Curriculum Vitae

Seokhyun Chung, Ph.D.

CONTACT INFORMATION

Assistant Professor (tenure-track)
Systems & Information Engineering
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RESEARCH INTERESTS

My research focuses on **data analytics** for **collaborative systems**. With the rise of Internet of Things (IoT) technologies, collaborative systems have become increasingly prevalent. These systems comprise of multiple IoT-enabled units/entities (e.g., machinery, 3D printers, electric vehicles, wearable devices, etc.), each equipped with the capability for data collection, local computation, and wireless communication. I enjoy developing and exploring analytics methodologies that leverage the edge computing power of these units to create smart analytics *collaboratively*. I envision that most, if not all, entities in various fields, including manufacturing and healthcare, will eventually be interconnected through IoT technologies, which necessitates innovative analytics methods that can handle critical yet unique challenges posed in such a novel environment. As such, I endeavor to **build and explore new analytics methodologies grounded in statistics and machine learning theories to harness heterogeneous, real-time, and dynamic data collected from collaborative systems**. The methods developed have contributed to diverse applications, including **smart manufacturing** and **digital health**. My research has been supported by the National Science Foundation (NSF) and the National Safety Council (NSC).

- **Methodologies**: Federated analytics, Bayesian statistical/machine learning, Probabilistic modeling, and Real-time active learning
- **Applications**: Smart manufacturing, Quality and reliability engineering, and Digital health.

EDUCATION

University of Michigan, Ann Arbor, MI, USA
Ph.D. in *Industrial & Operations Engineering* *Sep. 2018 – Apr. 2023*

University of Michigan, Ann Arbor, MI, USA
M.A. in *Statistics* *Sep. 2021 – Apr. 2023*

Korea University, Seoul, South Korea
M.S. in *Industrial Management Engineering* *Mar. 2016 – Aug. 2018*

Korea University, Seoul, South Korea
B.S. in *Industrial Management Engineering* *Mar. 2010 – Feb. 2016*

PUBLICATIONS

Journal Papers

1. Baek, Y., Bae, B., Yang, J., Cho, W., Sim, I., Yoo, G., **Chung, S.**, Heo, J., and Lee K. (2024+) "Network of Artificial Olfactory Receptors for Spatiotemporal Monitoring of Toxic Gas" *Science Advances* (accepted)
2. **Chung, S.** and Kontar, R. (2024) "Federated Multi-output Gaussian Processes," *Technometrics*, 66(1), 90-103.

- ***Quality, Statistics, and Reliability (QSR) Best Paper finalist***, 2022 INFORMS Annual Meeting

3. **Chung, S.** and Kontar, R. (2024) "Federated Condition Monitoring Signal Prediction with Improved Generalization," *IEEE Transactions on Reliability*, 73(1), 438-350.

4. **Chung, S.**, Kontar, R., and Wu, Z. (2022) "Weakly-supervised Multi-output Regression via Correlated Gaussian Processes," *INFORMS Journal on Data Science*, 1(2), 115-137.
   - ***Quality Control & Reliability Engineering (QCRE) Best Student Paper finalist***, 2021 IISE Annual Conference

5. **Chung, S.**, Chou, C.-H., Fang, X., Kontar, R., and Okwudire, C. (2022) "A Multi-stage Approach for Knowledge-guided Predictions with Application to Additive Manufacturing," *IEEE Transactions on Automation Science and Engineering*, 19(3), 1675-1687.

6. Kontar, R., Shi, N., Yue, X., **Chung, S.**, Byon, E., Chowdhury, M., Jin, J., Kontar, W., Masoud, N., Noueihed, M., Okwudire, C. E., Raskutti, G., Saigal, R., Singh, K., and Ye, Z. (2021) "The Internet of Federated Things (IoFT)", *IEEE Access*, 9, 156071.

7. Wang, J., **Chung, S.**, AlShelahi, A., Kontar, R., Byon, E., and Saigal, R. (2021) "Look-ahead Decision Making for Renewable Energy: A Dynamic "Predict and Store" Approach", *Applied Energy*, 296, 117068.

8. **Chung, S.** and Kontar, R. (2021) "Functional Principal Component Analysis for Extrapolating Multi-stream Longitudinal Data," *IEEE Transactions on Reliability*, 70(4), 1321.

9. **Chung, S.**, Park, Y.-W., and Cheong, T. (2020) "A Mathematical Programming Approach for Integrated Multiple Linear Regression Subset Selection and Validation," *Pattern Recognition*, 108, 107565.

10. Lee, S., Kim, Y., Kahng, H., Lee, S.-K., **Chung, S.**, Cheong, T., Shin, K., Park, J., and Kim, S. B.* (2020). "Intelligent Traffic Control for Autonomous Vehicle Systems based on Machine Learning," *Expert Systems with Applications*, Vol. 144, 113074.

