

Profile

I am a machine learning researcher specialising in machinery fault detection, anomaly detection and reinforcement learning applied to noisy real-world sensor data. My doctoral thesis, *Advancing Machinery Fault Detection from Passive Monitoring to Autonomous Agency*, was submitted for examination on 4 August 2026. This work moves fault detection away from asking whether a signal looks normal and toward asking whether the physical coupling between signals still holds, which is a critical failure mode dominating coupled machinery that reconstruction-based methods structurally miss. My first-authored research appears in multiple Q1 journals, alongside CORE A and A* venues. I have also carried research through to production, including a real-time computer vision system deployed at Gimpo International Airport in South Korea. Alongside research, I teach undergraduate AI & data science at Deakin University, review for multiple venues, serve on conference program committees, and represent graduate researchers on the Faculty Board.

Education

Deakin University, School of Information Technology

Waurin Ponds, VIC, Australia

Doctor of Philosophy

Oct 2022 – present

Thesis submitted for examination on 4 August 2026.

Thesis: *Advancing Machinery Fault Detection from Passive Monitoring to Autonomous Agency*

Supervisors: Assoc. Prof. Sunil Aryal, Dr Mohamed Reda Bouadjenek and Prof. Richard Dazeley

Changwon National University

Changwon-si, South Korea

MS in Information and Communication Engineering

Mar 2019 – Feb 2021

Thesis: *Bearing fault detection using switchable normalization-based convolutional neural network*

CGPA 4.44/4.5 (Higher Distinction).

Kathmandu University

Dhulikhel, Nepal

Bachelor of Engineering, Electrical & Electronics Engineering

Aug 2012 – Nov 2016

Research and Professional Experience

PhD Researcher

Waurin Ponds, VIC, Australia

Oct 2022 – present

Deakin University, School of Information Technology

- Developed CMR-Mamba, a dual-encoder state-space architecture that monitors the causal relationship between sensor channels. On a hydraulic pump leakage dataset, reconstruction-based detection reaches 0.358 AUROC, below chance, while CMR-Mamba reaches 0.984 on the same data.
- Introduced the first inverse reinforcement learning formulation of machinery fault detection, which learns a reward for healthy dynamics from normal operation alone and requires no fault labels. Published at AAMAS 2026 and accepted at CIKM 2026.
- Executed the first systematic evaluation of all 15 combinations of dual-phase motor current, torque and vibration on the Paderborn University bearing dataset, across 30,450 experiments per feature set.
- Benchmarked classical and deep methods across eight industrial datasets, with multi-seed runs and 15-fold cross-validation, and reported the cases where the methods fail.
- Built reproducible multi-stage pipelines on Deakin's SLURM-managed multi-GPU HPC cluster.

Graduate Research Teaching Fellow

Waurin Ponds, VIC, Australia

Mar 2025 – present

Deakin University, School of Information Technology

- Teach tutorials for SIT112 Introduction to Data Science and Artificial Intelligence, covering Python programming, data visualisation and machine learning fundamentals.
- Mark assessments and provide feedback to undergraduate students.

Research Assistant

Waurin Ponds, VIC, Australia

Sep 2025 – Feb 2026

Deakin University, School of Engineering

- Conducted a structured literature review on geopolymer and alkali-activated composite materials, covering precursor and mix-design parameters, compressive strength, durability behaviour and characterisation methods.
- Worked in a cross-disciplinary engineering team, bridging machine learning methods and materials engineering.

Sessional Academic

Waurin Ponds, VIC, Australia

Mar 2024 – Nov 2024

Deakin University, School of Information Technology

- Taught tutorials for SIT112 Introduction to Data Science and Artificial Intelligence, covering Python programming, data visualisation and machine learning fundamentals.
- Marked assessments and provided feedback to undergraduate students.

