YI-PING CHEN

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EDUCATION

Dep. of Mech. Eng., Northwestern University Sep. 2022 - Present
Ph.D. Candidate, expected to graduate in Jun. 2026 Evanston, IL, US

- Advisor: Dr. Wei Chen
- Doctoral Cluster in Predictive Science and Engineering Design
- Dissertation: *Continuous Learning and Decision-Making for the Digital Twin of Engineering Systems*

Dep. of Mech. Eng., National Taiwan University (NTU) Jul. 2018 - Jul. 2020
Master of Science Taipei, Taiwan

- Advisor: Dr. Kuei-Yuan Chan
- Overall GPA: 4.18/4.3; graduate ranking 2/41 in the design division
- Thesis: *Optimal Uncertain Parameter Excitation and Estimation: a Case Study on Vehicle Model Development*
- Dean's award for outstanding master's thesis (top 5% among all graduates of School of Engineering)

Dep. of Mech. Eng., National Cheng Kung University (NCKU) Sep. 2014 - Jun. 2018
Bachelor of Science, Phi Tau Phi Tainan, Taiwan

- Overall GPA: 3.96/4; ranking 2/198 in the department
- Graduated with Phi Tau Phi Honor (top 1% academic performance in the College of Engineering)
- Dean's list (top 10% academic performance of the class in the academic year, three times)
- Undergraduate Research Advisor: Dr. Hong-Sen Yan
- Undergraduate Thesis: *Integrated Design of Gear Type Differential and AC Motor with Planetary Gear Train for Electric Vehicles*

EXPERIENCE

Integrated DEsign and Automation Lab (IDEAL), Northwestern Univ. Sep. 2022 - present
Ph.D. Student Evanston, USA

- Project: NSF Engineering Research Center for Hybrid Autonomous Manufacturing Moving from Evolution to Revolution (ERC-HAMMER)
  - Multi-fidelity data fusion and adaptive sampling method for global fitting and Bayesian Optimization with Latent Variable Gaussian Process (LVGP).
  - Proposing frameworks for the real-time decision-making and online model updating for the Digital Twin of data-driven systems.
  - Conducting a multi-step model predictive control framework (MPC) and its uncertainty quantification for the Direct Energy Deposition (DED) machine using Time Series Dense Encoder (TiDE).
  - Building physics-based surrogate model for sheet deformation and constructing its corresponding MPC using Koopman Operator.

- Project: NSF Manufacturing ADvanced Electronics through Printing Using Bio-based and Locally Identifiable Compounds (MADE-PUBLIC)
  - Optimizing process parameters for the graphite-graphene exfoliation via Wet Jet Milling process using Bayesian optimization (BO) with Gaussian Process.
  - Optimizing the lasing parameters for ion-selective electrodes (ISEs) for laser-induced graphene (LIG) production using BO with Latent Variable Gaussian Process (LVGP).

National Chung-Shan Institute of Science & Technology (NCSIST) Jan. 2021 - Jun. 2022
R&D Engineer, Flight Control Group, Aeronautical Research Laboratory Taichung, Taiwan

- Building 6 Degree of Freedom (DoF) dynamic models with multi-body dynamics in Simulink
- Designing/validating nonlinear dynamic inversion (NDI) control laws on UAVs and fifth-generation fighter
- Implementing Model-based Design of software with Matlab System Qualification Toolkit
- Built a data processing GUI for analyzing flight test data, which saves more than 90% of effort on filtering noise and identifying eccentric values

Army of Republic of China (Taiwan) Sep. 2020 - Dec. 2020
Private, mandatory military service Kaohsiung, Taiwan

System Optimization Laboratory, NTU Jul. 2018 - Aug. 2020
Master's Student / Research Assistant (Part-time) Taipei, Taiwan

- Project: Validation and Verification of Machine Parameters in Dynamic Manufacturing Environment - Dynamic Parameter Calibration in Cyber-Physical Systems, sponsored by the Ministry of Science and Technology (MOST), Taiwan
- Built a 6 DoF three-wheeled vehicle model in Simulink
- Proposed a procedure of vehicle model calibration that decouples and estimates unknown model parameters via Global Sensitivity Analysis, optimization, and polynomial chaos-based Kalman Filter

Advance Power Research and Development Center, NTU Jul. 2018 - Jun. 2019
Research Assistant (Part-time), supervisor: Prof. Jung-Ho Cheng Taipei, Taiwan

- Project: Design of the X-by-wire EV Open Platform for AI Autonomous Driving R&D and XiL Validation Technique Development, sponsored by MOST
- Led a group to construct fail-safe strategies via System Theoretic Process Analysis (STPA), Failure Mode and Effect Analysis (FMEA), and Statistical process control
- Built and completed HiL testing platform for an autonomous vehicle

Creative Mechanism Design & Research Laboratory, NCKU Mar. 2016 - Jun. 2018
Undergraduate Research Assistant (Part-time) Tainan, Taiwan

- Designed a novel electric vehicle transmission subsystem by synthesizing a geared-motor, a reduction, and a differential covering conceptual and detailed design phases.

