

Chen Lequn

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INDUSTRY EXPERIENCE

American Express

Manager - Data Science

Singapore

Jan 2026 - Present

- Part of the **Decision Science Centre of Excellence** in Singapore, partnering with risk, product, and engineering stakeholders on AI-enabled decision-support initiatives.
- Developing an internal **Agentic Case Copilot** for credit and fraud risk operations that synthesizes case context, highlights key drivers, and supports faster analyst investigation and decisioning.

Accenture

AI/ML Computational Scientist

Singapore

April 2025 - Jan 2026

- **Developed a hierarchical multi-agent orchestration layer** that automates end-to-end Know-Your-Client (KYC) reviews for a top-tier Swiss banking client, seamlessly linking document extraction, discrepancy analysis, and source-of-wealth corroboration. Introduced a **supervisor-worker agent orchestration mechanism** that breaks each case into sub-tasks, dispatches them to specialized agents, and consolidates the results.
- **Built a LangGraph-driven Agentic AI platform** with production-grade **agent-to-agent (A2A) communication protocol**, featuring asynchronous messaging, thread-based workflow tracking, and interrupt/resume capabilities, enabling coordination across **20+** specialized agents.
- **Implemented multi-stage LLM pipelines** leveraging advanced prompt engineering to reliably extract structured data from unstructured financial and income documents, achieving **> 95%** extraction accuracy.
- Developed **scalable microservice architecture** (Kubernetes) that deploys and auto-scales multi-agent systems, ensuring high efficiency and system availability.
- **Built a unified audit-trail & compliance dashboard** that logs every agent interaction, providing real-time traceability for regulators and internal audit teams.
- **Optimized workflow latency by 4x** through parallel agent execution and smart queuing, reducing KYC cycle time from days to under 12 hours. **Reduced manual review effort by >80%**, freeing compliance analysts for higher-value activities and cutting operational costs by \$1.2 M annually.

A*STAR, Advanced Remanufacturing and Technology Centre (ARTC)

Research Scientist

Singapore

April 2024 - March 2025

- Authored **4 technology disclosures** with significant potential for licensing and commercialization by industrial partners, and published **4 top-tier academic journal papers** in areas such as AI-driven defect detection and manufacturing optimization.
- Led a flagship project for the **Sectoral AI Centre of Excellence for Manufacturing (AIMfg)**, developing advanced AI pipelines, including object detection and OCR for 2D engineering drawing information retrieval and Graph Neural Networks for 3D CAD model feature recognition, increasing overall accuracy by 20%.
- Designed and optimized a **Retrieval-Augmented Generation (RAG) pipeline** integrated with Neo4j knowledge graphs for manufacturability analysis, achieving a 25% improvement in contextual and answer relevancy based on rigorous performance metrics.
- Fine-tuned **Vision Language Models (VLMs)**, including Florence-2 and Idefics3-8B-Llama3, for automatic manufacturing feature recognition, leading to a **30% improvement in recognition accuracy**.
- Developed an **adaptive robotic toolpath planning strategy** for 3D printing of propeller blades, achieving a 30% reduction in deviation and waste. Designed a **multi-modal audio-visual fusion network** for real-time monitoring and quality inspection, achieving 95% accuracy in defect detection.

A*STAR, Singapore Institute of Manufacturing Technology (SIMTech)

Research Intern & PhD research attachment

Singapore

Aug 2019 - March 2023

- Published over **10 top-tier journal papers** as the first/corresponding author, received **2 Best Paper Awards**, and achieved first place in an international Hackathon competition
- Designed a **multi-modal data fusion** method with novel deep learning architectures, integrating vision, acoustic, and thermal sensor data for defect detection in hybrid robotic additive manufacturing, achieving 95% detection accuracy in real-time.
- Built a Robot Operating System (ROS)-based software platform for in-process adaptive toolpath generation in 3D printing, enabling real-time dimension deviation corrections and enhancing product quality.
- Conducted machine learning-assisted surrogate modeling and multi-objective optimization of a novel Fe-Ni-Ti-Al maraging steel using CALPHAD simulations, advancing material design for high-strength, lightweight applications.
- Developed a data-driven adaptive control method for laser power modulation based on melt pool size signals, improving defect mitigation and manufacturing precision in the laser additive manufacturing process.