11. Lee, H., **Chung, S.**, Cheong, T., and Song, S. H. (2018) "Accounting for Fairness in a Two-stage Stochastic Programming Model for Kidney Exchange Programs," *International Journal of Environmental Research and Public Health*, 15(7), 1491.

12. Yea, M., **Chung, S.**, Cheong, T., and Kim, D. (2018) "Sharing of Benefits from a Logistics Alliance Based on a Hub-Spoke Network: a Cooperative Game Theoretic Approach," *Sustainability*, 10(6), 1855.

13. Yuh, J., **Chung, S.**, and Cheong, T. (2017) "Reformulation-linearization Technique Approach for Kidney Exchange Program IT Healthcare Platforms," *Applied Sciences*, 7(8), 847.

Under Review & Working Papers (∗: corresponding author, †: student advised by me)

14. **Chung, S.**∗ and Kontar, R. "Real-time Adaptation for Online Condition Monitoring Signals using Label-aware Neural Processes." (2nd round revision, [arXiv preprint])

- ***Quality Control & Reliability Engineering (QCRE) Best Track Paper finalist***, 2024 IISE Annual Conference

15. Gao, J†. and **Chung, S***. "Federated Automatic Latent Variable Selection in Multi-output Gaussian Processes" (submitted, [arXiv preprint])
16. **Chung, S.** and Cha, H.*, and Cheong, T.* "An optimization model and algorithm for job scheduling with extra resource allocation in shipbuilding (submitted)"
17. Cheong, J. and Yue, X., and **Chung, S.*** "Fed-Joint: Joint Modeling of Nonparametric Degradation Signals and Failure Events for Remaining Useful Life Prediction using Federated Learning"

Teaching Experience

Teaching interests: Statistical models, Applied Bayesian statistics, Machine learning & Artificial intelligence, and Predictive analytics.

Instructor (at University of Virginia)

- SYS 4582: Selected Topics in Systems Engineering – Data Mining (Spring 2024)
- SYS 6021: Statistical Modeling I (Fall 2023, 2024)
- Capstone Design (Fall 2024 – Spring 2025)
  - Project 1: Improving Patient Flow in the UVA Emergency Department: Understanding Efficiency, Throughput, and the Quality of the Patient Experience
  - Project 2: Improving TheUsual.ai's Restaurant Recommendation Engine leveraging Machine Learning and Large Language Model training

Teaching Assistant (at University of Michigan)

- IOE/STATS 570: Experimental Design (Winter 2022)
- IOE 265: Probability & Statistics for Engineers (Winter 2020, 2021)

Teaching Certificates

- Completion of Rackham-CRLT Preparing Future Faculty (PFF) seminar, 2022
  - Five-week intensive training program on inclusive teaching and learning for undergraduate and graduate level courses

Grants

Funded Projects

- ReDDDoT Phase 1: Planning Grant: Facilitating Responsible, Ethical, and Explainable Ergonomic Exposure Assessments when using Artificial Intelligence Methods
  - Sponsor: National Science Foundation
  - Amount: $300,000
  - Date: Oct. 2024 – Sep. 2026
  - Role: Co-PI
  - With Dr. Sol Lim (PI; VTech) and Dr. Maury Nussbaum (VTech)
- Contributing to Responsible Artificial Intelligence (AI)-Based Biomechanical Exposure Assessment
  - Sponsor: National Safety Council
  - Amount: $50,000

- Date: Jul. 2024 – Jun. 2025
- Role: Co-PI
- with Dr. Sol Lim (PI; VTech)

- Achieving the Future of Worker Injury Risk Assessment: Personalized and Privacy-Preserving
  - Sponsor: 4-VA
  - Amount: $31,000
  - Date: Jul. 2024 – Jun. 2025
  - Role: PI
  - with Dr. Sol Lim (VTech) and Dr. Maury Nussbaum (VTech)

- Diversity, Equity, and Inclusion Student Grant
  - Sponsor: College of Engineering at University of Michigan
  - Amount: $1,480
  - Date: Mar. 2020 – Dec. 2020
  - with INFORMS Student Chapter at UM

Awards, Honors, & Scholarships

Awards

- QCRE Best Track Paper Finalist, 2024 IISE Annual Conference
- QSR Best Paper Competition Finalist, 2022 INFORMS Annual Meeting
- QCRE Best Student Paper Award Finalist, 2021 IISE Annual Conference
- IEEE Access Featured Article of the Year, 2021

Scholarships

- Rackham Predoctoral Fellowship (one of the most prestigious awards granted by Rackham Graduate School, 2022 – 2023 [Link])
- IOE Department Fellowship, University of Michigan (full tuition and stipend, 2018 – 2019)
- National Scholarship for Science and Engineering, Korea Student Aid Foundation (merit-based scholarship for full tuition, 2010 – 2015)

