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Polarj Sapkota

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Work Experience

EE/Co-founder	**Rolos Engineering**	**May '25 – Present**

- Providing full-scale development services in embedded & control systems, analog & power electronics and software/data applications.
- Designed custom power converters, controls and embedded systems for custom industrial applications. One industrial project complete: TRIAC firing control system for industrial heating.
- Responsibilities: Hardware/firmware design; client outreach, management & communication.

Chief Engineer/Founder	**Cymbiosys**	**Jul '24 – Jun '24**

- Creating next-gen highly-scalable wireless sensor networks for bio-conservation.
- Built prototype 60x cheaper than current state-of-the-art. 400x cheaper by commercial release.
- Technology validated and supported by conservation experts from 4 major organizations.

Field Engineer Apprentice	**General Electric**	**Nov '23 – Jul '24, NP/IN**

- Spearheaded a project with the Global Qualification Labs team to add upto 40 GHz SI(Signal Integrity) testing capabilities to EMI/EMC lab at JFWTC, Bengaluru. Capabilities: sub-nanosecond TDR & S-parameter characterization of high-speed circuits.
- Led 4 technical sessions to strengthen background knowledge of team in SI & completed 6 certification courses through Teledyne LeCroy SI Academy.
- 4 installations & multiple corrective action activities of 3T & 1.5T Magnetic Resonance Imaging equipment with Field Services team.

Control Systems Engineer	**Garudeus Aviation Inc.**	**Aug '23 – Nov '23, NP**

- Designed inertial frame flight controller & motor control algorithms for BLDC rotors of an eVTOL.
- Designed automatic load-tester for on-board power circuits testing. Test range: 1 W to 1 kW.
- Designed on-board electrical systems & networks for communication between sections of the vehicle.

Electrical Engineering Intern	**UTK Hydropower Ltd.**	**Feb '23 – Mar '23, NP**

- 21-day special program for electro-mechanical study of Nepal's largest hydropower plant (456 MW).
- Modeled plant & studied impact on national economy with reference to energy policy.
- Conducted local load-flow & contingency studies to estimate plant annual revenue and losses.

Instrumentation Intern	**Yatri Motorcycles**	**Feb '22 – May '22, NP**

- Designed a high-precision 8-step PGA (Programmable Gain Amplifier) development board as a part of the Data Acquisition System for Yatri's test rigs which served to validate FEA results against real-time telemetry data from strain gauges and load cells.
- Specs: 8-Ch Multiplexed inputs to 2 PGA chips | Max. gain 128 | CMRR >120dB | 3-bit control.
- Components selection & sourcing for PCB (Printed Circuit Board) manufacture.

Publications

- **Experimental Validation of Dynamic Line Rating of Electric Lines** (IEEE PowerCon 2024)
  .

Education

| **Dhulikhel** | **Kathmandu University** | **2018 \| 2023** |

- BE Electrical & Electronics Engineering in Power & Control.

| **Kathmandu** | **St. Xavier's College** | **2015 \| 2017** |

- +2 in Science.

Skillsets

- Circuits & Systems Design: high-frequency analog/digital filters & wave-shaping circuits, Proteus Circuit Design Suite, Multisim, LTSpice, Ki-CAD PCB Suite, FPGA Synthesis with Verilog HDL, Simulink Signal Processing, High speed digital design, SI/PI with Cadence Sigrity, PDN Design.
- Control Systems: Modeling & stability analysis of dynamic systems, Analog/digital control, PID, Full-state feedback, LQR, LQG, Kalman Estimation, Simulink control system toolboxes, Embedded instrumentation with microcontrollers using SPI, UART, I2C.
- Power System Design: Transmission System, Load Flow & Contingency Studies, Building Electrification, Switchgear, ETAP, DIGSilent PowerFactory, Illumination design with DiaLUX
- Research & Documentation: Literature review, paper writing, publishing, MS & Libre-Office Suites
- Lab Equipment: Oscilloscope, Function Generator, VNA, Power-Spectrum Analyzer, Light-Spectrum Analyzer, TDR, Goniophotometer, Custom test circuits for debugging.
- Programming Languages: C/C++, Python, MATLAB

Projects

- **Real-time thermal rating of overhead transmission lines (2023) -** R&D of a system that calculates the real-time ampacity of overhead conductors based on ambient air & conductor temperature, wind speed and solar heating and then creating predictive models to forecast future ampacity for proper system planning.
- **Design & analysis of feedback control system of a dye-injection process (2022) -** Designed control system to achieve required level of tightness & setpoint tracking response of a high-speed dye injection process used in pharmaceutical or other mission critical liquid injection applications taking higher order effects into account.
- **Heartbeat Anomaly Detection (2022) -** ANNs & LSTM based predictive model to detect anomalies in heartbeat signals to detect abnormal conditions such as atrial fibrillation, etc.
- **Binaural Recording (2021) -** Development of a sound localization scheme & recording system to mimic sound localization characteristics of human ears to create immersive audio recordings.
- **Path Planning for mini-rovers (2021) -** Design of a GN(Guidance & Navigation) system for mini-rovers with rear wheel drive for obstacle avoidance & coarse terrain locomotion.
- **Gamepad Haptic Feedback (2021) -** Design of an instrumentation module for gamepad controllers to map position of analog sticks in 2D space and create appropriate vibrations/response. Low-power cross-compatible module without microcontrollers.
- **Multi-Level Security System (2020) -** A security system with user control & two-factor authentication. Completely built on discrete logic without the use of micro-programmed units.