Dr. Chih-Li Sung

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Experience

Assistant Professor 2018 - Present
Department of Statistics and Probability, Michigan State University, U.S.A.

Visiting Assistant Professor May - July, 2022
Department of Statistics, National Cheng Kung University, Taiwan

Graduate Research Assistant 2014 - 2018
Georgia Institute of Technology, U.S.A.

Research Assistant 2013 - 2014
Academia Sinica, Taiwan

Statistical Engineer 2010 - 2013
Walsin Lihwa Corp., Taiwan

Education

Ph.D. in Industrial Engineering 2014 - 2018
Major in Statistics, Minor in Computer Science
Georgia Institute of Technology, U.S.A.
Thesis title: *Contributions to binary-output computer experiments and large-scale computer experiments*
Advisors: Profs. C. F. Jeff Wu and Benjamin Haaland

M.S. in Statistics 2008 - 2010
National Tsing Hua University, Taiwan

B.S. in Applied Mathematics 2004 - 2008
National Tsing Hua University, Taiwan

Research Interests

Computer Experiments, Experimental Designs, Uncertainty Quantification, Machine Learning, Big Data, and Applications of Statistics in Engineering

Grants

- **Active**:
  - NSF DMS 2338018 (**PI**, 06/01/2024 - 05/31/2029, $423,591), *CAREER: Single-Fidelity vs. Multi-Fidelity Computer Experiments: Unveiling the Effectiveness of Multi-Fidelity Emulation.*
- **Completed**:
  - NSF DMS 2113407 (**PI**, 07/01/2021 - 06/30/2024, $142,009), *Collaborative Research: Efficient Bayesian Global Optimization with Applications to Deep Learning and Computer Experiments.* This project is in collaboration with Dr. Ying Hung at Rutgers University.

Editorial Services

- **Associate Editor**
  - The New England Journal of Statistics in Data Science 2024 - present
  - Technometrics 2022 - present
  - Computational Statistics & Data Analysis 2021 - present

Publications

Green color indicates supervised student

22. **Sung, C.-L.**, Song, Y., and Hung, Y. (2025). Advancing inverse scattering with surrogate modeling and Bayesian inference for functional inputs.
SIAM/ASA Journal on Uncertainty Quantification, 13(2), 339-517.

21. Zhou, M., Zuo, R., **Sung, C.-L.**, Tong, Y., and Wang, X. (2025). Region-optimal Gaussian process surrogate model via Dirichlet process for cold-flow and combustion emulations.
Computer Methods in Applied Mechanics and Engineering, 439, 117894.

20. Steensma, A. K., Kaste, J. A., **Heo, J.**, Orr, D., **Sung, C.-L.**, Shachar-Hill, Y., and Walker, B. J. (2025). Modeling with uncertainty quantification identifies essential features of a non-canonical algal carbon-concentrating mechanism.
Plant Physiology, 197(2), kiae629.

19. **Heo, J.** and **Sung, C.-L.** (2025). Active learning for a recursive non-additive emulator for multi-fidelity computer experiments.
Technometrics, 67(1), 58-72.
(Winner of INFORMS 2023 QSR Best Student Paper)
(Winner of 2024 ASA SPES + Q&P Best Student Paper)

18. **Lin, W.-A.**, **Sung, C.-L.**, and Chen, R.-B. (2024). Category tree Gaussian process for computer experiments with many-category qualitative factors and application to cooling system design.
Journal of Quality Technology, 56(5), 391-408.
(C. Z. Wei Memorial Award from CIPS in 2022)

17. **Sung, C.-L.**, Wang, W., Cakoni, F., Harris, I., and Hung, Y. (2024). Functional-input Gaussian processes with applications to inverse scattering problems.
Statistica Sinica, 34(4), 1883-1902.

16. **Sung, C.-L.**, Wang, W., Ding, L., and Wang, X. (2024). Mesh-clustered Gaussian process emulator for partial differential equation boundary value problems.
Technometrics, 66(3), 406-421.

15. **Sung, C.-L.**, Ji, Y., Mak, S., Wang, W., and Tang, T. (2024). Stacking designs: designing multifidelity computer experiments with target predictive accuracy.
SIAM/ASA Journal on Uncertainty Quantification, 12(1), 157-181.

14. **Sung, C.-L.** and Tuo, R. (2024). A review on computer model calibration.
WIREs Computational Statistics, 16(1), e1645.

13. **Sung, C.-L.** and Hung, Y. (2024). Efficient calibration for imperfect epidemic models with applications to the analysis of COVID-19.
Journal of the Royal Statistical Society: Series C, 73(1), 47–64.

