Ye Kwon, Huh

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Research Statement

My research interests encompass deep learning, machine learning, statistical modeling, and uncertainty quantification, focusing on practical applications such as anomaly detection and RUL prediction in complex systems like energy, manufacturing, and healthcare. Specifically, I am interested in fusing engineering-specific domain knowledge with cutting-edge ML techniques to design powerful and interpretable data-driven solutions.

Skills

Research Areas Engineering-Informed Machine Learning / Deep Learning, Statistical Modeling, Data Analytics, Prognostics

Statistical Models Bayesian Neural Network, Hierarchical Bayesian Model, Gaussian Process, LSTM, Markov Chain Monte Carlo, Deep Survival Model, LLM (BERT, Llama 2 7B, Mistral 7B)

Programming Python (PyTorch, TensorFlow, Scikit-learn, Huggingface, SciPy), R, SQL, Matlab, AWS Sagemaker, Stan

Education

University of Wisconsin-Madison   *Wisconsin, US*
Ph.D. in Industrial and Systems Engineering (Expected Graduation: Summer 2025) | 4.0/4.0   *September 2020 - Current*
- Lab for System Informatics and Data Analytics (Advisor: Professor Kaibo Liu)
- Ph.D. Minor in Computer Science

University of Wisconsin-Madison   *Wisconsin, US*
M.S. in Statistics | 4.0/4.0   *September 2023 - May 2024*

Korea University   *Seoul, South Korea*
Bachelors in Business Administration and Statistics | 4.22/4.5   *March 2014 - August 2020*
- Leave of Absence due to military service (2015 - 2016)

Work Experience

Amazon.com   *Wisconsin, US*
Applied Scientist Intern, Amazon Pharmacy   *May 2024 - August 2024*
- Developed a drug utilization review (DUR) prioritization/filtering ML model using **AWS Sagemaker** in the Amazon Pharmacy Science Team. **Deprioritzed 65.20% of DUR conflicts**, which **decreased average time spent in DUR by 45% and annual cost savings of $63k per pharmacist**.
- Led discussion sessions with pharmacists and stakeholders, and improved the model based on feedback and requirements.
- Used **few-shot prompting** with LLMs to facilitate in-context learning of DUR categories.
- Facilitated shadowing sessions with pharmacists to learn the current pain points of the DUR process. Delivered suggestions to streamline the DUR process and strategies for future growth.

University of Wisconsin-Madison   *Wisconsin, US*
Graduate Research Assistant   *September 2020 - Current*
- Developed an integrated uncertainty quantification model using **Bayesian Deep Survival Models** to propagate modeling uncertainties in event and longitudinal data, **resulting in an average 59% decrease in RUL prediction errors** (Paper 1)
- Designed a data-driven solution for modeling the progression of void swelling in irradiated materials using a **Bayesian Hierarchical Piecewise Linear Model**, **resulting in average 18% decrease in MAE, and 25% in MAPE** relative to other data-driven methods (Paper 2)
- Created a Bayesian sensor selection model with **Bayesian spike-and-slab priors**, **increasing the F1 score from 0.56 to 0.98** (Paper 3)
- Other contributions include: ML model for critical heat flux prediction (Paper 4), UMAP for failure mode identification (Paper 5), Deep learning model for multi-type data (Paper 6)

Publications

Published or Accepted Papers

1 **Ye Kwon Huh**, Minhee Kim, Kaibo Liu, and Shiyu Zhou "An Integrated Uncertainty Quantification Model for Longitudinal and Time-to-event Data", to be published in *IEEE Transactions on Automation Science and Engineering*, 2024
2 **Ye Kwon Huh**, Minhee Kim, Katie Olivas, Todd Allen and Kaibo Liu, "Degradation Modeling using Bayesian Hierarchical Piecewise Linear Models: A case study to predict void swelling in irradiated materials", to be published in *Journal of Quality Technology*, 2024

Submitted Papers

3 **Ye Kwon Huh**, Kaibo Liu, "A Bayesian spike-and-slab sensor selection approach for high-dimensional prognostics", submitted, *IEEE Transactions on Automation Science and Engineering*, 2024
4 Bruno P. Serrao, **Ye Kwon Huh**, Eliot Ciuperca, Elvan Sahin, Kaibo Liu, Juliana Pacheco Duarte "A Quantitative Analysis of ATF Surface Characteristics on Critical Heat Flux using Machine Learning", Under Review, *Nuclear Engineering and Design*, 2024
5 Ying Fu, **Ye Kwon Huh**, and Kaibo Liu "Degradation Modeling and Prognostic Analysis Under Unknown Failure Modes", under-review, *IEEE Transactions on Automation Science and Engineering*, 2024

Papers Under Preparation

6 **Ye Kwon Huh**, Ying Fu, Kaibo Liu, "An uncertainty-informed neural network-based prognostic model for multi-type data", 2024

Achievements

2023   **Travel Scholarship**, Student Research Grants Competition, University of Wisconsin-Madison

2022   **2nd Place**, SIG Wisconsin-Madison Ph.D. & PostDoc Brainteaser

2020   **Chancellor's Opportunity Award**, University of Wisconsin-Madison