Schaeffler Hub for Advanced Research at NTU (SHARE at NTU)

R&D Engineer (Part-time)

Singapore

Jan 2020 - Dec 2020

- Integrated the A* path-finding algorithm into AGV functionalities in the Gazebo simulation environment using ROS, improving navigation efficiency and obstacle avoidance.
- Designed and implemented collision avoidance algorithms and QR code recognition systems, improving navigation accuracy by 20% for mobile robots in dynamic scenarios.
- Created a Qt-based Graphical User Interface (GUI) to facilitate seamless communication between microprocessors and electric motor controllers, improving system usability and control efficiency.

EDUCATION

Nanyang Technological University

Ph.D. in Robotic Metal 3D Printing, Mechanical Engineering, Multimodal Deep Learning

Singapore

Aug 2021 - Oct 2024

- **Thesis:** Multi-sensor fusion for in-situ defect detection and adaptive quality enhancement in laser-directed energy deposition
- **Advisors:** Professor Moon Seung Ki (NTU), Dr Yao Xiling (NRF Singapore, A*STAR SIMTech), Dr Liu Kui (A*STAR SIMTech)

Nanyang Technological University

Bachelor of Engineering (Mechanical engineering)

Singapore

Aug 2017 - Jun 2021

- **Honours (Highest Distinction):** CGPA 4.68/5.00
- **Specialisation:** Robotics and Mechatronics
- **Advisors:** Dr Yao Xiling, Professor Moon Seung Ki

Technical University of Denmark (DTU)

Semester Exchange (GEM Explorer Overseas Programme)

Copenhagen, Denmark

Jan 2019 - Jun 2019

SKILLS

- **AI/ML Frameworks:** LangChain, LangGraph, CrewAI, PyTorch, TensorFlow, Keras, Scikit-learn, Hugging Face Transformers, MLFlow
- **Robotics & Simulation:** ROS/ROS2, MoveIt, Gazebo, ABB RAPID, Kuka KRL
- **Manufacturing:** CAD/CAM, CALPHAD Simulation, Laser-DED/Welding systems
- **Data Engineering:** Neo4j, SQL, OpenCV, Essentia
- **Soft Skills:** Cross-functional leadership, technical mentoring, grant writing, industrial collaboration.

PRESS COVERAGE

- **NTU MAE News:** "MAE PhD Student - Chen Lequn won the first place in American Society of Mechanical Engineers (ASME), Computer and Information in Engineering (CIE) 2023 Hackathon" 2023
- **NTU MAE News:** "MAE student - PhD student Chen Lequn wins Best Paper award at International Conference of Additive Manufacturing" 2022

SCHOLARSHIP AND AWARD

- **SIMTech & ARTC Best Student Awards:** 2023/2024
- **Best Paper Award:** The 2nd International Conference on Design for 3D Printing, 2023
- **ASME 2023 Hackathon First Place - (\$1400):** Autodesk Problem: Automating Material Selection for Product Design). 34 Participants from 18 institutions, including Purdue University, MIT, Boston University, Texas A&M, UT Austin, Northwestern, McGill University, etc., 2023. [\[Code\]](#)
- **Best Paper Award - (\$1000):** International Conference of Additive Manufacturing for a Better World, 2022
- **The Global Undergraduate Awards:** Highly Commended in Engineering Category, 2021
- **A*STAR Graduate Scholarship (AGS, PhD) - (\$400,000.00):** 2021 - 2025
- **Certificate of Distinction for Professional Internship:** 2021
- **NTU Journal Publication Award (Q1) - (\$1,000.00):** 2021
- **NTU Journal Publication Award (Q2) - (\$800.00):** 2021
- **NTU URECA Undergraduate Research Excellence Award (\$300.00):** 2020
- **The Global Undergraduate Awards:** Highly Commended Award in Engineering Category, 2020
- **Dean's List (AY2018-AY2019):** School of Mechanical and Aerospace Engineering, NTU
- **NTU President Research scholar (Merit):** 2018-2019, **(Distinction):** 2019-2020
- **3rd place in DTU Robocup Challenge Competition:** 2019
- **Science and Engineering Undergraduate Scholarship (SM2 Scholarship, Singapore Ministry of Education) - (\$255,000.00):** 2016-2021

JOURNAL PUBLICATIONS

Current h-index: 17. Total citations: 1152 (based on **Google Scholar**).