12. Zhou, M., Ni, C., **Sung, C.-L.**, Ding, S., and Wang, X. (2024). Modeling of thermo-physical properties and vapor-liquid equilibrium using Gaussian process regression.
International Journal of Heat and Mass Transfer, 219, 124888.

11. Zhou, M., Chen, W., Su, X., **Sung, C.-L.**, Wang, X., and Ren, Z. (2023). Data-driven modeling of general fluid density under subcritical and supercritical conditions.
AIAA Journal, 61(4), 1519-1531.

10. **Sung, C.-L.**, Haaland, B., Hwang, Y., and Lu, S. (2023). A clustered Gaussian process model for computer experiments.
Statistica Sinica, 33(2), 893-918.

9. **Sung, C.-L.**, Barber, B. D., and Walker, B. J. (2022). Calibration of inexact computer models with heteroscedastic errors,
SIAM/ASA Journal on Uncertainty Quantification, 10(4), 1733-1752.

8. **Sung, C.-L.** (2022). Estimating functional parameters for understanding the impact of weather and government interventions on COVID-19 outbreak.
Annals of Applied Statistics, 16(4), 2505-2522.

7. **Sung, C.-L.**, Hung, Y., Rittase, W., Zhu, C., and Wu, C. F. J. (2020). Calibration for computer experiments with binary responses and application to cell adhesion study.
Journal of the American Statistical Association, 115(532), 1664-1674.

6. **Sung, C.-L.**, Hung, Y., Rittase, W., Zhu, C., and Wu, C. F. J. (2020). A generalized Gaussian process model for computer experiments with binary time series.
Journal of the American Statistical Association, 115(530), 945-956.

5. **Sung, C.-L.**, Wang, W., Plumlee, M., and Haaland, B. (2020). Multi-resolution functional ANOVA for large-scale, many-input computer experiments.
Journal of the American Statistical Association, 115(530) 908-919.

4. Chang, Y.-H., Zhang, L., Wang, X., Yeh, S.-T., Mak, S., **Sung, C.-L.**, Wu, C. F. J., and Yang, V. (2019). Kernel-smoothed proper orthogonal decomposition-based emulation for spatiotemporally evolving flow dynamics prediction.
AIAA Journal, 57(12), 5269-5280.

3. Mak, S., **Sung, C.-L.**, Yeh, S.-T., Wang, X., Chang, Y.-C., Joseph, V. R., Yang, V., and Wu, C. F. J. (2018). An efficient surrogate model for emulation and physics extraction of large eddy simulations.
Journal of the American Statistical Association, 113(524):1443-1456.
(SPES Award from ASA in 2019)

2. Yeh, S.-T., Wang, X., **Sung, C.-L.**, Mak, S., Chang, Y.-H., Wu, C. F. J., and Yang, V. (2018). Data-driven analysis and mean flow prediction using a physics-based surrogate model for design exploration.
AIAA Journal, 56(6):2429-2442.

1. **Sung, C.-L.**, Gramacy, R. B., and Haaland, B. (2018). Potentially predictive variance reducing subsample locations in local Gaussian process regression.
Statistica Sinica, 28(2):577-600.

Submitted Papers

2. **Boutelet, R.** and **Sung, C.-L.** (2025) Active learning for finite element simulations with adaptive non-stationary kernel function.

1. Chen, Y., **Sung, C.-L.**, Kusari, A., Song, X., and Sun, W. (2024). Uncertainty-aware out-of-distribution detection with Gaussian processes.

Conference Proceedings

3. Li, Y., Wang, X., Mak, S., **Sung, C.-L.**, Wu, C. F. J., and Yang, Y. (2018). Novel perspectives of spatial flame transfer function identification and thermo-acoustic instability analysis. In *Proceedings of the 2018 AIAA Propulsion and Energy Forum.*

2. Li, Y., Wang, X., Mak, S., **Sung, C.-L.**, Wu, C. F. J., and Yang, Y. (2018). Uncertainty quantification of flame transfer function under a Bayesian framework. In *Proceedings of the 2018 AIAA Aerospace Sciences Meeting.*

1. Chang, Y.-H., Zhang, L., Wang, X., Yeh, S.-T., Mak, S., **Sung, C.-L.**, Wu, C. F. J., and Yang, Y. (2017). Spatial-temporal flow dynamics prediction with large design space via data-driven analysis and LES-based surrogate model. In *ILASS-Americas 29th Annual Conference on Liquid Atomization and Spray Systems.*