Deep Learning and Software Development Researcher

Jinju-si, South Korea

Sep 2021 – Aug 2022

IP Camp

- Engineered “Shine”, a real-time deep learning-based accessible-parking enforcement system running at 92.16% mAP at more than 25 FPS on edge hardware, deployed in production at Gimpo International Airport, Seoul, and Jinju Welfare Center. Published in *Expert Systems with Applications*.
- Built lightweight face-recognition models for resource-constrained embedded devices.
- Supervised a team of undergraduate students for one month on an object detection project. The team placed second in their university competition.

Graduate Research Assistant

Changwon-si, South Korea

Mar 2019 – Feb 2021

Changwon National University

- Designed a switchable-normalisation CNN for bearing fault classification on the CWRU dataset across four load conditions, achieving above 99% accuracy. Published in *IEEE Access*.
- Contributed to automatic sonar target recognition through 1D-to-2D signal preprocessing and CNN evaluation.
- Mentored undergraduate students in the laboratory. One of them later co-authored a journal paper with me.

Operation Assistant (R&D)

Kathmandu, Nepal

Apr 2018 – Feb 2019

Nepal Electronic Payment Systems Ltd, now Nepal Clearing House Limited

- Carried out end-to-end testing of ATM and point-of-sale systems before production deployment, validating failure cases prior to go-live.
- Monitored live transactions and resolved technical issues in production, working in Linux, PuTTY and SSH.

Secondary-level School Teacher

Tikapur, Nepal

Oct 2016 – Apr 2018

Shree Marigold Academy Vidhya Mandir

- Full-time teacher of secondary-level Mathematics, Science and Computer Science.

Publications

Full list on the Google Scholar profile. Citation counts as of 10 August 2026.

Peer-reviewed journal articles

- **D. Neupane**, R. Dazeley, M. R. Bouadjenek, S. Aryal. “Multi-Sensor Anomaly Detection Using Scalograms and Kurtograms Fusion on the Paderborn University Dataset.” *Mechanical Systems and Signal Processing*, vol. 254, art. 114333, June 2026. DOI: [10.1016/j.ymssp.2026.114333](https://doi.org/10.1016/j.ymssp.2026.114333) [IF = 10.2; citations = 1]
- **D. Neupane**, M. R. Bouadjenek, R. Dazeley, S. Aryal. “Data-Driven Machinery Fault Detection: A Comprehensive Review.” *Neurocomputing*, vol. 627, art. 129588, 2025. DOI: [10.1016/j.neucom.2025.129588](https://doi.org/10.1016/j.neucom.2025.129588) [IF = 6.7; citations = 229]
- **D. Neupane**, A. Bhattarai, S. Aryal, M. R. Bouadjenek, U. Seok, J. Seok. “Shine: A Deep Learning-Based Accessible Parking Management System.” *Expert Systems with Applications*, vol. 238, Part F, art. 122205, 2024. DOI: [10.1016/j.eswa.2023.122205](https://doi.org/10.1016/j.eswa.2023.122205) [IF = 9.4; citations = 45]
- **D. Neupane**, Y. Kim, J. Seok, J. Hong. “CNN-Based Fault Detection for Smart Manufacturing.” *Applied Sciences*, vol. 11, no. 24, art. 11732, 2021. DOI: [10.3390/app112411732](https://doi.org/10.3390/app112411732) [IF = 2.9; citations = 46]
- **D. Neupane**, Y. Kim, J. Seok. “Bearing Fault Detection Using Scalogram and Switchable Normalization-Based CNN (SN-CNN).” *IEEE Access*, vol. 9, 2021. DOI: [10.1109/ACCESS.2021.3089698](https://doi.org/10.1109/ACCESS.2021.3089698) [IF = 4.2; citations = 100]
- **D. Neupane**, J. Seok. “A Review on Deep Learning-Based Approaches for Automatic Sonar Target Recognition.” *Electronics*, vol. 9, no. 11, art. 1972, 2020. DOI: [10.3390/electronics9111972](https://doi.org/10.3390/electronics9111972) [IF = 2.9; citations = 249]
- **D. Neupane**, J. Seok. “Bearing Fault Detection and Diagnosis Using Case Western Reserve University Dataset with Deep Learning Approaches: A Review.” *IEEE Access*, vol. 8, pp. 93155–93178, 2020. DOI: [10.1109/ACCESS.2020.2990528](https://doi.org/10.1109/ACCESS.2020.2990528) [IF = 4.2; citations = 700]