- [1] J. Su #, **L. Chen** (#Common First Author), S. Van Petegem, F. Jiang, Q. Li, J. Luan, S.L. Sing, J. Wang, and C. Tan, "Additive manufacturing metallurgy guided machine learning design of versatile alloys", *Materials Today*, 2025 (IF: 21.1, Q1). [\[Journal\]](#)
- [2] M.T. Khan, **L. Chen***, Z. Yong, J.M. Tan, W. Feng, and S.K. Moon, "From Drawings to Decisions: A Hybrid Vision-Language Framework for Parsing 2D Engineering Drawings into Structured Manufacturing Knowledge", *Robotics and Computer-Integrated Manufacturing (RCIM)*, Vol. 99, 2026 (IF: 11.4, Q1). [\[Journal\]](#) [\[arXiv\]](#)
- [3] M. T. Khan, **L. Chen***, Y.H. Ng, W. Feng, N.W.J. Tan, and S.K. Moon, "Leveraging Vision-Language Models for Manufacturing Feature Recognition in CAD Designs", *ASME Journal of Computing and Information Science in Engineering (JCISE)*. [\[Journal\]](#) [\[arXiv\]](#) [\[Dataset\]](#)
- [4] J. Xie, M. Safdar, **L. Chen***, S.K. Moon, and Y.F. Zhao, "Audio-visual cross-modality knowledge transfer for machine learning-based in-situ monitoring in laser additive manufacturing", *Additive Manufacturing*, 104692, 2025 (IF: 10.3, Q1). [\[Journal\]](#) [\[arXiv\]](#) [\[Dataset\]](#)
- [5] **L. Chen***, G. Bi, X. Yao, J. Su, C. Tan, W. Feng, Y. Chew and S. K. Moon, "In-situ process monitoring and adaptive quality enhancement in laser additive manufacturing: a critical review", *Journal of Manufacturing Systems*, vol. 74, Pages 527-574, 2024 (IF: 14.2, Q1). [\[Journal\]](#) [\[arXiv\]](#)