PEER REVIEWED JOURNAL PAPERS

[J4] **Chen, Y.-P.**, Tsai, Y.-K. Karkaria, V., Chen, W., 2025, "Uncertainty-Aware Digital Twins: Robust Model Predictive Control using Time-Series Deep Quantile Learning", submitted to *Journal of Mechanical Design*.

[J4] **Chen, Y.-P.**, Karkaria, V., Tsai, Y.-K., Rolark, F., Quispe, D., Gao, R., Cao, J., Chen, W., 2024, "Real-Time Decision-Making for Digital Twin in Additive Manufacturing with Model Predictive Control using Time-Series Deep Neural Networks", submitted to *Journal of Manufacturing Systems*.

[J3] Karkaria, V., Tsai, Y.-K., **Chen., Y.-P.**, and Chen, W., (2025), "An Optimization-Centric Review for Integrating AI and Digital Twin Technologies in Manufacturing", *Engineering Optimization*, (DOI:10.1080/0305215X.2024.2434201).

[J2] **Chen, Y.-P.**, Wang, L., Comlek, Y., and Chen, W., 2024, "A Latent Variable Approach for Non-Hierarchical Multi-Fidelity Adaptive Sampling ", *Computer Methods in Applied Mechanics and Engineering*, 421 (2024) 116773. (DOI: 10.1016/j.cma.2024.116773).

[J1] **Chen, Y.-P.**, and Chan, K.-Y., 2021, "Unknown Parameter Excitation and Estimation for Complex Systems with Dynamic Performances," ASME *Journal of Mechanical Design*, 143(9):1-25, 2021. (DOI: 10.1115/1.4050107)

REFERENCED CONFERENCE PAPER

[C6] Dewberry, N. K., AlHmoud, I., Benton, K., Suarez, D., **Chen, Y.-P**, Karkaria, V., Tsai, Y.-K., Brock, M., Alazzawi, N., Chowdhury, S., Chen, W., Cao, J., Gokaraju, B., 2024, "A Real-Time VR-Enabled Digital Twin Framework for Multi-User Interaction in Industry 4.0," *53rd SME North American Manufacutring Research Conference*, submitted.

[C5] Karkaria, V., Lee, D., **Chen, Y.-P.**, Yu, Y., Chen, W., "An Attention-based Spatio-Temporal Neural Operator for Physics Prediction and Discovery," *The 28th International Conference on Artificial Intelligence and Statistics (AISTATS)*, submitted.

[C4] **Chen, Y.-P.**, and Chan, K.-Y., 2020, "Designing Excitation Maneuvers With Maximal Parameter Sensitivity for an X-by-Wire Autonomous Tricycle," *Proceedings of the ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.*. Virtual, Online. August 17–19, 2020. V11BT11A025. ASME. (DOI: 10.1115/DETC2020-22257)

[C3] **Chen, Y.-P.**, and Chan, K.-Y., 2020, "A Model Validation Approach: Designing Excitation Operation via Simulation-based Global Sensitivity Analysis," the 37th Chinese Society of Mechanical Engineers Conference, Yunlin, Taiwan, 16-17 Nov.

[C2] **Chen, Y.-P.**, and Chan, K.-Y., 2020, "Excitation and Estimation of Unknown Model Parameters in a Vehicle System," the 37th Chinese Society of Mechanical Engineers Conference, Yunlin, Taiwan, 20-24 Oct.

[C1] **Chen, Y.-P.**, and Yan, H.-S., 2018, "Integrated Design of Gear Type Differential and AC Motor with Planetary Gear Train for Electric Vehicles," 21th Conference on The Chinese Society of Mechanism and Machine Theory. Taipei, Taiwan, 11-12 Dec.

PRESENTED CONFERENCE PAPER WITH ABSTRACT SUBMISSION

[P5] **Chen, Y.-P.**, Tsai, Y.-K., Karkaria, V. N., and Chen, W., 2025, "Uncertainty-Aware Digital Twin: a Simultaneous Multistep Robust Model Predictive Control for Additive Manufacturing ", *18th US National Congress on Computational Mechanics*. Chicago, July 20–24, 2025.