Peer-reviewed conference articles

- **D. Neupane**, M. R. Bouadjenek, R. Dazeley, S. Aryal. “Label-free industrial fault detection via adversarial inverse reinforcement learning, a system for run-to-failure prognostics.” *ACM International Conference on Information and Knowledge Management (CIKM 2026)*. Accepted 9 August 2026. [CORE A]
- **D. Neupane**, R. Dazeley, M. R. Bouadjenek, S. Aryal. “Learning Rewards, Not Labels: Adversarial Inverse Reinforcement Learning for Machinery Fault Detection (Extended Abstract).” *Proceedings of the 25th International Conference on Autonomous Agents and*

Multiagent Systems (AAMAS 2026), Paphos, Cyprus, pp. 3223–3225, 2026. DOI: [10.65109/AXYX4522](https://doi.org/10.65109/AXYX4522) [CORE A*; citations = 3]

- **D. Neupane**. “From fault detection to agency, a framework for industrial autonomy (Doctoral Consortium).” *Proceedings of the 25th International Conference on Autonomous Agents and Multiagent Systems* (AAMAS 2026), Paphos, Cyprus, pp. 4035–4037, 2026. DOI: [10.65109/ORJT7684](https://doi.org/10.65109/ORJT7684) [CORE A*]
- **D. Neupane**, M. R. Bouadjenek, R. Dazeley, S. Aryal. “A Comparative Study of Semi-Supervised Anomaly Detection Methods for Machine Fault Detection.” *PHM Society European Conference*, vol. 8, no. 1, 2024. DOI: [10.36001/phme.2024.v8i1.4053](https://doi.org/10.36001/phme.2024.v8i1.4053) [citations = 11]
- **D. Neupane**, M. R. Bouadjenek, R. Dazeley, S. Aryal. “Machinery fault detection using advanced machine learning techniques (Doctoral Symposium).” *PHM Society European Conference*, vol. 8, no. 1, 2024. DOI: [10.36001/phme.2024.v8i1.3947](https://doi.org/10.36001/phme.2024.v8i1.3947) [citations = 5]
- **D. Neupane**, J. Seok. “Deep learning-based bearing fault detection using 2-D illustration of time sequence.” *2020 International Conference on Information and Communication Technology Convergence* (ICTC 2020), pp. 562–566, 2020. DOI: [10.1109/ICTC49870.2020.9289232](https://doi.org/10.1109/ICTC49870.2020.9289232) [citations = 21]

Data challenge submissions

- **D. Neupane**, P. Kundu, S. Aryal, R. Dazeley, M. R. Bouadjenek. “HUMS2025 Data Challenge Result Summary.” *14th Defence Science and Technology International Conference on Health and Usage Monitoring Systems* (HUMS 2025), 2025.
- **D. Neupane**, L. D. Tamang, N. D. Huynh, M. R. Bouadjenek, S. Aryal. “HUMS2023 Data Challenge Result Submission.” *13th Defence Science and Technology International Conference on Health and Usage Monitoring Systems* (HUMS 2023), 2023.