- [6] **L. Chen*** and S. K. Moon, "In-Situ Defect Detection in Laser-Directed Energy Deposition with Machine Learning and Multisensor Fusion", *Journal of Mechanical Science and Technology*, 2024. [[Journal](#)]
- [7] J. Su, F. Jiang, J. Teng, **L. Chen**, M. Yan, G. Requena, L-C. Zhang, Y. M. Wang, I V. Okulov, H. Zhu and C. Tan, "Recent Innovations in Laser Additive Manufacturing of Titanium Alloys", *International Journal of Extreme Manufacturing*, 2023 (IF: 14.7, Q1). [[Journal](#)]
- [8] J. Su, F. Jiang, J. Teng, **L. Chen**, G. Requena, M. Yan, L-C. Zhang, Y. M. Wang, I V. Okulov, G. Bo, H. Zhu, and C. Tan, "Laser additive manufacturing of titanium alloys: process, materials and post-processing", *Rare Metals*, 2024 (IF: 8.8, Q1). [[Journal](#)]
- [9] **L. Chen**, G. Bi, X. Yao, C. Tan, J. Su, N. P. H. Ng, Y. Chew, K. Liu and S. K. Moon, "Multisensor fusion-based digital twin for localized quality prediction in robotic laser-directed energy deposition", *Robotics and Computer-Integrated Manufacturing*, vol. 84, p. 102581, 2023 (IF: 11.4, Q1). [[Journal](#)] [[Full-text](#)]
- [10] **L. Chen**, X. Yao, C. Tan, W. He, J. Su, F. Weng, Y. Chew, N. P. H. Ng, and S. K. Moon, "In-situ crack and keyhole pore detection in laser directed energy deposition through acoustic signal and deep learning", *Additive Manufacturing*, 103547, 2023 (IF: 11, Q1). [[Journal](#)] [[arXiv](#)]
- [11] S. K. Moon, N. P. H. Ng, **L. Chen**, and G. D. Ahn, "A novel quality inspection method for aerosol jet printed sensors through infrared imaging and machine learning", *CIRP Annals - Manufacturing Technology*, 2023 (IF: 4.1). [[Journal](#)]
- [12] C. Tan, Q. Li, X. Yao, **L. Chen**, J. Su, F. L. Ng, Y. Liu, T. Yang, Y. Chew, C. T. Liu, and T. DebRoy, "Machine Learning Customized Novel Material for Energy-Efficient 4D Printing", *Advanced Science*, vol. 1, p. 93-105, 2023 (IF: 15.1, Q1). [[Journal](#)] [[Code](#)]
- [13] J. Lee, P.C. Chua, **L. Chen**, P. H. Ng, Y. Kim, Q. Wu, S. Jeon, J. Jung, S. Chang, S. K. Moon, "Key Enabling Technologies for Smart Factory in Automotive Industry: Status and Applications", *International Journal of Precision Engineering and Manufacturing - Smart Technology*, vol. 1, p. 93-105, 2023. [[Journal](#)] [[Best Paper](#)]
- [14] J. Su, C. Tan, F.L. Ng, F. Weng, **L. Chen**, F. Jiang, T. Jie and Y. Chew, "Additive manufacturing of novel heterostructured martensite-austenite dual-phase steel through in-situ alloying", *Materials Today Communications*, vol. 33, p. 104724, 2022 (IF: 3.8, Q2). [[Journal](#)]
- [15] J. Su, **L. Chen**, C. Tan, Y. Chew, F. Weng, X. Yao, F. Jiang, J. Teng, "Progress in Machine-Learning-Assisted Process Optimization and Novel Material Development in Additive Manufacturing", *Chinese Journal of Lasers*, vol. 49, no. 14, Art. no. 14, Jul. 2022. [[Journal](#)]
- [16] P. Xu, X. Yao, **L. Chen**, C. Zhao, K. Liu, S.K. Moon, and G. Bi, "In-process adaptive dimension correction strategy for laser aided additive manufacturing using laser line scanning", *Journal of Materials Processing Technology*, vol. 303, p. 117544, 2022 (IF: 6.3, Q1). [[Journal](#)] [[Code](#)]
- [17] **L. Chen**, X. Yao, P. Xu, S.K. Moon, and G. Bi, "Rapid surface defect identification for additive manufacturing with in-situ point cloud processing and machine learning", *Virtual and Physical Prototyping*, vol. 16, no. 1, pp. 50-67, Oct. 2020 (IF: 10.6, Q1). [[Journal](#)] [[Video Demo](#)] [[Code](#)]
- [18] **L. Chen**, X. Yao, Y. Chew, F. Weng, S. K. Moon, and G. Bi, "Data-driven adaptive control for laser-based additive manufacturing with automatic controller tuning", *Applied Sciences*, Vol. 10, no. 22, Art. no. 22, Jan. 2020 (IF: 2.7, Q2). [[Journal](#)] [[Video Demo](#)]

