tiered network of sub-teams comprising of over 100 students.
- Achieved a high retention rate of new team members in 2023 (over 90%), due to the implementation of positive changes after reflecting on the teams' strengths and limitations in 2022.
- Utilising effective leadership skills to ensure goals are completed to a high standard, team members are motivated and key deliverables are met for the competitions we attend with 0 missed deadlines or deliverables

Electrical Engineer September 2022 - July 2025
Monash Nova Rover *Clayton, Australia*

- Worked with NVIDIA Jetson Carrier board development, involving the development of ethernet, MIPI CSI, GMSL, CAN bus, motor control, SPI, PCIe, I2C and SMD soldering and PCB assembly.
- Responsible for the programming and overall system design to ensure the PCBs work as intended in challenging and tough environments, with a focus on low-latency, synchronisation, reliability and modularity.
- Developed C code for STM32 embedded systems for motor control and sensor monitoring, dsPic33 and PIC16 systems for motor and servo control, utilising CAN bus, SPI and I2C for peripheral connection and communication.
- Worked on mechanical aspects of the rover and have knowledge of SolidWorks, including FEA, sheet metal assemblies and 3D printing
- Applied IPC-2221 and EEE-INST-002 standards in PCB layout, derating, and component selection.
- Performed transient analysis, reverse-polarity testing, thermal testing, and signal integrity validation to ensure robust performance in field environments.

Electrical Technician July 2023 - Nov 2024
Versatile Technology *Clayton, Australia*

- Versatile Technology is the number one producer of beverage can testing gauges worldwide, responsible for 95% of all global production.
- My role was to assemble, test, calibrate and verify the gauges in production, where I am involved in wiring harness design and construction.
- Calibration of sensor data, multi camera setups (RGB and UV cameras) and custom mechatronic systems to NMI and NIST standards for mass, distance, reflectivity and more.
- Familiar with working with STM32, ATMEL AVR and ARM processors for embedded sensor data collection, motor driving and for sensor fusion

Achievements and Qualifications

- Authored paper published in the IEEE robotics and automation magazine
- Achieved 2nd Place in Australian ARC 2024 Rover challenge
- Achieved 2nd Place in International URC 2023 Rover challenge
- Advanced Altium Training certificate
- Monash Travel Abroad Scholarship

Projects

Jetson Orin NX Carrier Board | *Multi-Layer PCB Design* July 2024 – Nov 2024

- Developed an entirely custom carrier board that interfaces with a backplane system with full peripherals and extended connectivity for the Warratah autonomous Rover. The system has 600 parts.
- Multi-board design with complex power solution and upgradable camera daughter-boards for repairability and ease of upgrade.
- Development included thermal, power and timing analysis of power system daughter card, high-speed signal integrity analysis.

Doom Neural Network agent | *Python, ML, Reinforcement Learning* May 2022 – May 2022

- Create a Neural network that can control the "Doom guy" in the classic 1993 game and navigate and survive a complex environment
- A combination of neural network architectures were used to create a robust and lightweight agent
- Utilising a LSTM network for memory, the agent was able to remember where enemies were and manage multiple threats concurrently
- Using a CNN network for real time Image processing, the network had no access to internal information.

Skills

Languages: Python, C++, HTML/CSS, Verilog, MATLAB
Software: Altium, LTSpice, PSpice, Solidworks, TINA-TI, KiCad, Simulink
Developer Tools: ROS2, Git, Linux, Bash, Neovim, VS Code, LaTeX
Systems: DC-DC converters, Embedded Software Engineering, Embedded Systems, Computer Vision
Testing Tools: Oscilloscope-based transient analysis, Bench-level Load testing
Soft Skills: Intercultural Competence and Collaboration, Leadership and Project Management, Problem Identification and Solution Development, Emotional Intelligence and Empathy, Effective Communication and integrity.

Community and Outreach

Facilitated robotics workshops with primary students at the 2023 Space Forum
Facilitated Women in STEM Workshops in over 50 secondary schools
Represented Monash University and Monash Nova Rover at the 2023 Space Convention
Event Organiser for Women in STEM Information Night
Facilitated opening event with NISA
Attended and aided US Consulate visit

References

Marcel Scherrmann, — GNC Team Lead, *Rocket Lab*, email: marcel.scherrmann@rocketlab.co.nz
Chao Chen, — Associate Professor, *Monash University*, email: Chao.Chen@monash.edu
Reggie Michelson, — Operation Specialist *Amber Electric* email: reggiemichelson@gmail.com

More references available upon request