Manuscripts under review

- **D. Neupane**, M. R. Bouadjenek, R. Dazeley, S. Aryal. “Cross-domain industrial fault detection by causal mechanism monitoring.” *Mechanical Systems and Signal Processing*. Under review. [IF = 10.2]
- **D. Neupane**, M. R. Bouadjenek, R. Dazeley. “Are the governing physics preserved? A causal vision for industrial anomaly detection.” *IEEE International Conference on Data Mining* (ICDM 2026). Under review. [CORE A*]

Research Metrics

Google Scholar and Scopus, as of 27 August 2026

Total citations (Google Scholar)	1436
h-index	8
i10-index	8
Peer-reviewed journal articles	7
Peer-reviewed conference articles	6
First-authored outputs	All
Q1 journal articles	5
CORE A and A* venue articles	3
First article published	April 2020
Under Review	2

Scholarships and Awards

Scholarships and fellowships

- Deakin University Postgraduate Research Scholarship (DUPRS), full tuition and stipend, Oct 2022 – present.
- Changwon National University International Students Full Scholarship, tuition and stipend, Mar 2019 – Feb 2021.
- Fellow, fully funded, Summer School on Risk in New Aviation and New Energy, Smart Aviation Center, Beihang University, China, in partnership with École Nationale de l'Aviation Civile, France, held at Hangzhou, China, supported by the Young Envoys Scholarship, Jul 2025.
- ETMC Sponsored Scholar, HUMS Conference, Mar 2025.
- AAMAS 2026 Student Scholarship, Apr 2026.

Prizes and awards

- Finalist, Student of the Year (Regional), Victorian International Education Awards, Study Melbourne, Nov 2025.
- 3MT People's Choice Award, School of IT Heat, Deakin University, Jun 2025.
- Top 10 Presenters, Annual School of IT HDR Conference, Deakin University, Nov 2024.
- Doctoral Symposium selection, 8th European Conference of the PHM Society (PHME 2024), one of eight presentations selected globally, conference fee waived, Jul 2024.

Teaching, Supervision and Mentoring

Teaching

- Graduate Research Teaching Fellow and Sessional Academic, SIT112 Introduction to Data Science and Artificial Intelligence, Deakin University, Mar 2024 – present. Undergraduate tutorials, assessment marking and written feedback.

- Secondary school teacher, Shree Marigold Academy Vidhya Mandir, Nepal, Oct 2016 – Apr 2018. Taught Mathematics, Science and Computer Science full time for 1.5 years.

Supervision and mentoring

- IP Camp, South Korea, 2021 – 2022. Supervised a team of undergraduate students for one month on an object detection project. The team placed second in their university competition.
- Changwon National University, 2019 – 2021. Mentored final-year undergraduate students in the laboratory. One of them later co-authored a journal paper with me.

Academic Service

Journal reviewing

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| ■ IEEE Transactions on Industrial Electronics [Jan 2022] | ■ Signal, Image and Video Processing [Mar 2024] |
| ■ Engineering Applications of Artificial Intelligence [Sep 2026] | ■ Symmetry [Feb 2024] |
| ■ Neurocomputing [Sep 2024, Sep 2026] | ■ Animals [Jan 2024] |
| ■ Applied Soft Computing [Oct 2021] | ■ Sensors [Dec 2023] |
| ■ IEEE Access [Apr 2024] | ■ Journal of Marine Science and Engineering [Oct 2023] |
| ■ Scientific Reports [Feb 2024] | ■ Journal of Big Data, Springer Nature [Sep 2023] |
| ■ Discover Applied Sciences [May 2024] | ■ Springer Nature [Certificate of Reviewing, Sep 2022] |
| ■ Electronics [Apr 2024] | ■ Bentham Science Publishers [Certificate of Reviewing, Jun 2023] |

Conference reviewing and program committees

- Program Committee member, The 26th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2027).
- Program Committee member, International Conference on Neural Information Processing (ICONIP 2026).
- Program Committee member, Australasian Computer Science Week (ACSW 2026), Adaptive Learning and Intelligent Systems Conference 2026, and Track 4 Applications.
- Program (Technical) Committee member, International Conference on Health and Usage Monitoring Systems (HUMS 2027).
- Program Committee member, 21st ACS/IEEE International Conference on Computer Systems and Applications (AICCSA 2024), Track on Data Science, Knowledge Engineering and Ontologies.
- Program Committee member, 20th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA 2023), Track 3 Data Science and Track 4 Artificial Intelligence and Cognitive Systems.
- Program Committee member, 19th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA 2022), Track 4 Artificial Intelligence and Cognitive Systems.
- External reviewer, 29th International Conference on Neural Information Processing (ICONIP 2022).
- External reviewer, 17th International Conference on Mobility, Sensing and Networking (MSN 2021).

