BEN PAUL RICHARD

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PROFESSIONAL SUMMARY

Innovative MSc Advanced Control Systems Engineer with hands-on expertise in embedded systems, low-level software optimization, and algorithm development. Proven track record developing and validating embedded control algorithms in C/C++, reducing commissioning time by 25% and improving system stability by 20%. Passionate about computer architecture, GPU computing, and semiconductor innovation. Skilled in Python, C/C++, Linux kernel optimization, control systems modeling, and real-time hardware-in-the-loop (HIL) testing. Demonstrated 10x mindset through optimization of complex systems, cross-functional collaboration, and continuous learning.

EDUCATION

MSc, Financial Engineering

World Quant University (Online, USA) | 2025 – Present

- **Relevant Courses:** Financial econometrics | stochastic modeling & Monte Carlo simulation | derivatives pricing | portfolio optimization | risk management (VaR/CVaR) | time-series forecasting and ML/DL for alpha research and signal generation using Python (NumPy, Pandas, scikit-learn).
- Building an ML-powered quantitative framework integrating econometrics, stochastic modelling, and Monte Carlo simulation to forecast returns, price derivatives, and optimize portfolios with back tested risk-adjusted performance.

MSc, Advanced Control and Systems Engineering

The University of Manchester, United Kingdom | 2024 - 2025 | (Merit)

- **Relevant Courses:** Control Systems Fundamentals | Process Automation | System Identification & Artificial Intelligence | Advanced Power System Protection & Control | System Modelling | Applied Control & Autonomous Systems | Digital Control | Robotic Manipulators | Quantum Computing Fundamentals;
- **Dissertation: Noise-Adaptive Grover Search Algorithm on NISQ Hardware** - *Quantum-inspired optimization for fault-tolerant control systems*

Designed quantum circuit optimization algorithms using Qiskit for NISQ processors, analyzed noise mitigation strategies, and algorithmic performance on hardware simulators. Demonstrated advanced understanding of quantum-classical hybrid approaches.

BEng, Mechanical Engineering

Anna University, India | 2017 - 2021 | (First Class Honors)

- **Relevant Courses:** Electrical Machines & Power Systems, Circuit Analysis & Electronics, Thermodynamics & Energy Systems, Mechatronics, Electrical Drives and Controls, Electrical/Electronics/Instrumentation Engineering, Computer-Aided Design and Manufacturing, Fluid Mechanics and Machinery, Engineering Design, Manufacturing Technology.
- **Final Year Project:** Regenerative Braking System for Electric Vehicles using a squirrel cage induction motor. Designed, simulated, and fabricated an energy-efficient braking system in MATLAB/Simulink and SolidWorks, focusing on kinetic energy recovery, system integration, and performance optimization for electric vehicle applications.

SKILLS

- **Mechanical Engineering & Design:** Mechanical Equipment Design & Fabrication | Piping Systems & Flow Control | Equipment Installation & Commissioning | 3D CAD Modelling (SolidWorks, AutoCAD (Mechanical & Electrical)) | SolidWorks | Revit | GD&T | Engineering Drawings | FEA & Design Validation | Material Selection & Welding Standards | Equipment Testing & Troubleshooting.
- **Programming Interfaces**: Python | C/C++ | Embedded C | Assembly (ARM, x86) | Git | Arduino.
- **Computer Architecture & Systems:** CPU/GPU architecture fundamentals | ARM Cortex-M | x86 ISA | Memory hierarchies | Instruction pipelining | Vector operations.
- **Hardware:** Verilog / SystemVerilog | Digital logic fundamentals | RTL comprehension | CPU microarchitecture basics.
- **Embedded & Low-Level Systems:** Linux kernel | Device drivers | Bootloaders | Real-time systems | Hardware-in-the-loop (HIL) testing | Verilog | VHDL.
- **Control & Signal Processing**: PID control | Model Predictive Control (MPC) | State-space modeling | Kalman/Particle filters | SLAM | System identification (ARX/OE models).
- **Networking & I/O**: TCP/IP protocols | UDP | Ethernet | UART/I2C/SPI | Modbus TCP | HART communication | Network socket programming.
- **Tools & Platforms**: MATLAB/Simulink | Quarc HIL | Git/GitHub | MATLAB Control System Toolbox | Ansys | Docker | LabVIEW | Microsoft Office Suite (Excel with VBA, Word, PowerPoint) | Engineering Drawing Interpretation & Development | **Security & Analysis:** Wireshark, Burp Suite, Frida, Paraben, Autopsy, Nmap, Metasploit, OWASP ZAP | **Forensics & Reverse Engineering:** Ghidra, IDA Pro, JADX, APKTool, Magisk | **Infrastructure:** Linux, Windows, ASP.NET, Java.
- **Soft Skills:** Problem-solving | Effective communication | Cross-functional teamwork | Attention to detail | Troubleshooting | Calibration & testing | 10x mindset

