SEULKI HAN - CURRICULUM VITAE

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EDUCATION

Ph.D., University of Connecticut, Chemical and Biomolecular Engineering   Aug 2019 - Current
Advisor: Dr. George M. Bollas
Thesis:

M.S., Incheon National University, Energy and Chemical Engineering   Mar 2015 - Feb 2017
Advisor: Dr. Jiyong Kim
Thesis: Multi-scale optimization for the design and operation of complex renewable energy systems

B.S., Incheon National University, Energy and Chemical Engineering   Mar 2011 - Feb 2015

SKILLS

Software	Microsoft Office
Programming	MATLAB, GAMS
Software/Algebraic modeling language	ALAMO, GPTIPS, GAMS
Mathematical Programming/Optimization	Linear programming, Integer programming, Nonlinear programming
Machine learning/AI	Classification, Regression, Clustering, Dimensionality reduction, Feature engineering, Genetic programming, Neural networks Natural language processing
Data analytics	Data analysis, Data visualization, Data mining
Energy system analysis computer model	SAM, iHOGA, HOMER

TEACHING EXPERIENCE

Teaching Assistant   Aug 2019 - May 2020
University of Connecticut   *Storrs, CT, USA*

- Fluid Mechanics / a semester as teaching assistant for this course
- Advanced Process Control / a semester as teaching assistant for this course

Teaching Assistant   Aug 2016 - Dec 2016
Incheon National University   *Incheon, Korea*

- Chemical Reaction Engineering / a semester as teaching assistant for this course

RESEARCH EXPERIENCE

Graduate Research Assistant   Aug 2019 - Current
University of Connecticut   *Storrs, CT, USA*

- Developed machine-learning models for tool wear diagnostics, tool wear prognostics, and RUL prediction in precision machining
- Evaluated the impact of multi-sensor signals, multi-domain feature fusion, and data dimensionality on the improvement of accuracy in tool condition monitoring
- Developed physics-informed symbolic regression using genetic programming and improved model accuracy in predicting tool wear

Research Assistant   Nov 2014 - Feb 2017
Incheon National University   *Incheon, Korea*

- Developed an optimization-based decision-making model for the design and operation of a renewable energy supply system
- Generated renewable-based energy superstructure, which produce different energy (electricity, hydrogen, and fuels) using various sources (wind, solar, biomass, and carbon dioxide)
- Evaluated the impact of meteorological change, energy storage, and demand structure on the renewable energy supply system.

WORK EXPERIENCE

Researcher Mar 2017 - Jun 2019
Innovation Center for Chemical Engineering *Incheon, Korea*

I) Carbon Utilization

- Proposed an optimization-based framework for the systematic analysis and evaluation of carbon utilization strategies, in particular, energy production from coke oven gas
- Developed process model of technologies involved in carbon utilization systems using process simulator (ASPAN) to estimate technical and economic parameters, based on design specifications and normal operation conditions of the technologies
- Developed optimization models to assess carbon utilization strategies with four criteria: product quantity, energy consumption, production cost, and profit
- Evaluated the optimal strategies comparatively for the production of different types of energy chemicals to satisfy different technical and economic objectives

II) Water-Food-Energy Nexus

- Proposed a comprehensive decision model for the integrative design of a biorefinery for bioethanol production and its supply chain (BPSC) under the water-energy-food-land (WEFL) nexus framework
- Developed an optimization model using mixed integer linear programming to identify the optimal process configuration of a bioethanol production plant and the optimal bioethanol supply network
- Evaluated two scenarios of BPSC by cost and nexus optimizations in terms of various aspects such as involved technology type, energy supply cost, energy consumption, etc.

PROJECTS

- **Manufacturing diagnostics, prognostics and health management**, Air Force Research Laboratory, Materials and Manufacturing Directorate (AFRL/RXMS), USA (May 2020 - Current)
- **Energy Management Systems for Subtractive and Additive Precision Manufacturing**, CESMII-The Smart Manufacturing Institute, USA (Aug 2019 - May 2020)
- **Optimization-based decision-making model for residue gas utilization**, Korea Research Institute of Chemical Technology (KRICT), Ministry of Science and ICT (MSIT), Korea (Jan 2018 - Jun 2019)
- **Engineering education system of integrated design by case based plant process and safety**, Korean Evaluation Institute of Industrial Technology (KEIT), Ministry of Trade, Industry and Energy (MOTIE), Korea (Oct 2016 - Jun 2019)
- **Development of a decision support model for design of multi-scaling based energy systems**, National Research Foundation of Korea (NRF), Ministry of Science and ICT (MSIT), Korea (Nov 2014 - Apr 2017)

PEER REVIEWING

- Reviewed for Journal: Computers and Chemical Engineering
- Reviewed for Conference: International Conference on Control, Decision and Information Technologies (CoDIT)

PATENTS

- Han, S. (2021). Republic of Korea. Patent Number 10-2203502. "Method and server for estalishing optimization-based carbon utilization strategy"

PUBLICATIONS

- **Han, S.**, Awasthi, U., and Bollas, G. M. Physics-informed symbolic regression for PHM: recursive model for predictive maintenance in manufacturing. (In preparation)

- **Han, S.**, Pattipati, K. R., and Bollas, G. M. Surrogate model-based tool wear prognostics and remaining useful life prediction in precision machining. (In preparation)

- Mishra, D., **Han, S.**, Pattipati, K. R., and Bollas, G. M. (2023). Explainable Symbolic Regression Model for Tool Wear Diagnosis. 9th 2023 International Conference on Control, Decision and Information Technologies, CoDIT 2023, 2139–2144.