Invited talks

- Invited presentation. Research talk to visiting computer science students from Yeungnam University, South Korea, hosted by the Deakin University English Language Institute (DUELI), Burwood campus, 28 Jul 2026. Presented condition monitoring research to an audience with no background in the field.
- Invited speaker. “Machinery Fault Diagnosis using Advanced Machine Learning”, School of Artificial Intelligence, Jiangnan University, China, 18 – 22 Mar 2026. Fully funded Young Talent Exchange Program.
- Invited presenter and facilitator. UNSW Machine Condition Monitoring Workshop, Melbourne, Australia, 28 – 29 Mar 2025.

Professional development

- Trek Program, Cruxes Innovation, Nov 2025. Multi-week experiential program on research impact and translation, with peer coaching. Covered customer and problem discovery, human-centred design, industry engagement and stakeholder management.
- Empowering Innovative Leaders Program, Deakin University, Aug – Dec 2024.
- Leadership Development Program, Geelong Nepalese Association and Swinburne University of Technology, Geelong, 20 May 2023.

Professional memberships

- Australian Computer Society (Associate Member)
- Association for Computing Machinery (SIGIR and SigWeb student member).

Leadership and Community Service

Graduate Researchers Representative

Faculty Board, Science Engineering and Built Environment, Deakin University

Geelong, VIC, Australia

Jan 2026 – present

- Elected by peers to represent graduate researchers on the Faculty Board, and coordinate graduate research representatives across the faculty's schools.
- Pitched actionable solutions to three systemic HDR issues, being ad-hoc funding bottlenecks, post-scholarship email access and fragmented communication.
- Contributed to the creation of new university-wide representative forums as a direct result of the communication proposal.
- Advised on policy reforms, ensuring HDR perspectives shaped initiatives including the scholarship procedure review.

Regional Advisory Council Member

Geelong, VIC, Australia

Oct 2023 – May 2026

Victorian Multicultural Commission (VMC), Barwon South-West

- Selected as a representative of the Nepalese community for a three-year term on the Barwon South-West Regional Advisory Council, spanning Greater Geelong and surrounding communities.
- Acted as a direct link between local multicultural communities and Victorian Government policy, described in the role as the eyes and ears of the community.
- Contributed community-driven input on key regional issues including racism, mental health, family violence and employment access, and promoted social inclusion.
- Attended quarterly council meetings across the full three-year term alongside public forums and community events.

Student Ambassador

Geelong, VIC, Australia

Jan 2025 – present

The Lounge International Student Centre

- Initiated and now lead a 10c Container Deposit Scheme recycling program, turning recycling into ongoing funding for international student activities. Collected 150 containers in the first week, then led outreach to the Deakin University Student Association, Waurin Ponds Estate and local businesses, alongside an awareness campaign across the centre and social media. Mid-Jun 2026 – present.
- Moderated the “HDR and Family Hub: How I Got the Job” career event, facilitating discussion between academic and industry panellists and HDR students.
- Volunteered across workshops, orientation events and promotional outreach, representing The Lounge at Deakin University and Deakin College orientations, and helping welcome and interview new volunteers.