Awards

- **NSF CAREER Award** 2024
  National Science Foundation

- **SPES + Q&P Best Student Paper Winner** August 2024
  (Student: Junoh Heo) ASA
- **QSR Best Student Paper Winner** October 2023
  (Student: Junoh Heo) INFORMS
- **IMS New Researchers Travel Award** April 2023
  Institute of Mathematical Statistics
- **Full Membership in Sigma Xi** October 2021
  The Scientific Research Honor Society
- **Statistics in Physical Engineering Sciences (SPES) Award** August 2019
  American Statistical Association
- **Alice and John Jarvis, Ph.D. Student Research Award** April 2018
  (Honorable Mention) Stewart School of ISyE, Georgia Tech
- **Best Student Poster Winner** October 2017
  (1st Prize) Georgia Statistics Day, Emory University
- **Best Student Poster Winner** June 2017
  ISBIS Meeting, the IBM Watson Research Center
- **Spring Research Conference Travel Award** May 2016
  SRC, Illinois Institute of Technology
- **Hacklytics: Go Back Home Safe** April 2016
  (3rd Place) Data Science at Georgia Tech
- **Government Scholarship to Study Abroad** August 2015
  Ministry of Education, Taiwan
- **Dr. Chen Wen-Chen Statistics Science Thesis Award** June 2010
  Dr. Chen Wen-Chen Memorial Foundation

Teaching

- **Instructor**, Michigan State University
  - **STT442: Probability and Statistics II: Statistics** 2024
  - **STT481: Capstone in Statistics** 2018, 2019, 2020, 2021, 2022, 2023
  - **STT801: Design of Experiments** 2021, 2022, 2023, 2025
  - **STT997: Advanced Topics in Statistics** 2024
- **Graduate Teaching Assistant**, Georgia Institute of Technology
  - ISYE6413: Design and Analysis of Experiments January 2017
  - ISYE3770: Statistics and Applications August 2015

Mentorship

STT: Department of Statistics and Probability at MSU

- **Ph.D. Students**
  - Andrews Boahen (*STT*) 2024-present
  - Romain Boutelet (*STT*, co-supervised with Prof. Andrew O. Finley) 2023-present
  - Chun-Yi Chang (*STT*) 2022-present
  - Junoh Heo (*STT*) 2021-present
  - Wei-Ann Lin (*NCKU*, primary advisor: Prof. Ray-Bing Chen) 2019-2025
- **Masters-level Students**
  - Haojun Yang (*STT*) 2021-2022
  - Chun-Yi Chang (*STT*, Current position: Ph.D. student at MSU) 2021-2022
  - Kun Xia (*STT*) 2021-2022

- Wei Chen (*Florida Tech*, Primary advisor: Prof. Xingjian Wang) 2020-2021
- Ashton Pallottini (*STT*, Current position: Ph.D. student at U. of Chicago) 2019-2020
- Jinwon Park (*STT*) 2019-2019

- **Undergraduate-level Students**
  - Chungmin Lee (*Yonsei University*) 2024-present
  - Aditya Pendyala (*STT*) 2024-present
  - Noah Jankowski (*STT*) 2021-2022

- **MSU IMPACTS Trainees**
  - Duncan Boren (*BMB*, primary advisor: Prof. Josh Vermaas) 2022-2023
  - Joshua Kaste (*Plant Biology*, primary advisor: Prof. Yair Shachar-Hill) 2020-2021

Panel Review

- National Science Foundation (2022, 2024)

Conference/ Workshop Activities

- Organizing the workshop: "UQ and Trustworthy AI Algorithms for Complex Systems and Social Good" March 2025
- Organizing the session at JSM: "Recent Advances in Active Learning and Bayesian Optimization" August 2024

Educational Outreach

- **Take Your Child to Work Day** April 2025
  Dr. Guanqun Cao and I and I co-hosted an interactive exhibit titled "Random Rolls, Smooth Spins: Revealing the Secrets of the Bell Curve" as part of MSUs annual Take Your Child to Work Day. This campus-wide event invites children to explore career paths through engaging, hands-on activities.
- **13th Annual MSU Science Festival** April 2025
  Dr. Guanqun Cao and I co-hosted an interactive exhibit titled "Random Rolls, Smooth Spins: Revealing the Secrets of the Bell Curve" as part of the 13th Annual MSU Science Festivalan annual, free celebration of science driven by curiosity, wonder, and discovery.
- **12th Annual MSU Science Festival** April 2024
  Our lab hosted an engaging event: "Rolling the Dice: Unveiling Normal Distributions" as part of the MSU Science Festival. Our booth provided a fun and hands-on learning experience, helping learners of all ages understand the concept of normal distribution through fun and interactive games.
- **REU exchange program** 2024 Spring
  I had the honor of mentoring an exchange student from Xian University, alongside three talented MSU undergraduate students. As part of this program, I had the privilege of supervising an undergraduate research project titled "March Machine Learning Mania 2024," fostering innovation and exploration in the realm of machine learning.
- **Gifted Education Symposium** November 2023
  I shared my career journey and applications of statistics and AI, as well as future opportunities in these areas, with junior high school students in Penghu, Taiwan.