- **Han, S.**, Yang, Q., Pattipati, K. R., and Bollas, G. M. (2022). Sensor selection and tool wear prediction with data-driven models for precision machining. Journal of Advanced Manufacturing and Processing, 4(4).

- **Han, S.**, Mannan, N., Stein, D. C., Pattipati, K. R., and Bollas, G. M. (2021). Classification and regression models of audio and vibration signals for machine state monitoring in precision machining systems. Journal of Manufacturing Systems, 61, 45–53.

- You, C., **Han, S.**, and Kim, J. (2021). Integrative design of the optimal biorefinery and bioethanol supply chain under the water-energy-food-land (WEFL) nexus framework. Energy, 228, 120574.

- **Han, S.**, and Kim, J. (2019). A multi-period MILP model for the investment and design planning of a national-level complex renewable energy supply system. Renewable Energy, 141, 736–750.

- **Han, S.**, Kim, S., Kim, Y. T., Kwak, G., and Kim, J. (2019). Optimization-based assessment framework for carbon utilization strategies: Energy production from coke oven gas. Energy Conversion and Management, 187, 1–14.

- Cho, S., Won, W., **Han, S.**, Kim, S., Youa, C., and Kim, J. (2018). An optimization-based design and analysis of a biomass derived hydrogen energy system. Computer Aided Chemical Engineering, 44, 1573–1578.

- **Han, S.**, and Kim, J. (2017). Optimization-based integration and analysis of a complex renewable energy system for the transportation sector. Chemical Engineering Research and Design, 128, 1–14.

- **Han, S.**, and Kim, J. (2017). An optimization model to design and analysis of renewable energy supply strategies for residential sector. Renewable Energy, 112, 222–234.

- **Han, S.**, Won, W., and Kim, J. (2017). Scenario-based approach for design and comparatively analysis of conventional and renewable energy systems. Energy, 129, 86–100.

PRESENTATIONS

- **Han, S.**, Mishra, D., Pattipati, K. R., and Bollas, G. M. (2024). Symbolic regression-based hybrid models for a manufacturing process, 10th International Conference on Control, Decision and Information Technologies (CoDIT), Valletta, Malta.

- Mishra, D., **Han, S.**, Pattipati, K. R., and Bollas, G. M. (2023). Explainable Symbolic Regression Model for Tool Wear Diagnosis, 9th International Conference on Control, Decision and Information Technologies (CoDIT), Rome, Italy.

- **Han, S.** and Bollas, G. M. (2021). Regression Model for Tool Wear Monitoring in Precision Machining, AIChE, Boston, MA, USA.

- **Han, S.**, Maloney, T., and Bollas, G. M. (2020). Machine Learning Approach for Tool Condition Monitoring in Manufacturing Systems, AIChE, Virtual Meeting, USA.

- **Han, S.** and Kim, J. (2019). An optimization model for design and analysis of land-water-energy-food nexus in a bioethanol supply chain, KIChE, Jeju.

- **Han, S.**, Kim, S., Kim, Y. T., Kwak, G., and Kim, J. (2018). MILP model for assessment and anlyais of carbon utilization strategies: Application to residue gas utilization, KIChE, Daegu, Korea.

- **Han, S.** and Kim, J. (2016). MILP model for technology integration and investment planning of a complex renewable energy system, KIChE, Busan, Korea.

- **Han, S.** and Kim, J. (2015). An optimization-based investment planning for a complex renewable energy systems, KIChE, Ilsan, Korea.

- **Han, S.** and Kim, J. (2015). Optimization-based analysis of a complex energy superstructure, International Conference on Chemical and Polymer Engineering (ICCPE'15), Barcelona, Spain.

- textbfHan, S. and Kim, J. (2015). Optimization-based analysis of a complex energy system using renewable energy sources, KIChE Jeju, Korea.

- **Han, S.** and Kim, J. (2014). Design and life-cycle- cost analysis of scenario-based energy supply system for transportation sector, KIChE, Daejeon, Korea.

HONORS & AWARDS

Pratt & Whitney Advanced Systems Engineering Fellowship	2024
Pratt & Whitney Advanced Systems Engineering Travel Fellowship	2024
Predoctoral Travel Award, University of Connecticut	2024
Best Oral Presentation Award, KIChE conference	2019
Graduate Academic Scholarship, Incheon National University	2016
Graduate Academic Scholarship, Incheon National University	2015
Undergraduate Academic Scholarship, Incheon National University	2014
Undergraduate Academic Scholarship, Incheon National University	2013
Undergraduate Academic Scholarship, Incheon National University	2012

CERTIFICATIONS

DeepLearning.AI TensorFlow Developer   2024

PROFESSIONAL MEMBERSHIPS

American Institue of Chemical Engineers (AIChE)
IEEE