Executive Committee Member

Geelong, VIC, Australia

Jun 2023 – present

Geelong Nepalese Association (GNA)

- Joined as a volunteer on arrival in Geelong in Oct 2022 and was appointed to the executive board in less than a year in recognition of early contributions.
- Coordinate the community's participation each year in major cultural celebrations including Teej, Dashain and Pako Festa, one of Australia's largest multicultural street festivals.
- Lead logistics for the Teej program in Sep 2026 and run a capacity-building initiative from Jul 2026 to empower community members.
- Mentor newly arrived students, assisting with settling into life in Australia, accommodation and academic guidance.
- Manage the association's IT and website, supporting communication and outreach.
- Contributed to GNA's recognition as Organisation of the Year 2023 (NRNA Australia) and Best Musical Entry at Pako Festa 2026.

Student Ambassador

Geelong, VIC, Australia

Apr 2026 – present

City of Greater Geelong (Study Geelong)

- One of eleven ambassadors in a 12-month role representing international education across the Geelong region, which hosts over 4,000 international students from more than 90 countries each year.
- Invited to apply by the program coordinator after two years of visible volunteering at The Lounge and community events.
- Promote Geelong as a place to learn, live and explore through storytelling, and help plan and represent Study Geelong at regional events.

Earlier leadership

President

Dhulikhel, Nepal

2015 – 2016

Society of Electrical and Electronics Engineers, Kathmandu University

- Initiated the revival of the Electrical and Electronics Project Exhibition, resumed the year after the tenure, organised student competitions, and directed the *Encipher* department magazine team.

Joint Secretary

Dhulikhel, Nepal

2014 – 2015

Amnesty International Kathmandu University Youth Network (AIKUYN)

- Facilitated Training for Trainers sessions, preparing new volunteers and incoming executive members to run campaigns themselves.
- Served as Program Coordinator for the Annual General Meeting.

AIKUYN

- Coordinated the My Body My Rights and Say No to Enforced Disappearance campaigns.
- Organised rural outreach programs and free health camps.

Technical Skills

Fault detection and prognostics	Bearing inner and outer race, ball and cage faults, gear-tooth pitting, shaft misalignment, run-to-failure modelling, remaining useful life
Signal processing	Continuous wavelet transform, scalograms, kurtograms and spectral kurtosis, STFT, envelope analysis
Multi-sensor fusion	Vibration, motor current, torque, pressure and power signatures, feature-level and decision-level fusion
Machine learning	CNNs, state-space models (Mamba), graph and hypergraph networks, autoencoders, VAE, USAD, Deep SVDD, isolation forest, one-class SVM
Reinforcement learning	Adversarial inverse reinforcement learning, reward modelling, sequential decision-making, label-free agents
Causal methods	Causal mechanism residual monitoring, structural causal models, cross-channel coupling analysis
Computer vision	Real-time object detection (YOLO), licence plate recognition, edge deployment
Datasets	Paderborn University, CWRU, IMS, XJTU-SY, HUMS2023, ZeMA hydraulic, SWaT, N-CMAPSS, UNSW run-to-failure
Programming	Python (primary), MATLAB, C#, working knowledge of C++ and SQL
Frameworks and tools	PyTorch, TensorFlow/Keras, scikit-learn, Pandas, NumPy, scipy.signal, PyWavelets, matplotlib, seaborn
Infrastructure	SLURM-managed multi-GPU HPC, Git/GitHub, Linux, $\LaTeX$
Languages	English (fluent), Nepali (native), Hindi (fluent), Korean (basic)

Referees

All referees are at the School of Information Technology, Deakin University, Australia.

- **Prof. Richard Dazeley**, Professor and Deputy Head of School. PhD supervisor. richard.dazeley@deakin.edu.au
- **Assoc. Prof. Sunil Aryal**, Associate Professor. PhD supervisor. sunil.aryal@deakin.edu.au
- **Dr Mohamed Reda Bouadjenek**, Senior Lecturer. PhD supervisor. reda.bouadjenek@deakin.edu.au
- **Dr Davoud Mougouei**, Senior Lecturer. Unit Chair, SIT112, teaching referee. davoud.mougouei@deakin.edu.au