Software

7. Heo, J. and **Sung, C.-L.** (2024). `RNAmf`: Recursive Non-Additive Emulator for Multi-Fidelity Data. `R` package version 1.0.0.
6. **Sung, C.-L.** (2023). `MRFA`: Fitting and Predicting Large-Scale Nonlinear Regression Problems using Multi-Resolution Functional ANOVA (MRFA) Approach. `R` package version 0.6.
5. **Sung, C.-L.** (2023). `mcGP`: Mesh-clustered Gaussian process. `R` package version 0.1.

4. **Sung, C.-L.** (2022). `HetCalibrate`: Calibration of Inexact Computer Models with Heteroscedastic Errors. `R` package version 0.2.
3. **Sung, C.-L.** (2022). `GPcluster`: Clustered Gaussian Process. `R` package version 0.1.
2. **Sung, C.-L.** (2018). `calibrateBinary`: Calibration for Computer Experiments with Binary Responses. `R` package version 0.1.
1. **Sung, C.-L.** (2017). `binaryGP`: Fitting and Predicting a Gaussian Process Model with (Time-Series) Binary Response. `R` package version 0.2.

Dissertation Committee Service

STT: Department of Statistics and Probability at MSU

- Elliot Shannon (*STT*, in progress)
- Meiqi Liu (*STT*, in progress)
- Tathagata Dutta (*STT*, in progress)
- Duncan Boren (*BMB*, in progress)
- Xuran Wang (*CEPSE*, 2024)
- Haoxiang Feng (*STT*, 2024)
- Joshua Kaste (*Plant Biology*, 2024)
- Zi Li (*ECE*, 2023)
- Yao Song (*Statistics, Rutgers University*, 2023)
- Anirban Samaddar (*STT*, 2023)
- Mookyong Son (*STT*, 2023)
- Abhijnan Chattopadhyay (*STT*, 2022)
- Runze Su (*STT*, 2022)
- Ibrahim Kekec (*Economics*, 2021)
- Juna Goo (*STT*, 2020)
- Wei Chen (*Florida Tech*, master thesis, 2020)

Talks

Invited talks are boldfaced

- **2025**
  1. **Seminar, Institute of Statistical Science, Academia Sinica** (May). *Advances in multi-fidelity computer experiments with tuning parameters.*
  2. **Workshop, Kernel Methods in Uncertainty Quantification and Experimental Design** (April). *Advances in active learning and emulation for multi-fidelity simulations.*
  3. **Workshop, UQ and Trustworthy AI Algorithms for Complex Systems and Social Good** (March). *Recursive non-additive surrogate model for multi-fidelity simulations.*
  4. **Seminar, Department of Industrial and Systems Engineering, University of Washington** (Feburary). *Advances in multi-fidelity computer experiments: non-additive emulation and active learning.*
  5. **Colloquium, Department of Statistics, University of South Carolina** (January). *Advancing multi-fidelity computer experiments: applications to uncertainty quantification.*
- **2024**
  1. **JSM 2024 Conference, Portland** (August). *Functional-input Gaussian processes with applications to inverse scattering problems.*
  2. **2024 International Conference for Statistics and Data Science** (July). *Stacking designs: designing multifidelity computer experiments with target predictive accuracy.*

3. **The 28th South Taiwan Statistics Conference** (June). *Active learning for a recursive non-additive emulator for multi-fidelity computer experiments.*
4. **Seminar, Department of Mathematics and Statistics, University of Massachusetts Amherst** (April). *Stacking designs: designing multifidelity computer experiments with target predictive accuracy.*