[P4] **Chen, Y.-P.**, Tsai, Y.-K., Karkaria, V. N., and Chen, W., 2024, "Multi-step Robust Model Predictive Control with Time-series Learning and Quantile Regression", *Proceedings of the ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.*. Washington D.C., August 25–28, 2024. ASME.

[P3] **Chen, Y.-P.**, Wang, L., Comlek, Y., Chen, W., 2023, "A Unified Adaptive Sampling Framework for Multi-Fidelity Modeling and Bayesian Optimization via Latent Variable Gaussian Process", *2023 Society of Engineering Science (SES) Annual Technical Meeting*, Minnesota, USA, 8-11 Oct.

[P2] **Chen, Y.-P.**, Wang, L., Comlek, Y., Chen, W., 2023, "Data Fusion of Multi-fidelity Systems via Latent Variable Gaussian Process for Active Learning Applications", *2nd IACM Mechanistic Machine Learning and Digital Engineering for Computational Science Engineering and Technology*, El Paso, Texas, USA, 23-27 Sep.

[P1] **Chen, Y.-P.**, Chen, Y.-H., and Yan, H.-S., 2019, "The Innovation Concept Designs of Mechanisms for Variable Compression Ratio Engine," 22th International Conference on Advances in Materials and Processing Technology. Taipei, Taiwan, 16-17 Nov.

ACADEMIC ACHIEVEMENTS AND AWARDS

- 2022-2026 Taiwan-Northwestern University Scholarship, funded by the Ministry of Education in Taiwan, for half of the expenses of doctoral study for four years.
- 2023 Predictive Science & Engineering Design Fellow
- 2023 NSF Fellowship Award for traveling grant at 2nd IACM MMLDE-CSET conference
- 2023 Leon M. Keer and Family Fellowship
- 2022 Walter-Murphy Scholarship
- 2021 Honorable Mention Award with USD 3500, 17th HIWIN Master's Thesis Award (the highest master's thesis award in M.E. field in Taiwan)
- 2020 Best Paper Award & Invited Keynote Speaker, Matlab Expo 2020, Taiwan
- 2020 Outstanding TA awarded, invited speaker at NTU TA workshop
- 2020 1st Place in Master Thesis Award, Chinese Society of Mechanical Engineering (CSME)
- 2019 Recruiting Fellowship of National Chung Shan Institute of Science and Technology, monthly stipend USD 650 (8 months) and reserved full-time R&D engineer position after graduate
- 2018 Award of Student Engineering Paper Competition, Chinese Institute of Engineering
- 2018 National Electric Vehicle Innovation Design and Construction Competition: 2nd in racing section, 3rd in technical report section
- 2017 Young College Elite of NCKU, selected 2/12000 for significant contribution and dedication to campus
- 2015-2019 Scholarships for outstanding academic performance of M.E. Dept. (six times)
- 2017 Undergraduate Research Fellowship (1 year), funded by Ministry of Science and Technology, Taiwan
- 2017 Gold Medalist and Ford Special Award on NCKU Mechanical Engineering Department's Capstone Project Competition
- 2016 Outstanding Engineering Mechanics Elite Award, China Engineering Consultants, Inc.

GRANT PROPOSAL WRITING

Foundation Models and Decisions for Digital Twins as a Learning System Sep. 2024
2025 Vannevar Bush Faculty Fellowship (VBFF) *Pending*

TEACHING EXPERIENCE

- Optimization in Engineering (2019 Fall, NTU, TA), graduate-level course given in English
- Introduction to Civic Education (2020 Spring, NTU, TA), undergraduate course given by NTU D-school
- Statistical Mechanics (2023 Fall, NU, Grader)
- Engineering Design and Optimization (2023 Winter, NU, Grader)
- Gaussian Process and Bayesian Optimization, in-group orientation (2024 Fall, Lecturer)

ACADEMIC MENTORSHIP

Research Mentorship

- Prarthana Chakrabarti, MS, Mar. 2024 - Jun. 2024, Graduate research assistant, *Constrained Time-series based Model Predictive Control*

- Christopher Luey, BS, Sep. 2023 - Dec. 2023, Undergraduate research assistant, *A GUI of Bayesian Optimization using Gaussian Process*
- Chun-Han Lin, BS, Undergraduate research assistant, Dec. 2018 - Jun. 2019, *Simulation of vehicle dynamics considering joint tolerance using ADAMS*