PEER-REVIEWED CONFERENCES PROCEEDINGS

- [1] Y. Xie, **L. Chen***, Y. Chew, A. S. Kumar, "Next-Layer Defects Forecasting in Laser Directed Energy Deposition Using Convolutional Long Short-Term Memory Autoencoder", *ASME 2025 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC CIE2025)*, Anaheim, California, USA, 17 - 20 August, 2025. [[Conference](#)]
- [2] M.T. Khan, **L. Chen**, et al., "Context-Aware Mapping of 2D Drawing Annotations to 3D CAD Features Using LLM-Assisted Reasoning for Manufacturing Automation", *arXiv preprint*, 2026. [[arXiv](#)]
- [3] M.T. Khan, **L. Chen**, et al., "Large Language Model-Powered Decision Support for a Metal Additive Manufacturing Knowledge Graph", *The Eleventh International Conference of the Asian Society for Precision Engineering and Nanotechnology (ASPEN 2025)*. [[arXiv](#)]
- [4] M.T. Khan, **L. Chen**, et al., "Fine-Tuning Vision-Language Model for Automated Engineering Drawing Information Extraction", *9th International Conference on Innovation in Artificial Intelligence (ICIAI 2025)*. [[arXiv](#)]
- [5] M.T. Khan, **L. Chen**, et al., "A Multi-Stage Hybrid Framework for Automated Interpretation of Multi-View Engineering Drawings Using Vision Language Model", *arXiv preprint*, 2025. [[arXiv](#)]
- [6] M.T. Khan, Z. Yong, **L. Chen***, J.M. Tan, W. Feng, and S.K. Moon, "Automated Parsing of Engineering Drawings for Structured Information Extraction Using a Fine-tuned Document Understanding Transformer", *arXiv preprint*, 2025. [[arXiv](#)]
- [7] M.T. Khan, W. Feng, **L. Chen***, Y. Ng, N.Y.J. Tan, and S.K. Moon, "Automatic Feature Recognition And Dimensional Attributes Extraction From CAD Models For Hybrid Additive-Subtractive Manufacturing", *ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC CIE2024)*, Boston, USA, 25 - 28 August, 2024. [[Conference](#)] [[arXiv](#)] [[HybridCAD Dataset](#)] [[HybridCAD++ Dataset](#)]
- [8] J. Kim, **L. Chen***, W. Feng, Y. Chew, and S.K. Moon, "Single-Track Melt Pool Simulation In Robotic LaserDirected Energy Deposition Under Speed Inaccuracy", *The 30th International Conference on Computational & Experimental Engineering and Sciences (ICCES2024)*, Singapore, 3 - 6 August, 2024.
- [9] **L. Chen***, Y. Chew, W. Feng, and S. K. Moon, "Inference of Melt Pool Visual Characteristics in Laser Additive Manufacturing using Acoustic Signal Features and Robotic Motion Data", *2024 10th International Conference on Control, Automation and Robotics (ICCAR 2024)*, Singapore. [[Conference](#)] [[Full-text](#)]
- [10] **L. Chen**, N. P. H. Ng, J. Jung and S. K. Moon, "Additive Manufacturing for Automotive Industry: Status, Challenges and Future Perspectives", *2023 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, Singapore, 19 - 23 December, 2023. [[Conference](#)]
- [11] Y. Xie, **L. Chen***, X. Yao, W. Feng and S. K. Moon, "Adaptive Voxelization and Material-dependent Process Parameter Assignment for Multi-Material Additive Manufacturing", *2023 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, Singapore, 19 - 23 December, 2023. (**Shortlisted Best paper award**) [[Conference](#)]
- [12] **L. Chen*** and S. K. Moon, "In-Situ Defect Detection in Laser-Directed Energy Deposition with Machine Learning and Multisensor Fusion", *2023 2nd International Conference on Design for 3D Printing (ICD3DP)*, Jeju, Korea, 18 - 21 Oct, 2023. (**Best paper award**)
- [13] **L. Chen**, X. Yao, W. Feng, Y. Chew, and S. K. Moon, "Multimodal Sensor Fusion for Real-Time Location-Dependent Defect Detection in Laser-Directed Energy Deposition", *ASME 2023 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE2023)*, Boston, USA, 20 - 23 August, 2023. [[arXiv](#)] [[Video Demo](#)]

