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.

 $The sis \ title: \ {\it Contributions} \ to \ binary-output \ computer \ experiments \ and \ large-scale \ computer \ experiments$

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

- 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.
- 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

- Technometrics 2022 - present

- Computational Statistics & Data Analysis

2021 - present

Publications

- 17. **Sung, C.-L.**, Wang, W., Ding, L., and Wang, X. (2024+). Mesh-clustered Gaussian process emulator for partial differential equation boundary value problems. *Technometrics*, accepted.
- 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), in press.
- 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.
- 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.
- 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)

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

[†] Supervised student

- Heo, J.[†], Sung, C.-L. (2023). Active learning for a recursive non-additive emulator for multi-fidelity computer experiments, submitted. (Winner of INFORMS 2023 QSR Best Student Paper)
- 2. Sung, C.-L., Song, Y., and Hung, Y. (2023). Advancing inverse scattering with surrogate modeling and Bayesian inference for functional inputs, submitted.
- Lin, W.-A.[†], Sung, C.-L., and Chen, R.-B. (2022). Category tree Gaussian process for computer experiments with many-category qualitative factors and application to cooling system design, submitted.
 (C. Z. Wei Memorial Award from CIPS in 2022)

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.
- 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 National Science Foundation	2024-2029
• 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	May 2016

SRC, Illinois Institute of Technology

• 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

• 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

- Romain Boutelet (STT, co-supervised with Prof. Andrew O. Finley)
 Chun-Yi Chang (STT)
 Junoh Heo (STT)
 Wei-Ann Lin (NCKU, primary advisor: Prof. Ray-Bing Chen)
 2023-present
 2022-present
 2021-present
 2019-present
- 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

- Noah Jankowski (STT)

2021-2022

• MSU IMPACTS Trainees

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

Dissertation Committee Service

STT: Department of Statistics and Probability at MSU

- Meiqi Liu (STT, in progress)
- Tathagata Dutta (STT, in progress)
- Duncan Boren (BMB, in progress)
- Xuran Wang (CEPSE, in progress)
- Haoxiang Feng (STT, in progress)
- 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)

Software

- 7. Heo, J. and Sung, C.-L. (2023). RNAmf: Recursive Non-Additive Emulator for Multi-Fidelity Data. R package version 0.1.0.
- 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.
- 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.

Talks

• 2023

Invited talks are boldfaced

- 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.