WORK EXPERIENCE

Graduate Trainee Engineer, *Zebronics India Pvt Ltd* | *Dec 2023 – May 2024*

Embedded Systems & Firmware Development:

- Developed and validated embedded control algorithms in C/C++ for industrial automation systems, improving functional stability by 20% and reducing commissioning time by 25%.
- Implemented real-time control loops for motorized systems; optimized algorithm performance via profiling and code review.
- Debugged complex firmware issues using oscilloscopes and logic analyzers; root-caused 5+ critical failures in embedded control pathways.

Design & Documentation:

- Designed and reviewed electrical schematics and functional design specifications (FDS) per industry standards and project timelines.
- Contributed to cross-functional design reviews, identifying edge cases and performance bottlenecks early in the development cycle.

System Integration & Testing:

- Performed system calibration, internal testing, and fault isolation using multimeters, oscilloscopes, and network analyzers.
- Collaborated with QA and field teams to reduce commissioning time by 25% and ensure robust system delivery across 8+ product lines.
- Diagnosed and serviced board-level electronic components (motherboards, CCTV power supplies, SMPS).

ERP & Process Management:

- Utilized SAP ERP for tracking procurement, inventory, and maintenance; improved process alignment and reporting accuracy by 18%

Engineering Intern, Guru Services (Voltas Authorized System Solution Provider) | Dec 2022 – Dec 2023

Large-Scale Control System Commissioning & Optimization

- Commissioned and optimized 15+ industrial HVAC control systems, performing advanced PID tuning and reducing downtime by 15%.
- Implemented and validated cascade control strategies for multi-loop chiller systems; improved setpoint tracking accuracy by 12%.
- Designed and tested control interlocking systems, ensuring full compliance with safety standards across 10+ industrial projects.

Troubleshooting & Fault Resolution

- Resolved 25+ major control and electrical faults across 15+ chiller units, optimizing reliability and minimizing downtime by 15%.

- Executed advanced troubleshooting on power/control circuits (up to 415V); resolved motor starter and relay issues systematically.
- Calibrated 40+ temperature and pressure control loops for optimal performance in VRF and ductable HVAC systems.

Hardware & Field Engineering

- Assisted in compressor overhauls and motor rewinding (10–100 kW), ensuring restored efficiency and adherence to OEM standards.
- Verified power system integrity for new installations, including cable sizing, grounding, and protection scheme design

Junior Engineer (Intern), SKI Precision Products | May 2021 – Dec 2022

- Operated and programmed CNC machines; designed components and tooling using AutoCAD and SolidWorks.
- Performed design validation via FEA and precision quality checks using CMM; achieved <0.05mm dimensional accuracy.
- Supported process optimization and cross-functional troubleshooting.

Engineering Intern – Integral Coach Factory, Indian Railways| Mar 2021 – Apr 2021

- **Project:** Validation of Field Welding Parameters and Revision of WPS to Improve Productivity.
- Validated welding parameters and updated WPS documentation; enhanced productivity and compliance in rolling stock fabrication.
- Gained hands-on exposure to industrial safety systems, production workflows, and cross-functional collaboration.

RESEARCH AND PROJECTS

Mini GPU - RTL-based Multi-Core Parallel Processor (SystemVerilog) | Self-Directed Hardware Design Project:

- Designed and verified a simplified multi-core GPU in SystemVerilog, implementing dispatcher, thread scheduling, ALU datapaths, and memory interfaces; validated parallel workloads via simulation testbenches.
- Analysed architectural trade-offs (cores vs threads) and documented microarchitecture decisions, gaining practical RTL and processor design experience.
- ***Technologies:*** SystemVerilog/Verilog, RTL simulation, testbench design, Git, Linux tools

Autonomous Mobile Robots - Motion Control & Localization:

- Designed and simulated motion control algorithms (PID, Sliding Mode Control, Cascade) with accurate trajectory tracking.
- Integrated advanced localization: Extended Kalman Filter (EKF), Particle Filter, and SLAM for real-time pose estimation.
- Implemented CBF-CLF-based QP planning for obstacle avoidance and goal-seeking behavior.
- ***Technologies:*** MATLAB, Simulink, Python | Impact: Foundation for real-time robotic autonomy.

