# 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

 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.

- 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, in press.
- 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.
- 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)

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

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

# Teaching

- Instructor, Michigan State University
  - STT481: Capstone in Statistics 2018, 2019, 2020, 2021, 2022, 2023 Student evaluation (average of SIRS form; 1 is the best and 5 is the worst):

2018 Fall	2019 Spring	2019 Fall	2020 Spring	2020 Fall
1.638	1.537	1.680	1.665	1.612
2021 Spring	2021 Fall	2022 Spring	2022 Fall	2023 Spring
1.598	1.713	1.392	1.919	1.560

- STT801: Design of Experiments

 $2021,\,2022,\,2023$ 

Student evaluation (average of SIRS form; 1 is the best and 5 is the worst):

2021 Spring	2022 Spring	2023 Spring
1.340	1.498	1.205

- STT997: Advanced Topics in Statistics

2024 Spring

Student evaluation (average of SPLS form; 5 is the best): 4.5

• Graduate Teaching Assistant, Georgia Institute of Technology

- ISYE6413: Design and Analysis of Experiments

January 2017

- ISYE3770: Statistics and Applications

August 2015

## Mentorship

#### • Ph.D. Students

STT: Department of Statistics and Probability at MSU

- 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

#### • 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.
- 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

- Elliot Shannon (STT, in progress)
- Meiqi Liu (STT, in progress)
- Tathagata Dutta (STT, in progress)

STT: Department of Statistics and Probability at MSU

- 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**

#### 2025

Invited talks are boldfaced

- 1. Workshop, UQ and Trustworthy AI Algorithms for Complex Systems and Social Good (March). Recursive non-additive surrogate model for multi-fidelity simulations.
- 2. Seminar, Department of Industrial and Systems Engineering, University of Washington (Feburary). Advances in multi-fidelity computer experiments: non-additive emulation and active learning.
- 3. 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.

- 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, manyinput 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, manyinput 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.