Graduate School Application Mentorship Sep. 2022 - present

I have been serving as a graduate program application mentor since 2022 under the Taiwanese Young Researcher Association (TYRA). Most of the students I mentored were either connected from TYRA or my academic siblings. I help proofread application materials, connecting them to other Ph.D. students, and mock interviews

- Yu-Lin Chen, May. 2024 - current, applying for Ph.D. program in 2025 Fall in Robotics.
- Cheng-Wei Wang, Aug. 2024 - current, applying for Ph.D. program in 2025 Fall in Aerospace.
- Jin-Yin Lin, Aug. 2024 - current, applying for Ph.D. degree in 2025 Fall in Material Science/Chemistry.
- Tzu-Yuan Huang, July. 2022 - Dec. 2022, committed to Ph.D. program in School of Computation, Information and Technology at Technical University of Munich.
- Wei-Chen Tseng, Sep. 2022 - Dep. 2022, committed to Ph.D. program in Computer Science in University of Texas in Austin.
- Leo (Yuan-Mao) Lee, Sep. 2022 - Dec. 2022, committed to Ph.D. program in Material Science and Engineering, Stanford University.
- Emma (Yi-Chen) Lin, Sep. 2022 - Dec. 2022, committed to M.Eng. program in Biomedical Engineering at Duke University.

ACADEMIC SERVICES: PEER REVIEW JOURNALS

- 2024 - *current* Structural and Multidisciplinary Optimization
- 2023 - *current*, Computational Methods for Applied Mechanics and Engineering
- 2021 - *current*, Reliability Engineering & System Safety
- 2020 - *current*, Applied Mathematical Modelling

LANGUAGES AND SKILLS

Language	Mandarin (Native), English (Fluent, TOEFL: 106/120)
Software	Matlab, Simulink, ADAMS, Solidworks
Programming	Python, R
Technical Strength	Optimization, Metamodel techniques, Design Under Uncertainty, Design & Analysis of Computer Experiment (DACE), Nonlinear Dynamic Inversion, Multi-Fidelity Design Optimization, Machine learning/Deep learning (Pytorch) Model Predictive Control
Interests	Music: Drummer in worship team for more than 10 years, Harmonica Sport: High school basketball team Culinary, Photography

LEADERSHIPS & EXTRACURRICULAR ACTIVITIES

Student Leader, Predictive Science & Engineering Design Fellows Sep. 2023 - Jun. 2024

- Organizing progress presentations and planning social events

President, Northwestern Taiwanese Student Association Feb. 2023 - Feb. 2024

- Launched a mentoring and orientation program for incoming graduate students

Co-Founder & CEO, NCKU Electric Vehicle Racing Team Sep. 2017 - Jun. 2018

- Founded and led an electronic racing team of 20 members with solid leadership and project management skills
- Built our first race car in a year and raised funds of more than USD 6000
- Successfully built our first race car in a year
- Won 2nd place in racing section and 3rd place in technical report section in a national competition

Vice President, United Department Association, NCKU Jul. 2017 - Jun. 2018

- Served as a student representative to advocate for students' rights
- Responsible for networking and funding allocation among all departmental student associations
- Held 11th NCKU Bicycle Festival, the largest department & school expo for high schools in southern Taiwan, with 20,000 participants from all over Taiwan

President, Student Association of Mechanical Engineering, NCKU Jul. 2016 - Jun. 2017

- Launched 2 technical clubs with industry sponsors Kymco (Motorcycle Club) and Syntex (Robot Club)
- Secured 300 parking spots from Bureau of Transportation, Tainan City Government for the M.E. department building

Chair & Instructor, NCKU Harmonica Club Jul. 2015 - Jun. 2016

- Gave lessons and led practices on harmonica quartet and group ensembles
- Won the champion in both harmonica quartet and small group ensemble in college group, National Student Music Competition, 2016
- Held 8th NCKU Harmonica Cup – a major competition for harmonica lovers in Taiwan

Oversea Learning

- 2023 Semicon @ Tokyo, visitor, sponsored by HIWIN Corp.
- 2018 Enterprise Visits @ Chengdu, China, sponsored by NTU.
- 2017 Business investigation and visits @ Vietnam, sponsored by Syntex Corp.
- 2016 JIMTOF Student attendee selected and sponsored by HIWIN Corp.
- 2014 Short-term Overseas Exchange @ Beihang University, Beijing, China

Summer Camps

- Held several camps on leadership training in NCKU
- Participated in youth and kids camps held by church
- Participated in bilingual camp with Village Gospel Mission and NCKU campus fellowship for the rural kids in Yulin, the poorest region in Taiwan