- [14] **L. Chen**, X. Yao, K. Liu, C. Tan, and S. K. Moon, "Multisensor fusion-based digital twin in additive manufacturing for in-situ quality monitoring and defect correction", *24th International Conference on Engineering Design (ICED 2023)*, Bordeaux, France, 24 - 28 July, 2023. [[Conference](#)] [[arXiv](#)] [[Video Demo](#)]
- [15] **L. Chen**, X. Yao, P Xu, S. K. Moon, W. Zhou, and G. Bi, "In-Process Sensing, Monitoring and Adaptive Control for Intelligent Laser-Aided Additive Manufacturing", *Transactions on Intelligent Welding Manufacturing (TRINWM)*. [[Chapter](#)]
- [16] **L. Chen**, X. Yao, N. P. H. Ng, and S. K. Moon, "In-situ melt pool monitoring of laser aided additive manufacturing using infrared thermal imaging", *2022 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, Kuala Lumpur, Malaysia, 7 - 10 December, 2022. [[Conference](#)]
- [17] **L. Chen**, X. Yao, and S. K. Moon, "Toolpath design for in-process surface defect correction in hybrid additive-subtractive manufacturing", *2022 International Conference on Design for 3D Printing*, Singapore, 22 - 23 Sep, 2022.
- [18] **L. Chen**, X. Yao, and S.K. Moon, "In-situ acoustic monitoring of direct energy deposition process with deep learning-assisted signal denoising", *Materials Today Proceedings, The 1st International Conference on Additive Manufacturing for a Better World*, Singapore, 23 - 25 August, 2022. (**Best paper award**) [[Conference](#)]
- [19] **L. Chen**, X. Yao, P Xu, S.K. Moon, and G. Bi, "Surface Monitoring for Additive Manufacturing with in-situ Point Cloud Processing", *The 6th International Conference on Control, Automation and Robotics (ICCAR)*, Singapore, 20 - 23 April, 2020. [[Conference](#)]
- [20] P Xu, X. Yao, **L. Chen**, K. Liu and G. Bi, "Heuristic Kinematics of a Redundant Robot-Positioner System for Additive Manufacturing", *The 6th International Conference on Control, Automation and Robotics (ICCAR)*, Singapore, 20 - 23 April, 2020. [[Conference](#)]

INVENTIONS

- [1] **Technology disclosure**: "PropelPath: High-Speed Directed Energy Deposition Toolpath Strategy for Propeller Manufacturing with Complex Geometries", **1st inventor**
- [2] **Technology disclosure**: "An Acoustic-based In-Situ Monitoring Platform for Real-Time Process Monitoring and Defect Detection in Laser-Directed Energy Deposition", **1st inventor**
- [3] **Technology disclosure**: "A method for laser power closed loop feedback control with robot motion monitoring during DED process via optical sensor and infrared thermal measurement"
- [4] **Technology disclosure**: "Integrated Multi-sensor Fusion and Machine Learning Platform for Localized Defect Detection in Laser-Directed Energy Deposition", **1st inventor**

PROFESSIONAL SERVICE

Professional Membership

- **Institute of Electrical and Electronics Engineers (IEEE)**: *Student Member* (Nov 2022 - Present)
- **American Society of Mechanical Engineers (ASME)**: *Student Member* (Nov 2022 - Present)

Volunteer

- **IEEM 2022 conference**: *Student Helper*, 2022
- **IEEM 2023 conference**: *Student Helper*, 2023

Journal Reviewer

- **Additive Manufacturing (Q1)**
- **Advanced Science (Q1)**

- Virtual and Physical Prototyping (Q1)
- Journal of Manufacturing Process (Q1)
- Engineering Applications of Artificial Intelligence (Q1)
- Computers in Industry (Q1)
- Scientific Reports (Q1)
- Measurement (Q1)
- Optics and Lasers in Engineering (Q1)
- Advanced Engineering Materials (Q1)
- ASME Journal of Computing and Information Science in Engineering (JCISE)
- Scientific Programming
- International Journal of AI for Materials and Design
- Heliyon
- Applied Artificial Intelligence
- Digital Twins
- Computational Materials Science

Conference Reviewer

- ASME IDETC-CIE 2024

Other services

- Judge for Singapore Science and Engineering Fair (SSEF) 2024

REFERENCES

- **Moon Seung Ki**
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