Presentations & Talks

Invited Talks

1. Probabilistic Predictive Analytics for Collaborative Systems
   - Department of Industrial Management Engineering, Korea University, Jun. 2024
   - Department of Industrial Engineering, Yonsei University, May. 2024
   - UVa AI/ML Seminar, University of Virginia, Oct. 2023
   - Department of Industrial and Systems Engineering, North Carolina A&T State University, Sep. 2023
2. Collaborative Data Analytics for Smart and Connected Systems
   - Department of Industrial and Systems Engineering, Korea Advanced Institute of Science & Technology, Mar. 2023
   - Department of Industrial Engineering, University of Arkansas, Feb. 2023
   - School of Systems and Enterprises, Stevens Institute of Technology, Feb. 2023
   - Department of Engineering Systems and Environment, University of Virginia, Feb. 2023

- Department of Industrial and Manufacturing Engineering, Florida State-Florida A&M University, Feb. 2023
- Department of Industrial Engineering, Clemson University, Jan. 2023
- Department of Industrial and Systems Engineering, Auburn University, Jan. 2023
- Department of Industrial Engineering, University of Pittsburgh, Jan. 2023
- Department of Industrial Engineering, Ulsan National Institute of Science & Technology, Dec. 2022
- Department of Industrial and Systems Engineering, University of Missouri, Dec. 2022

Conference Presentations

1. Real-time Adaptation for Time-series Prediction using Label-aware Neural Processes
   - 2024 INFORMS Annual Meeting, Seattle, WA (upcoming)
   - **QCRE Best Track Paper Competition**, 2024 IISE Annual Conference, Montréal, CA, May 19 – 21
2. Fast Personalization for Heterogeneous Condition Monitoring Signals Using Neural Processes
   - 2023 INFORMS Annual Meeting, Phoenix, AZ, Oct. 15 – 18
3. Federated Multi-output Gaussian Processes
   - **QSR Best Paper Competition**, 2022 INFORMS Annual Meeting, Indianapolis, IN, Oct. 16 – 19
4. Federated Condition Monitoring Signal Prediction with Improved Generalization
   - 2021 INFORMS Annual Meeting, Anaheim, CA, Oct. 24 – 27
5. Weakly-supervised Multi-output Regression via Correlated Gaussian Processes
   - **QCRE Best Student Paper Competition**, 2021 IISE Annual Conference
   - 2020 INFORMS Annual Meeting
   - The 2020 Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS), Ann Arbor, MI, Feb. 28 (poster)
6. Functional Principal Component Analysis for Extrapolating Multi-stream Longitudinal Data
   - INFORMS 2019 Annual Meeting, Seattle, WA, Oct. 20 – 23
   - The 2019 Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS), Ann Arbor, MI, Mar. 28
7. Mathematical Programming for Regression Subset Selection with Diagnostic Constraints
   - 2017 INFORMS Annual Meeting, Huston, TX, Oct. 22 – 25.
8. Reformulation-linearization Technique Application on Integer Programming Models for Organ Exchange Program
   - 2016 INFORMS Annual Meeting, Nashville, TN, Nov. 13 – 16.

Mentoring

Advisees

- Jingyi Gao (PhD Student, Aug. 2023 –)
- Jiaxin Shen (PhD Student, Aug. 2024 –)

- Ramin Soleimani (visiting PhD student, Aug. 2024 –)

PhD Dissertation Committee

- Hossein KavianiHamedani (UVA Systems Engineering, 2024)
- Negin Moghadasi (UVA Systems Engineering, 2024)
- Navreet Kaur (UVA Systems Engineering, 2023)

Service, Volunteering & Activities

Academic Service

- Reviewer for *Technometrics, INFORMS Journal on Computing, IISE Transactions, IEEE Transactions on Reliability, IEEE Transactions on Automation Science and Engineering, IEEE/ASME Transactions on Mechatronics, Journal of Intelligent Manufacturing, and AISTATS*
- Session chair at *INFORMS Annual Meeting 2022, 2023, 2024*
- Student representative, *The 2021 Michigan Student Symposium for Interdisciplinary Statistical Sciences*

Society Leadership

- Chapter president, Central Virginia Chapter at Korean-American Scientists and Engineers Association (KSEA) (Aug. 2023 –)
- Chair, Social Division of INFORMS at UM (2020)
- President, Korea University Alumni Association at UM (2021 – 2022)

Outreach

- Society of Women Engineers at UVA (2024 –)
  - Volunteering at high school visit weeks to introduce Systems Engineering and ongoing research
- Science Communication Fellows at UM Museum of Natural History (2022)
  - Developing inquiry-based activities that showcase and share my research with K-12 students and/or the public at community outreach events

Modified on Oct. 2024