- **2023**

1. **Annual Meeting and Conference of Chinese Statistical Association** (December). *Stacking designs: designing multi-fidelity computer experiments with target predictive accuracy.*
2. **Seminar, Institute of Statistical Science, Academia Sinica** (October). *Active learning for a recursive non-additive emulator for multi-fidelity computer experiments.*
3. **Seminar, Department of Statistics, National Chengchi University** (October). *Stacking designs: designing multi-fidelity computer experiments with target predictive accuracy.*
4. **Seminar, TAMIDS, Texas A&M University** (August). *Stacking designs: designing multi-fidelity computer experiments with target predictive accuracy.*
5. **Industry 4.0 Technology Implementation workshop** (August). *Statistical emulation, calibration, and optimization for digital twin.*
6. **EcoSta 2023, Tokyo, Japan** (August). *Functional-input Gaussian processes with applications to inverse scattering problems.*
7. **ISI World Statistics Congress 2023** (July). *mcGP: mesh-clustered Gaussian process emulator for partial differential equation systems.*
8. **ICSA Applied Statistics Symposium 2023** (June). *Stacking designs: designing experiments for multi-fidelity modeling with confidence.*
9. **Spring Research Conference 2023** (May). *Stacking designs: designing experiments for multi-fidelity modeling with confidence.*
10. **Seminar, University of St Andrews, Scotland** (January). *When epidemic models meet statistics: understanding COVID-19 outbreak.*

- **2022**

1. **AISC 2022, UNC Greensboro** (October). *Functional-input Gaussian processes with applications to inverse scattering problems.*
2. **Seminar, Virginia Tech** (September). *Stacking designs: designing multi-fidelity computer experiments with confidence.*
3. **JSM 2022 Conference, Washington DC** (August). *When epidemic models meet statistics: understanding the impact of weather and government interventions on COVID-19 outbreak.*
4. **Seminar, Academia Sinica, Taiwan** (July). *Stacking designs: designing experiments for multi-fidelity modeling with confidence.*
5. **EcoSta 2022, Kyoto, Japan** (June). *Stacking designs: designing experiments for multi-fidelity modeling with confidence.*
6. **Seminar, National Tsing Hua University, Taiwan** (May). *When epidemic models meet statistics: understanding COVID-19 outbreak.*

- **2021**

1. **INFORMS 2021 Conference** (October). *Estimating functional parameters for understanding the impact of weather and government interventions on COVID-19 outbreak.*

2. JSM 2021 Conference (August). *Estimating functional parameters for understanding the impact of weather and government interventions on COVID-19 outbreak.*
3. **JSM 2021 Conference** (August). *Multi-level emulator for multi-fidelity simulations.*
4. **UQ Seminar, Academy of Mathematics and Systems Science, Chinese Academy of Sciences** (January). *Computer experiments with binary time series and applications to cell biology: modeling, emulation and calibration.*

- **2020**

1. JSM 2020 Conference (August). *Calibration of inexact computer models with heteroscedastic errors.*
2. **Seminar, University of California, Los Angeles** (February). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments.*
3. Colloquium, Michigan State University (January). *Applications of computer experiments: emulation and calibration.*

- **2019**

1. **INFORMS 2019 Conference** (October). *A clustered Gaussian process model with an application to solar irradiance emulation.*
2. **INFORMS 2019 Conference** (October). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments.*
3. **ICOSDA 2019** (October). *Exploiting variance reduction potential in local Gaussian process search.*
4. **ICISE 2019** (June). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments.*
5. **EcoSta 2019** (June). *Exploiting variance reduction potential in local Gaussian process search.*
6. **The 28th South Taiwan Statistics Conference** (June). *Exploiting variance reduction potential in local Gaussian process search.*
7. **Seminar, Academia Sinica, Taiwan** (June). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments.*
8. **Seminar, National Tsing Hua University, Taiwan** (May). *Computer Experiments with Binary Time Series and Applications to Cell Biology: modeling, estimation and calibration.*
9. **Research Colloquium, Purdue University** (February). *Applications of computer experiments: emulation and calibration.*

- **2018**

1. **INFORMS 2018 Conference** (October). *An efficient surrogate model for emulation and physics extraction of large eddy simulations.*
2. **Workshop on Computer Experiments, Academia Sinica, Taiwan** (July). *Calibration for computer experiments with binary responses.*
3. SIAM UQ (April). *Calibration for computer experiments with binary responses.*

- **2017**

1. INFORMS 2017 Conference (October). *A generalized Gaussian process model for computer experiments with binary time series.*
2. Georgia Statistics Day, Emory University (October). *A generalized Gaussian process model for computer experiments with binary time series* (poster presentation).
3. JSM 2017 Conference (July). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments.*

4. ISBIS Meeting (June). *Multi-resolution functional ANOVA for large-scale, many-input computer experiments* (poster presentation).
5. SPUQ Workshop (May). *A generalized Gaussian process model for computer experiments with binary time series* (poster presentation).
6. NAE Regional Meeting (April). *Surrogate modeling and data-driven physics extraction of large-eddy simulations* (poster presentation).

- **2016**:

1. ICSA Symposium (June). *Potentially predictive variance reducing subsample locations in local Gaussian process regression.*
2. SRC Conference (May). *Potentially predictive variance reducing subsample locations in local Gaussian process regression.*