Quanser Aero2 Control Systems - 2-DOF Helicopter Stabilization:

- Implemented multiple control strategies: PID, LQR, LQG, Model Reference Adaptive Control (MRAC), and Feedback Linearization
- Conducted Hardware-in-the-Loop (HIL) testing using Simulink and QUARC; validated robustness under fault conditions.
- Achieved robust stabilization across a wide flight envelope.
- ***Technologies:*** Simulink, QUARC, C/C++ | Outcome: Certified expertise in advanced control synthesis and real-time validation

Model Predictive Control (MPC) for SISO/MIMO Systems:

- Developed MPC for a continuous-stirred-tank reactor (CSTR) with constraint handling and input saturation.
- Performed trade-off analysis for stability vs. control effort; validated multi-variable prioritization
- ***Impact:*** Mastered industrial-grade control design methodology.

System Identification & Digital Control Design:

- Built and validated ARX/OE models from real-time experimental data; achieved 87% model accuracy.
- Designed and tuned digital PID controllers using Ziegler-Nichols, IMC, and root locus methods.
- ***Skills Demonstrated:*** Rigorous model validation, practical controller tuning, real-world data analysis.

Mobile Robot Cascade Control - Leader-Follower Navigation:

- Developed leader-follower navigation strategy using inner-loop motor control and outer-loop sonar feedback.
- Simulated real-time obstacle avoidance and dynamic setpoint adjustment.
- **Technologies**: MATLAB, Python | Outcome: Expertise in hierarchical control and multi-agent coordination.

Robotic Manipulator Control (Python) - Forward/Inverse Kinematics

- Simulated forward/inverse kinematics and Jacobian control for multi-DOF manipulators.
- Implemented Lagrangian modeling and dynamic control techniques.
- **Tools:** Python, NumPy, MATLAB | Impact: Deep understanding of nonlinear control and robotic dynamics.

Patent Filed: 'Electric Power Generation from IC Engine Waste Heat' - Published Feb 2023.

IEEE Conference Publication: Co-authored paper on 'Army Surveillance Robot with Landmine Detection and Removal'.

Relevance: Demonstrates innovative mindset and technical depth in systems thinking and mechatronics/embedded systems.

CERTIFICATIONS

1. **Zero To Mastery: Advanced Ethical Hacking Bootcamp (Network Hacking & Security) -** MITM attacks, DNS spoofing, DHCP starvation, DoS/DDoS testing, router exploitation, MAC spoofing, manual exploit development, network defense strategies.
2. **Zero To Mastery: Cybersecurity - Personal Online Security -** Online privacy protection, phishing & identity theft prevention, password management, VPN usage, browser and device security best practices.
3. **Zero to Mastery: Python Developer -** Production-level Python coding, design patterns, real-world projects with Git/CI-CD integration.
4. **Zero to Mastery: C++ OOP -** Advanced OOP, STL, memory management, template metaprogramming.
5. **Zero to Mastery: Data Structures & Algorithms -** Coding interview-level DS/Algorithms; Big-O analysis.
6. **Zero to Mastery: System Design + Architecture -** Microservices, load balancing, distributed systems design.
7. **Zero to Mastery: Machine Learning & Deep Learning Bootcamp -** TensorFlow, CNNs, transfer learning, production ML pipelines.
8. **LinkedIn Learning: PLC Developer Pathway -** Ladder logic, SCADA integration, PLC software development.
9. **Google IT Support Professional Certificate Series (5 Courses) -** IT Security, Operating Systems, System Administration, Computer Networking, Technical Support Fundamentals.
10. **Google Certified:** Python Programming
11. **Zero to Mastery:** Understanding Quantum Computing - 2.6 CPE credits (NASBA)
12. **AutoCAD, CATIA V5, SolidWorks, GD&T;** Certified (CADD School)
13. **Lean Six Sigma & Six Sigma White Belt Certified (C.S.S.C) -** Process improvement, quality tools, statistical methods

LEADERSHIP & VOLUNTEERING

- **Course Representative | University of Manchester MSc Program:** Represented cohort, liaised between students and faculty, and contributed to program improvements**.**
- **Community Volunteer: Flood Relief & COVID-19 Response | India:** Coordinated relief distribution and supported migrant workers' return during lockdowns.
- **Education Volunteer | Church Outreach Program, India:** Mentored 25+ students in physics and mathematics to help them succeed in board exams.
- **Regular Blood Donor & Health Awareness Campaign Volunteer:** Organized screening camps and awareness sessions

ADDITIONAL INFORMATION

Languages: English (Fluent), Tamil (Native), Hindi (Conversational), French (Basic)

REFERENCES: Available upon request.